Harvard Business School

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Harvard BiGS-CoBS Special Issue

Climate Change

Strategies for advancing the green transition

CEO perspectives on industrial policy

How can large corporations become more sustainable?

Money Talks: Banks can accelerate decarbonization

The Circular Economy: Its challenges and impact across frontiers

Harvard Business School | Institute for Business in Global Society

Harvard BiGS Team

Harvard Business School's Institute for Business in Global Society is pleased to present research-backed insights about climate change in this collaborative publication. This content combines the latest thinking of faculty, researchers, and business leaders from both Harvard Business School BiGS and the Council on Business & Society's member schools. We invite you to explore – and share – this publication and to increase your understanding of climate change, a critical global challenge we all face. We hope that the expert knowledge provided here will motivate you to take meaningful action.

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CoBS Team

The Council on Business & Society (CoBS) is delighted to welcome you to this special joint-publication on the pressing issue of climate change. Bringing together the expertise of leading faculty, researchers, and industry experts from the CoBS member schools with those of the Harvard Business School Institute for Business in Global Society (BiGS), our wish is that this publication sparks awareness, builds on your existing knowledge or provides you with further insight in order to take an active part in addressing one of the most urgent and necessary issues of our times – climate change. We hope you enjoy your reading.

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Editorial

Climate change is here – an everyday subject, a topic on everyone's lips, and increasingly an ever-present news item bringing us images of the devastating effects of global warming on the environment, infrastructure, homes, businesses and livelihoods, not to mention lives. Although a regular occurrence since the beginning of time, scientific evidence unanimously agrees that it is humankind's economic activity, especially since the 1980s, that has contributed to greatly speeding up this change.

So what can we do? Clearly, business and industry have the sheer global scale and presence to tackle GHG emissions effectively. They also have the power to innovate and invent new, cleaner and greener ways of doing business and conducting trade. And finally, they have the obvious power to create wealth, which can be used both to fund the green transition, and to benefit citizens and society through a variety of channels.

As the green transition unfolds, academia and education can serve both as catalysts for developing managers and leaders willing to deploy sustainable and responsible business practices, and as partners to business and industry in forging workable solutions.

Indeed, by means of their research, knowledge, and engagement over the years, academic institutions and faculty have contributed to creating organizations such as Global Compact, UN PRME, the SDGs, and the WEF, which opened the debate on sustainability nearly 25 years ago, and which have since helped businesses by providing clear guidelines, frameworks and tools for them to prosper while doing good for society and the planet.

All over the world, companies create and distribute value, deploying resources, coordinating the work of millions of persons, providing goods and services to whole populations. It matters that the people at the top of these increasingly influential organizations are professional, knowledgeable, but moreover, humane. Business schools have a central role to play in educating these future leaders, and ensuring they have the right mix of skills and wisdom to tackle the challenges ahead.

In this context, this publication – a joint initiative from the Harvard Business School Institute for Business in Global Society (BiGS) and the Council on Business & Society (CoBS) and its member business schools from across the globe – attempts to break new ground, putting together their respective academic knowledge, drawn from top research. It endorses our belief that business *can* do good, and that many of the world's challenges linked to climate change can effectively be mitigated, or even solved, by corporations and companies whatever their size and sector. Dear reader, may you find ideas, inspiration, and insight in this publication you have now on your hands. Whether CEO, manager, entrepreneur, policy-maker, employee, student, or citizen – both knowledge and a potentially better, more sustainable world are yours for the making.

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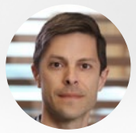

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Facing Climate Change: Companies, leadership, and society

BiGS Actionable Intelligence

CEO Perspectives on Industrial Policy

Debora L. Spar, Joseph Fuller

To learn more from the BiGS Global Leadership Roundtable in Washington, DC, please visit the BiGS Knowledge Hub.

CEOs and other business leaders must monitor the implementation of federal legislation aimed at boosting domestic manufacturing, decarbonizing the economy, and increasing U.S. competitiveness with China. Companies ranging from General Motors to privately held grid vendors are leveraging federal investments in areas ranging from electric vehicle infrastructure to semiconductor production. At the same time, they must anticipate risks, such as policy shifts with new administrations, workforce shortages, and geopolitical tensions. **Harvard** Professors **Debora L. Spar** and **Joseph Fuller** explore.

The report reflects the institute's convening earlier this year with nearly 50 CEOs, White House advisors, business leaders and Harvard Business School faculty members. The group held candid conversations about how industrial policy is being implemented, the challenges it faces, and the possibilities and problems that may lie ahead. The stakes have arguably never been higher, faculty said.

"With the federal government investing far more aggressively in industrial policy than it has in decades, CEOs must heighten their vigilance in tracking policy and program changes," said Debora Spar, the senior associate dean of Harvard Business School who founded BiGS and is the former president of Barnard College. "BiGS aims to play a crucial role in this unprecedented era by serving as a forum in which leaders across sectors can come together to collaborate and compare notes, and by delivering research-based analyses to help both businesses and government officials understand the implications of these shifts."

MANY ATTENDEES AGREED THAT THE PROGNOSIS, SO FAR, IS POSITIVE.

Construction employment is at its highest point in U.S. history; new factory construction has more than doubled since the pandemic; and the trade deficit with China is the lowest it has been since 2010. Other attendees were more skeptical, however, citing uncertainties stemming from workforce, capital, and supply chain shortages.

Of course, it's too early to declare the results. And the pivotal November 2024 federal election raises even more questions about the future, given its role in deciding party control of the White House and both chambers of Congress.

BIRTH OF AN ERA

This recent chapter in U.S. industrial policy emerged from three landmark pieces of federal legislation passed since 2021: the Infrastructure Investment and Jobs Act (IIJA); the Creating Helpful Incentives to Produce Semiconductors (CHIPS) and Science Act; and the Inflation Reduction Act (IRA).

Together, the three bills allocated trillions of dollars and helped focus federal government efforts on boosting U.S. industry, an area that some experts say has been neglected in recent decades.

"We haven't talked about it for a long time in the United States, but it is an important set of ideas that goes way back in economic history," Aaron "Ronnie" Chatterji, a professor at Duke University and former White House advisor, said in an interview with BiGS on the sidelines of the roundtable discussion. "In short, industrial policy is when the government provides support—often subsidies, grants, loans, tax credits—to key industries."

"A lot of countries in Asia and Europe have been doing this for a long time, but since the 1990s these policies haven't been in fashion in the United States. What's interesting about the CHIPS and Science Act and the Inflation Reduction Act and the bipartisan infrastructure law and other things is that they constitute a return to industrial policy."

Participants at the roundtable agreed that the time may be right for such an approach. Support is high for assisting industries facing threats from China, for working to mitigate climate change, and for creating high-paying jobs in struggling areas of the United States.

One roundtable participant, Omar Vargas, vice president and head of global public policy for General Motors, said in an interview with BiGS that investments in electric vehicle charging stations from the IRA and the IIJA could play an important role in supporting his company's goal of an all-electric future.

"There's a lot of public investment going into EV charging through the federal government and being led through state and local governments," he said. "We're confident that in the next couple of years we're going to have a vigorous EV charging network in the United States."

A PRECEDENT FOUND IN OUTER SPACE

Today's policies have a predecessor that offers lessons. In the late 1950s and the 1960s, the United States believed that dominating space exploration was so critical it could not be left to market forces. So, the government spent more than $791 billion on its space program and saw great success, including numerous technological advances and the Apollo moon landings.

By the 2000s, interest in space travel receded. The government switched its approach to the space program to one that relied on funding start-ups, which sparked a surge of private investments.

Now the government buys satellites from companies like SpaceX, which also has commercial customers.

THE CHIPS AND SCIENCE ACT

National security concerns and job creation helped inspire the CHIPS and Science Act. In 1990, 37% of semiconductors, or "chips," worldwide were made in the United States. Now, that number is only 12%. This drop in semiconductor production has long worried government leaders, who are concerned about being dependent on potentially hostile powers for an important component of the technology industry.

The CHIPS and Science Act is intended to bring back semiconductor manufacturing to the United States. It takes an innovative approach, more like a venture capital firm and less like a government bureaucracy. The act offers nearly $300 billion in subsidies but forces private firms to compete for them. As of June 2024, the government had awarded $29.5 billion in grants and $25.1 billion in loans.

But the legislation has risks, according to participants at the BiGS roundtable. It could fail to increase domestic production and be characterized as wasted subsidies to industry rather than productive investments.

TARGETING CHINA

The industrial policy's three cornerstone pieces of legislation contain a total of $2 trillion in federal subsidies intended to compete with China, which gives large subsidies of its own to key industries. In addition, the Trump and Biden administrations have restricted investments with China and imposed tariffs.

These policies have already recorded successes: the United States has added 800,000 manufacturing jobs, and the trade deficit with China has reached a 14-year low.

"What we're seeing now frankly, is industry leaders making bets on America again, because the Biden administration has said… we're going to build chips in the United States again," Chatterji told BiGS.

Still, potential problems remain, according to roundtable participants. The policies might harm U.S.-China relations, spark another trade war or encourage regional trading blocs that could reduce global trade overall.

JOBS AND TRAINING

At the heart of the new industrial policy is the goal of creating well paid manufacturing jobs in places that have lost them over past decades and are suffering economically.

But what happens if there aren't enough skilled workers to fill those jobs? Roundtable participants addressed these concerns. Several recommended changes to the U.S. educational system to better prepare students. One suggested broader investment in Science, Technology, Engineering and Math (STEM) education. Another recommended making the education system more responsive.

Overall, participants at the roundtable were cautiously optimistic that the nation's new industrial policy could achieve its goals.

"We have to think about what legitimizes industrial policy in a capitalist society," said Joseph Fuller, a management professor at Harvard Business School and co-director of the school's Managing the Future of Work initiative. "It takes a rallying cry to achieve ambitious goals. It's doable, but it certainly won't be easy."

By: Bill Ainsworth

CoBS Insight

Climate Change – a new and unavoidable cause for philanthropy

Arthur Gautier, Éléonore Delanoë, and Dr. Charles Sellen



Professor **Arthur Gautier,** Executive Director, **ESSEC Philanthropy Chair, Éléonore Delanoë,** Consultant at **EY,** and **Dr. Charles Sellen,** Global Philanthropy Fellow, **Lilly Family School of Philanthropy at IUPUI,** explore the recent upsurge in philanthropic interest for this urgent cause – climate change.

In January 2020, devastating fires in Australia stoked a surge of global generosity with nearly €100m donated by anonymous givers, companies or celebrities.

In February, the love-him-or-hate-him CEO of Amazon, Jeff Bezos, now first fortune in the world, announced his entry into philanthropy by setting up a $10bn climate fund. In June, his group launched the Climate Pledge Fund, a programme to invest in corporates facilitating the transition toward the low-carbon era.

But if the climate seems to be imposing itself as an urgent cause for private donors and citizens, it still only makes up a small fraction of the philanthropic flow of funds – a surprising paradox given the gravity of the problem at hand.

A CAUSE (UNTIL NOW) NEGLECTED BY DONORS

The shift and impetus of civil society in response to global warming has considerably increased in the last few years. However, climate still only represents a minute portion of private donations. And when people give for the environment it is, moreover, rarely for "climate" as such.

The latter is often pushed into the background of the various environmental struggles (ocean conservation, air quality, forests, wildlife, etc.) which form a bundle but do not overlap.

As such, the movement offers a mixed and miscellaneous face including rhetoric and objectives which are sometimes hard to render compatible: conserving biodiversity, advocating economic degrowth, massively investing in the production of decarbonized energy, establishing carbon taxes and markets, or minimizing the impact of climate change for populations at risk.

This weak visibility granted to the climate cause is accompanied, as mentioned, by little private financing. In 2015, the members of the Environmental Grantmakers Association, which groups the main American philanthropists specialised in environmental issues, gave $1.54 billion in subsidies – only $142m of which was destined for the climate. According to the OECD, 143 large foundations operating in the field of development spent a mere $1.5bn (6.5% of their aggregated budget) between 2013 and 2015 to fight against climate change.

For private individuals too, climate remains far behind the most popular causes. The French, for example, prefer child protection, the fight against social exclusion, or even medical research, whereas the Americans only devote 3% of their giving to the environment – and as such still less for climate alone.

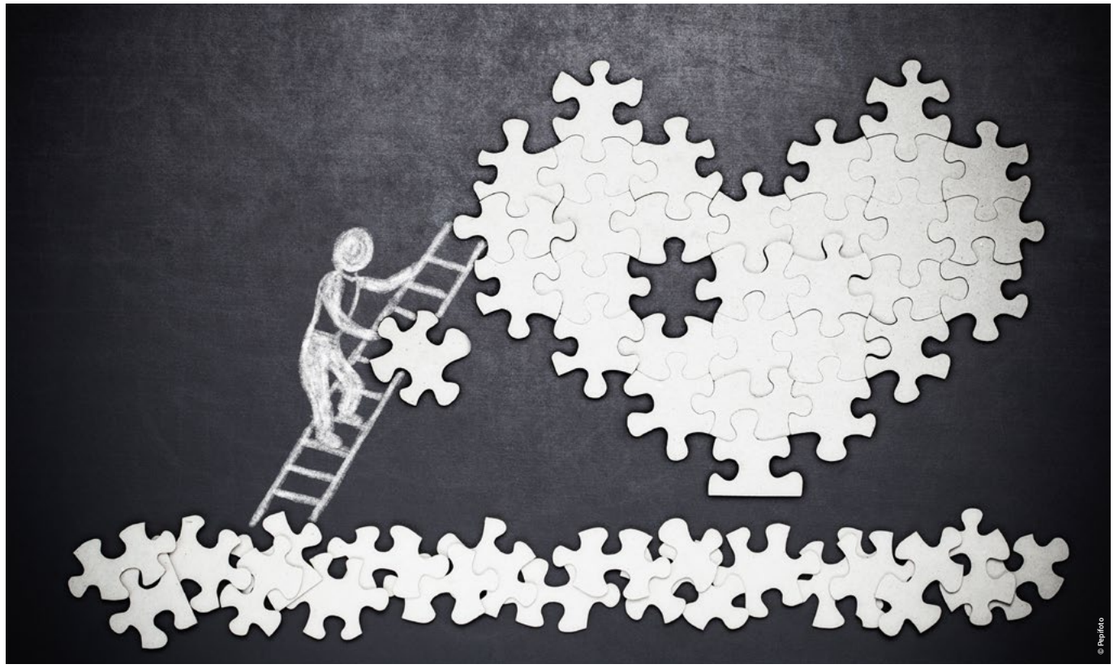
Mutually, private donations only count for a drop in the ocean of funds required to fight against climate change and its consequences. In 2015, only 0.1% of financing for the climate came from philanthropy. The IPCC (Intergovernmental Panel on Climate Change) estimates that $1,600 to 3,800 billion dollars of annual investment is required until 2050 to limit warming to 1.5°C in relation to the pre-industrial level – a scenario which focuses on the prevention of the crisis. Yet, climate adaptation, which consists in adjusting societies and ecosystems to minimize the negative impact of climate change, could constitute a much larger cost item...

COGNITIVE INCONSISTENCY AND AWARENESS

Why is there such a gap between the urgency of the problem and the timidity of the reactions it generates? A preference for the present, a "spectator effect" watering down individual responsibility or even "ecoparalysis" and "solastalgia": there are many of us who suffer from cognitive inconsistency, our behaviour seeming to be at odds with our beliefs.

As such, the World Economic Forum's Global Risks Reports position climate risk in first place among planetary risks – even before pandemics from the double perspective of their probability and gravity.

Despite these alarming signals, the media only give limited cover to climate-related topics in their reports or debates. In 2019, for example, Le Monde granted only 5% of its articles to climate change, with climate accounting for only 1% of France 2's topics appearing on its prime-time televised news.



> The World Economic Forum's Global Risks Reports position climate risk in first place among planetary risks.

This gap can also be explained by the psychology of giving. The complexity of the climate topic and its shape-shifting character demands greater thought from potential donors than a cause that is simple to understand such as aid to earthquake victims. Moreover, empathy for others' suffering and the identifying of real victims play an important role in triggering the act of giving. Yet, it is difficult to feel concerned by climate change as long as it remains a far-off threat, dispersed, and without an immediate victim.

The last few years have been a game-changer. Successive natural catastrophes attributed to climate imbalance – fires, floods, etc. – have shocked public opinion and the climate movement has grown in size. Climate change is now a source of major anxiety for people the world over. And in the philanthropy sector too, the subject has gained importance.

CLIMATE AND PHILANTHROPY – A COMMON STORY

Onlookers to this trend, several flagship philanthropic commitments have been strongly mediatised, notably that of Jeff Bezos who was immediately criticized for his hazy character, his insufficient funding – 8% of his wealth – given the magnitude of the problem, and the contradiction between his philanthropic gesture and his billionaire entrepreneurial practices.

Already in 2009, the British businessman Richard Branson had created the "Carbon War Room" to identify and test innovative solutions for the energy transition. According to the ClimateWorks Foundation, donations for climate increased by 30% between 2015 and 2017. This is still far from enough, but the trend is increasing.

Philanthropy's interest in climate is not, however, completely new. Back in 1987, meetings between experts who set the foundations for the IPCC were financed by the Rockefeller Brothers Fund.

In the 1990s, groups of stakeholders such as the Energy Foundation were set up to promote clean energies to citizens and decision-makers – and still continue to this day to meet within alliances to offer their financing capacities to the benefit of a shared strategy.

Because of its ideological diversity, philanthropy however has never been an ally of the climate. The Koch brothers, billionaires whose fortunes was made in the oil industry, have financed think tanks and climate denial campaigns in the United States for over thirty years. Without doubt, they remain the most emblematic example of the alliance between elite philanthropy and fossil fuels.

Whether progressive and eager to react to climate challenges, or conservative and climate sceptic, American donors have been the spearhead of climate philanthropy. This is less developed in Europe where the financing of general interest causes is more or less catered for by the state.

In China, where greenhouse gas emissions overtook those of the USA in 2007, the rise of an ultra-rich class has strengthened a well-anchored philanthropic tradition which recently seized hold of the subject of the climate. As such, the billionaire Niu Gensheng has positioned himself as a leading figure in climate philanthropy, whereas the businesswoman He Qiaonv tallied up the largest donation in history for the conservation of biodiversity.

Private generosity in favour of the climate comes in many ways: the financing of NGOs specialised in appeals, networks of experts, support to local initiatives or even investment in companies providing solutions to the climate crisis to name but a few. In spite of its limited resources, philanthropy has a key role to play in the coming ecological transition.

Its rallying effort is all the more necessary given that the causes currently given priority – such as health or assistance to the needy – risk being hit full force by the effects of climate change.

It remains to be seen if the actors in the philanthropy field will be sufficiently organised and strategic to really "make the difference".

Originally published on The Conversation in French.

BiGS Actionable Intelligence

Industrial Decarbonization: Harvard research offers model to navigate the challenge

Gunther Glenk

CEOs in construction and heavy industries must prioritize innovative abatement strategies to meet rising global demand for cement while reducing emissions. Prof. **Gunther Glenk** shares new research out of **Harvard Business School** that offers an economic framework allowing industrial companies to identify cost-efficient pathways toward substantial emission reductions.

Cities like Cairo, Chongqing, Delhi, and Kinshasa are experiencing population explosions accompanied by unprecedented demand for homes, offices, factories, and infrastructure. In another part of the world, the Biden Administration's policy-driven infrastructure boom is gaining steam in the world's largest economy.

These trends translate into ballooning global demand for steel, cement, and other raw materials used in all types of construction. This demand comes as pressure is mounting on companies to reduce their greenhouse gas emissions to meet the climate targets of the Paris Agreement.

The problem: heavy industry significantly contributes to global emissions. In particular, the cement industry accounts for about 8% of global annual carbon dioxide emissions, and cement production already doubled in the first two decades of this century.

BAD SIDE EFFECTS

Industrial emissions are hard to abate. "The difficulty is that a large share of emissions is typically inherent in the production process, especially in the cement industry," Gunther Glenk, a climate fellow at Harvard Business School's Institute for Business in Global Society (BiGS), told The BiGS Fix. He co-authored a recent paper offering a new model to inform corporate abatement decisions.

While many companies can focus primarily on switching from fossil fuels to cleaner energy sources, industrial manufacturers face more fundamental options about production process changes and carbon capture to reduce emissions.

For example, Portland cement—the most common type of cement in general use around the world—is produced first by crushing quarried limestone and mixing it with sand or other components and water. Next, that mixture is heated at 1,400°C (more than 2,500°F) and converted into calcium oxide (known as clinker), a chemical reaction that releases carbon dioxide into the atmosphere. Finally, the clinker is finely ground and mixed with other materials to make cement.

NEW ABATEMENT COST TOOL

A new working paper by Glenk and co-authors develops an economic framework for identifying cost-efficient combinations of abatement measures a company would need to implement to substantially reduce emissions. The authors then implement the framework in a software optimization tool and calibrate it in the context of European cement plants that must obtain emission permits under the European Emissions Trading System.

For Portland cement production, the primary abatement options include substituting clinker with supplementary cementitious materials, using biomass instead of fossil fuels for heating the kiln, and replacing limestone with recycled concrete. Emissions that can't be eliminated during production can also be captured and stored.

A complicating factor in the analysis is that in the cement industry, as in many other industries, abatement measures exhibit interaction effects when implemented together. For example, the abatement effect of supplementary cementitious materials varies depending on whether they are combined with carbon capture equipment. Because of such interaction effects, companies cannot simply compare the abatement costs of individual measures but require an optimization algorithm that selects the cost-efficient combination of measures from all feasible combinations.

Using new industry data, the researchers examine the incentives for European cement producers to reduce emissions under different market prices for emission allowances in the European Emissions Trading System. They find that recent market prices of around €85 per ton of carbon dioxide incentivizes firms to reduce their annual direct emissions by about one-third relative to the status quo today. Yet, if these prices were to reach €125 per ton, cement producers would have incentives to reduce emissions by almost 80% relative to current emission levels.

> Decarbonization is at the forefront of corporate strategy for cement producers with net-zero targets.

FORMIDABLE TARGETS

Research on decarbonizing cement is very timely. Several cement sector leaders have declared targets aligned with the Paris Agreement on climate change.

Forty of the world's leading cement manufacturers — which account for 80% of global cement production outside of China — have committed to reaching net-zero concrete production by 2050. They include global giants that dominate the U.S. market: Ireland's CRH, Mexico's Cemex, France's Holcim, and Germany's Heidelberg Materials. These 40 companies also are working on reducing industry-wide emissions with the other major producers that are part of the China Cement Association, which represents more than half of global cement production.

Decarbonization is at the forefront of corporate strategy for cement producers with net-zero targets. In the case of Holcim, when Miljan Gutovic was designated incoming CEO in January 2024, a press release announcing his appointment highlighted "decarbonization and advanced technologies transforming how we build."

Teresa Landaverde Lorenzo, senior carbon manager at Heidelberg Materials headquarters in Germany, told The BiGS Fix that the company is focusing strategy and mobilizing resources to meet a net-zero target by 2050. By 2023, Heidelberg achieved a reduction of more than a quarter of emissions relative to 1990. She acknowledges that the next steps will be tougher than the first ones. For example, carbon capture requires long lead times to retrofit existing facilities.

Achieving industry-wide net-zero is even more daunting. Demand for cement is forecast to proceed at a double-digit pace for decades. In recent years, China alone has consumed nearly as much concrete every two years as the United States did during the entire 20th century, according to the U.S. Geological Survey.

MARKET INCENTIVES IN ACTION

Landaverde Lorenzo of Heidelberg Materials said that collaboration with academic researchers helps Heidelberg consider more and possibly better options on the road to net-zero in 2050. The new model provided by Glenk and co-authors allows Heidelberg to better strategize for interim targets in a competitive way, she said.

"We are always looking for the final score so seeking the maximum result we can get," Landaverde Lorenzo said. She lauded the new model for helping consider choices to meet urgent needs, saying, "In cases where we need to make a specific reduction that is not zero, the model is a helpful tool."

By: Desmond Dodd

CoBS Insight

How Can Large Corporations Become More Sustainable?

Frederik Dahlmann, Wendy Stubbs, and Kevin Morrell



What are the strategies to achieve sustainable goals in a corporation? Professors **Frederik Dahlmann, Warwick Business School, Wendy Stubbs, Monash University,** and **Kevin Morrell, Cranfield School of Management,** explore how goal-setting approaches have been the backbone of corporate success and how they can be transposed to sustainable goals.

Related research: *Corporate actors, the UN Sustainable Development Goals and Earth System Governance: A research agenda,* The Anthropocene Review 2019, Vol. 6(1-2) 167–176, sagepub.com/journals-permissions DOI: 10.1177/2053019619848217 journals.sagepub.com/home/anr

THE IMPACT OF HUMANS ON THE PLANET EARTH

Humans have had such a significant and decisive impact on the Earth's ecosystems, that the current era has been dubbed the Anthropocene. This is technically defined as the current geological epoch, viewed as the period during which human activity has been the dominant influence on climate and the environment.

To attract more focus on the pressing issues associated with the Anthropocene, various governance organisations, as well as universal guidance, guidelines and metrics, have been established. Earth System Governance provides a framework for developing new insights into governing this coupled socio-ecological system while the UN Sustainable Development Goals (SDGs) provide a shared blueprint for peace and prosperity for people and the planet, now and into the future.

At the heart of the SDG initiative are 17 goals which serve as an urgent call to action by all countries – developed and developing – in global partnership. They recognise that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth – all the while tackling climate change and working to preserve our oceans and forests.

While CSR is a happening topic in any corporation, what are the broader implications of the Anthropocene and the role of corporate actors in engaging with and supporting Earth System Governance by contributing to the UN SDGs?

THE PATH AHEAD

The Anthropocene faces unprecedented global challenges ahead and the assessment of these challenges can no longer be tackled by individual business practices and organisations. Unless the philosophy of *'We don't win alone and we don't lose alone'* is adopted by all the stakeholders involved to create an immediate and significant positive impact in the Anthropocene, the path ahead seems very rough.

Effective Earth System Governance will require changes at a far broader level to promote and ensure collective and collaborative action by policy makers, civil society and the private sector. And moving away from the traditional concepts, this also requires new financial and business models that are compatible with the 'requirement of flourishing life on Earth'.

Dahlmann, Griggs, Stubbs and Morell identify three potential high-impact strategies which, if implemented, could lead to significant new insights into how corporate actors display responsibility and accountability regarding Earth System Governance:

- Integrating global goals into corporate target-setting
- Integrating global goals into codes of corporate governance
- And Integrating global goals into new business models.

GOAL-SETTING IN CORPORATIONS

The philosophy of achieving the desired position through goal-setting has traditionally been successful in many corporations. The benefits of steering organizations through goals include setting priorities for attention and resources, galvanizing efforts, benchmarking and progress tracking, as well as overcoming short-termism.

The UN SDGs have been positioned as an innovative form of global governance that complements more traditional governance approaches such as norms and rules (i.e. legislation and regulation). While policymakers around the world have understood how to tackle the spatial, temporal and contextual factors of such goals, what is lacking is corporate understanding of how to translate and integrate the UN SDGs into their strategies and business models.

Indeed, organisations are coming up with solutions to address the issue. Inspired by the decades-long successful and central process of setting organisational performance targets, companies have recently adopted a variant of that approach wherein executive remuneration schemes depend on achieving sustainability targets.

The UK government and other non-profit organizations have also played a significant role in encouraging and supporting the corporations to place more attention on sustainability. Initiatives such as reducing greenhouse gas emissions and deforestation, or increasing renewable energy, energy productivity, and electric vehicles, and other sustainability metrics have helped companies in the context of corporate sustainability performance.

INTEGRATING GLOBAL GOALS INTO CORPORATE TARGET-SETTING

As much as goal-setting in corporations is an important starting point, the key question is whether such individual target-setting approaches are effective in the face of a global biophysical and socioeconomic system. More worrying is the fact that corporations as central actors – and arguably drivers of the Anthropocene – explicitly feature only once in the 17 UN SDGs.

Moreover, there have been various efforts to highlight the commercial opportunities from integrating the UN SDGs – however, general awareness in the private sector remains ambiguous, limited in scale and largely anecdotal.

Whether and how companies can reconcile corporate impacts on people, planet and prosperity while at the same time satisfy their overriding *raison d'être* of (short term) profit and shareholder returns is a billion-dollar question that is worth billions of people's lives.

While businesses are increasingly recognising the various economic and strategic benefits from being more socially and environmentally responsible, such approaches are predominantly driven by corporate assessments rather than concerns for finding solutions to global challenges that may require a departure from 'business as usual'.

This calls for a better understanding and more in-depth research of the corporate perception of high-level issues such as the Anthropocene, Earth System Governance and the UN SDGs, and whether and how sustainability goal-setting could be more effectively integrated into the corporate sector.

> Corporations as central actors – and arguably drivers of the Anthropocene – explicitly feature only once in the 17 UN SDGs.

INTEGRATING GLOBAL GOALS INTO CODES OF CORPORATE GOVERNANCE

Current corporate governance, as complementary as it has been to corporations, treats companies as individual actors and not as part of an interconnected network. Even the few forward and inclusive corporate governance models based on stakeholder perspectives remain silent on the need for systemic integration into wider external governance systems.

Such gaps in current governance models expose a need to examine corporate governance codes as well as rules and regulations, both at national and international levels, to support the implementation of the UN SDGs. Relevant legislation, codes and norms therefore need to be updated to reflect the wider sectoral and value chain implications of businesses' products, practices and actions, and encourage boards of directors to look beyond the narrow confines of their organizations when monitoring, controlling and steering them.

INTEGRATING GLOBAL GOALS INTO NEW BUSINESS MODELS

Research suggests that the majority of businesses are focused solely on short-term profit-maximization and would not hesitate to exploit resources such as the natural environment and people. As such, it is now more important than ever to transform companies' fundamental understanding of business models.

As a result of major crises such as the global financial crisis and political blindness to social and environmental challenges – and as a response to the critics of capitalism and business-greed – innovative initiatives based on constructive concepts such as *Shared Value, Net Positive, Future Fit, Conscious Capitalism and Blueprint for a Better Business* have risen to prominence.

Such initiatives are covered under the blanket term 'Purpose Ecosystems' because of their shared efforts to redefine the purpose and nature of business and focus upon broader non-financial performance outcomes. These purpose ecosystems offer concrete action frameworks, business templates and other practical guidance such as audit and certification to improve businesses' legitimacy in society.

The ultimate objective for companies should be to try and adopt business models with a *sustain-centric* orientation in order to address the interconnected set of seemingly incompatible social, ecological and economic challenges with the help of all the stakeholders involved to form a unified network. This also requires businesses to develop new ways of creating and accounting for value for society that goes beyond the financial bottom line.

BILLIONS OF DOLLARS VS BILLIONS OF PEOPLE

Unlike other dominant animals that were at the top of the food chain, humans reached the podium in a very short span of time, largely thanks to their cognitive abilities. The consequences of this, however, are profound. The fundamental nature of Mankind's relationship with the planet, and society that has been fashioned over time, has been altered to an almost irreversible condition in several ways.

In the end, it is our moral duty to care for our society and planet so that future generations avoid the consequences or worse, miss out on an opportunity to indeed face the consequences. Typically, this is achieved by inspiring changes among people, corporations, governments and every other stakeholder part of the natural ecosystem.

Big corporations who have been both the beneficiaries and causes of much of these changes should be more accountable and responsible for their actions. While they have guidance and guidelines in many sources and forms, true change can happen only if they decide to embed sustainable values in their business models, corporate codes and goals. Will they be on time or will it be too late?

BiGS Actionable Intelligence

Breaking Up with Fossil Fuel Taxes is Hard to Do

Dustin Tingley

Research from **Harvard Kennedy School** professor **Dustin Tingley** reveals that the revenue source for state and local tax bases represents a little-known challenge to clean energy adoption in the United States. Communities that have long relied mostly on fossil fuel-related revenues don't know how to replace that money with new streams from clean energy projects, and investors have limited incentives to direct projects to these "energy communities."

In Wyoming, state tax revenues generated from coal, natural gas, and oil represent up to 65% of its budget, according to the nonprofit Wyoming Outdoor Council. These funds are essential for covering basic services like police salaries and public school education.

However, as the green energy transition progresses, the state's heavy reliance on fossil fuels raises a critical question: How will states like Wyoming finance government services when these revenues start to decline?"

Wyoming — which is collaborating with Harvard Kennedy School's Growth Lab to identify sustainable solutions — is hardly alone.

The U.S. has hundreds of similar "energy communities" with tax revenue streams derived mainly from fossil fuels, according to the Washington, D.C.-based independent, nonprofit research institution Resources for the Future (RFF).

The institute estimates that fossil fuels generated $138 billion annually in 2015-19 for all governments in the United States. That figure is likely conservative since it is difficult to obtain reliable data from local governments, Daniel Raimi, director of equity in RFF's Energy Transition Initiative, told Harvard Business School's The BiGS Fix.

Compounding this situation, many states don't have an income tax, says Dustin Tingley, a Harvard University professor. Last year, Tingley authored a major study of stakeholders involved in the clean energy transition that revealed strong resistance to it in a range of local communities. Based on that research, Tingley co-authored with Princeton University political scientist Alexander Gazmararian a book, Uncertain Future: The Politics of Climate Change.

Combined, these factors make the transition to renewable energy not only complicated but also a hard sell, Tingley says.

In general, Americans view fossil fuels as a convenient and low-cost energy source supported by good infrastructure. This favorable perception is magnified in pockets of the country rich in fossil fuel resources. Besides local government revenue, jobs and cultural patterns in support of these industries have flourished over generations to become part of the bedrock of the communities.

THE GAP BETWEEN OLD AND NEW ENERGY TAX BASES IN ALASKA, COLORADO, AND BEYOND

To understand the impact of fossil fuel-generated tax revenue, in early 2024, RFF looked closely at a subset of energy communities with reliable tax data. These included 79 counties in 10 states, such as North Slope Borough, Alaska; Kern County, California; Weld County, Colorado; and Midland County, Texas.

In energy communities with recent clean energy projects, the RFF estimates that fossil fuel industries continue to produce tax revenues in orders of magnitude higher than the clean energy projects. The study found that fossil fuels generated more than $10,000 per capita in government revenue in 5 of the 79 sample counties reviewed and more than $1,000 per capita in 28 counties. In contrast, solar and wind projects generated about $100 per capita in 11 counties, RFF found. The biggest tax revenue earner among these countries took in only about $1,000 per capita.

Furthermore, while policymakers are struggling to find ways to tap into new clean energy tax revenues, many areas of the U.S. are in the midst of a fossil fuel boom. In New Mexico alone, an increase in natural gas production has fueled a jump in tax revenues of almost 50% over three years.

POORLY TARGETED INCENTIVES

The centerpiece of the Biden Administration's climate policy, the 2022 Inflation Reduction Act (IRA), makes a crude attempt to direct investments in new energy projects to energy communities. On top of new tax credits for clean energy projects, the legislation designates an additional 10% credit if projects are built in areas in which more than 25% of local tax revenues come from fossil fuels.

"It's just not a well-targeted policy," Raimi told The BiGS Fix. "I don't think a 10% bonus tax credit is going to be a game changer for these places. And there's not really an opportunity to fix that legislation administratively. Congress would have to act [again]."

When renewable energy investments end up in energy communities, it is more by chance than by policy design.

> While policymakers are struggling to find ways to tap into new clean energy tax revenues, many areas of the U.S. are in the midst of a fossil fuel boom.

The Internal Revenue Service is charged with interpreting which areas can be defined as an energy community under the IRA, and the IRS recently ruled that nearly half of the land mass in the U.S. qualifies.

On a positive note, RFF's Raimi points out that the IRS definition of energy communities covers most of New Mexico, West Virginia, and Wyoming. However, inexplicably, large sections of oil- and gas-producing regions are excluded, such as portions of the Permian Basin (in western Texas and southeastern New Mexico), the state of Oklahoma, Bakken (in eastern Montana and western North Dakota), and other parts of North Dakota.

SUPPLY CHAINS FOR CLEAN ENERGY TECHNOLOGIES ONE SOLUTION?

Developing new tax bases for these communities to maintain essential public services will require major economic diversification efforts and financial support from the federal government, according to RFF. Raimi views these shifts as a political strategy to build support for renewable energy projects among project beneficiaries.

One smooth long-term transition could involve building supply chains for clean energy technologies that embed support for those technologies, Raimi says. He cites a growing number of recent investments supporting links between clean energy/decarbonization and manufacturing or other growth initiatives in swing states that are important to both major political parties. Two examples:

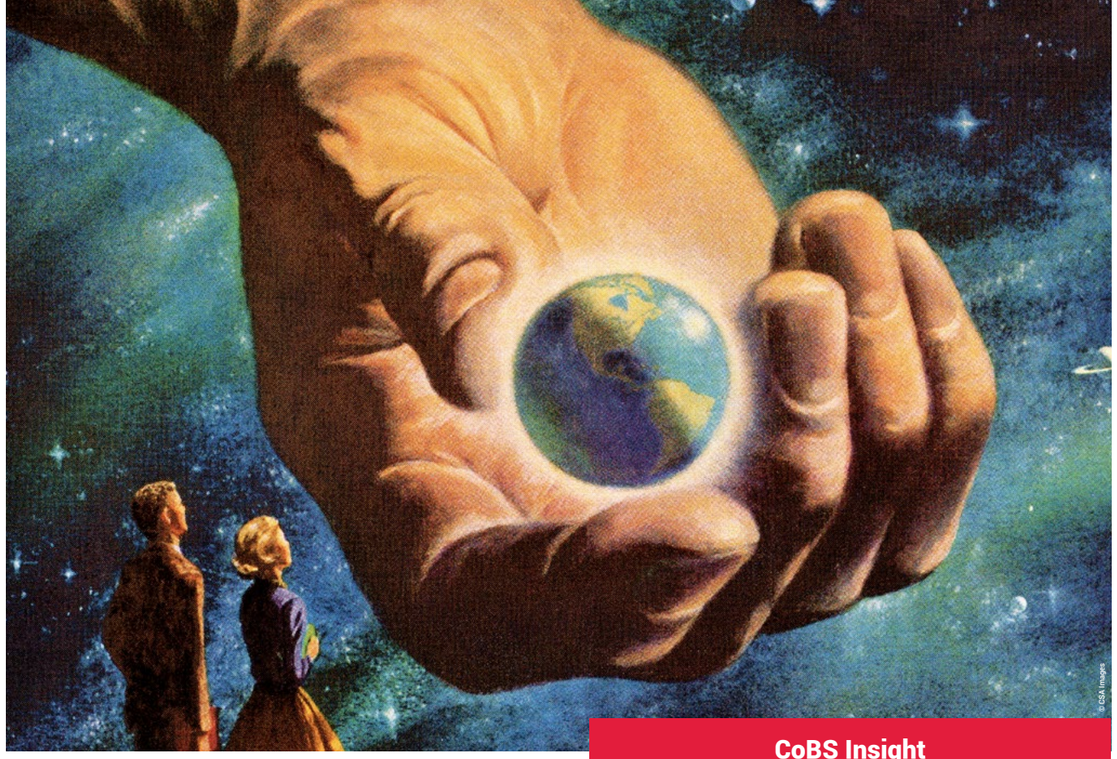
North Carolina: Toyota is building a $13.9 billion battery manufacturing plant.

New Mexico: Pattern Energy Group began production this year on the $11 billion Sun Zia wind electricity and transmission project.

While the existing renewable energy investments spurred by the IRA are substantial, Raimi says that he considers efforts so far to be baby steps toward the goal of developing new tax bases for fossil fuel-reliant state and local governments.

"There are a couple of examples, but it's not a systematic trend," Raimi told The BiGS Fix.

By: Desmond Dodd



CoBS Insight

This was Then, This is Now: What kind of leadership does the climate crisis call for?

Emilie Prattico

Emilie Prattico, Senior Director of Strategy at **BCG BrightHouse,** and author of the book **The New Corporate Climate Leadership,** explores the new breed of leader the world needs in order to anticipate, avoid, accommodate, and recover from crises from now to 2030.

In the past few weeks, the volume – both by number and by resonance – of announcements made by companies on climate change seemed to signal an unprecedented shift in the private sector's engagement to tackle the crisis. What does this tell us about the kind of leadership we can expect and the kind we need to tackle the climate crisis today and in the crucial years ahead?

Where deforestation is concerned, a coalition of public and private sector actors pledged to eliminate tropical deforestation by financing local efforts to protect and maintain standing forests. In the aviation sector, a sector not renowned for being on the "solutions" side of the climate equation, major players came together to make a net-zero commitment. A group of the world's largest retailers – H&M Group, Ingka Group (IKEA), Kingfisher plc and Walmart came together to accelerate a movement in their industry to achieve net-zero emissions by 2050 at the latest, with interim commitments to halve emissions by 2030. For energy, several commitments were made, all amounting to a clear signal that "the end of coal is in sight," such as The First Movers Coalition, a public-private partnership comprised of more than 30 companies with a market cap of over $8 trillion, launched to make emerging clean energy technologies accessible and scalable.

Impressive as all of this sounds, it pales in comparison to the commitment of the financial sector to deploy $130 trillion over the next three decades to decarbonize the global economy, via The Glasgow Financial Alliance for Net Zero, which represents more than 450 banks, insurers and other asset managers in dozens of countries.

HARNESSING THE LARGEST COMPANIES

The scale of action, radical collaboration the likes of which we have never seen before, and the level of ambition are all unheard of and in some ways are a cause for celebration and hope. Going by standards of past COPs, and of corporate climate action to this day, this marks a clear success at mobilizing critical actors of the fight to avert the worst of the climate crisis. Indeed, at least since the Paris COP where the historic agreement was signed in 2015, one of the major stakes of the fight against climate change has been to mobilize the private sector.

Recognizing that companies hold much of the world's resources and leverage, and are involved in most of the planet's high-emitting activities, tackling the crisis was never going to be possible without harnessing the largest companies – and the ones in the most polluting sectors at that. Seeing what was achieved in Glasgow, then, should be one of the most positive steps we could have hoped for.

THAT WAS THEN, AND THIS IS NOW

But that was then, and this is now. Between now and 2030 we must avoid unmanageable climate change by pursuing rapid and aggressive decarbonisation while also investing in resilience, meaning our capacity to anticipate, avoid, accommodate, and recover from crises. Going ahead, the features of leadership called for by the climate crisis need to go account for this – and while Glasgow was a nod in this direction, the final tally shows that companies do not have the full suite of tools to tackle climate. The path ahead will include the following:

1) From tactical to transformational thinking. What is at stake is not simply a 2-degree pathway – indeed not even a 1.5 one. This is a 2015 model of thinking that undergirded the Paris Agreement but is no longer fit for purpose. It is no longer sufficient merely to be "less problematic" but rather, true leaders will proactively build the inclusive economies of tomorrow by way of "just transitions," not just for those communities that are currently dependent on the high-carbon economy but for those who will be central to building the low-carbon economy of the 21st century.

2) Imagination, and not just ambition. Having worked in the field of climate action for over a decade, I can say that the word "ambition" is probably the most used (and misused). Thinking in terms of ambition only, however, locks us into particular models when what we need is nothing less than new paradigms. Climate change is not only an environmental problem requiring scientific and technical solutions, but it also calls for cultural, economic, social, and political changes too. Leading companies will reinvent not only their emissions models, but the entire ecosystem in which they operate and that they in turn constitute.

3) Cathedral thinking. The standard for leadership is reaching net zero by 2050 with clear milestones by 2030. Given that CEOs remain in post for an average of six years, there is a discrepancy between the timelines of their tenure and the timeline of climate action. True leaders need the vision to launch multi-generational and multi-stakeholder initiatives that will outlive the authority of any given individual or executive board. There is no doubt urgency but there is also the need to steadfast and persistent action even when companies are not in the spotlight, such as at a UN summit. Will the initiatives introduced at COP survive the excitement of the moment and translate into deeply entrenched action that is designed to last several decades?

4) Courage and patience in a time of urgency. Leaders need to understand that building coalitions takes time; persuading colleagues and superiors to lead requires significant investments of labor and considerable persuasive ability; and that it is only ultimately worth it if a sequence is set that leads to transformation. In addition, courage is the key attribute for the new corporate climate leader – the courage to speak hard truths to colleagues and also the courage to get out of professional silos and comfort zones. There is an old adage that few conflicts are solved without engaging the combatants. Similarly, it is impossible to properly manage and ultimately solve the climate crisis without engaging and working with those countries and companies who are driving the crisis. We often hear about the urgency of the climate crisis, but most who have had the opportunity to work in this field will also tell you that without patience, we will not build the transformation we need, one that is designed to last and that is inclusive.

No doubt these features will evolve in the years to come, as the climate crisis becomes even more urgent and as new generations of leaders take the reins of facing it. One of the challenges of the predicament is that what usually takes decades or generations, from technical innovation to leadership revolutions, must occur in a matter of years. While we welcome and even celebrate companies' joining the climate fight with pledges and commitments, we urge them to consider what deep changes will be needed not only to deliver on them, but in order to ensure that the scale, scope, and focus of their action is what the world needs.

02

Climate Change and the Role of Legislation and Green Finance

BiGS Actionable Intelligence

Money Talks: Banks can accelerate decarbonization, research shows

Boris Vallee and Daniel Green

Recent **Harvard Business School** research by Professors **Boris Vallee** and **Daniel Green** offers first proof that when lenders divest from coal producers and coal-reliant industries, the resulting rationing of capital leads to lower carbon emissions. This knowledge will encourage banks in their current strategy and give other industries an incentive to act, to avoid becoming the next target.

Consumers who are eager to mitigate climate change can take many actions, such as reducing the number of airline flights they take or installing solar panels on their homes. But the planet is in a race against time, and individual action alone won't help most countries reach net zero by 2050 — the goal to prevent the planet from warming more than 1.5°C above pre-industrial levels.

Pondering this overwhelming problem, HBS professors Boris Vallee and Daniel Green turned to the business world's actions, and in 2021, started looking for evidence that the coal divestment policies of large banking institutions are effective at reducing carbon emissions. Coal, after all, is the source of more than a fifth of all CO2 emissions and is more carbon-intensive than any other energy source. Therefore, phasing out coal-fired power production is critical to reach net zero. The coal industry also is reliant on large amount of capital, typically from banks.

Vallee and Green's report, "Can Finance Save the World? Measurement and Effects of Coal Divestment Policies by Banks (pdf)," indicates promising results: Coal firms that face strong divestment policies from their historic lenders reduce their borrowing by a quarter compared with their unaffected peers. This capital rationing leads to reductions in CO2 emissions, as divested firms are more likely to close facilities.

Awareness of this impact also could encourage business, government, and civil leaders to further roll out these policies to tackle climate change — possibly to other industries, such as oil and gas.

"To break up the status quo and to decarbonize our economies, we need to think differently and ask new questions," said Vallee, who has focused recently on finance's possible role in accelerating the transition to a low-carbon economy.

NO EVIDENCE UNTIL NOW

Although the divestment movement began back in 2006 with a student campaign in the United Kingdom, until now, there's been no proof that the banking industry's experimental coal divestment policies achieve the desired results.

This evidence of the impact from coal divestment arrives as debate rages in the investment world around divestment vs. engagement. Today's leaders in the finance space face a dilemma: Do they use their financial "seat at the table" to convince a company to become greener? Or do they divest their funds, sending a signal to the company and market that dirty industries will find it harder to raise money?

WHY DOES COAL DIVESTMENT WORK?

In short, money talks.

Vallee and Green's research reveals that the coal industry has few options for securing alternative debt financing if an existing source vanishes. The number of banks that facilitate coal-related deals is so small — and the relationships so deeply entrenched — that by default, these bankers have disproportionate influence over what gets financed.

Coal-fired power plants owned by companies that are exposed to bank divestment policies are more likely to be retired, the research shows.

"What we found in this case is that banks divesting from coal directly leads to real impact — more than anyone thought," Vallee said. "This means that the financial effects translate into environmental effects. By reducing capital expenditures, facilities are decommissioned, and CO2 emissions ultimately fall, as any alternative source of energy is less carbon-intensive."

For the project, Vallee and Green examined 12 years of data between 2009 and 2021 on bank's coal divestment policies (tracked by the nonprofit group Reclaim Finance), coal company financing transactions and financial statements, and the operating status of coal mines and coal-fired power plants.

The researchers spoke with executives at several banks that have implemented coal divestment bans following the 2015 Paris Accords. The team also gleaned insights from Berlin-based Urgewald, a nonprofit that produces the Global Coal Exit List, which contains three divestment criteria that investors can apply to screen coal companies out of their portfolios.

Vallee and Green identified about 80 banks around the world that have implemented coal divestment policies, affecting more than half of coal lending activity.

Not all bans created equal

Currently, the banks that are the most active in coal lending implement weaker divestment policies, according to the HBS research.

One classic weak policy is prohibiting only the worst practices, such as mountaintop removal coal mining, which cover only a small fraction of coal projects.

In contrast, a more sincere policy would phase out all types of coal projects, starting with new projects, then potentially banning new clients, and finally phasing out existing clients by lowering the threshold of revenue that they can earn from coal.

By: Barbara DeLollis

CoBS Insight

Social and Environmental Accounting: Measuring sustainability

Putting a value to the impact people and their organisation have on the world around them is not an easy task, says Prof **Adrián Zicari, ESSEC Business School,** especially in the context of ethics in finance.

Adrián Zicari 

WHAT THE NUMBERS CAN'T – AND DON'T – SAY

Sustainability has become one of the most pressing issues of the day, with the entire world becoming more aware of problems such as environmental degradation, inequality, and climate change. As such, sustainability involves maintaining 'a social and environmental balance' that reduces negative impact in the future.

In light of this, it is important that a form of measurement—or accounting—be developed. This measurement has been given the name 'social accounting', and can also be replaced by terms such as 'sustainable accounting' and 'nonfinancial accounting', says Prof Zicari. Yet, what it actually measures is not very clear, for there are various parameters that represent the complex nature of social and environmental impact.

The growing volume of information contained in reports on sustainability published by corporate houses is proof of this problem, for there is a distinction between 'comprehensiveness' and 'comprehension'—as the reports become larger, the more difficult it is to understand them. To top it all, social and environmental indicators are not always accounted for using currency units, which are widely understood.

Moreover, conventional accounting dates from around the fifteenth century, and has well established practices and conventions. By contrast, social accounting took its first steps in the 1970s and gained traction in the 1990s, mainly in Europe, with the idea that accounting should encompass more than just economic impact. This means that the field, while more developed today, still has some ground to cover before being as uniform as its financial counterpart.

REPORT TO IMPRESS

One issue that needs to be addressed is that of reporting. Until now, social reporting has generally been voluntary, although some regulation does exist, mostly in Europe. Yet, given the freedom to report, many companies choose to report essentially to gain legitimacy, for companies need to address societal expectations.

In addition, a study of corporate reports in the USA reveals that companies with not-so-stellar environmental performance tend to use more optimistic language, which suggests that some environmental disclosure is strategic. Even if one assumes that companies do not provide misleading information, companies can't be expected to provide open-access to all their social and environmental information.

This brings us to the question of whether regulation will help—for even though CSR actions may be voluntary, and thus out of the scope of a firm's duties, there is some consensus that some form of compulsory reporting will increase the information available and also comparability among various reports.

SPARE THE ROD

Soft-law deals with existing reporting frameworks—such as the Global Reporting Initiative (GRI), Sustainability Accounting Standards Boards (SASB), and Integrated Reporting (IR)—and even though compliance to these frameworks is voluntary, compliant companies have to conform to a certain structure when publishing data. Despite this standardization, 'comparability among companies using the same reporting standard can still be difficult', according to Prof Zicari. But it is not a lost cause, for voluntary social reporting can still be used to engage with stakeholders.

Hard-law, on the other hand, requires mandatory social disclosures and while it increases social reporting, as evidenced in some studies in both Spain and Italy, quantity does not mean quality. Further, social reporting is merely a means to an end—sustainability—not an end in itself. Achieving sustainability will perhaps require more—an active civil society that will use social reporting tools to drive the change needed.

> There is a need to be aware of what social accounting can and cannot do. For it isn't a magic wand that when waved will simply replace problems with sustainable solutions.

To this end, previous research suggests that regulations should foster involvement of civil society, promote easy access to sustainability data, and presentation of the said data in a comparable manner.

AN INSIDER'S ACCOUNT

But reporting only takes into account half the story, for it doesn't really capture what goes on inside the firm. For instance, a case study focused on a small industrial company in New Zealand, with a CEO genuinely committed to CSR, facing no internal resistance, and with initiatives such as inclusive hiring—shows that implementing social accounting is not a piece of cake, no matter how favourable conditions may be.

This is perhaps because of the level of integration between a firm's internal indicators, also known as the 'management control system' (MCS) and the firm's CSR indicators. The ideal case is one where the firm's CSR indicators are a part of the MCS, allowing the firm to pursue a developed sustainability strategy.

Given how managers acting in good faith and little internal resistance in their companies can also fail at achieving sustainability, a need for an integrated approach is felt. This integration may come from a clearer definition of CSR together with corporate performance, as opposed to an approach where CSR is the responsibility only of a certain team within the overall organisation.

INTERTWINED

The next step is to consider how social reporting relates to its traditional counterpart—the financial result. And while one may assume these to be isolated from one another, the reality is a little more nuanced. This is because there is an overlap of audiences—an expense by a company to say, buy a new equipment to reduce pollution has an impact on the bottom line, as well as on the environment.

Similarly, an investor could like to look at the finances to see the where the company is headed and also at the social report to better understand the risks involved.

And while several frameworks have attempted to identify a cause and consequence relation between social and conventional accounting, a clear link is yet to be found. As such, managers may implement sustainability strategies when deemed appropriate, even if a business argument for one cannot be made.

Managers may also want to choose their framework carefully, for each one of them has different indicators. For example, the GRI includes a large set of varied indicators, targeting multiple stakeholders, while the SASB's indicators differ by industry.

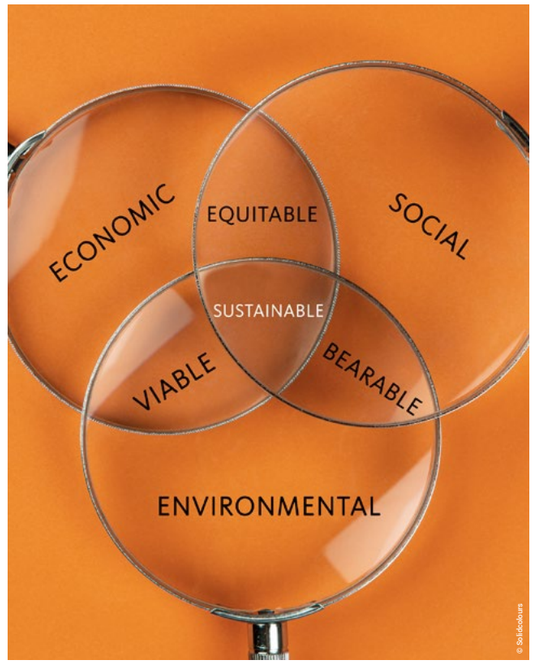
THE BIG PICTURE

One should also not lose sight of the fact that social accounting is not the end goal. Sustainability is. This brings the debate to a crucial argument—whether social accounting will help achieve that objective. And while some research suggests that is indeed the case, the big picture tells a different story.

This is because studies suggest that social accounting can lead to 'institutional appropriation'—marginal improvements without significant change. This is not to say that the entire exercise has been in vain—large companies across the globe now release social reports and social reporting is now a mainstream academic discipline rather than being a niche field.

One problem is that improvements in large corporations do not compensate for business-as-usual trends in small and medium companies that form the bulk of the production and employment bandwagon.

Furthermore, social accounting increases disclosure that may lead to token improvements without challenging the status quo. This is akin to treating the symptom but not the cause. For example, transportation-related accounting may lead to improvements in numbers such as fuel efficiency and tonnes of emissions. Yet, it does nothing to answer more fundamental questions such as the need to travel so much. The COVID-19 crisis is a good example of how it took a global pandemic, not social accounting, to make real change possible – business meetings only then started to be increasingly held online despite this being possible before.



As such, there is a need to be aware of what social accounting can and cannot do. For it is not a magic wand that when waved will simply replace problems with sustainable solutions. To that end, a concerted effort from an active citizenry and the use of tools from other areas such as design thinking can also go a long way to save us and our future – from ourselves.

BiGS Actionable Intelligence

The Future of Climate Finance: A 'whole-system' approach

Peter Tufano 

To effectively finance critical climate projects that can decarbonize the world and meet global net zero goals, CEOs, investors, and lenders should focus on multi-sector financing solutions that explicitly re-engineer risks and returns, according to **Harvard Business School** Professor **Peter Tufano.** a recent panel at Harvard University. This "system-wide" finance approach—blending public and private financing—can fill market gaps to achieve sustainable outcomes, while helping firms stay receptive to both challenges and opportunities.

Financing capital-intensive climate-related initiatives necessary to lowering emissions by 2050 will cost trillions of dollars, highlighting the need for innovative financing solutions, Peter Tufano, a professor at Harvard Business School, said, citing recent estimates.

In response, Tufano and colleagues are working on a "whole-system" approach to finance, which combines public and private organizations, along with risk and return engineering, to provide efficient and effective financial solutions to climate change.

"We have to direct more private and public money to generate a huge climate 'dividend,' some in the form of social benefits and some in the form of private benefits," Tufano told an audience during Harvard Climate Action Week in June. Tufano moderated a panel with finance leaders from BlackRock, ArcelorMittal, and the International Finance Corporation (IFC).

Climate finance more than tripled globally during the last decade, from about $364 billion in 2012 to almost $1.3 trillion in 2022, according to data from the nonprofit Climate Policy Institute. Much of that growth took place in the last four years.

Yet the global economy still needs about $275 trillion in cumulative spending between 2021 and 2050 to meet emission goals, according to data from McKinsey & Co. That's an average of about 7.5% of global GDP each year.

What that means is that, while nearly $1.3 trillion was spent in 2022 to finance climate-related projects worldwide, global economies need to spend a great deal more each year moving forward. And no single sector can handle it alone.

Decarbonizing economies globally, Tufano said, requires developing new strategies, including more public-private financing partnerships and capital structures that facilitate whole-system financing between government and private firms.

"We're going to have to transform both risks and returns so that both private and public parties can find ways to work together," Tufano said.

THE KEYS TO 'WHOLE SYSTEM' FINANCING

In addition to Tufano, the panel included Anmay Dittman, a managing director at BlackRock, the world's largest asset manager; Lana Graf, global lead for artificial intelligence (AI) and deep tech venture capital at IFC, a member of the World Bank Group that focuses on the private sector in emerging markets; and Irina Gorbounova, vice president or mergers and acquisitions and head of the XCarb Innovation Fund at steel company ArcelorMittal.

The experts discussed how the "capital stack" will become more sophisticated as climate change continues and financing decarbonization projects becomes more costly. Some companies are themselves taking a diversified approach.

ArcelorMittal, for example, has been decarbonizing its steel by using hydrogen and other sources that emit less carbon, but has also acquired four recycling centers that cost roughly $1 billion. In addition, the company's venture fund has spent almost $300 million in community allocated funding.

"We launched three years ago with the intention to invest roughly $100 million a year, then on top of that, of course, you've got projects," Gorbounova told the audience. "We are also developing our own renewable energy."

BlackRock's assets under management include both pure-play climate funds, which total about $11 billion, and some diversified funds that also invest in climate work, Dittman said. Blended finance (combining both public and private investors) can work, she said, if investors with varying objectives all believe their goals are being met.

"At the end of the day, if you want the blending to work, you really need to understand exactly what each mission set is for the investors," she said.

> The “capital stack” will become more sophisticated as climate change continues and financing decarbonization projects becomes more costly.

SPREADING RISK EXPOSURE

Investors must also trust that asset managers are mitigating the amount of risk properly, Dittman said.

“To really resonate in the private markets, you need to understand what they're looking for and then you need to earn the trust that you're managing their capital in a way that is risk-aware and that is delivering on their goals,” Dittman told the audience.

Blended financing often involves different parties taking on different pieces of a project and diverse financing instruments, because each party's individual risk preferences can differ. Deals in blended finance often involve parties that are unwilling to hold certain kinds of instruments or types of risk, she noted.

The result is that gaps remain in financing decarbonization projects. Some investors have smaller funds and lack the capital to work with larger, more complex projects. But investors with deeper pockets want less risk and sometimes avoid financing almost mature, but not fully mature, technologies. Fully mature technologies often do not fit some of the funds' investment criteria because of the potential for lower returns.

“Every investment we make is not just a passive investment so that we invest and see if it's going to work out,” said Gorbounova at XCarb Innovation Fund, which debuted in March 2021. “It's always a strategic lens. We are looking to decarbonize and still make the value chain regardless of the technology pathway we take.”

ArcelorMittal's strategy is different, Gorbounova said, because the company's needs are energy-intensive, requiring a lot of clean energy to produce decarbonized steel. This led XCarb Innovation Fund to invest $25 million in nuclear power company TerraPower, which was founded by billionaire investor Bill Gates in 2008.

Investing in long-term storage is also vital when companies are using renewable energy. The XCarb Innovation Fund, for instance, made an investment in Form Energy — led by CEO and former Tesla executive Mateo Jaramillo — in 2022, which provides multi-day energy storage capacity, and the fund signed a joint development agreement with Form. The fund will provide direct reduced iron (DRI) for Form Energy's battery technology, which is now undergoing large-scale production trials, she said.

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Providing the capital to fund these decarbonization projects is not the only solution, Gorbounova said. “What I'm trying to say is that it's not just pure financing, it's really this package of the equity investment coupled up with a strategic agreement that hopefully will get them to bridge some of this gap,” she said.

Some traditional lenders are willing to fund solar and other renewable technologies, but she said interest in mature technologies is not universal. “We see some of the mega shops like BlackRock, Brookfield, and Temasek raising the funds, so I see movement in the space,” she said. “But it's still insufficient to fully bridge this gap.”

Some organizations are watching to see how traditional lenders operate. IFC, for example, seeks to lower risk by examining whether organizations like BlackRock invest in a project, according to Graf.

“That would be almost a mutual mandate in the risk appetite, so it means that we would be quite comfortable there,” she said.

Finding projects that could be replicated in other countries is also important to IFC. “We're trying to understand if the markets might be repeatable and that's fascinating,” Graf said. “When you can develop one solution for a country and then repeat it — fantastic.”

By: Ellen Chang

CoBS Insight

A Lower-Carbon Global Economy: The need for better coordination across the different pathways

Fang Lee Cooke

Professor **Fang Lee Cooke, Monash Business School,** explores the various national approaches to net-zero goals around the world and how they can be effectively coordinated.

In October 2022, a United Nations report warned that only an "urgent system-wide transformation" to a global low-carbon economy will deliver the huge cuts to greenhouse gas emissions needed by 2030 if we're to avert the worst impacts of global warming.

But while there's agreement on the scale of cuts needed, there's no agreement on how to get there. Countries have different plans and priorities, reflecting the different pressures they're under, whether it's internal politics, energy dependencies, and uneven finances, resources and living standards.

Meeting this critical global challenge is going to depend on whether these disparate approaches and pressures can be coordinated to deliver the scale of cuts needed. So, what is driving the differing approaches around the world, and what scope is there to better-coordinate them?

IN-COUNTRY CLIMATE POLITICS

Internal "climate politics" is a driving force behind the different approaches being taken by national governments.

The rising electoral power of "Green"' parties in Europe is creating pressure on governments to adopt more proactive climate policies. In France, 25% of 18 to 24-year-olds voted for the Green Party in the 2019 European Parliament elections, while in Germany more than a third of young people voted Green. In June 2019, Finland's ruling coalition, which included the Green Party, announced plans to achieve "carbon neutrality" by 2035, 10 years earlier than Finland's original plan. Denmark makes full use of renewable energy, while Germany has been making serious efforts to develop renewable energy with the introduction of its "Climate Action Law" and Climate Action Programme 2030.

Further afield, Canada has been able to implement a carbon tax to encourage reductions in emissions, while Japan and South Korea have released detailed development roadmaps for hydrogen energy.

In the United States, while the "Green New Deal" is supported by 104 congressional members, and was backed by four contenders for the Democratic presidential nomination in 2020, the pressure on government to take decisive action to reduce emissions is weaker and diluted across different state governments.

In 2019, Australia's National Hydrogen Strategy was adopted, with hydrogen energy rising to the level of a national strategy. The strategy is expected to pave the way for Australia's hydrogen economy, thereby enhancing Australia's energy security, creating a large number of jobs, and establishing a multibillion-dollar export industry.

The Chinese government is increasingly determined to address the climate change issues, and is increasingly investing in clean technologies. But getting buy-in from businesses in this manufacturing-driven economy remains a formidable challenge.

THE POLITICS OF NORTH AND SOUTH

"Climate politics" in the international arena also operates between high and lower-income countries – the Global North and Global South, respectively. For a long time, people have been discussing the degree to which the north should be expected to carry a higher burden than the south when it comes to cutting emissions.

For lower-income nations it's critical they strike a balance between sustainability and affordability in their efforts to achieve low carbon, which means that a multi-step, incremental and transitional approach would be more effective than a one-step, radical and transformational approach.

CLIMATE BUSINESS

Climate politics and climate business often go hand-in-hand – there's money to be made as well as spent in the transition to a low-carbon economy, and this relationship between business and government varies around the world.

> Climate politics and climate business often go hand-in-hand – there's money to be made as well as spent in the transition to a low-carbon economy.

Financial groups such as BlackRock Capital have aligned with different governments to invest in carbon-reduction programs, while clean energy companies are seeking to expand and capitalise on renewable or low-carbon technologies, often facilitated by varying government financial incentives.

TECHNOLOGICAL ADVANCEMENT

Technological progress is profoundly changing the way energy is produced and consumed, and opening new avenues for achieving low-carbon economies that may be universal, but which also may suit some countries more than others.

For example, building on its manufacturing strength and backed by the government, China has developed a globally competitive solar panel industry, and is making fast progress in electric vehicle design and production.

Breakthroughs in oil and gas production technology, big data, artificial intelligence, virtual reality, the "Internet of Things", Blockchain, and other new technologies, as well as nano, graphene and other new materials, are driving the energy industry to transform to high-efficiency, green, low-carbon, digital, and intelligent energy production and supply.

CULTURAL TRADITIONS

One of the less obvious drivers behind the differing approaches to reducing emissions are cultural traditions. A 2020 study found that local culture had an important impact on energy consumption across 28 countries.

For example, a culture centred on individual car ownership will generate higher carbon dioxide emissions, whereas cultures that embrace public transport can be expected to generate less emissions.

Solar home systems can effectively replace fossil fuel, but it's difficult for some families in religious countries to accept it, because electric cookers lack the "natural" characteristics such as flame and smoke. While smoke in some locations also has the practical use of keeping the insects out of homes, flames bring light, which is of spiritual significance.

CLIMATE CHANGE AND LOW-CARBON TRANSITION – TOWARDS A COMMON GLOBAL AGENDA?

This backdrop of different and sometimes competing agendas and circumstances among countries is one of the reasons why significant reductions are proving difficult to achieve. The response of countries to the COVID-19 pandemic is emblematic of this.

The pandemic prompted governments around the world to make large investments in economic recovery. If there had been more international coordination on how to invest recovery funds, governments could have agreed to invest in low-carbon economic growth, such as technology, renewable energy, and the infrastructure and jobs of a low-carbon economy. Instead, countries have generally focused simply on driving a recovery as fast as possible, including a recovery in emission levels.

On the plus side, an important outcome at the recent COP27 meeting in Egypt was the commitment to create a loss and damage fund that is expected to provide funds to lower-income countries, especially those vulnerable to the impacts of climate change. While the details are yet to be worked out, it's this sort of coordination on policy that is badly needed.

Whether we achieve a fair and timely transition to a global low-carbon economy is ultimately contingent upon the ability of governments and citizens to navigate our differences. And key to that is acknowledging these differences in the first place.

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With kind acknowledgements.

BiGS Actionable Intelligence

Billions in Clean Energy Tax Breaks, Federal Expenditures in Play during 2024 Elections

Dustin Tingley and Jonas Meckling

The Biden Administration implemented the biggest policy initiative globally to reduce greenhouse gas emissions: the Inflation Reduction Act of 2022. While the legislation is unlikely to significantly affect the 2024 U.S. elections, Biden's ambitious new decarbonization and clean energy approach may have 'staying power' regardless of election outcomes, according to **Harvard** Professors **Dustin Tingley** and **Jonas Meckling.** Businesses and other actors are jockeying to preserve its benefits — which include nearly $1 trillion in tax breaks and expenditures through 2031.

Climate change may not be top of mind for voters in the 2024 U.S. elections despite June being Earth's 13th consecutive month to break a global heat record. But the stakes are high for U.S. climate policy.

"Climate change is not going to be driving the presidential election," predicts Harvard University Professor Dustin Tingley, who wrote a major study of stakeholders involved in the clean energy transition.

In early 2024 polling by the Pew Research Center, the environment, energy, and climate change were low on the list of U.S. voter concerns. Instead, mainly bread-and-butter economic and hot-button culture war issues filled their top-10 list.

Still, the stakes are high for U.S. climate policy. Election outcomes will affect the policies that have been supercharging business and investment decisions around decarbonization and the clean energy transition. The U.S. is the world's second-largest carbon emitting economy, after China, and the largest per-capita.

The centerpiece of the Biden Administration's climate policy, the 2022 Inflation Reduction Act (IRA) – the single biggest policy initiative in the history of U.S. climate policy – promotes renewable energy sources, and bolsters climate resilience. It is also expensive. A Brookings Institution analysis estimates that the climate provisions affect the federal government budget by nearly $1 trillion in tax breaks and expenditures through 2031.

On the other hand, the risk of not decarbonizing is the social cost of carbon emissions — such as increasing temperatures, rising sea levels, and the economic impact of those changes on agriculture, health, and energy use. The IRA is forecast to lower carbon emissions by 6-11 percentage points, according to the Brookings analysis.

Furthermore, while global warming doesn't top the list of voter election priorities, Americans increasingly worry about climate issues. Another Pew poll conducted in 2023 found that two-thirds of U.S. adults favor developing renewable energy sources over expanding the production of oil, coal, and natural gas. Evolving public opinion has prompted many businesses, even heavy carbon emitters, to rally around the Biden Administration's seismic shift in climate policy and push toward decarbonization.

BILLIONS AT STAKE AS CLIMATE POLICY IN THE BALANCE

Tingley told Harvard Business School's The BiGS Fix that control of the White House and Congress will determine the nature and pace of implementation of the U.S. effort to decarbonize, most notably through the IRA. The legislation passed both houses of Congress on party-line votes. Republicans criticized it with terms such as "reckless spending spree" and said it was too generous to foreign, especially Chinese, companies. GOP members have introduced bills in the current Congress to overturn all or part of the legislation.

Despite vocal opposition, the IRA and other efforts have brought benefits to politically diverse areas. Goldman Sachs Asset Management research shows that in the IRA's first year of implementation, it prompted the announcement of 280 clean energy projects across 44 states, representing $282 billion of investment. Most of those newly announced IRA-related investment projects, valued at $225 billion, were in congressional districts with a Republican representative. About 60 percent of the jobs expected to be created from those projects also are in Republican districts.

ENERGY TRANSITION INCENTIVES FOR BUSINESS

Clean energy and other decarbonization tax incentives for businesses and individuals are the most likely to survive any political changes following the 2024 elections, according to Tingley. Certain initiatives that require administrative action are less likely to be a priority if the White House changes hands.

The IRA also contains billions of dollars in loan programs and subsidies that require annual congressional appropriations, which would be affected by one-party control of both houses of Congress or split control of the House and Senate.

A CHALLENGE TO OVERCOME SKEPTICAL HEARTS AND MINDS

The transition to renewable energy must overcome challenges to win support among residents in areas historically linked to fossil fuels, Tingley's study points out. Many Americans have learned hard lessons from previous economic transitions that create skepticism about new promises of a better future in a decarbonized economy.

The toughest audience may be in many U.S. states such as Wyoming and Texas or communities that depend heavily on funding from taxes from fossil fuel industries to pay for basic public services, from schools to roads to public safety.

The IRA makes a crude attempt to channel investments in new technologies to these "energy communities." The legislation designates certain clean energy projects as eligible for enhanced tax credits if they are built in areas in which more than 25 percent of local tax revenues come from fossil fuels. In practice, when investments end up in those communities, is more by chance than by policy design.

"This is not a carefully targeted policy," says Daniel Raimi, director of equity in the Energy Transition Initiative at Resources for the Future, a Washington, D.C.-based independent, nonprofit research group. He has criticized the IRA's broad language that is intended to direct investment to energy communities. He notes that the Internal Revenue Service is charged with interpreting which areas can be defined as an energy community under the IRA. The IRS recently ruled that nearly half of the land mass in the U.S. qualifies.

On the other hand, some clean energy investments are emerging in areas that Democrats need to carry to win the presidency and make gains in Congress. Raimi points to sizable investments in battery facilities in swing states such as North Carolina, Michigan, and Wisconsin and other energy-related investments in Nevada, New Mexico, and Pennsylvania. However he argues that investments in energy communities are not laser-targeted or happening rapidly enough to offer any clear idea about the likely impact on public opinion.

"Climate and energy have been swept up like so many other things have into the culture wars," Raimi told The BiGS Fix. He cautions against any effort to predict the views of voters or policymakers based on purely cost-benefit assumptions. "It's an open question as to whether any sort of real-world investments and economic benefits are going to overcome the kind of ideological divide that this issue is part of."

A NEW POLICY COALITION EMERGING

Even without big shifts in public opinion or voting behavior, the Biden climate policy may still have a shield against elections or political rhetoric.

"The Biden administration developed the IRA as both a policy to tackle climate and also a political strategy to make the policy a little stickier," says Jonas Meckling, a climate fellow at Harvard Business School's Institute for Business in Global Society (BiGS).

Without a sufficient track record or implementation that could shift public opinion by the time 2024 polls open, Meckling says the best chance for continuity lies with a shifting policy coalition around the Biden Administration's new direction.

> The risk of not decarbonizing is the social cost of carbon emissions.

Very few industry associations opposed the IRA and businesses are its biggest beneficiaries, Meckling told The BiGS Fix. Large corporations are investing and planning based on tax credits and grants that they would be expected to fight for. They may team up with other actors — such as state and local governments, workers, and other interested parties — to maintain powerful pressure for some policy continuity that transcends other political or ideological considerations. A recent study showed, for instance, that some businesses in states with strong climate and clean energy policies supported federal climate policy.

"It's a story of using public investment to shift the interests of key players," says Meckling, noting that Obamacare and other major legislation have survived electoral and political turbulence. The key, he says, is "Does the IRA mobilize enough actors who are willing to fight for maintaining it?"

By: Desmond Dodd

CoBS Insight

Where ESG Doesn't Pay Off

Pierre Chaigneau 

Tying executive pay to environmental or social outcomes sounds like a good idea. In practice, it's throwing good money after bad. **Pierre Chaigneau,** Professor of Finance at **Smith School of Business, Queen's University** explains.

The ESG (environmental, social and governance) investment framework is a much livelier topic than it really ought to be. It ought to be boring.

Institutional investors, who know an ill wind when they feel one, are clearly concerned that climate change and lax corporate governance will imperil the value of their holdings. The prospect of stranded assets and Enron-level scandal can have that effect. Investors have been pushing for an independent standardized way of rating ESG that would help them compare the performance of publicly traded businesses on, say, carbon emissions or diversity targets. ESG serves that purpose, albeit as an imperfect and ever-evolving rating tool.

Yet, for some, ESG rating for investors is "a dangerous political agenda masquerading as altruism" that may constitute a hub-and-spoke (or even Chinese!) conspiracy. It's some grotesque result of a woke agenda—at the very least a scam.

ALIGNMENT TOOL

You can only begin to understand this reaction by viewing ESG not as a tool for rating but as a tool for alignment. It is one means by which investors can align the priorities of senior management teams of companies in their portfolios with their concerns about sustainability and good governance. By trading stocks, they bake these concerns into the share price, a metric guaranteed to get any CEO's attention.

The same logic can hold for corporate boards. If ESG is an alignment tool for institutional investors, surely it can be the same for board directors. Boards have long incorporated share price into compensation packages to focus executive attention on boosting short-term profits and mitigating losses. They could certainly incorporate ESG into executive compensation to align executives on non-financial outcomes as well.

Many corporate boards agree. According to one survey, as of 2021, 73 per cent of S&P 500 companies had adopted ESG performance measures. According to another, 80 per cent of Canadian public companies are using at least one ESG factor in their executive compensation plans, with social factors being the most popular.

This type of ESG uptake is yet one more alarming proof point for conspiracists and culture warriors. Yet the use of ESG in executive compensation even worries many supportive experts. It has been suggested that, at best, it is ineffective or, at worst, it leads to unintended consequences. There are not only the challenges of designing robust ESG metrics but also the problem of incorporating them into complex compensation packages weighed down by cross-cutting incentives.

SIGNALS FROM STOCK PRICES

Count Pierre Chaigneau among the skeptics. Chaigneau, the Commerce '77 Fellow of Finance at Smith School of Business, has extensively studied the economics of executive compensation. While he agrees that ESG reports and ratings, imperfect though they are, provide material information for investors, he says that ESG-based compensation is generally unnecessary for boards to align their executive leaders to ESG-related outcomes.

This is his thinking: If institutional investors are already making decisions on buying or selling a stock partly based on ESG ratings—which many now do—then ESG considerations are already embedded in the share price of public companies. Therefore, company boards can use share price-based incentives in their executive compensation with some confidence that ESG considerations will be part of those incentives.

"Stock price-based compensation," says Chaigneau, "is one measure that will provide incentives on the financial dimension but also on the ESG dimension." An earlier study he conducted based on game theory came to the same conclusion.

Chaigneau showed in another study that even if corporate board directors were focused solely on short-term financial returns, with no regard for longer-term ESG concerns, their executives with share price-based incentives would still pick up the signal from institutional investors that green concerns needed to be taken seriously.

In fact, his research shows that executive compensation doesn't have to be particularly sensitive to ESG ratings for executives to be motivated to make investments supportive of ESG.

GUARDING AGAINST GAMING

Some boards, of course, may still opt to incorporate ESG-related targets in their executive compensation plans. If they feel pressure to do so, Chaigneau has two pieces of advice: One, use full ESG ratings (that are based on hundreds of measures) rather than cherry-pick a handful of measures that show the company in the best light. And two, use metrics from more than one ESG rating firm. If a board is serious about outcomes and isn't just engaged in greenwashing, it must guard against executives gaming the incentives associated with ESG measures for their personal benefit.

This is not as far-fetched as you may think. The ESG ratings industry is fragmented with raters taking different approaches to the measurement, scope or weighting of data. ESG raters are transparent regarding how they derive their ratings, making it easier for executives to anticipate and game their company's numbers if they are sufficiently motivated. They can choose to invest in certain technologies or initiatives that pump up their company's ESG rating (and potentially their compensation), even if the company's actual ESG performance doesn't improve.

A study Chaigneau conducted with Nicolas Sahuguet (HEC Montreal) showed that, if needed, it would be far better for boards to base their compensation schemes on data from multiple ESG rating firms rather than just one. Their study, which simulated various scenarios, showed that increasing the number of ratings used for managerial compensation purposes improved the social and environmental impact of the firm, and that the distorting effect of ESG ratings weakened as the number of ratings grew.

The reason for this is intuitive, says Chaigneau. "It's harder for a manager to game multiple rating methodologies than to game a single methodology."

AN INCENTIVE FOR THE TIMES?

Chaigneau's shrewd approach to mitigating one of the vulnerabilities of ESG-based compensation is a welcome contribution to a field that is still in its infancy. It is not at all certain, however, that ESG ratings will ever be an effective direct incentive for senior executives or improve the social impacts of corporate activities.

Yes, a great many organizations are adopting some form of ESG-based executive compensation. But the motive for doing so likely has more to do with keeping up appearances or responding to investor pressure rather than pursuing a deeply-felt strategic goal. As well, most ESG-based executive compensation is geared to short-term outcomes (via annual bonuses) rather than rewarding more visionary leadership (via long-term equity instruments).

The other unknown is the power of the signal. So far, the incentives built into executive compensation plans to advance ESG goals are dwarfed by the incentives to maximize share value. A recent study of companies with leadership positions in the Business Roundtable, an industry group that has embraced ESG, showed that explicit, non-discretionary ESG incentives are "economically insignificant relative to executives' incentives to maximize share value arising from shares owned outright and unvested or unexercised equity-based compensation."

Will that change going forward? And, if not, will the ESG signal that is already embedded in share prices be a sufficiently powerful incentive for executives, as Chaigneau's research suggests? Or maybe this is all a dangerous political agenda masquerading as altruism, and we'll soon wake up and see the light.

By Alan Morantz.

Related research: Executive Compensation with Socially Responsible Shareholders, Pierre Chaigneau, Nicolas Sahuguet, 2023.

03

How industry can tackle climate change

BiGS Actionable Intelligence

New Business Model for Profitable, Remote Hybrid Power Projects

Christian Kaps, Michael W. Toffel, and George Serafeim



As solar power networks expand to potentially deliver electricity to more than 1 billion people living outside traditional grids, questions persist about how energy production and energy storage technologies can best be integrated to ensure a profitable yet low-cost energy supply. Recent research led by **Harvard Business School** professors **Christian Kaps, Michael W. Toffel,** and **George Serafeim** sheds new light on possible solutions.

Millions of households and businesses around the world aren't served by national electricity grids and instead must rely on expensive, high-carbon diesel power generation, if any exists. However, new research led by a Harvard Business School (HBS) professor reveals a solution: an innovative approach that helps investors make better decisions about remote renewable energy networks, potentially increasing profitability and improving the delivery of reliable energy supply.

The new approach involves using a mix of solar energy and energy storage technologies to replace some diesel generation and increase electricity access. This is timely because tens of billions of dollars in new investment is planned or underway to deliver hybrid solar power to off-grid communities in remote regions across Africa, Europe, and the Americas.

This new approach requires "an evidence-based model to determine the right mix of technologies," Christian Kaps, an HBS assistant professor who has researched renewable electricity generation and storage for six years, told HBS's The BiGS Fix. This model is precisely what Kaps and his fellow researchers explore in their paper published last year in Management Science.

BILLIONS SLATED TO BE SPENT ON OFF-GRID POWER

The global mini-grid market consists of more than 50,000 installed and planned grids in more than 130 countries, according to the Energy Sector Management Assistance Program at the World Bank. Of that market, nearly 30,000 mini-grids are planned for development in 77 countries and territories in the next few years, of which 99 percent will be powered by solar. The UN Sustainable Development Goals (SDGs) call for achieving universal power access by 2030.

In their Management Science paper, Kaps and co-authors Simone Marinesi and Serguei Netessine explore the mix of power generation and power storage used in communities that lie outside national electricity grids. When the primary renewable energy source stops generating electricity after dark, hybrid sources of power generation are intended to keep the lights on around the clock. These hybrids combine renewable solar power with storage capacity or fossil fuel backup.

FINDING A MARKET-DRIVEN MIX

"The big question with the green energy transition is how much of it is market-driven," Kaps told The BiGS Fix. He and his colleagues set out to understand how different energy production and storage technologies work together, and under which circumstances they should be combined to assure a consistent, low-cost supply of energy.

The new findings offer a starting point for investors where off-grid power networks are under consideration: an approach that allows them to quickly explore a variety of storage technologies and cost scenarios.

Recently, solar power mini-grids have been rolled out to replace diesel — especially in West Africa and remote areas of high-income economies — or to provide power for infrastructure or mining projects. However, the initial experience with solar-based mini-grids was mixed due to the unreliability of production and limited storage capacity.

Big private energy developers — including Tata Power Renewable Mini-Grids in India and Husk Power in India and Africa — with the support of global development institutions, use a multi-faceted approach to achieving the universal power access called for by the SDGs. These include scaling mini-grids using a mix of solar, wind, diesel, and storage.

As of 2022, about $37 billion in new investment was planned, according to the World Bank's Energy Sector Management Assistance Program. Several times that amount would be required to reach all areas of the world with people not currently served by existing grid power sources.

Kaps notes that the new model outlined in his paper also is relevant for large investment projects located outside major populations centers that require power, including those in more developed economies.

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UNEXPECTED FINDINGS ON STORAGE

The article, «When Should the Off-Grid Sun Shine at Night? Optimum Renewable Generation and Energy Storage Investments,» explores how to determine the optimal mix for generating reliable power, both profitably and at low cost. For instance, the article finds that solar power and storage capacity are strategic complements when both power and storage capacities are low. However, when there is a large amount of either solar power or storage capacities, the two technologies can become strategic substitutes that affect long-term investment decisions.

The authors also made a counterintuitive finding regarding storage capacity, where at first glance, high-efficiency but expensive lithium-ion batteries would be expected to offer the best power storage solution. Kaps and colleagues found that given the current conditions, lower-efficiency, cheaper technologies such as thermal storage capacity can more easily turn a profit in off-grid applications than lithium-ion batteries can.

HBS EMPHASIS: BUSINESS AND CLIMATE CHANGE

The article was selected to be part of a special section focused on Business and Climate Change of the academic journal Management Science. The section was edited by HBS professors Mike Toffel and George Serafeim, both pioneers in exploring the role of business, investments, and supply chains in the era of climate change.

"We asked how we can increase engagement in business and climate change research," said Toffel, regarding the project that was conceived about five years ago and evolved into the Management Science special section. The final selection of 23 articles, published in December 2023, were chosen from among scores of submissions from faculty and researchers across a range of universities and business disciplines.

Kaps' research was carried out and completed during his doctoral work at the University of Pennsylvania's Wharton School. He recently brought his expertise to HBS, where he joined the faculty in this past semester.

By Desmond Dodd

CoBS Insight

The Oil Industry and Sustainable Energies: Risky seas ahead, or plain sailing?

Michael Bradshaw, Mathieu Blondeel

How are international oil companies facing the pressure to transform to renewables? Professor of Global Energy **Michael Bradshaw, Warwick Business School** and Fellow at the **Royal Geographical Society,** together with **Mathieu Blondeel,** Professor of Global Energy Governance at the Institute for Environmental Studies (IVM), **VU Amsterdam,** explore the map of how they might navigate the potential storm ahead.

As the world seeks to shift towards a more sustainable future with renewable energy sources at the forefront, the global oil industry finds itself at a pivotal moment. Companies that have long extracted and sold fossil fuels are facing increasing pressure to adapt to what we have called a Global Energy System Transformation (GEST), shaped by climate policies, activist pressure, energy security concerns, changes in investors' preferences, and innovations driving down the cost of renewables and low-carbon technologies.

This GEST comes with significant *transition risk* – the fact that some sectors of the economy face big shifts in asset values or higher costs of doing business. As such, the critical uncertainty is about the speed of transition to a greener economy – and how this affects certain sectors and financial stability.

Transition risk is rampant in the global oil industry. If, say, government policies were to limit global warming to 1.5 degrees Celsius, as stated in the Paris Agreement, then 58% of the world's known oil reserves could not be burned. According to the IEA, reaching 'net-zero' emissions by 2050 means effectively ceasing all new development of long-lead time oil and natural gas fields. This could lead to changes in the value of investments held by banks, insurance companies and retail shareholders in this sector of course. ExxonMobil, for example, has been warning its investors that it is evaluating climate change and energy system transformation "in the context of overall enterprise risk, including other operational, strategic, and financial risks."

Despite such transition risk, GEST also presents opportunities for those who can navigate the fast-changing landscape. For oil companies, it's a race against time to adapt, innovate and diversify before they get left behind. Our research delves into the world of transition risk, exploring the various strategies and tactics that oil companies are using to stay afloat in this fast-changing landscape.

To understand the response of the global oil industry to the challenges of climate change and GEST, we believe that an interdisciplinary approach is needed. On the one hand, research on the political economy and socio-technical nature of GEST tends to treat the global oil industry as a monolith with common interests and strategic objectives. The strategy and (international) business literature, on the other, often fail to capture how political and social contexts affect company behaviour.

Instead, we argue, by bringing together insights from all these disciplines we can understand more intricately and comprehensively the actions and motivations of different oil companies. This has led us to introduce the 'Transition Strategy Continuum' as a way to categorize, analyse and understand the strategies of oil companies in the face of what is increasingly becoming an existential challenge for the industry.

RISK VARIATION IN A THREATENED INDUSTRY

One crucial factor to point out is that the global oil industry is actually comprised of a heterogeneous group of companies, each pursuing distinct goals, with unique corporate cultures, resources, and capabilities that they seek to employ to sustain competitive advantage over their competitors. In other words, they are varied group of corporate actors engaging in distinct political and business behaviours.

Take, for example, the difference between International Oil Companies (IOCs) and National Oil Companies (NOCs). The former are large publicly-traded oil companies, the likes of BP, Shell and ExxonMobil, and mostly headquartered in Western countries. NOCs, then, are (majority) state-owned companies like Saudi Aramco, ADNOC, and Qatar Energy, the largest of which mostly located in Middle Eastern, so-called 'petrostates'. Although much less studied, these NOCs account for more than half of global production and close to 60% of the world's oil and gas reserves.

Although both types of firms face transition risks, the degree of risk exposure differs significantly. Western-based IOCs, for example, are much more exposed to public scrutiny and activist pressure. They are, in other words, at risk of losing their 'social licence to operate', stakeholder and general public support for their practices and operating procedures. These growing climate accountability pressures are also reflected in the increased number of legal cases filed against oil companies. Already back in 2017, Shell, for example, warned shareholders that activist campaigns "could have a material adverse effect on the price of [our] securities and ability to access equity capital markets."

> The global oil industry is actually comprised of a heterogeneous group of companies, each pursuing distinct goals, with unique corporate cultures, resources, and capabilities.

NOCs need to worry much less about this 'social licence'. Not least because they are often considered the jewels in the crown of their respective economies. The rents NOCs generate are an essential source of national income and often used to maintain a 'social contract' between authorities and citizens.

Added to this, particularly the Middle Eastern NOCs arguably have easier access to so-called 'advantaged reserves'. Oil (and gas) reserves that have low(er) production costs, are less carbon-intensive to produce and are short cycle (more accessible with shorter lead time to recover investment). Those companies with *dis*advantaged reserves on the books thus risk being left with 'stranded assets', or unrecoverable oil (and other fossil fuel) investments because they are priced out of a shrinking market.

IOCS: NAVIGATING GEST USING STRATEGIC MANAGEMENT

Now, imagine you're a captain of an oil tanker, navigating through the choppy waters of the global oil industry. As energy system transformation changes the nature of competition, you and your crew must constantly strategize to maintain an edge over your rivals. As you plot your course, you come across two different maps – one that shows the positions of other ships in the industry, and one that highlights the resources each ship has at its disposal. These two maps, known as the position-based view (PBV) and the resource-based view (RBV), offer classic, yet valuable insights as you navigate the transition to cleaner energy sources.

The PBV, inspired by Michael E. Porter's classic five forces model, helps you understand the industry-level forces that determine your profit. You realize that in the face of increasing competition from electric vehicles, you'll need to find a position in the industry from which you can best defend yourself. To do this, you might create products that exploit changes in demand or restructure your activities to produce a sustainable competitive advantage.

The RBV, on the other hand, highlights the resources you have at your disposal. You realize that your rivals – advanced NOCs and other IOCs – may hold a significant advantage because of their access to the said advantaged reserves. To compete, you must enhance or defend your competitive positioning by creating products or services that exploit climate-related changes in demand or restructuring your activities to produce a sustainable competitive advantage.

Armed with your two maps, you might sense that something is missing before you can truly embark on your journey. Indeed, a third, weather map showing the meteorological circumstances that you'll encounter on your journey is needed. This map, known as the institution-based view (IBV, or the 'third leg of the strategy tripod') shows you the broader political, policy economic and social landscape and their impact on the company as well as the industry. This institutional context, after all, matters significantly.

As you finally set sail, you remember the words of Porter and Reinhardt – strategizing requires both 'inside-out' and 'outside-in' thinking. You take stock of your impact on the climate and put strategies in place to reduce it. You and your crew are ready to navigate the energy transition and position your ship for success.

All three types of competition, PBV, RBV and IBV can co-exist which makes these approaches complementary instead of contradictory. The RBV and dynamic capabilities literature can be used to expand understanding of the oil industry by providing a way to study individual company behaviour and heterogeneity in capabilities and resources at the company level, opening the "black box" of the industry. While the IBV puts great emphasis on understanding that companies and industries do not operate in a political, economic or social vacuum. To the contrary.

THE OIL INDUSTRY: ASSESSING TRANSITION STRATEGIES

Building on this scholarly work in international business and strategic management, we have introduced a novel interdisciplinary 'Transition Strategy Continuum' that helps assess and compare overarching oil business strategies in the face of the need for rapid decarbonization and the management of transition risks. In it, we identify three distinct types of transition strategies:

- A conservative 'Core Business' strategy where a company tries to maintain its position in global oil and energy markets
- A strategy of 'radical transformation' which entails a complete overhaul of the oil-centred strategy
- And a strategy of becoming an 'integrated energy company' (IEC) which entails a pivot away from a focus on producing gas and oil to offering a wider range of energy services.

This is a dynamic framework and companies, evidently, move between categories. Importantly, and this has become clear since the original publication of our article, strategic change is not exclusively unidirectional in that companies gradually adopt a more sustainable strategy. In recent months, both Shell and BP, for example, have both announced significant rollbacks of their respective transition strategies. This only adds to the need to understand the drivers and barriers of (transition) strategies within an industry at bay.

TOWARDS THE HORIZON

All three strategies necessitate the development and deployment of dynamic capabilities and other company resources among IOCs. So, faced with the pivotal moment and increasing pressure to set the compass towards a more sustainable future, it will be interesting to see which strategy, or combination of strategies, the IOC giants will choose, based on how they see this energy system transformation unfolding, and how much they are willing to invest – a challenge in risky waters, or an opportunity towards plainer sailing?

BiGS Actionable Intelligence

From Resistance to Support: Harvard research shows energy sector's shift on climate rules

Jonas Meckling

Companies with large carbon emissions have traditionally fought clean energy regulation, but new research out of Harvard Business School by **Jonas Meckling,** a climate fellow at Harvard Business School's **Institute for the Study of Business in Global Society (BiGS)** shows that opposition is not monolithic. Fossil-fuel-reliant companies have engaged in many strategies over the last three decades – including outright support for climate-friendly policies under certain conditions. As with many things in Washington, corporate lobbying on climate policy has few absolutes.

Common wisdom holds that oil and gas companies, electric utilities, and other industries with large carbon emissions generally oppose clean energy policies in Washington.

Now, a study of corporate advocacy spanning 30 years reveals that many companies are more flexible than previously thought. When confronted with political, policy and market conditions that necessitate change, well-known companies like Pacific Gas & Electric, Exelon, Dominion Resources have in fact supported climate-friendly regulation when it suited their economic interests.

The research shows what policy pros in Washington often learn through experience: high-polluting companies are sometimes willing to support clean energy policies, but the shift can take years—sometimes decades, and it is often dependent on political winds, market shifts, technological changes and other forces that are difficult to predict and often beyond control.

"The conventional notion is that business either supports or opposes [climate friendly policies]," said Jonas Meckling, a climate fellow at Harvard Business School's Institute for the Study of Business in Global Society (BiGS). "We have seen the U.S. business community shift from a monolithic opposition to climate policy 30 years ago to much more diverse strategies."

THE CHANGING PHASES OF ADVOCACY: 30 YEARS OF INCHING TOWARDS SUPPORT

In a study published in Policy Sciences, Meckling and co-author Irja Vormedal of Norway's Nansen Institute explained how many companies shifted from opposing to selectively supporting new regulation over the course of multiple rounds of policymaking.

The study identifies three phases in that evolution, beginning with outright opposition in the 1990s until today—a time when the researchers say that some companies are supporting climate friendly policies believing it's beneficial to their performance and reputation.

- Phase 1: The 1990s – Outright opposition
- Phase 2: 2005-2012 – Engagement
- Phase 3: 2013-Present – Some support

The study describes a dynamic landscape with frequent changes in politics, policy and markets. Factors such as changing technology, competitive advantage and public sentiment all play a role, as does the influence of policymakers.

In the face of those forces, companies often adapt their positions to shape policy rather than forfeit their voice in the process. "The reputational cost of not playing along becomes greater," Meckling said.

HOW COMPANIES EVOLVE

The study cites many examples of companies acting nimbly on climate policy, switching from opposition to selective—sometimes even genuine—support to protect their interests.

For example, the study described BP, PNM Resources, and the now merged ConocoPhillips and Duke Energy as "large emitters of [greenhouse gases] with assets linked to coal or oil production" in the 2000s, when members of Congress were writing multiple pieces of legislation to establish a federal carbon market.

Yet all four companies, and many others, eventually joined the U.S. Climate Action Partnership, a pro-reform lobby that authored model cap-and-trade legislation. While that support may seem out of alignment with company operations, it served as a hedge against more dramatic forms of government intervention.

"A considerable share of electric utilities and oil and gas firms shifted from opposition to strategic support for a favorably designed cap-and-trade scheme in the wake of growing political pressures and the threat of costlier regulation," according to the study.

> The alliances between government and business on the future of climate policy will only become stronger in the coming years.

The late Jim Rogers, former CEO of Duke Energy, explained the approach well at the time. "When you see a parade form on an issue in Washington, you have two choices: You can throw your body in front of it and let them walk over you, or you can jump in front of the parade and pretend it's yours."

POLICY AND MARKETS

By contrast, other utilities such as Exelon and Pacific Gas & Electric expressed what the study called "sincere support" for cap-and-trade reforms. Because they were less dependent on fossil fuels, a new system would provide them with a competitive advantage over their more carbon-heavy rivals.

"Owning little or no coal generation, but substantial shares of nuclear, hydropower and/or natural gas generation, they could … benefit economically from the proposed scheme," the study said.

This is not the only case in which companies have supported climate-friendly policies to advance their interests. In 2014, the Obama administration introduced the Clean Power Plan, with a goal to reduce power-sector emissions by almost one third over 2005 levels by 2030. Legal challenges tied up the plan beyond Obama's second term, and the incoming Trump administration sought to replace it with the more lenient Affordable Clean Energy plan in 2017.

Supporters of clean energy initiatives may have been surprised to see utilities such as Calpine Corp., Dominion Resources, NextEra Energy, Southern California Edison openly oppose the rollback, sometimes in court.

This was another case in which companies with a better carbon profile sought to support regulation and gain an advantage. "These utilities had a competitive edge over other, more carbon-intensive utilities due to their relatively clean generation portfolios, including little or no coal," the study said.

The study suggests that position in the market can impact on position on policy. Meckling says the opposite can also be true. As he put it, "Policy changes markets."

CONVERGING INTERESTS

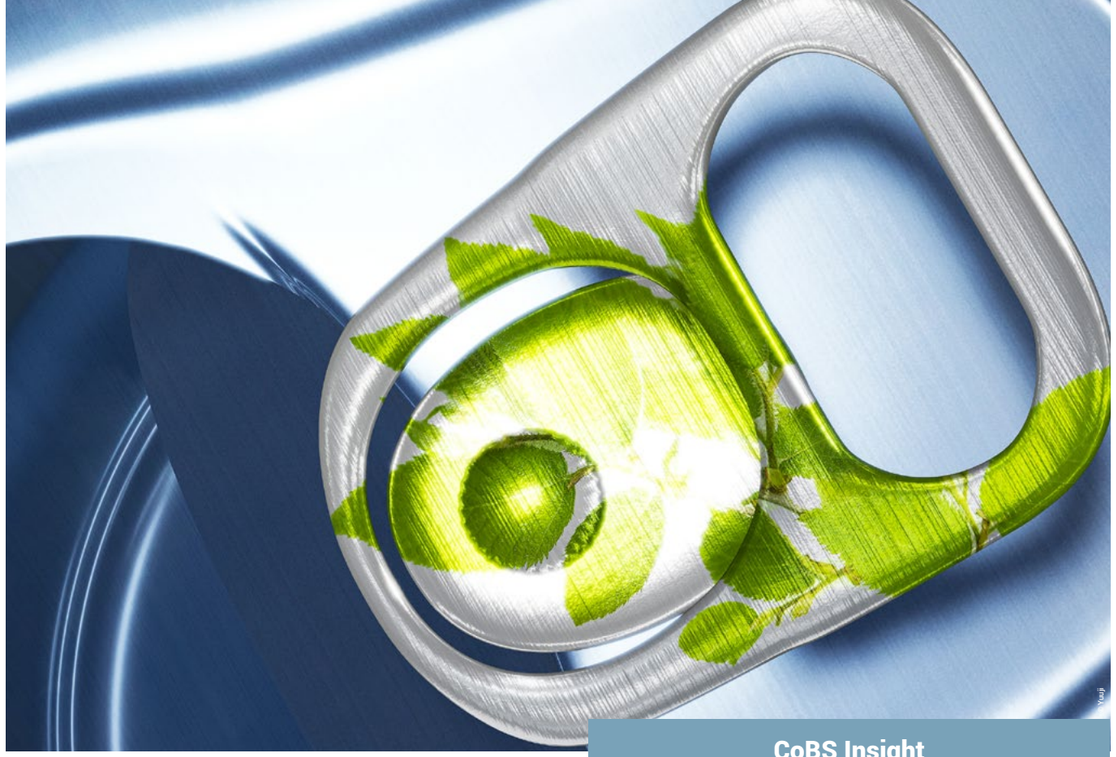
Experts in environmental policy say companies are likely to continue shifting positions to advance their interests as governments at all levels continue to play an active role.

"The alliances between government and business on the future of climate policy will only become stronger in the coming years," said Gizelle Wray, director of regulatory affairs at Savion, a utility-scale solar and energy storage developer in the U.S. and a portfolio company of global energy giant Shell.

The issue goes beyond public opinion and the politics around climate change and a clean environment, Wray says, because companies are not the only ones seeking benefits. Governments are engaged in a technology race to ensure their economies are at the forefront of new innovations that provide solutions to heavy carbon emitting industries, Wray says. They are increasingly interested in ensuring the new energy economy is implemented safely, reliably, and affordably.

Vormedal says companies leading the clean energy transition may have an advantage in dealing with governments that are eager both to partner and to regulate. As she put it, "Frontrunners in the ongoing race for clean technology leadership may take advantage of the potential for new alliances with government."

By: Desmond Dodd



CoBS Insight

The Circular Economy: Its challenges and impact across frontiers

Have we reached the point of no return in the fight against climate change? Or does mankind still have a few tricks up its sleeve? Professor **Susana Pereira, FGV-EAESP,** explores how the circular economy – the process of extending a product's life by reusing, sharing, upcycling – can be an answer to our problems.

Susana Pereira

Through an unlikely global alliance, humankind has fixed the problem of ozone layer depletion over the last few years. However, before celebrating this monumental feat, we have another task with odds stacked against us: Climate change. Awareness, interest, and actions pertaining to climate change are increasing exponentially and the fear among the scientific community is that it still might not be enough.

CIRCULAR ECONOMY: THE SAVIOUR?

Switching from a linear flow to a circular flow of products is a critical tool in the fight against climate change. Along with climate change, the rising costs of raw material acquisition and the environmental impact of disposal processes are also strong reasons to advocate for a circular economy. The objective of a circular economy is to extend the life cycle of products, by-products, and useful waste outputs.

One particularly important economic sector that places a high priority on the circular economy agenda is the packaging industry. Most one-way packaging, commonly referred to as single-use packaging, is discarded after its use and enters the waste stream in less than one year. On a global scale, this is a huge problem and could be the perfect use case for a circular economy approach.

Despite the growing recognition of the benefits of adopting a circular model rather than the traditional linear model, little is currently understood about the circular supply chain models and their replicability in different emerging economies around the world. What constitutes a 'circular supply chain', the practical implementation of supply chain process circularities, and the wider configuration of other actors in the network are some issues to be addressed.

CIRCULAR ECONOMY IN ACTION

Tetra Pak, a premier provider of food packaging, has operations in several countries including China and Brazil. In an effort to steer its model and to understand the difficulties of shifting from linear to circular, Tetra Pak decided to implement the change in Brazil and China.

Although both countries are culturally and linguistically very different, the company's circular supply chain in both countries is fairly similar in design. Similar to many MNCs that have established successful global footprints by standardizing their design and culture, Tetra Pak has effectively standardized supply chain management practices across different international contexts.

While it is a good idea to standardize processes and use similarities among different international contexts, it would be naive to assume that there won't be differences. While processes are standardized, the actors who perform these processes are different in the two countries across the supply chain.

A noticeable example among the differences is that customers return the packaging to the retailers in Brazil while such a loop is non-existent in China. Knowing such differences, Tetra Pak capitalized on the strengths of the local players to implement standardized supply chain sustainability practices, which played a key role in their successful transition.

(PRE-)REQUISITES FOR CIRCULAR MODEL SUCCESS

In any successful project, it is seldom about one or even two factors taking centre stage but usually a myriad of different factors working in combination to contribute to the success. However, there are key factors to be considered when implementing a novel idea, especially in areas where stakeholders are instilled with the 'that's how things work' attitude.

Collaboration and Education were the most important factors that contributed to the success of Tetra Pak in China and Brazil. Since supply chain management in both countries relies heavily on third-party players, Tetra Pak needed to provide them with technical advice, training, and equipment. Along with collaboration, Tetra Pak also formally acknowledged outstanding performance through award systems.

> Collaboration and education were the most important factors that contributed to the success of Tetra Pak in China and Brazil.

Novelty without educating the relevant stakeholders and the public is a guaranteed recipe for failure. Since people are not used to recycling, developing public awareness through a series of partnerships with retailers, schools, and food processing companies to educate end-consumers and other key stakeholders in the circular supply chain becomes an indispensable responsibility.

NO ONE-SIZE-FITS-ALL SOLUTION

The scientific community has warned us that we have already crossed the point of no return on the issue of climate change and even that has not pushed the issue to the global spotlight. This initiative by Tetra Pak has busted many myths surrounding the implementation of a circular economy. These include the presumption that collaboration among stakeholders is hard or counter-productive, that people won't take the effort to recycle things, and that a circular economy is not a good business move.

Overall, Tetra Pak's initiatives in both countries have led to fairly similar recycling rates (28% in China and 23.3% in Brazil). Much has been achieved in both countries. Yet, the recycling rates under 30% indicate that much work still remains to be done considering the large volume of single-use wastes generated by the populations in both countries

There is no one-size-fits-all solution when it comes to implementing a circular economy and especially in two different cultural and economic contexts like China and Brazil. Along with the cultural and systemic differences, there are also differences in the legal framework of the two countries. In the end run, irrespective of the country, support from governments is non-negotiable in the successful implementation of something as beneficial to people and planet as the circular economy.

Related research: *Circular supply chains in emerging economies – a comparative study of packaging recovery ecosystems in China and Brazil,* Luciano Batista, Aston Business School, Yu Gong, Southampton Business School, Susana Pereira, FGV-EAESP, Fu Jia, York Management School, & Alexandre Bittar, FGV-EAESP.

BiGS Actionable Intelligence

Are We at the Tipping Point of a Reimagined Consumer-Goods Market?

George Serafeim and Shirley Lu

There's a growing belief that business people could make a lot of money if they could change how consumers "consume." **Harvard Business School** research from Professors **George Serafeim** and **Shirley Lu,** in fact, suggests that persuading consumers to discard a throw-away mentality may represent a business opportunity worth "trillions of dollars." This dramatic shift would require reimagined business models as well as overhauled product designs and supply chains. BiGS reveals insights from investors and founders who are bringing a "circular" approach to the consumer goods market, including in some surprising ways.

Are we on the cusp of a revolution in recycled and reimagined consumer goods, known as the "circular economy?" A new wave of venture capitalists and entrepreneurs believe so. They're determined to help consumers and businesses discard a throw-away mentality across the entire product lifecycle, from the design phase to packaging and consumption — a shift that Harvard Business School research suggests could become a multi-trillion-dollar business opportunity.

Think about repurposing Apple iPhones, reselling Prada leather handbags, buying pricey facial serum in recycled plastic jars, and renting — rather than owning — gaming consoles and vacuum cleaners. And that's just the beginning.

"While we are living in wildly uncertain times, there is one thing that everyone can line up behind. Nobody likes waste," circularity investor Michael Smith told The BiGS Fix in an interview. "Everyone wants government, business, or their own lives to be as efficient as possible."

Smith's circularity-focused venture capital firm, Regeneration VC — which counts Leonardo DiCaprio as a strategic advisor — exemplifies a new breed of venture capital firms betting on profitability by addressing consumer materials and their greenhouse gas emissions. Buoyed by shifting consumer demand and the anticipation of a new regulatory landscape, these investors support startups that help major consumer brands curb their emissions and, in some cases, comply with regulations, ensuring that environmentally conscious consumers stay loyal.

HBS scholars who have studied this issue agree that it's possible to do good for the Earth and profit by adopting this circular model.

To that end, Regeneration VC invests in companies that innovate consumer product design (such as containers and packing materials), consumer use (products and brands), and reuse (logistics).

"We saw a lot of passion from consumers on wanting to buy things that are more environmental, wanting to get their purchases in line with planetary considerations," said Smith, who performed as a top-tier DJ and owned TV stations before he and partner Dan Fishman cofounded the firm.

That surge in capital comes as today's entrepreneurs increasingly recognize the urgency for disruption. Many are motivated by the growing environmental consciousness among Gen Z and Millennial consumers who want to fight climate change with practical, systematic approaches, but don't always find enough options to do so.

"You can't just tell people, 'Go rent stuff; it's better for the environment,' without providing the necessary supporting services," said Yael Shemer, cofounder and chief commercial officer of Tulu, one of the firms backed by Regeneration VC. "We need the infrastructure to follow suit. I advise other entrepreneurs to view circularity as a framework rather than just a goal. The more we integrate circular practices into existing supply chains and the lifecycle of products, the greater the impact we can achieve."

BEYOND RECYCLING: CIRCULATING EVERY MATERIAL AND EVERY PRODUCT

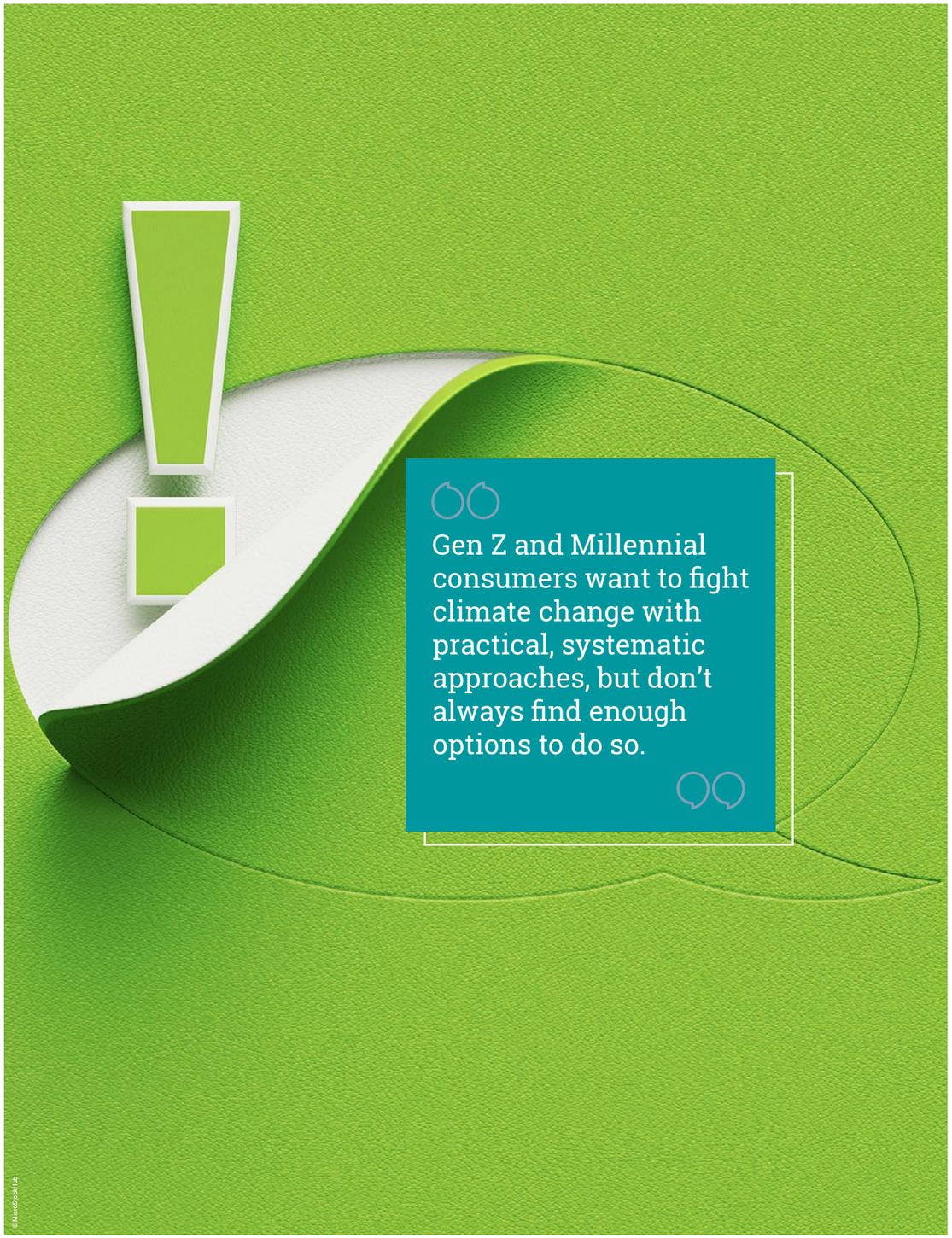
What is the circular economy that these investors and consumers are so keen on?

It is the opposite of today's linear economy — the market system of extracting raw materials for consumer products, manufacturing the products (among other things), then consumers buying the products, using them, and throwing them away.

Of course, many people love to recycle, reuse, and even compost. A circular economy model, however, circulates every material and every product for as long as possible to extend its lifespan. It could, for example, entail new ways to recycle plastics or waste to transform consumer packaging. In turn, this model could reduce emissions at every stage of a product's life cycle, from extraction to manufacturing to transportation to consumption and waste.

In most of the world, the opposite is happening.

More than 100 billion tons of materials are extracted from the Earth each year, a little more than 7% of which is reused or recirculated, according to the recent Global Circularity Gap Report. Material consumption has tripled in the last half-century, the report found, generating about 70% of global greenhouse gas emissions.



CONSUMER DEMAND IS CREATING A MAJOR BUSINESS OPPORTUNITY

Intuitively, it might appear that manufacturing longer-lived consumer products would be bad for business. However, HBS Professor George Serafeim and Shirley Lu, an assistant professor at the school, estimate that a transition to a circular economy is a multi-trillion-dollar market opportunity, driven by consumer demand. Serafeim has written extensively about this ongoing paradigm shift, which "has remained elusive" and is still undercapitalized.

Increasingly, companies and investors recognize that they can extend a product's useful life without harming a business model, according to Serafeim and Lu. This can take different forms. One approach is the product-as-service model, where consumers lease a product. Serafeim and Lu also highlight the secondhand iPhone market, which makes up 80% of the 300 million phones in the used phone market.

"Identifying the consumer as a temporary owner of a long-lived asset opens up opportunities to engage customers," Serafeim and Lu wrote in a 2023 paper, based on a May 2023 Catalyst Circular Economy Conference organized with Harvard Business School's Digital Data Design Institute.

The BiGS Fix, in conversations with investors, founders, and other experts, found more examples of business leaders and entrepreneurs who see opportunity in a circular economy. For instance, some industrial suppliers of plastics and other materials commonly used in everything from beauty product jars to shipping materials are quietly deploying venture capital in research and development projects or promising startups.

But unlocking these opportunities is rarely easy. Few circular economy models have matched Apple's scale and financial success in selling secondhand iPhones, according to Serafeim. During the 2023 circular economy event, Marcelo Claure — former CEO of Sprint and Softbank International — explained how Apple's iOS operating system is critical to ensuring that a secondhand iPhone maintains value. The system, he said, allows a consumer to bring their information to a new device and receive over-the-air updates.

REGULATORY CHANGES ARE ADDING TO PRESSURE FOR CIRCULARITY

Some business leaders who are passionate about the environment and sustainable practices are getting involved by supporting relevant legislation and regulation.

Europe now leads the way on the regulatory front, with efforts to both advocate for and regulate the circular economy. In the United States, regulations are changing to a lesser extent, although more companies will be required to report their value chain or life cycle emissions — called "Scope 3" emissions — in the years to come.

BIG CONSUMER BRANDS — AND B2B BRANDS — ARE LISTENING

For additional evidence of surging awareness of circularity among consumer-focused businesses, look at the anti-plastics movement — especially consumer-facing campaigns designed to decrease the use of single-use plastics, by companies ranging from Starbucks to Marriott International.

"Once people were seeing a turtle with a straw in its nose and the oceans full of plastic, people were like 'this is crazy, right?'" Martijn Lopes Cardozo, a venture partner at Regeneration VC, told The BiGS Fix. "As a result, those [consumer goods companies] have become very, very protective of their brand, and really feel they need to step up and make external statements and set goals for themselves on what are they are going to do about this."

Here are examples of startups in each phase of the life cycle of products:

CIRCULAR BUSINESS STARTUPS IN EACH PHASE OF THE LIFE CYCLE:

Design: Cruz Foam sells a combination of natural materials that can be used for packaging, as a replacement for Styrofoam, and that is compostable. More than 70% of the proprietary combination is agricultural food waste that comes from byproducts of farms in the U.S. Midwest, according to company CEO and cofounder John Felts. This effectively diverts waste from landfills, where otherwise, it would produce harmful methane emissions that would contribute to global warming.

"The era of businesses depending on oil-based materials such as expanded polystyrene or expanded polyethylene foam for packaging is coming to a screeching halt," Felts told The BiGS Fix. "These materials pose significant environmental hazards, and there is a growing consumer demand for more sustainable alternatives."

Cost is one of the most critical circular economy issues to address because some products that start very high-end have trouble scaling and growing, Felts said. Cruz Foam has achieved cost parity with certain types of packaging, he said.

The foam is named after the company's headquarters in Santa Cruz, Calif., which focuses on research and development. Commercial production of the foam takes place at a facility in Greensboro, N.C., and the company partners with foam converters, distributors, and manufacturers in locations including Southern California, North Carolina, Massachusetts, and Paris, France.

Established in 2017, the company has completed Series A funding.

Consumer use: New York-based startup Tulu specializes in offering residents of multi-family buildings on-demand access to lockers that contain a curated collection of rent-ready household appliances such as vacuums and irons, gadgets, and other goods from brands such as LG and Bosch.

Now in more than 30 cities — including New York, London, and Amsterdam — Tulu operates a physical and digital platform in medium- to large-sized apartment buildings and student housing, where residents are more likely to value experiences over material possessions, want to fight climate change and protect the world's natural resources — and have landlords who will cater to their preferences.

"We believe every product in the world can become a service," Yael Shemer, Tulu's cofounder and self-described "environmental entrepreneur," told The BiGS Fix. "For it to become the default, we need to create frictionless services that compete with the convenience of the linear economy."

Collaborating with major players such as Bosch has been key to scaling Tulu's circular solutions, Shemer told an audience at an Ikea-sponsored event at 2023 Climate Action Week in New York City. She also stressed the importance of working with landlords, specifically those who are keen to appeal to their target audience's lifestyle.

Underscoring Shemer's point, Charleston, S.C.-based Greystar, which manages and operates more than $300 billion in real estate assets that include multi-family buildings in 249 markets, touts its partnership with Tulu on its company blog. Greystar says it now offers the service in 40 residential and student housing sites — with more than 20,000 householders — in cities such as London, Manchester, Liverpool, and Dublin.

The landlord positions the Tulu service as another perk of living in its apartment buildings, alongside other tenant amenities such as a fitness center or landscaped garden.

Reuse: For anyone who has felt frustrated when their waste operator appears to combine all their previously separated recycled items, Greyparrot introduces the idea of "waste intelligence."

Greyparrot uses AI remote sensors to help recycling, regeneration, and waste companies — including government and commercial operators — track discarded matter to hunt for recyclable or circular materials. These waste analytics are helping to track collection, transfer, sorting, and recycling. According to the company's website, it is tracking 25 billion waste objects in 89 categories.

In context, the United States has about 3,000 open landfills and another 10,000 closed ones. For decades, the U.S. exported its waste (including recycled waste) to other countries, such as China. However, China stopped accepting outside waste in 2017.

By: Nora Fitzgerald and Barbara DeLollis

CoBS Insight

From Nature-Based Solutions to Nature-Based Enterprises: Innovating with nature to address societal challenges

Mary-Lee Rhodes, Siobhan McQuaid, Marcus J. Collier, Esmee Kooijman and Francesco Pilla

Nature-based solutions (NBS) have been widely recognised by governments in climate change and biodiversity strategies. But significant barriers exist for their large-scale implementation. Profs. **Mary-Lee Rhodes, Siobhan McQuaid,** Associate Director for Innovation, Centre for Social Innovation, **Marcus J. Collier** and Researcher **Esmee Kooijman** from **Trinity Business School, Trinity College Dublin,** together with **Francesco Pilla** from **University College Dublin,** take the first step in a thousand-mile march toward market development of the sector by proposing a classification for organisations delivering NBS and categorising their economic activities.

There is no question that the Earth is a giving planet. Its 'gifts' – natural ecosystems – provide services of crucial importance to human well-being by sustaining the quality of air, water, and soils, providing resources and energy, regulating the climate, and reducing the impact of natural hazards. Yet, human activities have significantly altered ecosystems, and biodiversity loss ranks among the most pressing issues we face today. The world lost an estimated USD 4-20 trillion per year in ecosystem services from 1997 to 2011 as a result of global land-use change.

What can be done to improve this alarming situation? Nature-Based Solutions (NBS) have a key role to play in turning the tide, by working hand in hand with nature, rather than against it.

BRIDGING THE GAP

NBS protect, effectively manage, and restore natural or modified ecosystems. In doing so, NBS generate a wide range of benefits locally and for society as a whole. These actions improve ecosystem functions and biodiversity, and decrease the vulnerability of climate change effects by increasing resilience for adaptation and mitigating greenhouse gas emissions. For example, stewardship of terrestrial ecosystems and improvement of agricultural methods have the potential to provide up to 30% of the greenhouse gas mitigation required until 2030 to keep global warming to less than 2oC compared to pre-industrial levels.

Examples of NBS include ecosystem-based adaptation and mitigation, eco-disaster risk reduction, green/blue infrastructure, and natural climate solutions. The benefits of implementing NBS to solve environmental challenges – as opposed to traditional approaches – have led to the adoption of the concept by policymakers, though not universally and to varying degrees of success. Nevertheless, implementation of NBS on the scale needed to contribute to these societal challenges requires the involvement of all stakeholders. NBS are increasingly viewed as a means to diversify and transform business for sustainable development, and the private sector could contribute to upscaling of NBS.

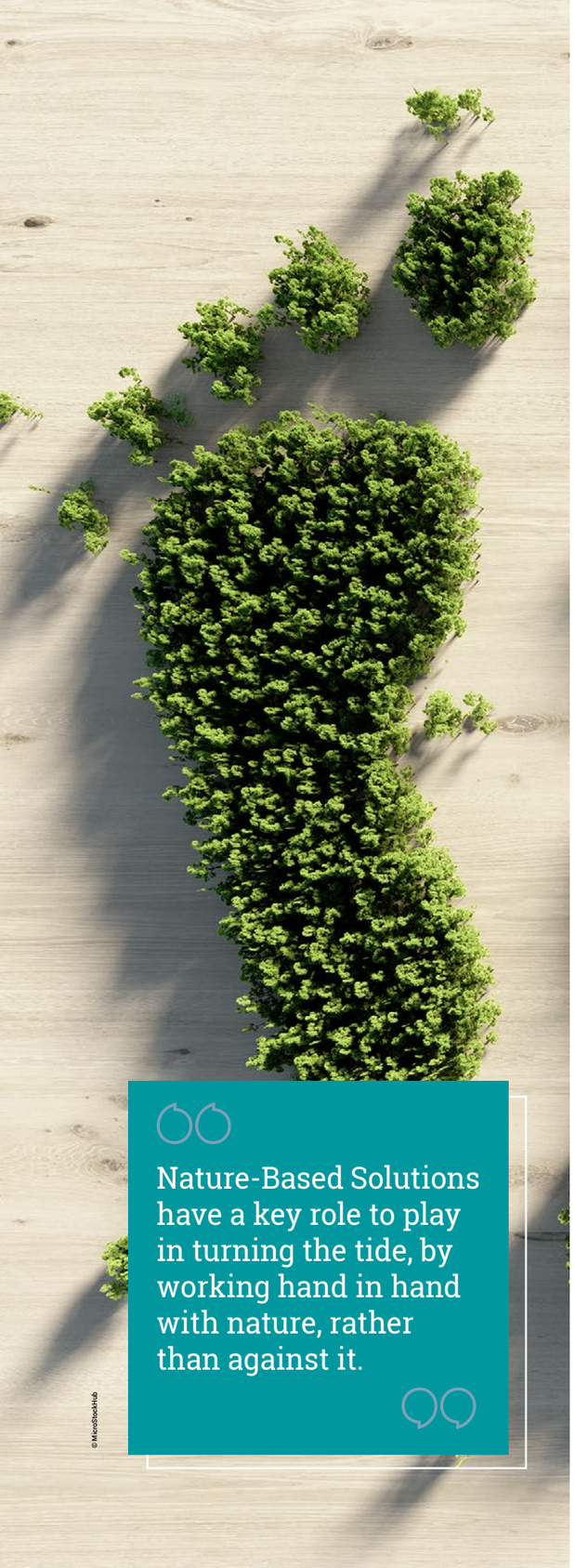
However, what kind of organisations contribute to the delivery of NBS? And what kind of activities do they undertake? As the market development is still in its infancy, industry classifications of sectors of economic and financial activity – Statistical Classification of Economic Activities in the European Community (NACE), for instance – do not account for NBS-related activities. As such, the research team and her co-researchers address this gap by exploring the characteristics and activities of organisations supporting the delivery of NBS using 174 data points collected by a literature review and an enterprise survey.

ENTER THE MATRIX

In order to capture all relevant types of organisations delivering NBS, the researchers propose a categorisation based on the criteria: First, engagement in economic activity, i.e., sell products or services for a given price on a market; and second, the use of nature. The fruit of this effort is summarised in the typology proposed below.

	Nature is at the Core of Activities	Nature is Not at the Core of Activities
Economic activity	Nature-based **enterprise**	Enterprises delivering nature-based products and services
No economic activity	Nature-based **organisation**	Organisations delivering nature-based products and services

Table. Types of establishment delivering nature-based solutions



> Nature-Based Solutions have a key role to play in turning the tide, by working hand in hand with nature, rather than against it.

© MicroStockHub

In essence, **Nature-based enterprises** – the most common organisation type uncovered - use nature as a core element of their product/service offering for the planning, delivery and/or stewardship of NBS and engage in economic activity. For example, community benefit enterprises specifically involve communities in governance and management of forests, to provide direct and indirect benefits for the public and the community with additional objectives such as conservation, poverty alleviation, development, cultural revitalisation, and political empowerment. Another case in point – nature-based tourism enterprises – cover a large range of services in the wilderness or related to wilderness, for example, accommodation and adventure activities, while providing benefits to nature conservation.

Nature-based organisations use nature as a core element of their product/service offering for the planning, delivery and/or stewardship of NBS but do not engage in economic activity. Examples of nature-based organisations include public-private companies, community groups and network organisations in forestry, community gardens and tourism.

Nature-based products and services may be offered by enterprises or organisations where nature is not a core element of their product/service offering. For instance, there are privately-owned forestry enterprises engaged in the development and utilisation of forest resources for timber production. As part of their management, they might contribute to conservation.

Once the types of establishment identified, the research team proceed to go one step deeper and explore the economic activities of organisations delivering nature-based solutions. 11 categories of economic activities are put forward, 7 in which nature is used directly, and 4 where it is used indirectly.

DIRECT NATURE-BASED ACTIVITIES

To begin with, activities under ecosystem creation, restoration, and management focus on the conservation and protection of not only natural ecosystems, but also urban ecosystems, such as allotments, community gardens and derelict areas.

• *NBS for public and urban spaces* involve urban regeneration projects in addition to green areas, parks, gardens and playgrounds, green infrastructure, and urban forestry.

• *NBS for green buildings* relate to solutions for air purification and water retention, such as green living roofs, and enterprises are involved in different activities around the design, implementation, and maintenance of their products.

• *NBS for water management and treatment* include natural solutions for the management of flood and surface water, in rural, peri-urban, and urban contexts, and wastewater management and treatment, and resource recovery.

• Activities under *sustainable agriculture and food production* encompass agroforestry, regenerative agriculture and horticulture, beekeeping and natural plant and soil improvement.

• Activities included under *sustainable forestry* and biomaterials use nature as a sustainable input for construction and manufacturing for buildings, industry, and products. Examples are the manufacturing and application of biomaterials for construction of agricultural and irrigation systems (such as hydroponics), growing algae for food products, and sustainable forestry.

• Finally, *sustainable tourism and health and well-being* cover eco-tourism activities and outdoor workshops for wellbeing purposes, such as forest bathing.

While comparing the aforementioned categories with their NACE counterparts, the fact that the latter misses the nature-based and sustainability focus at the heart of the economic activities, was brought to the fore.

INDIRECT NATURE-BASED ACTIVITIES

Initially, there are *advisory services* that include technical activities in the planning, design, implementation, and management of NBS, as well as social components, for example, community engagement. A second category covers *education, research, and innovation activities* focusing on knowledge collection and dissemination, and mainly comprise innovation and feasibility projects for NBS from environmental and social perspectives. Third, *financial service enterprises* offer services to businesses and individuals to finance ecosystem restoration projects, for example as a way to offset carbon impact, mainly in the form of reforestation. And lastly, activities under

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smart technology, monitoring and assessment of NBS use satellite imagery, environmental sensors, spatial tools, and data analytics for creating an inventory of tree species or analysing soil health, among others.

Once again, the closest NACE categories do not account for the level of detail of these activities, nor acknowledge the business models used.

TAKING THE NEXT STEP

Through the study of the characteristics of organisations delivering NBS and the categorisation of their economic activities, the researchers assert that this sector should be considered in future policy as a stand-alone sector with significant potential to contribute to the EU goal of achieving a climate-neutral economy by 2050.

The recognition of nature-based enterprises as important actors in the implementation of nature-based solutions is an essential first step in market creation for the products and services they offer. And through them, we achieve a higher goal – of giving back to nature as many or even more gifts than we take from it.

BiGS Actionable Intelligence

The State of EV Charging in America: Harvard research shows chargers 78% reliable and pricing like the 'Wild West'

Omar Asensio 

A pioneering scholarly review of 1 million EV charging station consumer reviews, led by **Harvard Business School** climate fellow Professor **Omar Asensio,** reveals widespread dissatisfaction with the current state of EV charging infrastructure. Among other things, the deep dive into tomorrow's gas station network estimates that drivers can successfully recharge their cars using non-residential EV equipment only 78% of the time, highlighting critical issues with reliability. The problems suggest there are business opportunities for entrepreneurs.

New data-driven research led by a Harvard Business School fellow reveals a significant obstacle to increasing electric vehicle (EV) sales and decreasing carbon emissions in the United States: owners' deep frustration with the state of charging infrastructure, including unreliability, erratic pricing, and lack of charging locations.

The research proves that frustration extends beyond "range anxiety," the common fear that EV batteries won't maintain enough charge to reach a destination. Current EV drivers don't see that as a dominant issue. Instead, many have "charge anxiety," a fear about keeping an EV powered and moving, according to scholar Omar Asensio, the climate fellow at HBS's Institute for the Study of Business in Global Society (BiGS) who led the study.

Asensio's research is based on a first-ever examination of more than 1 million charging station reviews by EV drivers across North America, Europe, and Asia written over 10 years. In their reviews, these drivers described how they regularly encounter broken and malfunctioning chargers, erratic and secretive pricing, and even "charging deserts" — entire counties in states such as Washington and Virginia that don't have a single public charger and that have even lost previously available chargers. EV drivers also routinely watch gas-engine vehicle drivers steal parking spots reserved for EV charging.

Asensio said that listening to the current drivers — owners rather than potential buyers — provides a new window on the state of America's charging system because drivers are incredibly candid about their experiences.

"It's different than what any one company or network would want you to believe," said Asensio, who is also an associate professor at the Georgia Institute of Technology. He added that most charging providers don't share their data and have few regulatory incentives to do so.

RESEARCH: EV CHARGERS LESS RELIABLE THAN GAS PUMPS

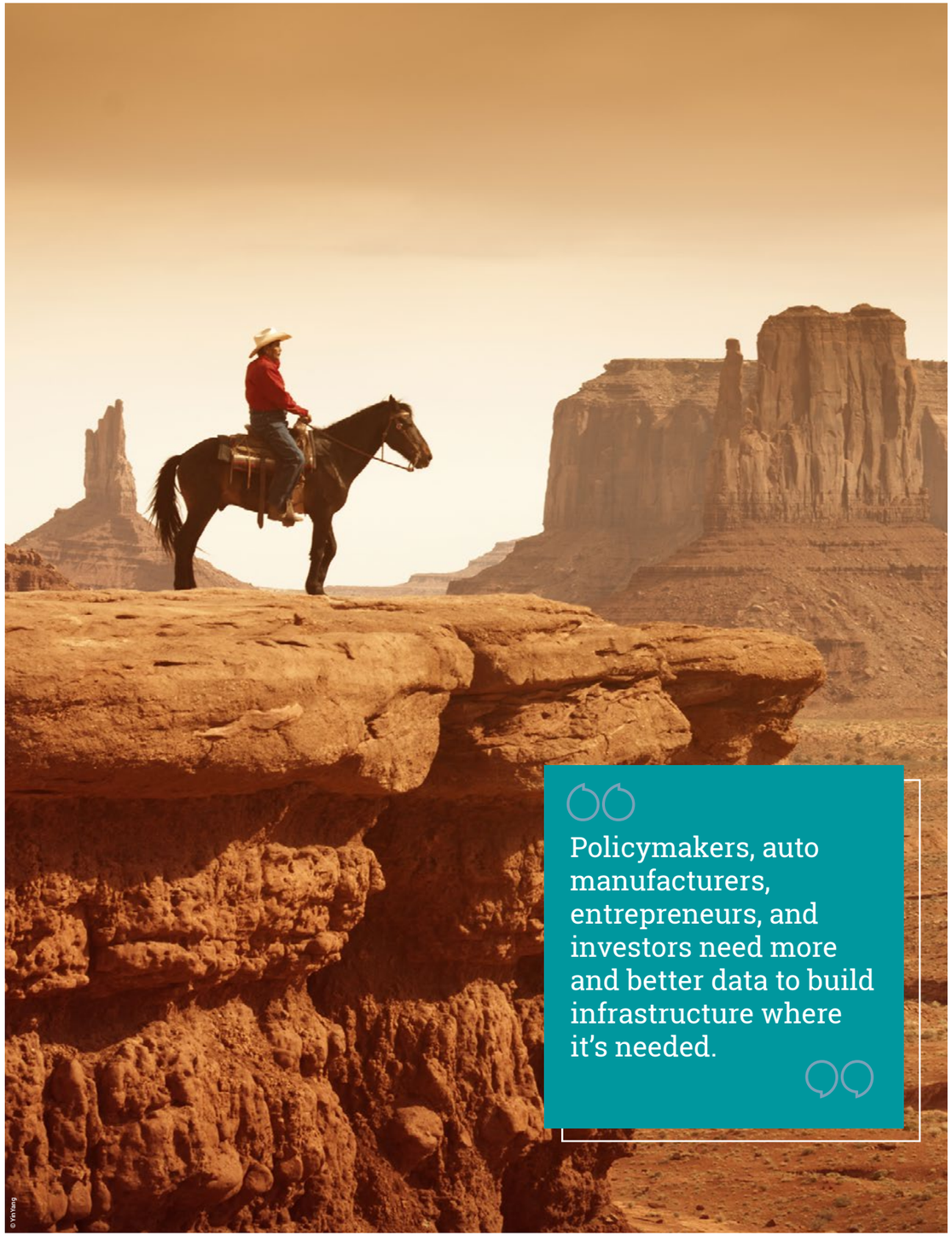
One of the study's main findings, discovered using customized artificial intelligence (AI) models trained on EV review data, is that charging stations in the U.S. have an average reliability score of only 78%, meaning that about one in five don't work. They are, on average, less reliable than regular gas stations, Asensio said. "Imagine if you go to a traditional gas station and two out of 10 times the pumps are out of order," he said. "Consumers would revolt."

Elizabeth Bruce, director, Microsoft Innovation and Society, said, "This project is a great example of how increasing access to emerging AI technologies enables researchers to better understand how we can build a more sustainable and equitable society."

Asensio's research is timely as U.S. policymakers, entrepreneurs, automakers such as General Motors and Tesla, and others grapple with how to develop the nation's charging network, who should finance it, and who should maintain it. Because charging influences vehicle sales and the ability to meet emissions targets, it's a serious question. EV sales have climbed, topping 1 million in 2023, but concerns over batteries and charging could slow that growth.

Today, there are more than 64,000 public EV charging stations in the U.S., according to the U.S. Department of Energy's Alternative Fuels Data Center. Experts say that the nation needs many times more to make a smooth, sustainable, and equitable transition away from gas-powered vehicles — and to minimize the anxiety surrounding EVs.

"I couldn't even convince my mother to buy an EV recently," Asensio said. "Her decision wasn't about the price. She said charging isn't convenient enough yet to justify learning an entirely new way of driving."



REVIEWS GIVE VOICE TO 1 MILLION DRIVERS

An economist and engineer by training, Asensio has been studying EV infrastructure since its infancy in 2010. At that time, the consensus among experts was that the private sector would finance a flourishing charging network, Asensio said. But that didn't happen at the scale expected, which sparked his curiosity about how the charging market would emerge at points of interest rather than only near highways.

To get answers, Asensio focused on consumer reviews "because they offer objective, unsolicited evidence of peoples' experience," he said.

The smartphone apps that EV drivers use to pay for charging sessions allow them to review each station for factors such as functionality and pricing in real-time, much like consumers do on Yelp or Amazon. Asensio and his team, supported by Microsoft and National Science Foundation awards, spent years building models and training AI tools to extract insights and make predictions from drivers leaving these reviews in more than 72 languages.

Until now, this type of data hasn't existed anywhere, leaving consumers, policymakers, and business leaders — including auto industry executives — in the dark.

RESEARCH REVEALS FIVE FACTS ABOUT EV LIFE

Here are some of the top findings from Asensio's research about public EV charging stations:

Reliability problems. EV drivers often find broken equipment, making charging unreliable at best and simply not as easy as the old way of topping off a tank of gas. The reason? "No one's maintaining these stations," Asensio said. Entrepreneurs are already stepping in with a solution. For example, at Harvard Business School's climate conference in April 2023, ChargerHelp! Co-founder Evette Ellis explained that her Los Angeles-based technology startup trains people to operate and maintain public charging stations. But until quality control improves nationwide, drivers will likely continue to encounter problems.

Driver clashes. One consumer complaint that surprised Asensio was a mysterious gripe from drivers about "getting ICE'd." The researchers didn't know what it meant, so they did some digging and discovered that ICE stands for "internal combustion engine." EV drivers adopted the term to grouse about gas-fueled car drivers stealing their public EV charger spots for parking.

Price confusion. Drivers are vexed by the pricing they encounter at public charging stations, which are owned by a mix of providers, follow different pricing models, and do not regularly disclose pricing information. The result is often surprises on the road. As one reviewer wrote, "$21.65 to charge!!!!!!! Holy moly!!!! Don't come here unless you are desperate!!"

Equity questions. Public charging stations are not equally distributed across the U.S., concentrated more heavily in large population centers and wealthy communities and less so in rural areas and smaller cities. The result is that drivers have disparate experiences, well-served in some areas and starved in others. Some parts of the country have become "charging deserts," with no station at all.

Commercial questions. Commercial drivers in many areas can't find enough public EV charging stations to reliably charge their cars. Here too, drivers are having very different experiences, well-supplied in some areas and not in others.

'WILD WEST' PRICING IS A MAJOR PAIN POINT

The research shows that EV drivers are dissatisfied with EV charging station pricing models, likening the situation to the "Wild West." Indeed, vehicle charging is both unregulated and non-transparent.

Pricing can vary substantially by facility, level of demand, time of day, and other factors, including the type of charger available. A 45-minute fast charger may have one price, while a traditional charger that takes 3 to 5 hours may have another. Pricing can also change by the hour, based on market conditions.

Unlike traditional gas stations, which often display fuel prices on lighted signs, EV stations rarely advertise what charging will cost. Drivers often arrive without any information on what to expect or how to make

comparisons, because there's no reliable way for consumers to find the most cost-effective places to charge. "The government has a source that lists all locations, but not in real-time," Asensio said. "You might need five different apps to figure it out."

The driver reviews in Asensio's data reflect the irritation caused by the current system. "People are getting frustrated because they don't feel like they're getting their money's worth," he said.

Why is the charging network so opaque? Research conducted by Asensio and his colleagues in 2021 found that charging station hosts, in the absence of regulation, have no incentive to share data — and they don't. Station hosts are typically privately owned, highly decentralized, not well-monitored, and have highly varied patterns of demand and pricing.

The lack of transparency prevents researchers — and journalists — from investigating trends. In stark contrast to headlines trumpeting the ups and downs of gas prices, news organizations are not reporting on differential pricing among EV charging stations.

'CHARGING DESERTS' EMERGE

With municipal, state, and federal governments all pushing to increase the number of electric vehicles on the road and decrease carbon emissions, experts agree that America will need more charging stations — a lot more.

Looking only at Level 2 chargers, which top off an EV battery in 3 to 5 hours and are the most common type, S&P Global Mobility estimates a need for 1.2 million nationwide by 2027 and almost twice that by 2030. That's in addition to in-home chargers.

Of course, that assumes robust growth in EV sales. "The transition to a vehicle market dominated by electric vehicles (EVs) will take years to fully develop, but it has begun," said Ian McIlravey, an analyst at S&P. "With the transition comes a need to evolve the public vehicle charging network, and today's charging infrastructure is insufficient to support a drastic increase in the number of EVs in operation."

Making matters more difficult, the chargers that do exist are not evenly distributed. Predictably, the places with the most public chargers installed are those with the highest number of registered electric vehicles, including states like California, Florida, and Texas. Yet, even as the federal government invests billions in new charging stations, many of them along major transportation corridors, places are left behind.

Asensio's research shows that small urban centers and rural areas attract fewer public charging stations, and in some cases, there are "charging deserts" with no facilities at all — and they may not be where you think.

For example, electric vehicles are popular in Washington state, which ranked fourth in number of EV registrations and sixth in number of public charging stations in 2023. Yet Ferry County, an area outside Spokane with about 7,500 residents, where the average commute is 25 minutes and the median income is about $46,000, had only one charging station for several years. And now there are none.

Similarly, Virginia ranked 11th in EV registrations and 13th in public chargers in 2023. There, researchers found Wise County, an area outside Roanoke and Knoxville, Tennessee, with about 3,500 residents and a median income of almost $45,000. The county has an average commute time of 22 minutes, but there are no public charging stations available.

EV charging presents a classic "chicken and egg" situation, begging the question of whether cars or charging facilities must come first. However, a lack of public charging in areas like Ferry County and Wise County makes electric vehicle adoption difficult.

As American drivers debate whether to swap their gas-powered vehicles for EVs and lower emissions, Asensio said research should play a larger role. Policymakers, auto manufacturers, entrepreneurs, and investors need more and better data to build infrastructure where it's needed, provide reliable charging, and facilitate EV sales.

"How [else] can we make effective decisions about the economics of EVs?" Asensio said.

GENERAL MOTORS: 'ANXIETY AROUND EV CHARGING'

Omar Vargas, head of public policy at General Motors, emphasized the importance of public EV charging infrastructure to driving EV adoption during an interview with The BiGS Fix at one of BiGS' business leadership roundtables in Northern Virginia.

"We're looking at what are the best places to install an EV charging station for a community," Vargas said. "The anxiety around EV charging is an inhibitor to EV adoption."

Beyond the public investment in rolling out charging infrastructure, GM (whose brands include Chevrolet and Cadillac) has committed $750 million in private capital to the development of EV charging stations. It is partnering with car dealerships and other companies. For instance, GM is testing charging stations at Flying J rest stops.

GM, which reported full-year revenue of $171.8 billion for 2023, also is joining community partnership efforts that are being formed to secure federal dollars through state and local governments. "We're helping that kind of planning, and we're pretty confident that in the next couple of years, we're going to have a vigorous EV charging network in the United States," Vargas said.

By: Barbara DeLollis and Glen Justice

Climate Change

And you?

As the green transition unfolds, academia and education can serve both as catalysts for developing managers and leaders willing to deploy sustainable and responsible business practices, and as partners to business and industry in forging workable solutions.

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