

Institutional policies for a healthy Anthropocene society

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abstract

The *Anthropocene epoch* refers to the geological epoch, now underway, that is defined by monumental, human-caused geophysical changes in planetary ecosystems. Human society is also changing, marked by an equally profound shift in attitudes, beliefs, and practices. In this article, we apply research on social change in institutions—that is, in the enduring belief systems, ideas, and practices that guide organizations and society—to propose policies that could prepare Anthropocene society to change in ways that would ensure healthier ecosystems. These policies would alter the institutions driving corporate governance, patterns of consumption, the role of science in business and society, and the time horizons used by governments and organizations to plan, and they would help society adapt to unpredictable changes in the climate and in ecosystems. Ultimately, the policies would shift long-standing institutional structures, or *logics*, that support market capitalism and the belief in technology's ability to solve all problems to help create a more enlightened culture and more stable ecosystems on a rapidly changing planet.

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We have become, by the power of a glorious evolutionary accident called intelligence, the stewards of life's continuity on earth. We did not ask for this role, but we cannot abjure it. We may not be suited to it, but here we are.

—Stephen Jay Gould¹

Core Findings

What is the issue?

Humans in the Anthropocene have crossed four of nine planetary boundaries beyond which natural ecosystems and human societies will tend toward collapse. To avoid this, a shift needs to occur in the two dominant types of logic that underlie much of present-day Western society: market capitalism and technological optimism. *Institutional theory* provides guidance on how to design effective policies that target regulations, norms, and implicit beliefs and agreement, driving requisite incremental, transitional, and transformational change.

How can you act?

Selected recommendations include:

- 1) Developing policies for eco-sensitive corporate governance
- 2) Prioritizing policies that reduce resource consumption

Who should take the lead?

Researchers, organizational leaders, and public policymakers

From the end of the last ice age more than 11,000 years ago until the latter part of the 19th century, humanity was blessed with a relatively stable climate. The stability of this period, which scientists named the *Holocene epoch*, was unlike the climate upheavals the Earth has experienced in its more distant geological past, and it allowed humanity to develop crops, plant farms, and build cities, nations, and civilizations. But the earth is quickly changing, and humans are the reason. In 2005, the United Nations concluded that “over the past 50 years, humans have changed ecosystems more rapidly and extensively than in any comparable period of time in human history.”² Since then, the pace of change has not slowed.

In fact, scientists now believe that humanity has transformed earth's climate and its ecosystems so dramatically that the Holocene epoch has ended and a new geological epoch has begun. And because human activity is driving this planetary makeover, scientists have named our current era the *Anthropocene epoch*, after the Latin word for “human.”

To deal with these global environmental changes, scientists first need to understand them. The old paradigms that held true during the Holocene epoch no longer apply, so scientists have developed new ones. Among the most useful is the *planetary boundary paradigm*.³ (See Figure 1.)

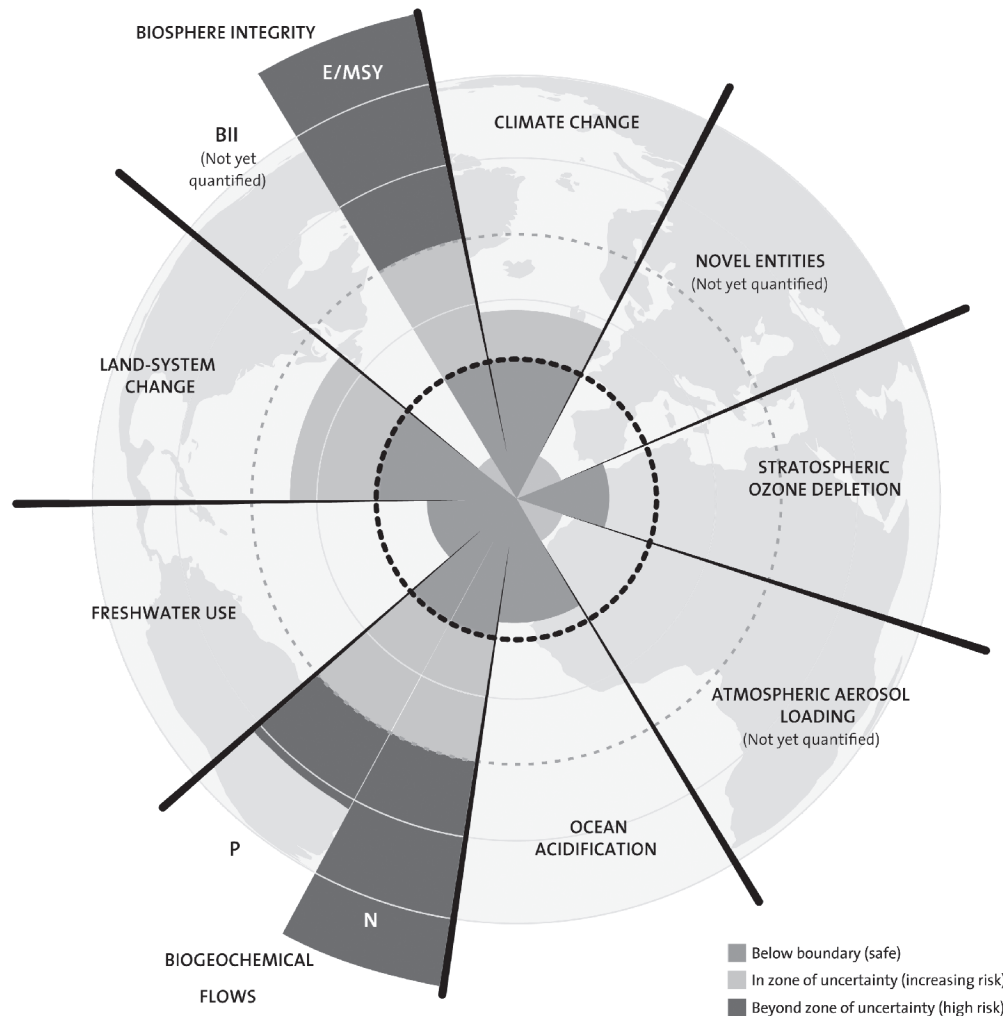
This paradigm defines nine different ways that people are altering the planet. It includes thresholds for each “beyond which the stability of planetary-scale systems cannot be relied upon,” as Michael Gillings and Elizabeth Hagen-Lawson have put it.⁴ In essence, planetary boundaries provide a fence that defines the space within which humanity can live safely.

Humanity has crossed four of these nine boundaries. Climate change is the best known, but boundaries have also been crossed for biosphere integrity (in the form of species extinction); nitrogen and phosphorus pollution of land, freshwater, and oceans; and changes to land use and land cover, such as deforestation.⁵ One of the nine boundaries—stratospheric ozone depletion—is on the mend, but boundaries for freshwater use and ocean acidification are being watched with concern, while data are still being collected for atmospheric aerosols, novel entities, and biodiversity intactness. Meanwhile, the human population is projected to grow from 7.5 billion people in 2021 to 10 billion by 2050, and global gross domestic product is projected to grow from \$80 trillion to \$135 trillion over the same time period, with lifestyles becoming increasingly resource and energy intensive. Although planetary boundaries are incompletely understood, scientists believe that if humanity continues on its current trajectory, more of these boundaries will be breached, pushing natural ecosystems and human societies toward collapse.

But the planetary boundaries paradigm also offers encouraging news. Because outmoded industrial-age policies were largely what drove society to push beyond planetary boundaries, new policies could reverse these trends and pull humanity back to safety.⁶ The best efforts so far at fashioning policy responses have come from discrete interventions designed to change the products and services people create and consume. These include replacing ozone-depleting chlorofluorocarbons with safer alternatives to reduce ozone depletion, putting a price on carbon, electrifying mobility, and switching to renewable energy sources to reduce greenhouse gas emissions.

These interventions have been essential, but they have not been enough to stop humanity

Figure 1. The planetary boundaries of the Anthropocene



Note. The dark dashed circle represents the planetary boundary for the global change represented by each wedge; in wedges that exceed the boundary, human influence threatens humans and other life forms. In the Biogeochemical Flows wedge, N and P refer to the global nitrogen and phosphorus cycles, respectively. In the Biosphere Integrity wedge, BII stands for Biodiversity Intactness Index, a measure of how land use pressures have diminished wild species abundance since premodern times (Scholes & Biggs, 2005), and E/MSY stands for extinctions per million species per year (Pimm et al., 2006). We encourage readers to visit the Stockholm Resilience Centre's website (<https://www.stockholmresilience.org/>) for updates on and discussions about this figure. Credit: J. Lokrantz/Azote based on Steffen et al. (2015).

Pimm, S., Raven, P., Peterson, A., Şekercioğlu, C. H., & Ehrlich, P. R. (2006). Human impacts on the rates of recent, present, and future bird extinctions. *Proceedings of the National Academy of Sciences, USA*, 103(29), 10941–10946.

<https://doi.org/10.1073/pnas.0604181103>

Scholes, R. J., & Biggs, R. (2005). A biodiversity intactness index. *Nature*, 434, 45–49. <https://doi.org/10.1038/nature03289>

Steffen W., Richardson, K., Rockström, J., Cornell, S. E., Fetzer, I., Bennett, E. M., Biggs, R., Carpenter, S. R., de Vries, W., de Wit, C. A., Folke, C., Gerten, D., Heinke, J., Mace, G. M., Persson, L. M., Ramanathan, V., Reyers, B., & Sörlin, S. (2015). Planetary boundaries: Guiding human development on a changing planet. *Science*, 347(6223), Article 1259855. <https://doi.org/10.1126/science.1259855>

from pushing out of the zone of safety. That is because they do not address the root causes of human-driven environmental destruction. Changing humanity's trajectory will require policies that drive deep and systemic social, economic, and political change—change that,

in turn, shifts the way humans live in, engage with, and perceive their relationship to the natural world. And deriving those policies requires a clear understanding of what actually motivates societal transformations.

“society must transform both its culture and its practices”

Fortunately, researchers in a branch of social science called *organizational studies* have been investigating this question for decades. In this article, we first present a brief overview of Anthropocene society through the lens of one of the field’s more encompassing theories, called *institutional theory*, and then offer five sets of policy suggestions to prevent or reverse humanity’s dangerous overshoot of planetary boundaries.

Why Societies Get Stuck

Institutional theory explains how formal organizational structures, including policies and practices, are adopted and how they spread. In applying it to the Anthropocene epoch, we begin with the premise that all aspects of the Anthropocene, including the science that has been used to identify it, are socially constructed—that is, people understand them only through a lens of culture and language.⁶ The emphasis in this discipline is on institutions. By *institutions*, we refer not to organizations, like a university or a legislative body, but instead to the enduring belief systems and practices that guide organizations and society, as in the institution of marriage.⁷ Because the beliefs and practices they embody are enduring, institutions tend to be stable, and this stability impedes change—even positive and necessary change.

Institutions can be sorted into three types: (a) government or other regulations and enforcement (*regulative institutions*); (b) norms, such as occupational standards and educational curricula (*normative institutions*); and (c) implicit beliefs and agreements about what confers legitimacy and authority (*cognitive institutions*).⁸ All types of institutions force stability, but they can also be levers for driving change.

The ultimate objective of that change is to alter the dominant *logic*, a term that comprises all three types of institutions. In institutional theory, a logic denotes an overarching outlook on the

world that translates beliefs into action. For example, religious logic favors collecting money from wealthier members of a congregation and leads to expectations that people should give alms for the good of the poor. Other types of logic include the logic of the state, the logic of the community, and the logic of the military.⁹

Two dominant types of logic underlie much of present-day Western society: market capitalism and technological optimism.⁶ By the logic of market capitalism, it takes a free market, property ownership, shareholder rights, limited regulation, and unlimited economic growth to produce socially optimal outcomes such as economic prosperity or a clean environment. By the logic of technological optimism, it takes human ingenuity and industrial innovation to solve the most pressing problems of our day. Both of these types of logic prioritize economic and technological progress. Both tend to devalue nature by viewing it as a mere source of raw material or a place to dump waste.

More than one type of logic can operate simultaneously, and one type can reinforce another. In a classic study, for example, German sociologist Max Weber, one of the founders of modern social science, argued that a Protestant religious logic—the Protestant work ethic—coexisted with a market logic and helped drive the emergence of modern capitalism.¹⁰ Today, market capitalism and technological optimism seem locked in place, and they are reinforcing each other and making planetary boundary problems worse.

How Societies Get Unstuck

To remain safely within planetary boundaries, society must transform both its culture and its practices. Institutional theory offers clues on how to proceed. For the past 20 years, much of the research in this field has focused on overcoming the ways institutions create barriers to change.¹¹ The work led to an important idea: Catalyzing the necessary change will require a new type of logic.

History shows that one type of logic can compete with another or even displace it, driving societal change. Such displacement

happened in Europe before and during the Enlightenment. Prior to this period, most Europeans viewed nature as unknowable, animated by mystical forces that could best be understood through a religious logic, primarily that of the Catholic Church. But beginning early in the 16th century, the Protestant Reformation undermined this logic, challenging it with a logic that offered laypeople the opportunity to read and interpret the scriptures themselves to understand the world, rather than rely solely on the interpretation of religious authorities. The Reformation cleared the way for the European scientific revolution, which promoted a scientific logic that demystified and cataloged nature through rational scientific inquiry. This shift set the stage for the Enlightenment, which lasted from the late 17th century into the early 19th century. The Enlightenment fostered a logic of rationality, exalting humans' ability to understand and control the world around them.

Over time, however, rationality morphed into a mechanistic worldview that sanctioned the exploitation of nature through unrestrained technological and commercial expansion.¹² In this way, the logic of the market and the logic of technological optimism led society—and the planet—directly into the Anthropocene. Those types of logic dominate Western society today but are not up to the task of addressing humanity's newfound level of impact on the natural world.

Recall that a logic—whether it is religious, nature based, market dominated, or about technological progress—guides thought into action.⁹ As humanity moves further into the Anthropocene epoch, a new type of logic is needed that incorporates emerging realities and accepts humanity's newfound role as steward of "life's continuity on earth," as Stephen Jay Gould put it.¹ This new type of logic would replace the belief that society dominates nature with the view that nature and society are inseparable and interdependent.

Shifting the logic of a culture can take a long time, as the historical examples described above show. Happily, there are other ways to overcome resistance and catalyze meaningful

societal change in a shorter time frame. Researchers in institutional theory have identified three approaches.

The first does not challenge existing institutions or the logic that they support. Instead, innovators pioneer new solutions that fit within the dominant logic. For example, the logic of market capitalism holds that environmental protection creates a drag on economic progress. Through that lens, any effort to address climate change threatens to eliminate jobs or hamper gross domestic product growth. But policymakers who promote technological solutions such as electric cars, offshore wind farms, or rooftop solar panels do not challenge the logic of either market capitalism or technological optimism. Instead, they can safely advocate for these technologies by framing them as market solutions to climate change that exhibit human ingenuity, create jobs, and improve the economy.

The second approach to overcoming resistance is to challenge institutions that support the existing logic. One way to do that is to shift norms. For example, within the logic of market capitalism, orthodox economists have followed Nobel laureate Milton Friedman in arguing that a corporation's only responsibility in a free-enterprise system is to maximize returns for its shareholders: it has no social responsibility to the public or society. But more recently, researchers who study how businesses can contribute to environmental sustainability have argued that companies should pursue not just profit but also environmental and social goals. Pursuing this "triple bottom line" of people, planet, and profit alters one institution supporting the logic of market capitalism to achieve more responsible outcomes.

Another way to challenge an institution is to change how an industry is regulated. For example, over time, regulations have established new norms that have increased corporations' obligations to protect others from health and environmental damage. New regulations that make polluters pay for the harm their pollution causes—through mandating cleanup costs, cutting subsidies, or imposing taxes or fees on polluters—could further reduce harm

10b

Projected human population by 2050



The estimated global GDP by 2050 is \$136 trillion

99%

Reduction of cost of solar photovoltaic powers from 1980 to 2012

from pollution without challenging the logic of market capitalism.

The third approach to overcoming resistance is more dramatic. It involves seizing the day after major crises and disruptions—such as terrorist attacks, environmental catastrophes, or hostile takeovers—because such events make a system amenable to rapid social change. As Winston Churchill is reputed to have said, “Never let a good crisis go to waste.”

Such a flip occurred after the terrorist attacks of September 11, 2001. Within months, President Bush had signed the Patriot Act into law, creating the Transportation Security Agency, which imposed travel restrictions, and the Department of Homeland Security, which changed social norms around privacy, freedom, and government control in ways that people never would have considered possible on September 10. In similar ways, the Santa Barbara oil spill of 1969, the Bhopal gas leak disaster of 1984, the discovery of the Antarctic ozone hole in 1985, and the Chernobyl nuclear disaster in 1986 rapidly flipped the logic by which people understood pollution, technological risk, and corporate responsibility. The COVID-19 pandemic is having a similar effect at the time of this writing.

To achieve change in society, it is important to match the approach to the circumstances. When resistance to change is high, incremental change is more feasible than rapid change, and therefore it is best to fit an intervention within the existing logic. For example, electric cars are catching on in part because they do not challenge people’s freedom of independent mobility, and they even improve on traits considered desirable, like styling and acceleration. Similarly, Beyond Burgers and other plant-based meats are gaining acceptance partly because they taste like real meat.

When the need for change is apparent, solutions are readily available, and resistance to change is moderate, changes in regulation can be successful. For example, plastic bag taxes or bans work best when the community sees plastic bag waste as a problem and solutions

(in terms of alternatives and implementation mechanisms) are readily available.

Both of the approaches just mentioned allow for careful policy prescriptions that do not rock the boat too much. Leveraging crises, in contrast, is potentially transformative, but it relies on unpredictable events and is less controllable. For example, the sudden discovery in 1978 that an abandoned hazardous waste dump in Love Canal, a neighborhood in Niagara Falls, New York, was causing birth defects, miscarriages, and leukemia in nearby residents led to the enactment of the federal Superfund cleanup law in 1980. This new law overhauled the norms of corporate financial liability for harms caused by dumping hazardous waste.¹³

However, leveraging crises can result in unexpected outcomes and an accompanying backlash that then impedes change. The Superfund law triggered a forceful corporate pushback that lasted for years. More recently, efforts to impose mask or vaccine mandates to protect people from COVID-19 have run into a buzz saw of opposition.

New Policies for the Anthropocene Epoch

To create a more enlightened Anthropocene society and healthier ecosystems, humanity needs to change its institutions, meaning the ideas and practices that guide organizations and society. But because institutions resist meaningful change, policies to shift them need to be chosen consciously and on the basis of the best available evidence of what will be effective. To that end, we have developed five categories of research-based policies that will shift society toward environmental sustainability in the Anthropocene epoch. These policies, which are summarized in Table 1, drive change by targeting one of the three types of institutions: regulations, norms, or implicit beliefs and agreements. Each set of proposals contains a mix of policies that drive incremental, transitional, and transformational change. Ultimately, the goal of all these policies is the same: to shift the two types of logic that underpin today’s global economy—market capitalism and technological optimism.

Table 1. Five sets of policies for shifting Anthropocene society

Category	Change mechanism	Policies	Policy examples
Policies for eco-sensitive corporate governance	Rethink the predominate focus on shareholders in corporate governance.	<ul style="list-style-type: none"> • Create new types of corporate governance that elevate considerations of the planet and people alongside profit outcomes. • Recognize natural systems as subjects with legal rights, as corporations are, rather than as property over which humans have ownership. • Base executive compensation on progress toward social and environmental objectives, not only share price. • Require transparency in corporate political activities. • Mandate economic metrics that assess broad social and environmental well-being. 	<ul style="list-style-type: none"> • BlackRock (Fink, 2019), the World Economic Forum (Schwab, 2020), and the Business Roundtable (Gelles & Yaffe-Bellany) challenging the idea that corporate governance should focus exclusively on maximizing shareholder value • Ecuador giving nature legal rights of personhood (Gleeson-White, 2018), and a panel of international lawyers proposing the criminalization of ecocide (Bowcott, 2020) • New Zealand’s economic metrics that shift the country’s focus to broad social and environmental outcomes (New Zealand Treasury, 2019)
Policies that reduce consumption	Promote sustainable consumption and reimagine success in non-material-based ways.	<ul style="list-style-type: none"> • Create environmentally sustainable supply chains and circular-economy production models. • Promote norms of sufficiency, restraint, repair, and philanthropy as measures of success. • Develop new forms of urban infrastructure that do not focus on shopping and reduce material and energy consumption. • Make consumption and distribution more equitable. 	<ul style="list-style-type: none"> • Circular-economy policies, such as those promoted by the Ellen MacArthur Foundation (n.d.), Dell, Adidas, Method, and Dow, as well as the Right to Repair movement (The Repair Association, n.d.) • New urbanism (Congress for the New Urbanism, 1996) • Patagonia’s Common Threads (Patagonia, n.d.-a) and Worn Wear (Patagonia, n.d.-b) initiatives • The degrowth movement (Roulet & Bothello, 2020) • Increasing self-sufficiency in local economies, as described by the Schumacher Center (Witt, 2014)
Policies to elevate the role of physical and social sciences in business and society	Reestablish science’s legitimacy in public and private decisionmaking.	<ul style="list-style-type: none"> • Fund and promote basic and applied science to achieve sustainability objectives. • Speak out publicly in support of science’s legitimacy. • Train and reward scientists for public engagement. • Integrate lessons on the scientific method into public education. 	<ul style="list-style-type: none"> • Science-based targets in corporate planning (Science Based Targets, 2020) • Letter from 75 CEOs, alongside union leaders, urging the United States to maintain its commitment to the Paris Agreement (Appelbaum et al., 2019) • Changes in K–12, college, and public science literacy programs (National Science Board, 2004)
Policies that extend corporate time horizons	Extend time horizons in corporate and public planning.	<ul style="list-style-type: none"> • Use longer (40- to 60-year) time horizons for planning. • Amend standard discounted cash flow methods and reduce discount rates to appropriately value long-term impacts on the natural environment. • Develop global standards and audit procedures for longer financial horizons (Task Force on Climate-Related Financial Disclosures, 2018). 	<ul style="list-style-type: none"> • Unilever’s elimination of quarterly financial reports (James, 2018) • The Long-Term Stock Exchange’s efforts to extend time horizons for return on investment (Delaney, 2016) • The Production Tax Credit, applying longer time horizons to public policies that promote sustainable technology investments (Nelson & Pierpont, 2013) • The Long Now Foundation’s (n.d.) Organizational Continuity Project, which seeks to create long-lasting institutions that can address multigenerational challenges
Policies that make society more adaptable and resilient	Embrace the new normal, which includes a less stable environment that is more prone to sudden shifts.	<ul style="list-style-type: none"> • Adopt new risk models that account for the new normal, such as those being adopted by the insurance sector (Hope & Friedman, 2018). • Develop new programs and infrastructure to address multiple challenges simultaneously, such as an economic stimulus, as well as low-carbon energy, energy efficiency, pollution abatement, and materials recycling. 	<ul style="list-style-type: none"> • The Federal Emergency Management Agency policy change to relocate people rather than rebuild storm-damaged properties (Sack & Schwartz, 2018) • Insurance policy shifts after the California wildfires to avoid rebuilding in risky areas (Kasler, 2020) • Building standards that incorporate climate resilience (Hill & Zaidi, 2016) • Planning and zoning laws that promote climate resilience (National Oceanic and Atmospheric Administration, n.d.) • COVID-19 green recovery policies that include the removal of fossil fuel subsidies and the taxation of carbon (Barbier, 2020)

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Policies for Eco-Sensitive Corporate Governance

Many people today still believe, as Friedman did, that the corporation's sole social purpose is to maximize shareholder profits. This view is embedded in many norms and regulations that reinforce the logic of market capitalism. It has also accelerated resource extraction and pollution, which has, in turn, caused environmental crises such as habitat destruction, ozone depletion, and excess greenhouse gas pollution.

Nevertheless, the market can be a powerful and constructive force. It has provided food,

drugs, shelter, and mobility, raising the standard of living and increasing the life span for millions of people over the past century. What is more, corporations have tremendous power to leverage market forces to solve environmental problems. For example, companies have helped reduce greenhouse gas emissions by developing better wind and solar technology. These advances have lowered the average installed cost of wind power from 7 cents per kWh in 2009 to below 2 cents in 2019,¹⁴ and it has lowered the cost of solar photovoltaic power by 99% between 1980 and 2012.¹⁵

“norms that govern corporate behavior are shifting”

For corporations to solve environmental problems, they have to prioritize such outcomes, which will require their moving away from Friedman’s single-minded focus on profit and instead making all three elements of the triple bottom line—people, planet, and profit—important priorities. As Klaus Schwab, founder and executive chairman of the influential World Economic Forum, has argued, corporations should generate value for their employees, customers, suppliers, local communities, and society at large and should act as “a steward of the environmental and material universe for future generations.”¹⁶

Fortunately, norms that govern corporate behavior are shifting. In the private sector, powerful market actors like the Business Roundtable, a consortium of CEOs from major U.S. corporations,¹⁷ and BlackRock, a multinational investment management company,¹⁸ have begun to challenge the idea that corporations exist solely to maximize profits for shareholders.

Innovative public policies can also drive change in the private sector. Policies to help protect the environment could include giving nature legally enforceable rights, as Ecuador did in 2008 by amending its constitution,¹⁹ or granting specific ecosystems the legal status of personhood, as has been done in New Zealand, Canada, Pennsylvania, and Florida.²⁰ Policies can also be more ambitious. For example, a group of international lawyers is drafting legislation that criminalizes the destruction of the world’s ecosystems.²¹ In each of these cases, the goal is to shift institutions that guide humanity’s view of nature so that people regard it as a subject under the law rather than as property.²²

Policies could also require corporations to be more transparent about their political activities and influence,²³ which would cut down on *corporate greenwashing*, the practice of publicly supporting sustainability while privately working to thwart the actions that promote it. ExxonMobil, for example, states on its website that “we are committed to positive action on climate change.”²⁴ Meanwhile, it spent over \$40 million in 2018 to lobby against policies that address climate change²⁵ and has supported

trade groups like the American Legislative Exchange Council and the American Petroleum Institute that have also lobbied against such policies. This position precipitated a proxy fight among ExxonMobil shareholders that resulted in two climate friendly directors gaining seats on the company’s board.²⁶

Other policies could address the disconnect between one common type of economic metric—stock market indices—and economic, social, and environmental well-being. For example, the Dow Jones Industrial Average grew steadily in the summer of 2020, even though the world was mired in the COVID-19 crisis,²⁷ the economy posted its worst drop on record,²⁸ and unemployment reached historic highs.²⁹

This disconnect suggests that stock market indices reflect only the narrow economic interests of shareholders rather than the broader interests of employees, the community, and the natural environment. As corporate attorney James Gamble wrote in 2019, many economic metrics compel corporate executives “to act like sociopaths,”³⁰ each running their company as “a textbook case of antisocial personality disorder [that] is obligated to care only about itself and to define what is good as what makes it more money.”³¹ To compensate for such antisocial tendencies, some companies are reconfiguring executive compensation to reward progress toward social and environmental objectives, and many companies are searching for ways to profit more while reducing their environmental impact by consuming less energy and fewer raw materials.

Nations can assess their progress toward social and environmental well-being by shifting their economic metrics and priorities. These are being developed and, in some locations, implemented. In 2019, New Zealand began basing its budget decisions on effects on overall well-being rather than economic outcomes.³² These

and all the examples above show how public and private policies can shift the logic of market capitalism.

Policies That Reduce Consumption

Today's global marketplace can fulfill a vast range of human desires and still provide clean air, water, and food.³³ Nevertheless, to remain within planetary boundaries, society must reduce its collective consumption of goods and resources. The World Business Council for Sustainable Development has already recognized that need, proposing the development of new models of what they call "sustainable consumption."³⁴

New private and public policies can help. Recycling offers a good start, and companies and communities are making strong efforts to get more people to recycle, both by designing more products that may be recycled and by creating the infrastructure to collect and process more recyclables.

But recycling is just a start, and the *circular economy* picks up where recycling leaves off. This approach involves designing products so they can be reclaimed at the end of their useful life, their parts and materials then refurbished and reused to keep them in circulation as long as possible.³⁵ Promoted by the Ellen MacArthur Foundation³⁶ and implemented by companies like Dell, Adidas, Method, and Dow,³⁷ among others, the circular economy can reduce demand for virgin natural resources, which can help keep humanity within planetary boundaries.

Advocates of the right-to-repair movement³⁸ are supporting this shift by pushing for legislation that compels companies to make it easier to repair their products. A Massachusetts law requires car manufacturers to provide independent mechanics with access to the same diagnostic tools used in dealerships, for example, and Montana is considering a similar law that covers both agricultural equipment and consumer technology.³⁹

The design of cities and their infrastructure can also slash the use of materials and fuels used

in transportation. Although some older cities, such as Boston and New York, remain walkable, most modern American cities are designed primarily as habitats for cars, with roads and parking dominating the cities' layouts. In cities such as Houston, Indianapolis, and Los Angeles and in suburbs nationwide, people drive to work and rely on cars for most of their transportation needs. This was by design. In the 1920s, the leaders of big oil and auto companies, along with the car-loving elites, "enforced dependency on the automobile," as Greg Shill wrote recently in *The Atlantic*.⁴⁰

Today, cities have begun implementing urban planning, zoning, and development policies that prioritize people and livability. *New urbanism*, a popular urban-planning movement, advocates for the renovation of downtown areas and the infill of unused space over suburban expansion, which can decrease suburbanization, road building, and the environmental impacts that follow.⁴¹ Some cities that closed off streets to create pedestrian malls for social distancing in response to the COVID-19 pandemic have maintained those driving restrictions as businesses have reopened. Other cities have developed new forms of cultural infrastructure that focus on the outdoors and forms of social engagement rather than shopping, such as the High Line in New York City, a 1.45-mile-long elevated linear park, greenway, and rail trail created on a former New York Central Railroad spur.

Reducing consumption also means taking a hard look at the disproportionate use of goods and services by the affluent few. Ultimately, society will need to make consumption more equitable and not base social status on material possessions. National policies can set the tone by no longer demanding continuous economic and material growth, which is pushing humanity past planetary boundaries, and instead emphasize consuming only what is needed.

A new social movement has begun calling for *degrowth*, which means to shrink rather than grow economies to levels more in line with the carrying capacity of the planet. Efforts to promote self-sufficient local economies can

help cities, towns, and regions become more resilient to the effects of climate change. Such efforts reduce the consumption of products and materials that have been shipped long distances, which reduces greenhouse gas pollution and can promote the protection of vulnerable ecosystems.⁴³

Meanwhile, some corporations have begun striving to eliminate planned obsolescence and are placing less emphasis on the satisfaction of immediate desires.⁴⁴ Patagonia is one company that is already doing this: Its Common Threads and Worn Wear initiatives encourage people to extend product lifespans by buying used clothing or repairing damaged items.⁴⁵

Policies to Elevate the Role of Physical & Social Sciences in Business & Society

Public trust in academic institutions, scientific agencies, and other sources of scientific information is rapidly eroding.⁴⁶ The public and even government leaders challenge science as mere opinion. But science is essential in the Anthropocene as ecosystems and the climate transform, and people need to trust scientific findings. To assess and adapt to rapid change and remain within planetary boundaries, society must bolster scientific literacy as an institution.

In the private sector, companies could change how they use science. Today, it is used primarily for product and process innovation and to assess customers and potential customers for marketing purposes. But companies could also use science to pursue social and environmental goals. For example, some companies are adopting science-based carbon emissions reduction policies in concert with the Science Based Targets initiative, which helps companies reduce or eliminate their carbon footprint.⁴⁷

Other companies pursue research that balances the quest for basic scientific understanding with considerations for applications and use.⁴⁸ For example, social science perspectives on network analysis have proved valuable for navigating the interpretation and application of big data sets in medicine (where they can be used to assess patterns of disease spread and treatment response in large populations of patients)

“science is essential in the Anthropocene”

and in responses to climate change (where they help in the assessment of emissions and shifts in weather patterns). In addition, many companies have spoken out to reinforce scientific conclusions on issues such as climate change, particularly in the face of opposition that attempts to cast doubt on the validity of the science. For example, 75 CEOs signed a letter in 2019, alongside union leaders, to urge the United States to maintain its commitment to the Paris Agreement.⁴⁹

Another way to elevate science is to encourage scientists and scholars to become more engaged in public and political discourse, bringing their work to the communities that most need it. In so doing, they could help people grasp what scientists do, how they do it, what their findings mean, and why their research is important. For this to happen, the norms of academic science and success must shift to empowering, training, and rewarding scientists for public engagement.⁵⁰ In this way, scientists could help increase public understanding of planetary boundaries and how society is overshooting them.

Grasping the concept of planetary boundaries requires people to understand science differently. In the past, scientists relied on direct observations, or they used methods and instruments that enabled individuals to observe the previously unobservable. These approaches were intuitive and easy enough for educated people to follow. Today, understanding science often requires that people trust and accept the results of computational models whose workings are too complex to intuit.⁵¹ For example, people rarely observe climate change directly and instead are asked to trust the projections of complex computational models of the earth's climate. Similarly, many have not directly observed the devastating effects COVID-19 can have on the human body and thus have dismissed or diminished the urgency of addressing it. The inability to observe and

experience science directly has led many people to regard it as being more politicized, uncertain, and open to challenge and interpretation than it is. Restoring trust in science will take efforts on several fronts. Because many people do not understand the scientific method or how it works, educational policies should require that children be instructed from an early age on the processes and outcomes of scientific research and that adults have opportunities to learn through science literacy initiatives.⁵³

Policies That Extend Corporate Time Horizons

People conceive of time as linear and continuous, and they often think short term. For example, business leaders tend to focus on quarterly or annual time frames, and policymakers think in terms of business and election cycles that last a few years. But planetary heating, sea level rise, and carbon cycles occur over decades, centuries, and millennia and can cause abrupt changes. The greenhouse gases emitted today will elevate temperatures and acidify the oceans for centuries, not quarters. In Anthropocene society, these long time scales must be considered.

The short-term thinking that dominates business institutions and business education today percolates into the larger world of business and economics. Most large multinational corporations, for example, use valuation techniques such as discounted cash flows, which are anchored in ideas that “favor short term gains at the expense of future generations,” as Arturo Cifuentes and David Spinoza have argued.⁵⁴

But pioneers in business are beginning to think long term. Unilever stopped issuing quarterly financial reports in 2018 to encourage managers to think less about the company’s short-term profits and more about its long-term health.⁵⁵ And to keep the shareholders of public companies focused on long-term rather than short-term thinking, Silicon Valley entrepreneur Eric Ries created an SEC-registered stock exchange to promote long-term investing. The Long-Term Stock Exchange (LTSE) uses several policies to promote the use of extended time horizons. In contrast to the typical focus

of corporate boards on quarterly and annual results, companies listed on the LTSE count a long-term shareholder’s vote more than a short-term shareholder’s vote, and they link executive compensation to long-term business performance. The LTSE also allows companies to know who their long-term shareholders are, which helps them understand which sources of capital are likely to remain stable.⁵⁶ Another initiative promoting long-term thinking, the Long Now Foundation’s Organizational Continuity Project, tracks organizations that have managed to stay stable over many centuries, even a millennium, to learn how to build long-lived organizations that can better address the multigenerational challenges facing humanity.⁵⁷

Some economists are also focusing on the long term, although not without pushback from conservatives in their ranks. Nicholas Stern stirred controversy in a landmark 2007 study on the economics of climate change.⁵⁸ Stern argued that the costs of stabilizing the climate were manageable, but delay would be dangerous and far more costly. His calculations were strongly influenced by his chosen *discount rate*, a measure economists use to estimate the value of an investment today based on projections of how much money it will generate in the future. Most economists use a discount rate of 5%–10%, which assumes that nothing in the present will have much value after 10 or 20 years. When analyzing the cost of climate change mitigation and adaptation, Stern instead used a rate of 1.4%, which added value to reducing harm to the environment. This same logic could apply to a wide array of global standards and audit procedures that can be used to promote long financial horizons, such as investment planning tools, financial disclosures, and financial pressure tests.⁵⁹

Public policies, too, should have long time horizons, and policymakers should consider a broader array of outcomes than monetary costs and benefits. Today, U.S. energy policy gets whipsawed from one election cycle to the next, making long-term planning difficult, if not impossible. For example, federal tax credits that subsidize the development of solar or wind farm installations are renewed on short annual cycles,

thereby discouraging long-term planning.⁶⁰ Energy policy should instead be developed with a 40- to 60-year time horizon, as promoted under the Paris Agreement and in the European Union climate agreements. Instead of asking what they want their company's energy mix to be in a few years, policymakers should ask what it should be in half a century and what steps need to be taken to get there.

Policies That Make Society More Adaptable & Resilient

Most people still see nature as being relatively static, as has been the case since the Enlightenment, with change happening slowly and continuously. This view squares with the logic of market capitalism and the logic of technological optimism, both of which view the world as being on a relatively continuous, upward path of progress.⁶¹

But science has shown clearly that the world has fundamentally changed. Sea levels are rising and drowning coastlines, and storms, droughts, and wildfires have become more frequent and severe. Earth's oceans, climate, and ecosystems now interact and behave in unpredictable ways. The environment is less stable and more prone to sudden shifts than it has been in the past.

Policies must be revised to adapt—and some already are being changed. Insurance companies, realizing that past is not prologue, are discarding outdated weather data that they once used in actuarial calculations and are instead hiring teams of in-house climatologists, computer scientists, and statisticians to redesign risk models to reflect today's climate and weather instability.⁶² In the wake of major California wildfires that burdened insurers with high payouts, the companies adjusted their policies to reduce their liability in wildfire zones and made it more difficult for customers to obtain coverage that would allow them to rebuild should disaster strike.⁶³ Now that 100-year storms occur far more often than they used to, localities are finding their insurance coverage being reduced or deemed nonrenewable. As a result, some are adjusting their planning and zoning laws⁶⁴ and building standards⁶⁵ to

prepare for more frequent storm disasters and guide rebuilding efforts. Such shifts can be seen in areas where weather-related impacts are greatest, notably near the coasts.

In the new normal, public policies must be adjusted as well to enhance resilience by planning for both climate and financial disruptions. Government agencies like the United States Federal Emergency Management Agency must shift flood response plans away from rebuilding to relocation, acknowledging that damaging weather events will recur and intensify.⁶⁶ Communities must focus on building resilience in the face of weather-related disruption and disaster.

To rebuild economically after the COVID-19 pandemic, the World Economic Forum has called for a "green recovery" that addresses multiple challenges simultaneously. Stimulus money could fund new programs and infrastructure that promote economic benefits while also furthering measures that promote climate resilience, such as low-carbon energy, energy efficiency, pollution abatement, and materials recycling.⁶⁷

The Resistance Ahead

Creating a healthy Anthropocene society requires that these proposed policies be implemented, each fitted to a particular condition and desired outcome, such as incremental, transitional, or transformational change. However, virtually all of these policies threaten closely held cultural, ideological, and religious beliefs that many now hold or benefit from. The policies challenge the logic that market forces, human ingenuity, and technological innovation inevitably lead to positive ends.⁶⁸ They stir fears of centrally planned socialist or communist economies and concerns that no good economic alternative to a free-market economy is available. They raise anxiety that people will lose freedom and stop taking personal responsibility. And they spark resistance from those who distrust scientists and cast them as liberal elites who elevate reason over faith and the rational over the intuitive or spiritual.⁶⁹

Such tensions already drive ideological resistance to policies that ban plastic straws and incandescent light bulbs or mandate low-flow toilets, as well as resistance to acknowledging and addressing climate change. They also have driven people to resist wearing masks or get vaccinated during the COVID-19 pandemic. In the future, similar fears could create ideological resistance to phasing out fossil fuels, reducing meat consumption, and other constructive moves that would help keep the world within planetary boundaries. Divisiveness, polarization, and misinformation are and will continue to be substantial barriers to transition and change.

For these reasons, planning for a healthy Anthropocene society must be inclusive in a new way, drawing in people who have not been consulted in the past. For example, the debate over climate change, which once might have been restricted to scientific agencies and political leaders, now includes religious leaders, meteorologists, media personalities, movie stars, sports figures, and the Pope. Such inclusivity and engagement should continue and even expand.

Conclusion

Research investigating mechanisms that alter institutions can inform and guide some incremental or transitional changes that can help keep the earth within safe planetary boundaries. And given the new normal caused by the Anthropocene (and COVID-19), policymakers will have plenty of opportunities to push for more rapid and transformational change when sudden, disruptive events compel a reexamination of the institutions and types of logic in society. Only by shifting the dominant logics of market capitalism and technological optimism will society be able to keep the planet within its livable boundaries—and thereby fulfill humans' long-abjured role as the planet's stewards.

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authors' note

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