



Ecosystems for Ecosystems

How Business Ecosystems Can Enable Collective Action Against Climate Change

NOVEMBER 12, 2021

By David Zuluaga Martínez, Martin Reeves, and Ulrich Pidun

The orchestrators of today's largest technology-enabled business ecosystems are uniquely positioned to help bring about collective environmental action.

Human societies have an outstanding ability to solve complex collective action problems, and for the past 400 years they have done so primarily through the

mechanism of the nation-state. However, states have found it especially challenging to tackle collective action problems that are global in scale.

The COVID-19 pandemic made it clear both how much power states have to act and how difficult it is for them to act in concert when challenges transcend national borders. COVAX, the international effort to ensure equitable access to COVID-19 vaccines, has shipped more than 365 million doses to some of the world's poorest countries.¹ Yet vaccine nationalism remains conspicuous, with affluent countries stockpiling vaccines even as research shows that they would be better off sharing them “to lower disease burdens in countries with less access, reduce the cost of having to be constantly vigilant for case imports, and minimize virus evolution.”²

State-led collective action on a global scale is even more constrained in response to complex challenges on longer timescales—which is precisely the case with climate change, arguably the greatest known existential threat humanity faces. We know that environmental degradation will have devastating consequences, but because harm materializes progressively over the course of decades rather than days or weeks, we have been less willing to take decisive action.³ The trajectory of state-led climate efforts proves as much. The Intergovernmental Panel on Climate Change (IPCC) issued its first report in 1990, but it took seven years to create the first legally binding agreement to reduce greenhouse gas emissions, the Kyoto Protocol. Seven more years passed before the Kyoto Protocol could enter into force. Over that 14-year period, annual global greenhouse gas emissions increased by 23%.⁴

While there is no question that states must play a central role in [climate action](#), we need to mobilize every resource available—including the power of private enterprise.

We think there is reason to be optimistic about the business community's ability to act collectively to tackle climate change. But rather than resting content with individual company “net-zero” pledges and efforts, we should leverage the sophisticated coordination mechanisms that enable thousands of independent companies to participate in today's business ecosystems. The governance model

behind today's largest technology-enabled business ecosystems can be a powerful tool for global climate action. The few orchestrators at the heart of those ecosystems have the ability and the strategic opportunity to mobilize thousands of businesses across the world in ways that few (if any) other existing coordination mechanisms can match. This will not solve all of our problems, but it could meaningfully accelerate progress.

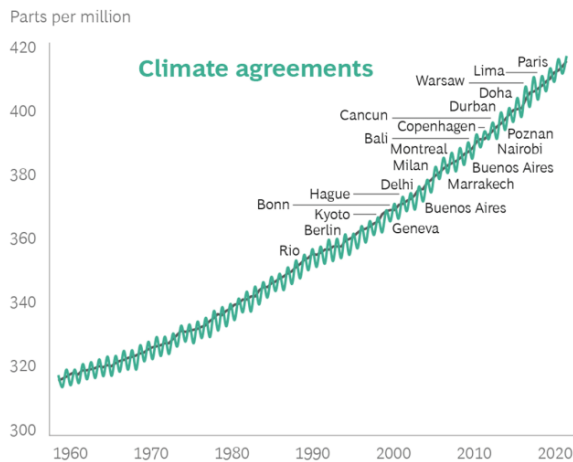
Why We Need Collective Business Action

Many businesses are already taking action on climate change at an individual level. At least one-fifth of the world's 2,000 largest public corporations have adopted some kind of net-zero greenhouse gas (GHG) emissions commitment.⁵ However, given the magnitude and complexity of the challenge we face, there are strong reasons to believe that individual efforts of this kind will fall short of what's needed.

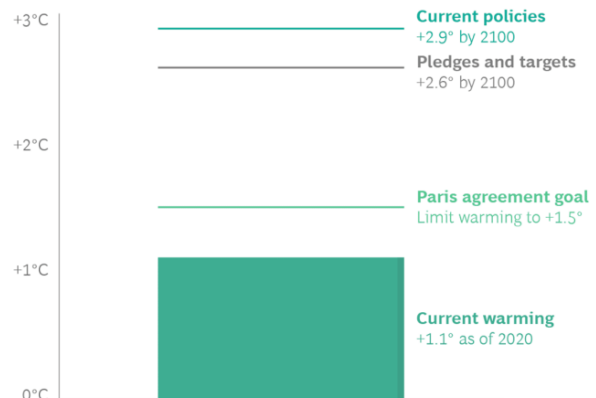
For starters, CO₂ emissions continue to rise despite the growing number of climate agreements and pledges. Additionally, even if we did manage to deliver on all the pledges and targets that governments and businesses have committed to, global temperature is expected to increase well above the goal set by the Paris Agreement. (See the exhibit.)

Today's Approach to Climate Change Is Insufficient

Atmospheric CO₂ at Mauna Loa Observatory



Global temperature rise over preindustrial average



Sources: Scripps Institution of Oceanography; National Oceanic and Atmospheric Administration; UC San Diego; Earth System Research Laboratories; Climate Action Tracker; Council on Foreign Relations.

Note: Current policies and pledges and targets are projections. In each scenario, the temperature shown is the most likely in a range of possible outcomes.

To complicate matters further, we lack clear, shared standards for how countries and businesses should pursue their net-zero ambitions, and we have no robust scorekeeping system to assess and track climate action plans. Among the 43% of Russell 1000 companies that have disclosed a commitment to reducing emissions, only 9% have set commitments that meet the Science Based Target Initiative (SBTi) scenario to limit global warming to 2 °C above preindustrial levels by 2100.⁶ As a recent study at Imperial College London puts it, “choosing different gases, different timing for net-zero emissions, and different methods of aggregating emissions can have very different outcomes.”⁷

The problem of translating lofty pledges into concrete plans that can be evaluated, measured, and compared is further complicated by the fact that individual companies may have nonadditive climate effects. Net-zero strategies defined by individual businesses could even have detrimental aggregate outcomes in some cases. For example, companies pledging net-zero emissions very often adopt “offset” strategies that rely on carbon trading. Highly carbon-intensive businesses could thereby become net-zero in a technical, accounting sense—without any

actual reduction in the overall amount of carbon that is released into the atmosphere. The offset strategy is constrained by the economics of carbon trading; it will only work until the price of carbon matches or exceeds the cost a business is willing to incur to honor its net-zero pledge. As the price of carbon rises, it is hard to tell whether individual businesses that have adopted the offset strategy will be driven to transform their business models—or just renege on their environmental commitments.

“

Net-zero strategies defined by individual businesses could even have detrimental aggregate outcomes in some cases.

Even when businesses do change the ways in which they operate to curb emissions, they may nullify their own contributions if they fail to act in concert with others. For example, it is estimated that a 10% reduction in vehicle weight could result in 6%

to 8% fuel economy improvements. One way to achieve that is by replacing cast iron and traditional steel with lighter materials such as aluminum.⁸ But because aluminum production continues to rely heavily on fossil fuel energy sources, the increase in emissions associated with higher aluminum demand could in some cases offset the beneficial effect of reduced fossil fuel consumption associated with vehicle weight.⁹ As noted by the IPCC’s 2014 report, mitigation strategies to reduce GHG emissions require a “lifecycle perspective” that cuts across the activities of individual businesses.¹⁰

As things stand, states have made progress toward setting global emissions targets, but those targets are vague, progress is difficult to measure, and enforcement is virtually impossible. Some businesses, especially large enterprises, have committed to contribute their share—but in aggregate these individual efforts could easily be insufficient. What is required is collective business action of the sort that the

business ecosystems of the digital age are uniquely positioned to enable, especially through the agency and activism of their orchestrators.

The Power of Orchestrators

In [our previous work](#), we have defined business ecosystems as dynamic groups of largely independent economic players that create products or services that together constitute a coherent solution. In short, ecosystems are a way for independent businesses to organize in order to realize a collective value proposition. The lesson to be learned from the expansion and proliferation of business ecosystems is that independent enterprises can, under certain conditions, successfully coordinate a very complex set of actors and activities to create value, without relying on command-and-control hierarchies.

While business ecosystems are diverse, their governance structures exhibit some key commonalities. Ecosystems are modular in that their components—the multiple businesses that contribute to them—are independent yet function as an integrated whole, at least for purposes of delivering a joint solution. Most importantly, ecosystems are held together by “orchestrators” that, despite having considerable power over the structure and workings of the ecosystems, nevertheless do not deploy hierarchical control of activities, as is the case in most individual enterprises and vertical supply chains.

Orchestrators are the central nodes of coordination that make an ecosystem’s collective value creation possible. They typically build the ecosystem and its coordinating platforms, encourage others to join, define standards and rules, and act as arbiters in cases of conflict. Some of today’s most successful ecosystems (as in the cases of Alibaba, Amazon, Apple, Tencent, Facebook, and Yandex) are built around orchestrator-owned digital platforms. Because of their place at the heart of ecosystems that can synthesize hundreds and even thousands of contributors, orchestrators wield extraordinary influence; they have the power to shape behaviors across far-reaching networks of partners, often on a global scale.

Our analyses suggest that over the past 20 years, ecosystem orchestrators have grown considerably in size, reach, and power. Among the S&P 100, the number of ecosystem orchestrators has grown from 3 to 22. More importantly, those 22 orchestrators account for 40% of the total market value of the S&P 100. The rise of ecosystems shows also in the share of new “unicorns” associated with them: 23% of the new unicorns between 2015 and 2021 have based their business model on orchestrating a business ecosystem.

“

Ecosystem orchestrators have the power to shape behaviors across far-reaching networks of partners, often on a global scale.

These facts illustrate the considerable (and growing) share of economic activity concentrated around ecosystems and therefore the extraordinary reach and coordinating power of their orchestrators. With thousands of contributors of all sizes relying partially or wholly on ecosystems, orchestrators have become critical nodes in some of the world’s largest and most complex coordination systems.

How Ecosystems Can Simplify the Challenge

Business ecosystems can enable ambitious climate action, essentially because they simplify the collective action problem we face. Instead of having to coordinate across thousands of enterprises globally, action by a handful of powerful orchestrators can have outsized effects because it can directly shape the decisions of their ecosystems’ contributors.

Consider the case of Amazon, which according to Marketplace Pulse has approximately 1.5 million active sellers.¹¹ Any norms or standards Amazon chooses to adopt as orchestrator of the global retail ecosystem that runs on its digital platform could shape the behavior of hundreds of thousands of businesses globally.

And the same holds for other orchestrators. When dealing with a problem at the scale of climate change, such drastic reduction in the number of key players whose decisions can be pivotal amounts to a transformation of the game, turning a virtually impossible consensus gentium into the feasible adoption of shared norms and practices by a few, disproportionately powerful actors.

“

When dealing with climate change, a drastic reduction in the number of key players whose decisions are pivotal can transform the game.

One important virtue of business ecosystems is the sheer diversity of contributors who can come to act collectively through the influence of orchestrators. More specifically, ecosystems reach large numbers of small and medium-size enterprises—those that

are less likely to make public net-zero pledges or indeed take any unilateral climate action. Yet the “long tail” of small and medium enterprises (SMEs) all over the world is critical to truly addressing climate change collectively, because SMEs account for 90% of all businesses, 50% of employment, and more than 40% of GDP globally.¹²

In a sense, ecosystems can realize the idea of “climate clubs” proposed by Nobel Laureate William D. Nordhaus. Collective action around climate change is especially difficult because of the free-rider problem: those who undertake costly mitigating action create benefits from which no one can be excluded, so those who do nothing can ride for free. To solve the free-rider problem, Nordhaus proposes that countries should create “club regions” such that “the dues to the club are expensive [emissions] abatement, while the penalties for nonmembership are tariffs on exports to the club region.”¹³ Business ecosystems could do something very similar, especially when they rely on **digital platforms**. Access to the platform can be immensely beneficial to individual businesses, but orchestrators could make

it the case that contributors pay their dues in terms of adherence to rigorous environmental norms, while exclusion from or higher cost of access to the platform could function as penalties for nonmembers. Orchestrators have the power to replicate in the business world the collective action dynamics of what Nordhaus has described as “the best hope for effective coordination” to contain global warming.

Business ecosystems have another important qualifying characteristic: the ability to unlock experimentation and innovation toward new solutions. An important aspect of the climate challenge problem is that we do not currently know all of the eventual solutions; we must iterate our way toward them. Climate change is as much a challenge of innovation as of execution. Any governance mechanism must therefore be evolvable in nature. Individual ecosystems can deploy their modular structures to explore, adapt, and iterate on solutions; through digital platforms, learning can be fast and easily spread around for contributor networks to continuously rebalance their approaches to a common problem. As multiple ecosystems do the same, there is the additional benefit of multiple, parallel experimentation.

Furthermore, the robust digital technologies that power most of today’s largest ecosystems can go a long way toward filling the complex “scorekeeping gap” of environmental mitigation. As noted above, today’s net-zero pledges are virtually impossible to evaluate and compare, in part because there are no robust standards on the scope and metrics for emission reduction plans and no continuous flow of consistent data. Digital tools can make the difference in terms of setting clear standards, aggregating progress data, and presenting an accurate picture of progress that also creates transparency over and within an ecosystem.

How Ecosystem Orchestrators Can Make a Difference

To reap the benefits of ecosystem-enabled collective action on climate change, orchestrators will need to adopt rigorous GHG emission standards as integral to the governing norms of their ecosystems. They can thereby mobilize the thousands of contributors in whose interest it is to retain access to the ecosystem. While many

orchestrators—including Amazon—are already mobilizing businesses in their own supply chains, we are talking here about something more ambitious because the vast set of contributors to Amazon’s ecosystem reaches well beyond the confines of their own operations.

So how could this work? We think there are a few concrete steps orchestrators can take.

Assess ecosystem-level climate impact. Orchestrators should think about all the upstream and downstream activities associated with either their business or their contributors’ businesses. Where are the most salient environmental impacts and risks? What clusters or types of contributors are responsible for the highest rates of energy use or GHG emissions? What is the total footprint of the ecosystem? It is already standard practice among some of the world’s largest businesses to track the environmental impact across their [supply chains](#). Apple, for instance, reports a total carbon footprint of 22.6 metric tons of CO₂e, of which 71% is associated with the entire product manufacturing value chain, including its suppliers.¹⁴ The addressable scope of an orchestrator’s footprint can be expanded to include the broader network of ecosystem contributors.

Map and understand the network of contributors. Orchestrators could in parallel develop a clear map of their business partners to identify the contributors and processes that account for the most salient climate impacts and determine where they are. How strong are the relationships with the agents involved? Are they one-off transactions or enduring partnerships? Where is the greatest potential for footprint reduction in terms of size, substitutability, technology adoption, and willingness?

Collaboratively set rigorous targets for the ecosystem. Engage the key players—including large contributors—to agree on what the ecosystem should collectively achieve in terms of climate action. Targets should be bold and backed by hard scientific evidence. Organizations like the Science Based Targets Initiative (SBTi) have the expertise to support orchestrators in their efforts to set the right ambitions

and give those goals concreteness (for example, a precise definition of what constitutes net-zero emissions).

Leverage coordination power. Orchestrators have the power to steer an ecosystem toward decision-making principles that incorporate a rigorous dimension of sustainability. For instance, they can require contributors to adopt certain standards or practices, “advantage” those that more proactively adopt sustainable solutions, and even serve as advisors or knowledge-sharing nodes for contributors to learn from best practices across the ecosystem. This can be especially effective in reaching the long tail of SMEs that are harder to engage directly. Consider, for instance, Alphabet’s decision to make available the cloud technology solution that helped reduce energy utilization for cooling data centers by 30%.¹⁵ Given the high environmental impact of cooling and heating commercial businesses, widespread access to this technology could enable businesses of all sizes in Alphabet’s ecosystem—and potentially beyond—to reduce their own emissions.

Orchestrators could also make transparent to consumers the environmental footprint of different companies and products, thereby creating a new adaptive mechanism for reducing emissions.

Keep action plans adaptable across contributors and over time. Individual ecosystem contributors face very different realities. For example, they may differ considerably in the extent of dependence on fossil fuels, access to clean energy sources, or feasibility of sustainable alternatives to existing business processes. To make collective targets reasonable and achievable, orchestrators need to foster the development of context-specific, science-based action plans for key contributors and empower agents across the ecosystem to design solutions within the bounds set by the ecosystem’s shared parameters. This decentralization of action while retaining norm-setting influence at the core can make the ecosystem both powerful and adaptable.

Design shared and actionable monitoring and reporting standards. Orchestrators, especially those that lead [digital ecosystems](#), can harness

the power of technology to create transparency and accountability. Technology can help build trust by gathering and communicating accurate information about the ecosystem's environmental impact, system-wide as well as company-level. It is important, however, that technology not be used with merely a compliance mindset but with a strong action and impact bias as well: agents across the ecosystem should learn from the decentralized experimentation and real-time efficacy of environmental efforts across the network.

Why Orchestrators Should Act Now

The existential urgency of climate change should be sufficient reason for orchestrators to take action, leveraging their position at the core of today's ecosystems for the good of everyone. But there are also strong strategic reasons why orchestrators should do so—and do it now.

As we have noted [elsewhere](#), one of the key principles of corporate longevity and resilience is “embeddedness”, the alignment of a company's goals and activities with those of the broader systems within which it operates. An enterprise is not poised for long-term success, or even survival, if it works against the goals and aspirations of society at large. Indeed, there are strong signals that some of the world's largest digital ecosystem orchestrators are increasingly at risk in this regard. Regulatory pressure aimed at curbing the power of digital ecosystem orchestrators over contributors is on the rise:

- A US judge ruled in September 2021 that Apple could no longer force its developers to use the company's payment system in apps.
- Amazon has come under increasing scrutiny for the terms on which it transacts with its ecosystem contributors (third-party sellers on its retail platform), becoming the target of an ongoing investigation by the EU competition commissioner.
- Alibaba was recently fined \$2.8 billion by Chinese regulators, on grounds that it unduly prevented merchants (contributors to its e-retail ecosystem) from selling

on other platforms.

The regulatory pressure on digital ecosystem orchestrators is part of a broader [challenge to the legitimacy of globalization and technology](#). Between 2010 and 2019, the share of people in the US who believed that tech companies had a positive impact on society decreased from 68% to 50%.¹⁶ Although citizens continue to hold technology companies in high regard, their trust and respect appear to be slipping.

In this context, turning ecosystems into active instruments for climate action can be a powerful reaffirmation of corporate purpose that is compatible with societal expectations and goals. Moreover, technology can here be robustly deployed for good, making sustainability pledges tangible and measurable for thousands of enterprises. Orchestrators can draw on what they already know how to do—build and sustain business ecosystems—to make substantial contributions in the effort to combat climate change, thereby renewing their “social license to operate.”

Creating environmental transparency can help orchestrators manage some of the risks they face today. But in so doing, they can also unlock a source of competitive advantage for the future. Orchestrators stand to gain by offering consumers a moral choice on something that they care deeply about and will care even more about over time.

Climate change is so urgent a challenge that we cannot afford not to try everything that could avail. While governments continue to mobilize, business ecosystems can become important complementary mechanisms for collective environmental action. Ecosystem orchestrators are uniquely positioned to bring this about. In short, they have the power to rebuild trust in the extraordinary problem-solving power of business.

The BCG Henderson Institute is Boston Consulting Group’s strategy think tank, dedicated to exploring and developing valuable new insights from business, technology, and science by embracing the powerful technology of ideas. The Institute engages leaders in provocative discussion and experimentation to expand the boundaries of business theory and practice and to translate innovative ideas from within and beyond business. For more ideas and inspiration from the Institute, please visit our [Latest Thinking page](#) and follow us on [LinkedIn](#) and [Twitter](#).

Authors



David Zuluaga Martínez

Principal, BCG Henderson Institute Ambassador
New York



Martin Reeves

Managing Director & Senior Partner, Chairman of the BCG Henderson Institute
San Francisco - Bay Area



Ulrich Pidun

Partner & Director, BCG Henderson Institute Fellow
Frankfurt

- 1 Gavi: The Vaccine Alliance. Figures as of October 15, 2021.
- 2 Wagner, Saad-Roy, Morris et al. “Vaccine nationalism and the dynamics of control of SARS-CoV-2,” *Science*, September 24, 2021.
- 3 Paul Slovic, “Perception of Risk,” *Science*, April 17, 1987. Cited in Elke U. Weber, “Climate Change Demands Behavioral Change: What Are the Challenges?” *Social Research: An International Quarterly*, Vol. 82.
- 4 <https://www.climatewatchdata.org/> (accessed October 7, 2021). BCG analysis.

- 5 The Energy & Climate Intelligence Unit and Oxford Net Zero. “Taking Stock: A global assessment of net zero targets,” March 2021.
- 6 Laura Thornton and Shannon Cabral, “More Corporate Climate Commitments Are Essential to Limiting the Effects of Global Warming,” Just Capital, September 2021.
- 7 J. Rogelj et al. “Net-zero emissions targets are vague: three ways to fix it,” Nature, March 16, 2021.
- 8 Office of Energy Efficiency & Renewable Energy, energy.gov, “Lightweight Materials for Cars and Trucks.”
- 9 Kvande et al. “Aluminum Production in the Times of Climate Change: The Global Challenge to Reduce Carbon Footprint and Prevent Carbon Leakage,” The Journal of the Minerals, Metals, and Materials Society, November 2019; IPCC, Climate Change 2014: Mitigation of Climate Change, Cambridge University Press, 2014.
- 10 IPCC, idem.
- 11 Marketplace Pulse, “Number of Sellers on Amazon Marketplace” (accessed October 7, 2021).
- 12 The World Bank, “Small and Medium Enterprises (SMEs) Finance: Improving SMEs’ access to finance and finding innovative solutions to unlock sources of capital” (accessed October 7, 2021).
- 13 William D. Nordhaus, “Climate Change: The Ultimate Challenge for Economics,” Nobel Lecture in Economic Science, Stockholm University, December 2018.
- 14 Apple, Environmental Progress Report, 2020.
- 15 Sundar Pichai, “Our third decade of climate action: Realizing a carbon-free future,” September 14, 2020 (accessed October 7, 2021).
- 16 “A Policymaker’s Guide to the ‘Techlash’—What It Is and Why It’s a Threat to Growth and Progress,” Information Technology & Innovation Foundation (itif.org), October 28, 2019.

ABOUT BOSTON CONSULTING GROUP

Boston Consulting Group partners with leaders in business and society to tackle their most important challenges and capture their greatest opportunities. BCG was the pioneer in business strategy when it was founded in 1963. Today, we work closely with clients to embrace a transformational approach aimed at benefiting all stakeholders—empowering organizations to grow, build sustainable competitive advantage, and drive positive societal impact.

Our diverse, global teams bring deep industry and functional expertise and a range of perspectives that question the status quo and spark change. BCG delivers solutions through leading-edge management consulting, technology and design, and corporate and digital ventures. We work in a uniquely collaborative model across the firm and

throughout all levels of the client organization, fueled by the goal of helping our clients thrive and enabling them to make the world a better place.

© Boston Consulting Group 2021. All rights reserved.

For information or permission to reprint, please contact BCG at permissions@bcg.com. To find the latest BCG content and register to receive e-alerts on this topic or others, please visit bcg.com. Follow Boston Consulting Group on [Facebook](#) and [Twitter](#).

