

The pace of the transition to an environmentally sustainable economy

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In watching the reaction of advocates and experts to the Supreme Court's decision in *EPA v. West Virginia*, I was struck by their dismay that the EPA would no longer be able to implement rapid sweeping change in the

nation's energy system. I have a little news for these experts: the EPA was never going to be able to quickly decarbonize the economy. It was always going to be a slow and gradual process. In Lisa Friedman's [New York Times](#) piece last week about the EPA's new approach to greenhouse regulation, she reported that:

"...The federal government's piecemeal approach, which is still taking shape, could make it tougher to achieve its goals, many observers said. Power plants that burn [fossil fuels](#) are one of the single largest contributors of carbon dioxide to the atmosphere, which is rapidly warming the planet. The Supreme Court's 6-3 decision, which concluded that the E.P.A. lacks broad authority to transform the nation's electrical system away from fossil fuels... did not strip the E.P.A. of its authority to regulate greenhouse gas emissions, but it allowed only narrower policies to regulate how individual [power plants](#) operate... *That means the administration's backup strategies are not likely to spur a rapid metamorphosis to clean energy unless the administration acts quickly and aggressively, experts said.*" (Emphasis added)

There will be no "rapid metamorphosis." It took Pearl Harbor and the threat of Nazi Germany in World War II to rapidly modernize and convert the U.S. economy, and even with FDR's political skill, it was still a close call. The complexity of our energy system and our deep dependence on energy meant the transition would never be rapid and sweeping. This lack of realism is built on a weak understanding of the pace of social, cultural, organizational, technological, and [economic change](#). While the rate of change isn't quick, the transition to environmental sustainability will happen, and the gradual process of change is already underway.

Economic and technological change has been proceeding since the dawn of civilization, but it has increased in speed over the past two centuries. Still, the pace is gradual and often invisible while it is underway.

America's transition from a manufacturing to service economy was invisible to many while it was advancing. A sustainable, renewable resource-based economy is both possible and necessary. It will require a process that will take decades to complete.

A careful, parsimonious approach to the use of physical materials that limits waste will make a production process more efficient and lower priced. We saw this when Total Quality Management reduced manufacturing waste and improved product quality in post-war Japan. In the 1950s and 1960s, "made in Japan" signified a low-quality product. By the 1980s, Japanese autos and electronics had developed a reputation for high quality and high value. As technology continues to develop, energy efficiency and renewable energy will beat other forms of energy on price, convenience, and efficiency. If we maintain a regulatory structure that punishes companies that release poison into the environment, the effort to reduce the risk of environmental liability will also result in cleaner production processes. Cities are being retrofitted for sustainability with sewage treatment and other infrastructure being designed to reduce our environmental impact.

Modern economic and [social life](#) has become less based on brawn than on brains. That means that potentially more and more attention will be paid to growing our economy while reducing damage to the planet. The companies that mine minerals and manufacture material goods, like fossil fuel and steel companies, command far less economic power than companies like Google, Amazon, and Microsoft. Ultimately this [economic power](#) will translate to political power, some of which will be devoted to ensuring free trade, immigration, and environmental protection—all policies that benefit these companies and their employees. The fossil fuel industry has an interest in burning oil; Amazon and Walmart need energy but have no reason to prefer fossil fuels to renewables. And based on all those [solar arrays](#) on the roofs of Walmarts, I suspect they've figured out the cost advantage of solar

energy.

There are at least six main stages of the transition to a renewable resource-based economy, and some will begin before others are completed. First, the theoretical or conceptual design of the transition must be fully articulated and understood. That phase is now underway. More and more people understand that we can't continue with a linear economy where every material we consume produces a waste that ends up in a dump. The concept of a circular economy is becoming better known and understood.

A second phase is to attract capital to the [green economy](#). The SEC climate disclosure rule now being proposed will be fought by some conservatives but should prevail since it's the job of the SEC to ensure corporate transparency for investors, and more and more investors are asking about environmental risk. Several non-governmental organizations have developed sustainability metrics, but this is too important an effort in governance to leave to the private sector. Government must ensure that these metrics are developed and carefully audited when applied. We are already seeing the development of the field of sustainable investment. Over 90% of Standard and Poor's top 500 companies are issuing environment and social governance reports this year, and the size of green investments continues to grow. These are all clear indications that this phase is underway. By the mid-2030s, I suspect this will be a mature element of the world of capital finance.

A third phase is development of public capital for green infrastructure. The \$1.2 trillion Biden infrastructure bill in 2021 included over \$300 billion for public green investment—the largest single investment in environmental infrastructure in American history. Both California and New York have issued green bonds to provide capital for public green infrastructure investment. This phase will take several decades to build momentum. The anti-tax and anti-investment ideology of the extreme

right has been building momentum from the Reagan years to the Tea Party to the Trump administration. These days we can't even raise the capital needed to repair bridges that are falling down, so green investments will need to be coupled with user fees whenever possible to retire debt. New York City's third water tunnel is an example of green infrastructure funded by water user fees. Infrastructure that directly generates revenues will be more readily constructed.

A fourth phase is the development of technology supporting an economy that grows without damaging the planet. This requires basic research funded by government and tax credits and deductions for corporate research and development. There are a number of technologies we need to develop: Our current form of waste recycling is woefully inadequate. Home sorting of waste is a good educational exercise, but little more. It is inefficient and often ineffective. We need to apply artificial intelligence and robotics to waste sorting and mining. Garbage must be a major source of resources in the future. We need to make food waste into fertilizer and mine garbage for plastics, metals, and all forms of material resources. We also need to improve and shrink solar cells with nanotechnology and improve [battery capacity](#) while reducing the toxicity of renewable energy technology. We need windows that serve as solar receptors and batteries the size of laptops that cost little and save solar and wind energy for periods without wind and sun. The current solar and battery technology beats fossil fuels in price, but not performance. The price needs to be way lower, and solar batteries need to work much better before they drive [fossil fuels](#) from the market. But all these technologies are coming.

This phase is well underway, and we are already seeing breakthroughs in new electric vehicle technologies. There are breakthroughs in battery technology. Other improvements have been incremental. Think of cellphones and laptops at the turn of the 21st century and compare them to what we have today. It has been a slow but steady process of

improvement.

The fifth phase is to develop the organizational capacity to utilize new technologies and to seamlessly integrate the behaviors needed to produce goods and services with the least possible impact on the environment. This is well underway. Companies like Land-o-Lakes are saving money by deploying agricultural practices that use as little water and chemicals as possible. Drones and satellites along with robotics and artificial intelligence are lowering the cost and reducing the environmental impact of farming. Many organizations are building the capacity to minimize their carbon and environmental impacts.

Finally, the sixth phase is to bring the organizational capacity, infrastructure, and capital needed to ensure widespread implementation, including the retrofitting of older facilities and elements of the built environment. This will be a gradual transition taking at least a quarter-century to complete—although elements of the old economy will persist for many more years.

Environmentalists and experts frequently question the "seriousness" of policymakers promising action on climate change. They look for big dramatic gestures and symbols to demonstrate "commitment." I understand the urge, but we need less drama and more low key, determined hard work. The good news is that [environmental sustainability](#) is a stage of economic development that is already underway. The bad news is that it will take a long time to get there, and we will see more damage along the way. We need to focus less on symbols and more on operational reality if we are to truly speed the process and reduce the long-term, irreversible damage to the planet.

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