Feature
Time to Put the Fossil-Fuel Industry Into Hospice
By Andrew J. Hoffman & Douglas M. Ely
What should we expect from a socially responsible fossil-fuel company in a world threatened by climate change? The answer is simple yet extremely challenging: Such a company and the executives who run it must devote their financial, technical, and political resources toward a just and orderly transition away from fossil fuels. In effect, leaders in the fossil-fuel sector must bring about the end of their industry as we know it.

How should we think about how to proceed? We suggest applying models adopted from the compassionate care of an individual, her loved ones, her caregivers, and everyone involved in the recognition of extreme, if not terminal, care. Society and the fossil-fuel industry face grave challenges. If humanity is to enjoy a stable environment at the end of this century, the fossil-fuel industry cannot continue. Its condition is terminal. Amid such a grim prognosis, three possible forms of treatment are available: triage, euthanasia, and hospice.

We present this assessment to provoke a discussion of a very real exercise as climate change. If we can address these questions, we can get a better glimpse of the awesome systemic challenge before us.

The Prognosis

The first step in the compassionate treatment of a terminal health condition is helping the patient and loved ones come to terms with the reality that the patient is very sick, is possibly dying, and needs extreme care. Three sets of considerations motivate a terminal prognosis for the fossil-fuel industry.

Acknowledging the full scope of the problem | Climate change is more than an environmental issue. It represents a systemic breakdown with widespread implications for life on this planet. This is not hyperbole—it is the assessment of leading scientists around the world, and this conclusion will forever change the nature of our economies. Human activity is increasing the atmospheric concentration of carbon dioxide, causing a 1°C rise in the average global surface temperature since preindustrial times, and we are struggling to contain continued warming to 2°C by mid-century. Such a temperature rise will lead to increased weather and climate instability, including droughts, wildfires, food insecurity, water scarcity, coastal flooding, disease proliferation, and social unrest.

Climate change is one of nine planetary boundaries that scientists have identified and warn that we cross at our own peril. These boundaries represent “thresholds below which humanity can safely operate and beyond which the stability of planetary-scale systems
cannot be relied upon.” These “key performance indicators” (KPIs) of the planet, as Lancaster University management professor Gail Whiteman calls them, are signaling danger. By exceeding the sustainable boundaries for land system use, pollutants (including plastics), nitrogen and phosphorous waste, and novel chemical releases, we are causing reduced rates of agricultural productivity, degraded marine ecosystems, and, most notably, increased rates of species extinction. This last impact, which scientists call the “sixth mass extinction,” could see half of the world’s current species disappear by 2100. Much as natural catastrophes extinguished the dinosaurs, viable species today are facing a similar catastrophe through human actions that are altering the planet’s ecosystems. In short, through the growth of our population and the economy that supports it, we now influence the biosphere in systemic ways that are unprecedented and that we do not fully understand.

Left unabated, climate change will likely cause global economic damage at an estimated present-discounted value as high as $22.5 trillion by 2100 in lost labor productivity, declining crop yields, food shortages, early deaths, property damage, breakdown of infrastructure networks, water shortages, air pollution, flooding, fires, and more. The Bank for International Settlements, an umbrella organization for the world’s central banks, warned in 2020 that climate change could generate one of the largest economic dislocations in history.

We must greatly reduce, eliminate, or even recapture greenhouse-gas emissions if global temperature is to be stabilized. Such a radical goal, according to University of Cambridge economist Dimitri Zenghelis, “means that the shape and structure of modern capitalism will have to be changed,” as the fossil-fuel sector underpins much of our present-day economy. In addition to this pragmatic diagnosis, we face the moral prognosis that the dire consequences of inaction will be unjustly imposed on the majority of humanity, both now and in the future, by a small minority. As climate activist Duane Elgin asks, “When will humanity express its moral outrage that it is wrong to devastate an entire planet for countless generations to come, just to satisfy the consumer desires of a fraction of humanity for a single lifetime?”

Recognizing the limited scope of economic policy solutions To address climate change, economists recommend carbon pricing to create market signals that will steer corporate strategy and entrepreneurial activity toward less carbon-intensive activities. While important as one tool for dealing with this issue, it will not be enough to catalyze the massive systems change that will reduce carbon emissions to zero in the necessary time scale. It will stimulate only incremental changes, and these will not fundamentally change the system that caused the problem; they will instead continue to make it worse.

To begin, such market adjustments treat the economic system as separate from the planetary system. That is a false premise. The two systems are deeply intertwined, though they change at drastically different paces. The pace of change in the planetary system must dictate the pace of change in the economic system—not vice versa. In 2021, the global average atmospheric concentration of CO₂ was 413.2 parts per million (ppm), setting a new record high, jumping 3.3 ppm over 2019 levels and 150 percent above the preindustrial level. That marked the fifth-highest annual increase in the 63 years of the National Oceanic and Atmospheric Administration’s records, despite the worldwide economic slowdown from the COVID-19 pandemic.

Global mean temperature reached 1.1°C above preindustrial levels, and both emissions and temperature are rising irrespective of the pace of change in our economy. To make matters worse, the rate of CO₂ concentration rise is now faster than the 2 ppm per year that scientists had previously predicted.

If we don’t come to terms with climate change by 2030, damage to the global climate will be irreversible. Scientific modeling warns that a CO₂ concentration of 450 ppm will likely drive average temperature rise above 2°C, the level set by the international community as the threshold of “dangerous.” If we reach 3°C, risks of crossing irreversible “tipping points” will increase dramatically, leading to the collapse of ice sheets, sea-level rise, and substantial species extinction. On our current trajectory, temperature rise could exceed 4°C by the end of the century. This is the time scale by which economic system change must occur.

But instead of taking immediate, drastic action, we wait for market solutions to develop while the planet is crossing critical environmental thresholds. We will not be able to simply adapt or innovate our way out of this crisis—human life cannot survive at wet bulb temperatures above 35°C, a threshold that some regions around the world have already crossed. In May 2022, for example, India and Pakistan faced a record-breaking heat wave that, according to experts, tested “the limits of human survivability.” Even if we stopped increasing CO₂ today, the temperature would still rise as previously released emissions continue to overheat the atmosphere.

In the end, the scientific and pragmatic reality dictates that we stop burning fossil fuels. This change must happen far more quickly than economic policy solutions alone can realize.

Accepting that substantially reducing greenhouse-gas emissions presents an existential challenge for the industry The economic rationale for hydrocarbon production is based on externalizing costs to human and nonhuman life. As fossil-fuel companies struggle unsuccessfully to be part of the climate solution, they are merely putting forward incremental and limited responses that do not address the core problem.

First, many fossil-fuel companies (and other carbon emitters, such as cement manufacturers) are pinning their hopes on carbon capture and sequestration (CCS) technologies to offset their emissions. But these technologies are not yet market-ready—in fact, most actually emit more CO₂ than they capture. In the view of many experts, according to an article in The Climate Herald, it is “not possible for most carbon capture and utilization methods to sufficiently reduce industrial CO₂ emissions in time to support the Paris Agreement targets.” It would be foolish to bet the future on an unproven technology.

Second, and more important, while 12 of the world’s largest fossil-fuel companies plan to cut their carbon and methane emissions by,...

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50 million metric tons annually by 2025, these goals are not binding and do not include scope 3 emissions—those emitted when the oil, gasoline, and diesel oil that companies sell are burned. For ExxonMobil, for example, scope 3 emissions make up roughly 90 percent of the company’s carbon footprint. Another oil major, bp, has also made a carbon-neutral pledge, which includes a 20 percent reduction of some scope 3 emissions, but the company defines those emissions narrowly, as only those in which the company has an equity share—specifically, CO2 emissions from the combustion of upstream production of crude oil, natural gas, and natural-gas liquids. The challenge to any fossil-fuel company to achieve actual net zero is monumental and likely impossible. Cutting downstream scope 3 emissions to zero poses an existential challenge for the industry and requires such companies to close or sell off their fossil-fuel assets.

**Compassionate Destruction**

History has marked the repeated demise of once thriving sectors because of the competitive forces of what Joseph Schumpeter termed “creative destruction,” where the market incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one.” The typewriter industry disappeared with the rise of personal computers, and the incandescent-lightbulb industry has dimmed as more energy-efficient lighting alternatives, such as compact fluorescent lamps (CFLs) and light-emitting diodes (LEDs), have become more cost competitive.

Creative destruction has also forced individual companies to remake themselves. Finnish multinational Nokia was founded in 1865 as a paper mill and has since expanded into cable, rubber boots, tires, and ultimately telecommunications hardware and software. 3M began in 1902 as the Minnesota Mining and Manufacturing Company, making sandpaper and grinding wheels; today the firm makes a wide variety of products, such as personal protective equipment, window films, dental and orthodontic products, medical products, car-care products, health-care software, and Post-it Notes. But these examples represent adaptation to shifting market conditions, not entire sectors disappearing for non-market-related reasons.

We have also witnessed the end of specific sectors because of government regulation—such as legislation in the United States that banned DDT application in 1972, that gutted the asbestos industry in 1980, and that is poised to end the industry for per- and polyfluoroalkyl substances (PFAS) today. But these sectors were not nearly as intertwined with the global economy and society as fossil fuels.

Today, a vast physical, economic, and political network undergirds the oil, coal, gas, and related chemicals sector. It cannot simply be replaced without massive political, social, and technological disruption. So, instead of “creative destruction,” we face the challenge of managing “compassionate destruction,” in which we guide all the complex and expansive elements of the fossil-fuel sector through a just and orderly transition to a carbon-free economy.

**Choice of Treatment**

Ever since coal-powered steam engines gave rise to the industrial revolution, fossil fuels have provided the energy that powers most of the world’s economic activity. While nuclear and renewable sources of energy are available, almost 80 percent of primary energy use still comes from carbon-based fuels, and ending it will not be easy. BlackRock CEO Larry Fink warns, “Divesting from entire sectors— or simply passing carbon-intensive assets from public markets to private markets—will not get the world to net zero.” Focusing solely on cutting supply and not reducing demand, he argues, will simply drive up energy prices and encourage more of a backlash against green-energy efforts. But the complexity, centrality, and interconnectedness of fossil fuels in the economy creates a paradox. The demise of the sector must be carefully orchestrated, and that will take time. But the urgency compelled by changes already underway in the natural environment means that the endgame needs to be undertaken quickly.

The patient needs urgent care. To consider such care, we acknowledge that corporations have been endowed with certain rights and responsibilities historically enjoyed by human beings and ask the obvious follow-on question: If a corporation is a person, can a corporation be assisted in death just as a person can be? And, if so, how do we provide compassionate assistance and comfort to the dying patient, as well as to those affected by the passing? To negotiate these questions, we offer three different models for consideration.

**Triage** Our first model, triage, is an approach that requires making difficult decisions in the face of conflicting priorities and limited resources. According to the US Department of Defense’s guidance on emergency war surgery, it involves “a process of sorting to identify and prioritize treatment given the limitations of the current situation, the mission, and available resources (time, equipment, supplies, personnel, and evacuation capabilities).” It entails the allocation of treatments for different conditions of the patient, and, in more extreme cases, the decision to remove an ailing limb or organ. How might corporate triage be applied to a fossil-fuel company?

We find one recent example from 2021, when investor Third Point called for Royal Dutch Shell to be split into “multiple stand-alone companies,” separating sustainable business lines from legacy fossil-fuel lines. Third Point argued that amputation of the extraction business, designed to maximize the survival of Shell, would force the company to accelerate a shift to lower-carbon businesses while presenting a vision for the corporation’s survival after the “operation.” In this case, an outside investor prescribed the triage-based approach, but companies in other industries have applied it to themselves. Following the Russian invasion of Ukraine in 2022, bp abandoned its 19.75 percent stake in the Russian fossil-fuel company Rosneft, incurring charges of up to $25 billion.

But triage can also bring about a new kind of entity, becoming truly transformative. In 2022, a billionaire and a Canadian asset-management firm launched an unusual joint bid to take over the Australian energy company AGL Energy and turn it into a renewable-energy company by shutting down its coal power plants earlier than planned. Similarly, CVS Pharmacy used triage in 2014 to transition from a drugstore to a health-care company by ending the sale of tobacco. While tobacco comprised a profitable portion of the business at the time, President and CEO Larry Merlo stated that “the sale of tobacco products is inconsistent with our purpose,” which was “helping people on their path to better health.”

**Euthanasia** Our second model, euthanasia, is defined by the Merriam-Webster dictionary as “the act or practice of killing or permitting the death of hopelessly sick or injured individuals (such
as persons or domestic animals) in a relatively painless way for reasons of mercy.”

The idea is not alien to economics. John Maynard Keynes once called for “the euthanasia of the rentier” class, those who extract profits or rents but do not create wealth in the aggregate economy and who, in the words of Joseph Stiglitz, “destroy wealth as a byproduct of their taking it away from others.” At present, fossil-fuel companies produce petroleum that is burned to support our economy but create greenhouse-gas emissions that are destroying wealth for others, through the facilitated increase in droughts, wildfires, food insecurity, water scarcity, coastal flooding, disease proliferation, and the social unrest that may result. A future in which we address climate change may require that the entire sector be euthanized.

Deciding on corporate euthanasia compassionately demands a deliberative process. For human patients, decisions on euthanasia require protocols including a terminal diagnosis; certification by a consulting physician; a psychological examination; and an exploration of alternatives, including palliative care, hospice, and pain-management options. For corporate patients, a similar protocol may be necessary. Most likely, that protocol will be guided by the government but should include the patient and those affected.

For example, in 1964, the US Surgeon General recommended that drastic controls on cigarette smoking be established to protect public health. Tobacco companies such as R.J. Reynolds and Brown & Williamson stood to lose billions of dollars in revenues if cigarettes were linked to cancer, and mounted a multipronged campaign to create doubt and confusion in the science of cigarette-caused cancer. As a result, it took four decades for cigarettes to be controlled by government regulation, and countless people were made sick or died as a result. But finally, in 1998, the four largest US tobacco companies entered into the Tobacco Master Settlement Agreement (MSA), which required the companies to make annual payments to the 46 participating states in compensation for medical costs of caring for people with smoking-related illnesses. The MSA also dissolved several tobacco trade groups (such as the Tobacco Institute) and prohibited most forms of tobacco advertising.

An important step in euthanasia is coming to terms with the extreme decision facing the patient, the doctor, and those affected by the outcome. Many actors in the fossil-fuel industry have denied climate science and funded campaigns of misinformation and misdirection, like the tobacco industry did, to prevent action addressing climate change. Today, the fossil-fuel sector continues to shift responsibility away from corporations and uses the rhetoric of consumer demand to individualize responsibility.

It is not ready to face the prognosis that confronted the tobacco industry; rather, it continues to focus on what it does best: finding, extracting, refining, and marketing fossil fuels.

In fact, fossil-fuel companies have taken little concrete climate action and continue to exploit the markets for fossil fuels, according to a recent study of their annual reports, earnings, and expenditures. For example, in the face of declining markets for fossil fuels precipitated by, among other things, the electrification of the automobile fleet, fossil-fuel companies have sought new markets. Most notably, attention is shifting to chemical production and, more specifically, plastics. The World Economic Forum predicts a doubling of plastics production by 2035 and a quadrupling by 2050, and projects that by 2050 the world’s oceans will contain more plastic than fish (by weight). This transition is merely problem shifting, as it may reduce the extent to which we are crossing one planetary boundary (climate change) and increase the extent to which we are crossing another (novel entity or chemical pollution).

The patient is in denial about its terminal condition and is engaged in bargaining. For example, the industry’s ongoing hope that carbon capture and sequestration will save it resembles a terminally ill patient holding out for a miracle cure. Industry leaders also use a demand-as-blame framework to avoid taking responsibility. Within hours after the Russian invasion of Ukraine on February 24, 2022, the American Petroleum Institute (API) began calling for the White House to “ensure energy security at home and abroad” by allowing more oil and gas drilling on public lands, extending drilling in US waters and cutting regulations that limit fossil-fuel activity. The fossil-fuel sector is showing limited signs that it can restrain itself from finding, extracting, refining, and marketing fossil fuels. Yet, like the tobacco industry in the past, fossil-fuel companies are now facing lawsuits from state’s attorneys general for misleading the public about climate change and the dangers of using fossil fuels.

**Hospice** | Our third model, hospice, can be triggered if the patient comes to accept his or her terminal condition. The US National Institute on Aging explains hospice as a treatment regimen that “provides comprehensive comfort care as well as support for the family, but ... attempts to cure the person’s illness are stopped. Hospice is provided for a person with a terminal illness whose doctor believes he or she has six months or less to live if the illness runs its natural course.”

Just as doctors are trained to preserve the patient, business leaders are trained to preserve the business. While bankruptcy and liquidation are situations that many of them face, these decisions are not undertaken when individual business financials are sound. Yet, as doctors have become increasingly concerned with the quality of life, not merely prolonging its duration, business leaders must do the same, determining when there exists no viable path that can balance the needs of the Earth and humanity against those of the corporation. They must plan for death of an organization, a decision that affects many stakeholders in multiple ways and has a comparable emotional journey for those most involved. Employees often tie their identities to their work, and deciding to let go and move on can be challenging for them. For customers, investors, suppliers, and others, that critical decision may be equally vexing.

Signs that this treatment regimen is possible are emerging, as some leaders within the fossil-fuel sector are discussing whether their prognosis is terminal. While many continue to remain in one of the first four stages of grief that psychiatrist Elisabeth Kübler-Ross associated with coming to terms with death—denial, anger, bargaining, and depression—others are moving toward acceptance that the science of climate change is real and that their industry is the chief cause of the crisis. For example, the International Energy Agency, a multilateral group whose mandate is to assure global energy security and stability, issued a report in 2021 that called for investment in new oil and natural-gas projects to stop immediately, and for sales of new gasoline- and diesel-powered vehicles to end by 2035, so that the global energy industry can achieve net-zero carbon emissions by 2050.
Ten Strategic Considerations for Managing the End of Fossil Fuels

The orderly transition of the oil and gas industry requires management of the individual corporation, the broader economy, and government and society at large.

MANAGE BUSINESS STRATEGY
1. Bring about the end of the entire sector through corporate collaboration.
2. Protect workers and avoid labor flight during transition.
3. Overcome political and social resistance to change.

MANAGE BROADER ECONOMIC IMPACTS
4. Manage the full scope of the financial impact of the transition.
5. Control the fate of products both used and unused.
6. Protect indirect workers in related industries.

MANAGE SOCIETAL AND POLICY ISSUES
7. Maintain justice and equity for all communities.
8. Decommission, remediate, and repurpose dedicated infrastructure.
9. Leverage the power of government.

MANAGE THE ROLE OF CORPORATE LEADERSHIP
10. Overhaul business education curricula as if people and the planet really matter.

Critical to this deliberative process is a sense of control and dignity, something hospice seeks to provide by managing physical, social, and emotional complexities. The core of the hospice approach is the “belief that each of us has the right to die pain-free and with dignity, and that families will receive the necessary support to do so” through compassionate care, counseling, and support to surviving family and friends. In the same way, corporate hospice can help those within or associated with a company or sector to come to terms with and plan for the end of what they know and to look toward what is to come.

Whatever form it takes, death is not merely an end but the beginning of a transformation into something else—whether that something else is a spiritual transition of the soul or the physical transition of the body. In a similar way, does the complex network that constitutes the fossil-fuel sector truly die, or does it become something new? Just as in organ donation, some of the sector’s economic and human assets may be redeployed toward some new purpose. People working in the industry have incredible financial, analytical, and geophysical expertise that can (and should) be recognized as a potential asset for a sustainable future. Additionally, the brand value of the logos of Shell, ExxonMobil, and bp have legacy value for drawing electric-car owners to recharging stations as symbols of refueling and replenishing. Even some physical assets will be redeployed—in 2021, an idled oil refinery in Newfoundland, Canada, was bought and will be converted to make biofuels from used cooking oil, corn oil, and animal fat. The process that brings us to this outcome must be based on compassionate treatment, informed and deliberate consent, and consultation with affected parties and others.

Managing the End

Estimates of how much money is needed for an energy transition away from fossil fuels over the next three decades range from $100 trillion to $150 trillion. This amount represents both historic entrepreneurial opportunities and massive dislocations with collateral issues that must be managed for a just and orderly transition. Models of triage, euthanasia, or hospice challenge the corporate manager in new and unusual ways. A process of compassionate care and treatment requires a leader to understand the complexity of the corporate ecosystem and identify leverage points for innovation and change on at least four levels: the corporation, the economy, the broader society, and ultimately leadership itself. We specifically suggest 10 sets of critical considerations and questions. (See “Ten Strategic Considerations for Managing the End of Fossil Fuels” on this page.)

Manage Business Strategy

The implications of triage, euthanasia, or hospice for a corporation are acute and require careful deliberation for an orderly transition. Corporate leaders face a series of considerations as they assume responsibility for how this treatment regimen might affect their employees and the communities in which they operate.

1. Bring about the end of the entire sector through corporate collaboration. The closure of the fossil-fuel sector will require the participation of and collaboration among a wide array of actors. Not only public companies like ExxonMobil, bp, Total SA, and Chevron but national oil companies that underpin the economies of countries such as China, Saudi Arabia, Russia, Brazil, India, Iran, and Venezuela will have to participate. If one fossil-fuel company were to merely cease production, another player would take its place, one that could be less scrupulous about environmental, social, safety, and political standards. This level of global cooperation is on a scale we have never encountered before.

One business model for managing collective action is “precompetitive collaboration,” where industry leaders work to find consensus on the future direction of the fossil-fuel sector and the economy as a whole. Precompetitive collaboration uses an iterative and collaborative framework that brings together all the relevant actors to coordinate their concerns, priorities, and actions. In this way, attention can move beyond incremental solutions to address the root causes of issues from multiple, diverse vantage points. As such, this process must involve not only the CEOs of the world’s fossil-fuel companies but also representatives from governments, trade associations, research centers, environmental activism, local Indigenous groups, and many other parties.

2. Protect workers and avoid labor flight during transition. Just as compassionate care of a dying patient requires comforting family members and friends, a just and orderly transition means not leaving people behind. When a company announces a plan to end its fossil-fuel activities, will employees who have opportunities elsewhere flee the company, leaving it short of talent to execute its plans? How will the loss of jobs be managed? Some skills can be readily transferred (e.g., accountants and salespeople), while others are largely industry specific (e.g., oil-field roustabouts). Estimates of the number of people employed in the fossil-fuel sector vary...
widely, ranging from 1 million to 2.6 million. The US Bureau of Labor Statistics estimates that 565,000 people work in the mining, quarrying, and oil and gas extraction sector, and 133,300 people work in the oil and gas extraction subsector. If fossil-fuel consumption were largely eliminated over a 20-year period (an extreme scenario), some economists calculate an average of 53,600 jobs lost annually. The International Renewable Energy Agency estimates that nearly 8 million jobs in the fossil-fuel industry could be directly displaced globally by 2050.

As fossil-fuel industries decline, the transition must be managed with dignity, offering displaced workers job retraining, education, and pensions to thank them for helping to bring about a modern world. This effort also might mean identifying parallel opportunities in industries that need similar skill sets (e.g., geothermal drilling, carbon-capture tracking, new lobbying priorities). Just as when a patient is dying, we need to make sure their dependents are cared for. Such care requires a clear vision and plan for transition that can foster inclusion and catalyze long-term reform that invigorates talented employees with new challenges to tackle.

3. **Overcome political and social resistance to change.** A decline and end of the fossil-fuel sector will precipitate political, economic, and social blowback. Those who stand to lose out in the transition will fight hard to protect what they have. In several states, the conservative lobbying group American Legislative Exchange Council (ALEC) is recommending laws to blacklist firms that boycott the fossil-fuel industry as a way to protect fossil-fuel companies from share sell-offs and other measures intended to address the climate crisis. In January 2022 public letter to Texas Comptroller Glenn Hegar, Lieutenant Governor Dan Patrick called out BlackRock’s Fink for “capriciously discriminating against the oil and gas industry” and declared, “If Wall Street turns its back on Texas and our thriving oil and gas industry, then Texas will not do business with Wall Street.”

The fossil-fuel industry is economically and culturally central to states such as Texas, and the basis of national prosperity and geopolitical power for nations such as Saudi Arabia, Venezuela, and Russia. Corporate leadership will need to identify stakeholders and involve them in the transition and its consequences. Just as end-of-life planning involves the preparation of a will, a just and orderly transition includes a plan to help those left behind.

### Manage Broader Economic Impacts

The effects of corporate triage, euthanasia, or hospice are not isolated to the companies undergoing these processes themselves. The fossil-fuel industry has impacts on the broader economy that must be managed, just as the impacts of a dying person on family members, friends, and colleagues must be negotiated.

4. **Account for the full scope of the financial impact of the transition.** The emergent clean-energy sector is growing rapidly. Some estimates report an employment base of nearly 3.3 million Americans, outnumbering fossil-fuel workers by upwards of 3 to 1. This growth is driven in large part by technological innovation and policy choices. The average installed cost of wind power dropped from 7 cents per kWh in 2009 to less than 2 cents in 2019. Solar photovoltaic power saw a 99 percent decrease in price between 1980 and 2012. Yet in 2020, the global renewable-energy sector enjoyed revenues of $692.8 billion, while global revenues for oil and gas reached approximately $2.1 trillion.

Market researchers estimate a compound annual growth rate (CAGR) for renewables of more than 8 percent from 2021 to 2030 but less than 2 percent for oil over the same period. As the market transitions, the fossil-fuel sector, as the foundation of energy for the modern economy, must play a significant role in both the process and the outcome of the energy transition that is underway, including the redeployment of financial assets.

The top 10 fossil-fuel companies in the world enjoy a market capitalization of $3.3 trillion. Sixty of the world’s largest commercial and investment banks collectively invested $3.8 trillion in fossil fuels from 2016 to 2020. In the first nine months of 2021, the 24 largest oil and gas companies netted $174 billion in profits, and 11 of them paid out $6.5 billion collectively to shareholders. How will these investments be maintained and transitioned? If a company announces a plan to end its fossil-fuel activities, will investors flee the company, leaving it short of capital to execute its plans? Similarly, will those investors who stay with the company watch their capital diminish? Finally, should fossil-fuel companies and their investors be compensated for fossil fuels left in the ground—fuel that was factored into the valuation of these companies and drew investors in the first place?

5. **Control the fate of products both used and unused.** There are 1.65 trillion barrels of proven oil reserves in the world, which amount to 46.6 times the world’s annual consumption levels and will last at least another 50 years. The International Energy Agency predicts a peak in demand between 2020 and 2040; the Organization of the Petroleum Exporting Countries (OPEC) predicts increasing demand, followed by a plateau after 2035. If that oil is burned, scientific modeling predicts that we will not be able to keep planetary temperatures at levels that are safe for human life. But how do we manage what will become a “stranded asset,” both avoiding a black market and allowing for an equitable solution? What will prevent defectors from extracting that valuable oil?

Answers to these questions must include constraints on supply (i.e., enforcement of extraction prohibitions), constraints on demand (i.e., reduction in oil value due to alternatives), and, for the sake of equity, variable requirements around the world that allow some developing nations to burn oil over a prescribed transition period as they seek to meet their primary needs. More locally, we can reduce the economic damage if we try to match needs with expertise (e.g., geothermal plants have need of drilling experts, while new energy companies need communications and energy systems expertise).

6. **Protect indirect workers in related industries.** For each fossil-fuel worker directly affected by the end of the fossil-fuel sector, there are additional jobs that depend on the sector. In India, every coal miner on a monthly salary generates up to 10 additional local jobs through their consumption. If the coal miner’s job is lost, these other local jobs also disappear. In the United States, the fossil-fuel industry provides nearly 7.2 million indirect jobs. For example, the oil and natural-gas industry purchases capital goods from a variety of US suppliers; these amount to $177 billion in new equipment and structures. Even companies that proclaim to reject fossil fuels (e.g., clothing suppliers) depend on petrochemicals derived from oil and natural gas. These kinds of impacts can be regional in their...
scope, and efforts to protect regional economies should be part of the energy transition.

**Manage Societal and Policy Issues**

Decisions about corporate triage, euthanasia, and hospice are made more difficult not only by these considerations but by other complex societal impacts. Corporate leaders must consider the process and distribution of these impacts to weigh the equity of who will bear the costs.

7. **Maintain justice and equity for all communities.** Millions of jobs in the fossil-fuel industry could be displaced by 2050. But these displacements will not fall evenly and will affect some communities more than others. In Wyoming, for example, nearly 8,400 people are employed in coal and nearly 68,000 are employed in natural gas and oil; these industries in total provide about 16.6 percent of jobs in the state. In addition, more than half of state and local tax revenues come from the fossil-fuel sector. Other states that are heavily dependent on the industry include Oklahoma, North Dakota, Texas, Louisiana, Alaska, New Mexico, and West Virginia. The economies in these states could be devastated if the industry were to decline and no provisions were made to offset the economic impact, in much the same way as the departure of manufacturing jobs turned midwestern US economies into the rust belt in the 1980s. Fossil fuels are still an enormously important source of employment across the world, and fossil-fuel jobs often offer higher salaries and better benefits than most jobs.

As the fossil-fuel industry declines or disappears, how will the economies of developing countries be protected? Can they make the infrastructure investments to transition their economies to non-carbon-based fuels and jobs? And can they protect themselves from efforts by fossil-fuel interests to extract rents for lost revenues? In 2021, fossil-fuel companies were suing governments across the world for more than $18 billion after action against climate change threatened their profits. They brought these suits under the Energy Charter Treaty, and the proceedings are being hosted within the fossil-fuel sector. Other states that are heavily dependent on the industry include Oklahoma, North Dakota, Texas, Louisiana, Alaska, New Mexico, and West Virginia. The economies in these states could be devastated if the industry were to decline and no provisions were made to offset the economic impact, in much the same way as the departure of manufacturing jobs turned midwestern US economies into the rust belt in the 1980s. Fossil fuels are still an enormously important source of employment across the world, and fossil-fuel jobs often offer higher salaries and better benefits than most jobs.

8. **Decommission, remediate, and repurpose dedicated infrastructure.** We must also address the enormous legacy infrastructure associated with the fossil-fuel sector. The United States alone has more than 2.6 million miles of fossil-fuel pipelines, 129 operable petroleum refineries, thousands of train cars and tanker trucks, approximately 542,000 underground storage tanks and a comparable number of aboveground storage tanks, and more than 150,000 fueling stations (95 percent of which independent operators own) to fuel 287 million registered cars and 38 million trucks. Globally, there are more than 600 operating refineries and 810 very large crude carriers (one VLCC can transport more than two million barrels of crude oil). How will these assets be redeployed or decommissioned? Further, an enormous legacy of hazardous waste looms from coal mining; oil exploration, refining, and transport; and shale-gas development that will require extensive remediation. Who will pay for it?

9. **Leverage the power of government.** The energy transition that is underway requires the involvement and unprecedented cooperation of governments from around the world. They have, and must continue to play, a critical role in determining the rate of innovation to no-carbon technologies through tax policies, subsidies, loan guarantees, procurement, and research-and-development support. At the least, governments must remain committed to carbon-reduction goals, such as those set by the 2015 Paris Agreement, to establish clear market signals for companies. The Norwegian oil company Equinor has made it clear that to meet its goal of allocating more than half of its annual gross capital expenditures to renewables or low-carbon solutions by 2030, it needs European and global leaders to stick to their climate commitments. Governments must also reduce, eliminate, or repurpose the $423 billion in subsidies for the fossil-fuel industry annually; help economically at-risk fossil-fuel workers through retraining; support local businesses; and invest in associated infrastructure. Finally, the power of government must be maintained in the face of pressure from incumbent fossil-fuel companies and their lobbying power as they spend nearly $200 million per year to delay, control, or block policies to tackle climate change.

**Manage the Role of Corporate Leadership**

Ultimately, decisions about corporate triage, euthanasia, and hospice require a new form of corporate leadership. The training of business leaders must be revised to cover all facets of the systemic changes such decisions entail, including transformations of the corporation, the economy, and society.

10. **Overhaul business education as if people and the planet really matter.** As these grave forms of treatment—triage, euthanasia, and hospice—and the list of critical, related questions make clear, transitioning away from the fossil-fuel sector is a monumental systemic challenge. It will require strong and thoughtful leadership from all within the fossil-fuel sector, as well as from leaders in business, government, and civil society. And, importantly, it will require a reassessment of how we train those future leaders. These needs must guide the transformation of business education.

Many business schools in the United States, the European Union, and elsewhere have begun to recognize the growing urgency of climate change and are incorporating the issue more centrally into their curricula. They are especially motivated by the scale of the market shift that climate change demands, which could range as high as $26 trillion through 2030 and create 65 million new low-carbon jobs. These schools are also desperate to avoid more than 700,000 premature deaths from air pollution. In response, they are gearing their curricula toward the development of new products, services, and practices and examining ways to transform business models, technology, and innovation.

These efforts, while critical, are missing a crucial component by focusing on only one side of the equation: the financial opportunity or the win-win. Schools tend to pay little, if any, attention to the other side of the equation: the eventual win-lose in some sectors. Given this gap, they are not preparing students to lead a just and orderly transition, which will require tough choices if we are to address the full scope of our climate problems. Business schools teach students how to launch, grow, and maintain companies, but not how to sunset them. Tomorrow’s business leaders should be taught to do something that previous generations
The host of considerations we have offered, and many more, open new avenues of inquiry for teaching important aspects of the role of business in society and how it will operate in the 21st century. The skills to dismantle an industry as complex and integrated as the fossil-fuel sector can help students develop a deeper understanding of the complex network that is the modern multinational corporation. To undertake such a task while the company is still financially viable brings the topic into a new domain, distinct from more straightforward considerations of bankruptcy and liquidation. Just as a mechanic can learn the intricacies of an internal combustion engine by taking one apart, a manager who is taught how to thoughtfully dismantle a company and its sector will be better prepared to understand how to build another business or sector more successfully. Today’s climate crisis affords the perfect opportunity to reimagine business education and how it conceptualizes entire sectors, the economy, and the nature of capitalism itself.

Time to Act

In facing a managed end to the fossil-fuel sector, we confront myriad questions that are as complex and intertwined as both the climate-change issue itself and the fossil-fuel sector that is its chief cause. If we can address these questions, we can get a better glimpse of the magnitude of the systemic challenge before us and can begin to implement steps that are commensurate with the challenge. If we cannot, we must resign ourselves to remaining dependent on the fossil-fuel sector and courting environmental and economic calamity.

The questions we raise here fit within the broader debate that is taking place about the role of the corporation in today’s market and political environment and the future of capitalism. Employees, investors, insurance companies, and other stakeholders increasingly expect that companies play a stronger role in addressing the social and environmental challenges of our day. In his annual letter to the CEOs of publicly traded companies, BlackRock’s Fink wrote in 2018 that they have a responsibility not only to deliver profits but to make “a positive contribution to society.” Similar statements have been made by the Business Roundtable, the World Economic Forum, and other groups. Against this backdrop, how do fossil-fuel companies put such aspirations into action?

For act they must. Responsible fossil-fuel companies face the pragmatic reality that the sector as we now know it must end. We must turn to, and work with, the market to carry out this resolution. The market—composed of corporations, the government, nongovernmental organizations, and the many stakeholders in market transactions, such as consumers, suppliers, buyers, insurance companies, banks, and so on—is the most powerful organizing force on Earth, and business is the most powerful entity within it. Though government is an important and vital arbiter of the market, business transcends national boundaries and manages resources that exceed those of many nations. Indeed, if no solutions come from the market, there will be no solutions. The market is causing climate change, and we must steer the market to stop it.