A new paradigm for a humane and ecological civilization

“We have it in our power to begin the world over again”, as Thomas Paine wrote in 1776, but we also have it our power to kill the planet. Which one will we choose? Much of our choice depends on what kind of economy we have – one that is ecologically sustainable into the indefinite future, vs. the one we have now that gives profit-obsessed corporations overwhelming decision-making power.

As John Feffer wrote recently:

“The global economy remains market-centered, even though the evidence has been mounting that these markets are failing us and the planet. Tweaking this model isn’t good enough. We need a new Copernicus who will provide a new theory that fits our unfolding reality, a new environment-centered economics that can maximize not profit but the well-being of living things.”

Copernicus, the 16th century astronomer who first proposed a framework for understanding that the planets revolve around the sun, was the main subject of the philosopher Thomas Kuhn’s groundbreaking book, “The Structure of Scientific Revolutions”, in which he elaborated the idea of a ‘paradigm’. A paradigm is a set of interconnected ideas that have a logical cohesion, so that even if some of the ideas fail, the whole maintains its capacity to explain and make sense of a part of reality. There may also be many ‘anomalies’, as Kuhn called them, which can be covered up by ‘tweaking’.

Kuhn’s focus of study, scientific revolutions, centered around the process of moving from an accepted paradigm to a new one. In fact, as he argued, people don’t move off of their world view – or give up on conventional wisdom, as John Kenneth Galbraith referred to it – unless there is an alternative that they perceive to be better. That is why it is crucial that we find a better alternative to today’s dominant economic paradigm, neoclassical economics.

Any economic paradigm will inevitably have a political agenda. In the case of neoclassical economics that agenda is hiding in plain sight: its overwhelming motivation is to argue that the less the government intervenes in the economy, the better (Keynes created an exception to this rule). In addition, it generally seeks to justify the current distribution of wealth and income. In other words, it is the intellectual core of modern day conservatism, both conventional and neoliberal.

Partly as a result of this paradigm, many of our systems are run to maximize short-term profits, not long-term efficiency. The public health system has been continuously starved of funds and has been denied the extra capacity that a resilient system would possess. As government in general is cut back, violence escalates and the only sectors of the state that are given free reign are the military and police, who often fill in for inadequate social services. The industrial base has been slipping away for decades, not because it was unprofitable, but because it was more profitable to outsource – and the effect was, first, to impoverish communities of color, and secondly, to destroy the economies of white working class communities, leading to a neofascistic reaction and the election of Donald Trump. Worst of all, maximizing profits has meant maximizing greenhouse gas emissions, which are more profitable than sustainable options, while huge swaths of irreplaceable forests are torn down in order to make cheaper hamburgers.

Without a new economic paradigm, the Left is left with trying to tweak a collapsing system. Each of these problems is addressed separately, with no or little capacity to gain from interlocking solutions. The big questions of economic growth and the health of the economy are left to the ‘experts’, who counsel patience while the market allegedly does its magic.

Just as premodern astronomers mistakenly thought that the universe revolves around the Earth, neoclassical economics argues that the economy revolves around the markets and exchange. Just as we now know that the planets revolve around the Sun, we need to understand that the economy revolves around the production of wealth by governments, ecosystems, and manufacturing. The market can only exchange that which has been produced. Had a perfect market system been set up in ancient Rome, it would not have led to a modern economy. Only technological advances in manufacturing and the construction of modern infrastructure by governments has made the construction of a modern economy possible. We have been blindly extracting the riches of nature and using its services, but now we have the science to understand how to redesign the global civilization in concert with nature so that our human ecosystems will not collapse as other civilizations have in the past.

When governments are democratically elected, a paradigm centered on production can put people at the center of an economic system instead of profits. Governments controlled by ‘we the people’ can reconstruct the economy in such a way that everyone can enjoy ‘life, liberty, and the pursuit of happiness’; or put another way, to quote another ‘founding father’, we can construct a society in which everyone is ‘healthy, wealthy, and wise’. Technology has created such powerful forces that the public will have to choose a set of plans to reconstruct the economy by building new infrastructure systems that work with nature, instead of against it. This in turn means that engineers and scientists should have more to say about economic policy than neoclassical economists; but whatever plans they come up with must be both comprehensive and comprehensible to the public, because the pushback against the construction of a sustainable society will be so intense that only an enthusiastic public will be able to push through such an agenda.

Ideally, this process of reconstruction will be encouraged by the democratization of the firm. If companies are owned and operated by their employees, they will clearly put the needs of people before profits, and such firms would support a program of reconstruction instead of opposing it.

Democracy can be viewed as an example of humans recreating the cycles that exist in ecosystems that make their functioning possible. Economies can be viewed as a kind of ecosystem, and by doing so we can see how to integrate human ecosystems into natural ones. But in order to do so, we need to change the way systems are used in economic thinking.

Neoclassical economics developed in the late 19th century, at a time when physics was developing, and in particular, a field called statistical mechanics. The excitement over this field was that it was now possible to explain the behavior of systems of a huge amount of elements, like the molecules of water in a system of pipes or the molecules of various gases in a container. Writers like Alfred Marshall and Leon Walras used the mathematical models of statistical mechanics to add to the classical economists, mainly David Ricardo, to form a synthesis called neoclassical economics. The problem is that the model assumes all the elements, in this case firms, are basically the same and have very little power over the market. That means that there is no difference between a manufacturing firm and a tourist firm as far as an economy is concerned, and it also makes it difficult to figure out why there is a growth in firms, since everything is supposed to stay the same – in fact, technology is assumed to not change, as the economy is modelled as occurring as a sequence of short-term events.

To make matters worse, one of the main ideas retained from Ricardo is the idea of diminishing returns, that is, as one factor of production increases, say land, the returns from that factor diminish. This idea was used by John Bates Clark and others at the turn of the century to argue that everyone receives income according to how they benefit the economy. Clark explicitly used this idea to try to counter Marx, who wanted to construct a society to do just that. But it also meant that it was basically impossible to explain economic growth, since you can’t explain how something increases if your only tool is explaining how things decrease. When Robert Solow elaborated the modern theory of economic growth in the 1950s, he could only account for about 20% -- and even that is suspect if you don’t believe that everyone receives that which they put into the economy.

I always thought that the theory of economic growth was the Achilles heel of neoclassical economics – there have been virtuouso attempts to explain growth statistically, but these attempts do not use any theoretical causation. Still, economists are happy to argue that free trade, or privatization, or deregulation or lower taxes will lead to greater economic growth, even though there is virtually no theoretical justification for their statements. Economic growth is the most spectacular process that occurs in modern economies, so not having a coherent theory is like arguing that physics is a science if it couldn’t explain the movement of the planets.

The economic growth we have been experiencing since the 1970s, however, has had two deleterious effects: it has mostly gone to the top 1%, and it is leading to ecological catastrophe. If we take a different approach to how systems work in economies, however, we can see how to attain economic growth that will benefit the 99% and will allow us to live gently on the planet.

At the same time that neoclassical economists were plumbing the depths of statistical mechanics, another revolution was going on in biology, the Darwinian revolution. This also included inventing the field of ecology, whose dynamics depend to some extent on evolution, and also took advantage of Darwin’s method of looking at ecosystems as sets of interconnected organisms. What developed from this path of study was the concept of the ecosystem being composed of a set of functions, called niches, that were occupied by different kinds of organisms in different ecosystems, but generally did the same sorts of things.

These sets of niches can be further organized into what is called trophic levels, that is, plants such as grass and trees form the primary producer level, herbivores like dear eat these plants to form the primary consumer level, carnivores like bears then eat the herbivores to form the secondary consumer level, and then recyclers like worms and fungi break down the dead matter from all these levels to form the detritivore level.

It is this last level, the detritivore level, that makes it possible for ecosystems to thrive for long periods of time by closing the circle of the ecosystem so that the production of the ecosystem does not overwhelm the ecosystem and choke it, the way algae can choke a pond if they get out of control – or the way humans are upending the climate by pumping it full of greenhouse gases. Ironically, it is the inability of ecosystems 300 million years ago to do this recycling on the new organic innovation of trees, that led to the creation of the coal that is now part of the cause of global warming. But humans are also tearing down ecosystems and destroying them by extracting resources to use as input to their production system. If we are to live on this planet this input should come from either renewable sources, like the Sun in natural ecosystems, or from the output that is recycled, as soil is made up of the breaking down of trees.

If we dig deeper we can see that an economy is an ecosystem because it also has the equivalent of trophic levels, like ecosystems, and is made up of functional niches, and this can help us explain economic growth. At the outermost level, the economy produces goods and services that the people consume, the consumer level. On the next level down, firms produce the industrial machinery that is used to produce consumer goods, which we can call the production machinery level. At the center of our human ecosystem sits certain classes of industrial machinery that very few people are familiar with now, that collectively are used by skilled workers to either make more of these kinds of machinery or more of the production machinery that is then used to make goods and services. These I call reproduction machinery, and they have a very special place in the economy.

For instance, machine tools are used to make the metal pieces of all machinery, including machine tools and production machinery. Steel-making equipment is used to make steel, which is then input into machine tools to make more steel-making equipment, or to make more machine tools, or to make a huge range of steel products. The same applies to electricity-generating equipment, which we want to shift from coal-run steam turbines to wind turbines, for instance. Then there is the semiconductor-making equipment that is used to run most machinery digitally.

When there are technological improvements in this reproduction machinery, the effects reverberate out to the rest of the economy, and whole eras are born. The invention of steel and electricity turbines created what is often called the second Industrial Revolution, and improvements in machine tools enabled the creation of Henry Ford’s assembly line and the era of mass production. Of course, the development of semiconductors led to computers, the internet, and the mobile device. All of these niches together form what are called positive feedback loops of innovation, within the levels and between them, that power economic growth.

Further, just as an ecosystem is composed of niches that all reside in the same geographic area, so these virtuous circles of technological innovation and reproduction perform better when they are closer together. In other words, it is devastating for an industrial economy to have its manufacturing and machinery industries ripped apart and sent overseas, the way the U.S. has done. Economies that have a full suite of industries – Germany, Japan, now China – have growing middle classes and in the case of China, is probably the most powerful country in the world, while the U.S. continues to decline, as it loses more and more industrial machinery and manufacturing industries.

Ironically, Alfred Marshall had a much better understanding of these processes than most of his successors. He conceived of prices in terms of what I would call trophic levels – what was available at the consumer level, what a factory could increase with machinery on hand, and what it could do with new machinery – he talked about the evolution of technology, and he eventually wrote about industrial districts, the advantages of many industries cohabitated in the same area. Thorstein Veblen wrote about the Industrial Arts, as he put it, and the possibility of soviets of engineers, who he thought should have a greater voice in economic affairs. After WWII, Seymour Melman wrote about the importance of worker control on the shop floor and explained how the military industrial complex and finance were destroying the manufacturing competence of the country, with catastrophic results. John Kenneth Galbraith wrote about the ‘New Industrial State’, how the state was an important factor in the industrial underpinnings of the economy.

The idea that manufacturing is central to the economy has even deeper roots in American thinking, beginning at the start of the Constitutional period when Alexander Hamilton argued that the new Federal government needed to encourage ‘infant industries’ and use tariffs to protect emerging American industries. This coincided with a decades long debate about ‘internal improvements’, as infrastructure was called, with the South afraid that a strong Federal government building capacity would empower the Feds to end slavery. Lincoln and the first Republicans used these ideas to set the stage for the blossoming of American industry, which was helped along at various times by new infrastructure systems like water projects, dams, and road systems. The Great Depression became a New Deal partly by building much of the infrastructure that is now falling apart. Infrastructure building is at the intersection of government and the creation of wealth. The virtuous circle of manufacturing and infrastructure building created a thriving middle class, until the destruction of this process by the takeover of neoclassical economics, multinational corporations and globalization led us to the multiple systems breakdowns that we are experiencing now.

But how do we rebuild this manufacturing ecosystem while making the economy more equal and saving the planet? I’ve been developing a Green New Deal plan for several years which we can use as an example of how the government planning about 20% of the economy would guarantee a more just and sustainable society.

Since the Interstate Highway System was probably the largest public works project in human history, let’s say we would build – and by we, I mean the government – an Interstate Renewable Electricity System that would strategically place wind and solar farms around the country, mostly in the Great Plains, so that there would always be enough wind blowing and enough sun shining somewhere to fill all our energy needs. Note that the market cannot do this because it cannot create such a large system (it would work even better if it extended to Mexico and Canada).

Now that we have a sustainable source of power – using the same solar energy that ecosystems use -- we can construct many other systems. An Interstate High-Speed Rail System could use that electricity and replace most air travel, and if it carried freight it could replace long-distance trucking. Manufacturing would use renewable electricity, but that would mean a fair amount of swapping out old machinery for new machinery (which is going on constantly in a healthy industrial system). The new machinery could also be designed to remove all air and water pollution and ensure worker health and safety. Most critically, in order to create a circular economy the way ecosystems are circular, the machinery could output products that could be recycled or reused, thus avoiding the need for most mining, which is the cause of much of our ecosystem destruction.

The current progressive model for making this happen is to lean on regulation, that is, mandate that companies reach a particular goal at a particular time. However, considering the resistance this would entail, and more importantly the amount of financial capital this would require, it would be much more straightforward if the Federal government simply paid for all this new equipment. The resultant products would be cheap, because the equipment would be free, leading to a higher standard of living and erasing our trade deficit because they would be cheaper than imports. The government could trade this money for equity in the firm, which it could then hand over to employees and bring us closer to a worker coop ownership model. The government could also perhaps receive income from their investment, or some combination.

The same model could be used to convert the other main pillar of production, agriculture. Agriculture accounts for about 1/7th of greenhouse gases, pollutes the water, and is in the process of destroying the soil that is the basis of all plant life. In addition, the crowded and unhealthy way livestock are raised greatly increases the risk of a new pandemic. So the government could buy all the equipment needed to convert to organic, artificial-fertilizer-free, sustainable livestock regenerative agriculture, including buying land for farmers near and in cities and towns. A new Civil Conservation Corps, similar to the one in the New Deal, could restore ecosystems around the country.

Government planning and ownership could also overcome several problems at once by constructing enough large, comfortable apartment buildings to create dozens of walkable neighborhoods. The cost of housing would go way down, thus increasing the standard of living, the practicality of transit would increase, since you need a certain level of density for transit to work, and that would mean most transportation would be electric. People could use bikes and walk more, increasing health outcomes. The civil engineers at StrongTowns.org have been arguing that suburbia is economically unsustainable because of the expense of spread out infrastructure, and densifying those areas would put our fiscal house in order as well.

For those who would still want cars – and if walkable neighborhoods were affordable and comfortable, that particular requirement might melt away – the government could provide large subsidies to buy electric cars, and the Interstate Renewable Electricity System could extend down to the house, allowing people to lease solar panels and electric charging stations so that they could benefit from the lower operating costs of electric cars.

This model could be extended to the entire planet if the rich countries provided the poorer countries with the green industrial machinery, so that they could construct their own sustainable production systems, in return for which the poorer countries would protect their ecosystems and retreat from them whenever possible. For example, much of the trade in wildlife meat that has caused the recent diseases such as Covid-19 have been the result of people who were formerly able to survive from farming being forced to trade wildlife instead.

All of this rebuilding would require a large-scale retraining and updating of the skills of tens of millions of Americans, so that the educational system would have to be reconfigured to upgrade the skill level of the United States. This is what the original public college and school systems did, but we need to extend this model so that there is lifelong learning, starting at birth, with more technical schools available, all for free. Anchoring this system could be an Interstate High-Speed Internet System, that would provide better, faster service, either for free or at reasonable prices, with a certain amount of storage and processing on the web (on the cloud).

The outcome of all these systems, designed with all the other ones in mind, is that many positive outcomes *emerge* from the system. The health of the population could improve to such an extent that a Medicare for All or National Health Service system would be much more affordable, since the food would be healthier, pollution would be eliminated, and people would walk and bike more (and might not be subject as much to the death and destruction wrought by cars). The causes of global warming would disappear. Ecosystem destruction would stop as we retreat from ecosystems and stop deforestation and mining. The financial system could be overhauled to emphasize public banking, as Ellen Brown has argued, and to allow the Federal government to create the investment money to build these systems, as Stephanie Kelton and other MMT advocates have explained.

But the most politically attractive aspect of a plan such as this would be the number of good jobs that would be generated. That is, there would be enough long-term, high-skill, well-paid jobs that all unemployment and even all underemployment and undesired part-time work would be eliminated. A Federal Jobs Guarantee could be put in place on top of this to insure that nobody would have to worry about finding a job. The demand for labor would be so great that the balance of power between employers and workers would shift decisively towards workers.

Economic growth would not destroy the planet, the way it is doing now, because the inputs and outputs would be clean and circular, like a natural ecosystem. So where would growth come from? It would not come from expanding suburbs, building huge McMansions, ever bigger SUVs, and ever cheaper burgers, which is where perhaps most of the ecological destruction that comes from economic growth is concentrated. The production system naturally constantly increases in productivity because engineers and skilled workers are constantly tweaking the machinery, and sometimes inventing whole new categories of machinery, without using more resources (Seymour Melman and I calculated that manufacturing productivity increases by about 3% per year owing to this underlying technological process). Growth would be mainly caused by improvement in quality, not increases in quantity.

Growth would be equitably distributed because national planning could guarantee that every part of the country gained employment equally. For instance, according to my calculations each Congressional district could have 10 1,000 person new factories, and 100 new 250-unit apartment buildings. The workers for these could be mandated to represent their community, thus insuring that communities of color would gain the benefits of employing all their residents. Workers in fossil fuel industries could be guaranteed new, equivalent jobs in other industries because that could be part of the national plan. The same could be done for workers in military industries, thus giving the political space to use the military budget for civilian goods. Everyone would get a good education, and could look forward to advancing their career, if they so chose. The surplus from all this economic activity could be put into other social welfare goals, such as doubling Social Security and providing real elder care. The benefits should be clear to 99% of the public – of all communities, genders, orientations, abilities.

I hope I have shown that it is possible to conceive of a different and more useful way of looking at the economy. By reorienting the economy to revolve around the government-led, manufacturing-centered and sustainable creation of wealth, we can reconstruct the broken systems that are causing so much misery and distress. But to achieve this, a vast majority of the public has to understand the benefits of this new economy, and work to elect governments that will create the new world that Thomas Paine envisioned. This has to be a truly democratic scientific, economic, and political revolution.