

Broadening the Dialogue: Exploring Alternative Futures to Inform Climate Action

N O V E M B E R , 2 0 1 8



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Futures CoLab brings together a network of experts—with diverse backgrounds and from all around the world—to engage in facilitated dialogues using an online platform. The goal of these dialogues is to collectively explore the implications of global systemic challenges and to propose potential responses. Futures CoLab is a collaboration between Future Earth and the MIT Center for Collective Intelligence.

FOREWORD

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The prosperity and livability of communities around the world increasingly depend on our capacity to tackle climate change. As recent science—and real-world events—remind us, time is short and the stakes are high. To avoid unacceptable impacts, we must drive the emissions that cause climate change to net-zero by roughly mid-century, an extraordinary challenge that will require rapid, sustained, transformative change across the global economy for decades to come.

The ClimateWorks Foundation mobilizes philanthropy to address climate change. We recognize the powerful role philanthropy can play—working with partners in civil society, government, and the private sector—to advance climate solutions. To help philanthropists deploy resources as strategically as possible, we offer global analysis and insights to inform what climate philanthropy does today and to cast light on changes and possibilities ahead.

This report reflects ClimateWorks' interest in broadening the dialogue around how the world might change between now and 2050 and how alternative futures could shape decarbonization pathways. We teamed with Futures CoLab, a partnership of Future Earth and the MIT Center for Collective Intelligence, to conduct a facilitated scenario development exercise using an online platform. More than 150 people from 38 countries participated, contributing perspectives from academia, civil society, business, think tanks, and government. Participants identified drivers of change, collaboratively developed four future scenarios, and explored the implications of those scenarios for climate action and climate philanthropy—not to arrive at definitive answers, but to expand our shared understanding of what the future may hold, and consider how current climate strategies may fare in a multiplicity of possible futures.

Some of the outcomes of this thought exercise aligned with our expectations, and some surprised us. Notably, many of the trends identified in this report are responses to climate impacts already underway, such as shifts in food production or migration patterns. Inequality and inequity were highlighted as significant risks into the future across all scenarios. We were pleased to see novel opportunities for decarbonization emerge between now and 2050, even in the most challenging scenarios.

We hope you find this report interesting and valuable, and we look forward to continuing this dialogue, incorporating an ever-wider set of voices, insights, and ideas as we all work together to achieve our climate goals and create a future in which everyone can thrive.



Charlotte Pera

PRESIDENT AND CEO, CLIMATEWORKS FOUNDATION

EXECUTIVE SUMMARY



It is impossible to predict what the world will be like in 2050, but it is possible to shape that world. To do so, it is necessary to anticipate and reflect upon a range of plausible futures that can illuminate potential opportunities and risks on the horizon.

This was the starting point for the ClimateWorks Futures CoLab exercise exploring alternative futures for climate mitigation philanthropy. The exercise took place during the summer of 2018 and brought together over 150 participants from 38 countries to engage in a facilitated scenario development exercise through an online platform.

The process began with participants identifying drivers of change, or forces with the potential to shape the world over the coming decades. In Section I of this report, these drivers are organized into four categories of relevance to climate action: public engagement and mobilization, decision-making and power, accountability and financial responsibility, and culture and social norms. We then categorized the drivers based on their relative status of development. Some drivers were characterized as trends, or forces that are already evident and exerting an influence today. Others were described as emerging developments, drivers that represent nascent forces on the horizon whose impact is not fully certain yet. Finally, a few drivers were characterized as wildcards, or forces that are highly uncertain but are important to keep in mind when considering forward-looking climate mitigation strategies.

Four scenarios that emerged from the exercise are outlined in Section II.

- **Hollowed Out** describes a world characterized by extreme inequality, where power is concentrated with a small group that controls global systems and platforms.
- **National Rivals** depicts a future where protectionist policies dominate and hostility between nation states, especially over resources, abounds.
- **Connected Communities and Cities** is a world where decentralized, local leadership becomes increasingly important, though tensions between urban and rural areas and inequalities within cities persist.
- **Consumers in Charge** describes a future controlled largely by corporations and the consumers they serve, leading to tensions between the push for material consumption and the push for sustainability.

We chose not to focus on a fifth scenario that emerged from the exercise: Trust Returns. This fifth scenario conformed roughly to what many people hope becomes our future. It outlines a positive narrative, for which many actors may already be planning, implicitly or explicitly. As such, exploring the Trust Returns scenario in more depth would not shed light on blind spots in current plans and strategies in the same way as the other four.

Section III of the report explores some implications of the scenarios for future climate action. After a brief background on the current focus areas for climate mitigation philanthropy, each of the four scenarios is revisited from the perspective of how current strategies and programs may fare. Which strategies or programs may be at risk in each future world? Which may remain valid, or increase in significance? What types of threats may emerge as these future worlds develop, and what new opportunities could arise? Asking these questions serves to challenge assumptions about the future and identify gaps in current thinking.

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OVERVIEW OF CLIMATEWORKS' 2050 EXPLORATIONS



In 2017, the ClimateWorks Foundation began internal discussions and analyses of potential 2050 carbon reduction goals to achieve a well-below 2°C pathway. Knowing that we must aim for net-zero carbon emissions by mid-century, ClimateWorks asked how climate mitigation philanthropy could best support a transition to a net-zero-carbon world.

In 2018, we broadened engagement and worked to deepen our 2050 analysis, including holding a stakeholder event in June 2018 with experts from research, philanthropy, academia, industry, and public office, and conducting this innovative exercise with Futures CoLab in July and August 2018.

No one knows what the world will look like in 2050, but we know profound changes lie ahead.

It is impossible to predict what the world will be like in 2050, but it is possible to shape that world. Designing strategies to steer society effectively toward net-zero carbon is complicated by the rapidly shifting socio-economic, political, and technological landscape. Anticipation is crucial, as failing to think in advance about potential disruptions may upset even the best-laid plans.

The transition to a low-carbon economy is gaining steam, amidst other megatrends such as expanding inequality and new developments in artificial intelligence (AI) and automation. Strategic foresight to inform decisions needs to be cognizant of developing trends, potential drivers of change, and how change happens.

Today's dominant economic paradigm still prioritizes growth with limited consideration for the direct and indirect effects of that growth on broader values of health, sustainability, and well-being. Increasing demand for energy and resources may lead to scarcity and conflict, while increasingly evident climate impacts may exacerbate political divides and will challenge our traditional systems.

The shift from incremental to transformational change will occur in different ways around the world, and ClimateWorks is applying both a regional and a global perspective. We also recognize that even in the most challenging future scenarios, novel opportunities for decarbonization between now and 2050 will emerge.

While there is more to explore, research, and learn, society cannot afford to wait until we know all the answers. Undertaking exercises such as the one described in this report help us to challenge our assumptions about the future, identify blind spots, and assess opportunities and risks, ultimately allowing us to design and adapt strategies that are more appropriate for the changing world we will all face between now and 2050.

INTRODUCTION TO THE FUTURES COLAB EXERCISE

Futures CoLab uses an online facilitated dialogue process to elicit the collective intelligence of an international network of experts, from a range of sectors and fields, to explore the risks and solutions to global systemic challenges. In this exercise, ClimateWorks and the Futures CoLab team engaged a global network of experts in strategic foresight, to explore scenarios of socio-economic, political, and technological developments that could impact climate action over the next 30 years.

Scenarios are routinely used as mechanisms for strategic foresight across a wide variety of sectors—including military, commercial, and non-profit—to inform decisions in a world increasingly characterized by volatility, uncertainty, complexity, and ambiguity (VUCA).¹ Anticipation is critical in the VUCA world—failing to consider potential disruptions in advance may upset even the best-laid plans. Strategic foresight is strengthened by capturing a diversity of perspectives, helping to overcome the biases we as humans often have when thinking about the future² and to better capture the constantly shifting dynamics that will shape the world in coming decades.

To this end, the ClimateWorks Futures CoLab exercise brought together 150 people from 38 countries to engage in a qualitative facilitated online dialogue³ over a four-week period between July 9 and August 3, 2018. The first week solicited ideas for, and discussions around, drivers of change. During the second week, participants were asked to combine drivers and discuss storylines, short narratives about a possible future based on combinations that could co-occur or reinforce one another. In the third week participants were guided through a process to critique, refine, and prioritize storylines. In the final week participants fleshed out a final set of storylines.

No preconceived theories or assumptions framed the exercise and online dialogue. Participants provided their input to general prompts and responded to the inputs of others. These inputs and discussions were grouped into common themes and then gradually winnowed down into core insights and a coherent narrative. The synthesis and integration of these discussions are presented in this report.

The Futures CoLab process complements scenarios that others have developed to help society understand the implications of a changing climate and the magnitude of the challenges ahead. For example, the Shared Socioeconomic Pathways (SSPs)⁴ used by the Intergovernmental Panel on Climate Change, were designed to enable climate researchers and policy analysts to build internally consistent, quantifiable pathways for climate mitigation. In contrast, the ClimateWorks Futures CoLab exercise explores the broader dynamic context in which climate mitigation actions will take place. It is intended to provide a nimble approach to engaging a wide diversity of participants in exploring what may be on the horizon but not on our radar. Given the constantly shifting dynamics that will shape the world in coming decades, it is critical to continuously anticipate and reflect on a range of plausible futures that may influence climate mitigation strategies. Futures CoLab provides a platform and process for these types of regular foresight exercises.

1 Bennett, N. and Lemoine, J. 2014. What VUCA really means for you. *Harvard Business Review* 92 (1/2)

2 Kahneman, D. 2011. *Thinking Fast and Slow*. Farrar, Strauss and Giroux: New York, USA.

3 Konno, N., Nonaka, I. and Ogilvy, J. 2014. Scenario planning: The basics. *World Futures* 70, 28-43.

4 O'Neill, B.C., Kriegler, E., Ebi, K.L., Kemp-Benedict, E., Riahi, K., Rothman, D.S., van Ruijven, B.J., van Vuuren, D.P., Bird-
kmann, J., Kok, K., Levy, M. and Solecki, W. 2017. The roads ahead: Narratives for shared socioeconomic pathways
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1 SECTION

MAJOR DRIVERS: TRENDS, EMERGING DEVELOPMENTS, AND WILDCARDS

The participants of the ClimateWorks Futures CoLab exercise highlighted multiple critical drivers that are likely to shape the next few decades, ranging from demographic shifts to evolving societal values. To help make sense of these many drivers, we grouped them into four categories:

- **public engagement and mobilization;**
- **decision-making and power;**
- **accountability and financial responsibility;**
- **culture and social norms.**

Each of the drivers were then characterized as trends, emerging developments, or wildcards. Trends refer to tendencies already evident in today's world. Emerging developments include nascent forces on the horizon, whose impact have not yet been fully realized. Wildcards include forces that remain highly uncertain but are interesting and important to track.

This section outlines these trends, emerging developments, and wildcards (summarized in Table 1) and is supplemented by direct quotes (set in *italics*) taken from contributions submitted by participants during the online exercise.

Table 1. Trends, emerging developments, and wildcards across the four categories of drivers relevant to climate action.

	Public Engagement & Mobilization	Decision-Making & Power	Accountability & Financial Responsibility	Culture & Social Norms
Trend	• Citizens are informed— and misinformed • Interaction of different age groups	• Changing balance of geopolitical power	• Responsibility for climate impacts across scales • Continuing debate on historical responsibility	• Use of new technologies • Shifts in food production and consumption
Emerging Development	• Networks of local, bottom-up initiatives	• Developments in national political landscapes • Climate impacts in defining profit and incorporating risks • Reshaping how climate policy is made	• Impact of emerging innovations	• Changing economic paradigms and measures of growth • Transformations in behavior and lifestyles
Wildcard	• Influence of augmented/ virtual reality	• Sharing innovations, software, and data	• Riskier climate mitigation options	• Human values and transition to a circular economy

1.1 Public Engagement and Mobilization

Question

How might public engagement and mobilization change in the next 30 years and what might this mean for climate action strategies?

Collective response

We see a clash between positive and negative trends, for example between greater transparency and calculated misinformation. The most decisive factors will be making human sense of overwhelming data and using credible messenger and/or transmission modes.

Summary of drivers

- More data is causing citizens to become increasingly informed—and misinformed
- The values and interaction of different age groups will affect engagement and mobilization
- Networks of local, bottom-up initiatives are set to reshape engagement and mobilization
- Augmented/virtual reality might influence citizens' self-awareness and willingness to engage

● Trend

● Emerging Development

● Wildcard

● Trend

More data is causing citizens to become increasingly informed—and misinformed

The next 30 years will see more data created, shared, and used. Improved access to data will continue to spread through expanded use of the internet, social media, smart phones, and other devices. Advances in science and technology, including for example *“attribution science constantly improving, connecting extreme weather impacts more conclusively to climate change,”* or innovations in satellite monitoring, could alter the quality and persuasiveness of information, potentially influencing public opinion on the reality and risk of climate change. The accuracy of such information, however, is not at all guaranteed. The balkanization of internet communities into self-reinforcing echo chambers and efforts to manipulate public opinion with false news stories, are already leading some to question the definition of facts. Furthermore, information overload can lead to confusion regarding what is real or not. Continuation or acceleration of these developments could polarize society further and have a strong impact on how—and why—people mobilize.

Amidst more data, it will become critically important to process and interpret what is actually seen and heard, as lived experience can be particularly persuasive in shifting perspectives. Shifting the narrative around climate change to focus on a broader suite of human experiences could unite groups that are currently highly polarized and motivate engagement. A more unifying narrative might emphasize the *“comprehensive damage of fossil fuel use”* in both the short- and long-term, highlighting the overlap between climate change and other sectors, for example the more immediate negative health impacts of fossil fuel emissions via reduced air quality. Emphasizing both individual, short-term interests as well as longer-term,

more abstract risks in climate policy could smooth implementation. As climate impacts such as sea level rise, heat waves, and extreme weather events become impossible to ignore, there could be a “*window of opportunity [...] to galvanize political action.*” We may see the emergence of new constellations of actors urging more aggressive action based on a new recognition of the severity of the problem.

Some experiences, however, such as nuclear disasters or geo-engineering effects, could result in “*mass mobilization against certain technologies as a backlash to severe side effects*” and could hamper climate innovation efforts. It is also possible that worsening climate impacts could trigger resignation in citizens who feel it’s too late to mitigate, especially if climate sensitivity is higher than anticipated.

As the public becomes informed they could become more engaged, for example, by organizing demonstrations or putting pressure on politicians and corporations. More citizens might also contribute to citizen science projects or involve themselves in “*open, participatory processes at the science-policy-society interface to facilitate learning about the policy solution space.*” Others, whose livelihoods depend on the continuation of the current fossil fuel energy economy, could remain unconvinced that the costs of mitigation are worthwhile. People in this situation might mobilize in support of relying primarily on geo-engineering or carbon removal strategies.

● Trend

The values and interaction of different age groups will affect engagement and mobilization

The social values of different age groups are likely to affect mobilization and engagement. We are already seeing “*international mobilization of youth for action on environment, in turn putting pressure on other actors.*” Activists from younger generations are organizing mass demonstrations or pursuing legal action to demand more sustainable governmental policy and corporate decisions. Over time, we might also see older generations supporting their children and grandchildren to push for more proactive legislation. But many nearing retirement age are likely to be resistant. Their priorities will be to maintain their pensions or other benefits that might be affected by more radical policy change.

● Emerging Development

Networks of local, bottom-up initiatives are set to re-shape engagement and mobilization

Technology advances could help disparate grassroots groups connect and collaborate on an unprecedented scale. This might involve creating networks to share resources (including money, information, or ideas) to help empower local-scale initiatives, or aggregation services so that consumers can measure and track the environmental impacts of different products to “*leverage their collective purchasing power at scale.*”

Networks of bottom-up initiatives have the potential to connect local interests with global scale. These “*glocalized networks*” might respond to tangible, first-hand experiences at a local level, while also helping share lessons learned across the world, bridging between different scales, knowledge systems, sectors, and worldviews. Promoting networks of grassroots groups could also help to overcome the perceived “*elitist cast to sustainability movements,*” which many believe currently hampers efforts to be more inclusive.

Decentralized networks may, however, run into ideological clashes due to the disparate origins of their constituent initiatives. Competing interest groups may try to discredit or diminish the effectiveness of such networks by exploiting minor differences in ideologies. Investments in supporting and strengthening broader networks of local initiatives that seek to

promote climate action goals could help to overcome this, for example “providing access to transnational information and social networks.”

● Wildcard

Augmented/virtual reality might influence citizens’ self-awareness and willingness to engage

As Augmented Reality and Virtual Reality become more accessible, strategically employing these tools could help to “build empathy for those suffering from extreme weather events” and other impacts of climate change, thereby encouraging the public to mobilize. These types of technologies could allow people to “test, track, and change their assumptions [regarding the lived experiences of people around the world], leading to self-aware economies.” This presupposes that these technologies would be powerful enough to make people begin caring for others whose lives are drastically different and far-removed from their own. Combining the use of such technologies with educational programs geared to building a sense of global community and compassion could enhance their impact.

On the other hand, these technologies could provide distractions from real life for large numbers of people, diverting their attention from pressing issues such as climate change. This could obstruct efforts to mobilize the public and could even lead to a breakdown of community bonds and a rise in individualism.

1.2 Decision-making and power

Question

How might decision-making and power change in the next 30 years and what might this mean for climate action strategies?

Collective response

Economic power will likely be more concentrated and political decision-making will be more diffuse. Multi-party strategic alliances will be crucial to getting anything done.

Summary of drivers

- Changes to the current balance of geopolitical power will have significant impacts on climate action strategies
- Developments in national political landscapes may lead to increased tensions and/or to strengthened collaboration
- Climate action strategies will be affected by whether organizations consider climate as they define profit and incorporate risks into decision-making
- New considerations and contributions could reshape how climate policy is made
- Sharing innovations, software, and data might provide opportunities and new challenge

● Trend

● Emerging Development

● Wildcard

● Trend

Changes to the current balance of geopolitical power will have significant impacts on climate action strategies

Multiple potential shifts in global geopolitics could be on the horizon, dependent, *inter alia*, on countries wielding power, conflict, and the role of international institutions. Each of these elements is summarized below.

Global powers

China may reclaim *“its historic role as a center of global affairs,”* driven by the One Belt One Road and other initiatives promoting China-centric regional and global development. China is already beginning to take the lead in regional and international climate negotiations and may prioritize climate mitigation in coming years, to maintain this leadership role or possibly to respond to *“constraints from Europe, Canada and partners on the Chinese market due to wasteful industrial production systems.”* China may resort to *“exporting high-carbon activities and related workforce to recipient nations unable to resist,”* particularly to developing countries, leveraging its position to mitigate its own domestic emissions at the expense of others.

The United States has a critical role in shaping climate action. In future years, we could see the United States emerge as a global leader on climate change through strengthened efforts and innovations in relevant domestic industries, enhanced, for example, by providing economic incentives to renewable industries to render them competitive in national and international markets. Or the United States may, by contrast, fail to adapt to changing geopolitical circumstances, and remain plagued by increasing polarization within the country, relying on increasingly reactive rather than proactive governance in global negotiations.

The standing of fossil fuel exporting nations may be jeopardized as they face declining revenues and *“fiscal crisis and social unrest,”* partially as a result of asset-price correction, which would have reverberating effects on the entire world. They may strive to *“disrupt global collaboration on zero-carbon energy”* by using their influence at the global scale to ensure continued reliance on fossil fuel energy. Alternatively, these nations may switch gears and invest heavily in renewable energy technology, paving the way for a more sustainable future and less uncertain sources of national revenue. This second possibility depends strongly on the types of incentives present to motivate such a transition.

Conflict

Geopolitical power shifts might also be driving factors related to conflict. Conflicts may arise over access to resources, for example water, and could create a negative feedback loop, where destruction from conflict further exacerbates the resource scarcity that incited it. Resource conflicts might also lead to diminished capacity to sequester carbon due to plant growth and limit the productive potential of land through unsustainable use. Conflicts may occur over other issues as well: trade and tariffs, energy supply, land-use, or space colonization, all of which could disrupt climate action strategies, destabilize political systems, or contribute to higher emissions.

The nature of conflict will also change significantly; instances of cyber-attacks and cyber-terrorism will increase as society relies increasingly on autonomous and digital systems. In fact, *“the battlefield landscape no longer resembles the ways wars were fought in the mid- to late-20th century,”* which carries uncertain outcomes for climate action.

The role of international institutions

Given the potential for significant changes in the balance of geopolitical power, it is also possible that international institutions such as the United Nations may lose legitimacy or be rendered ineffective. This means that the current system of goal-oriented, voluntary international governance may collapse. As *“sovereignty strengthens in post-colonial states,*

solutions may emerge from issue-based coalitions that bypass universal institutions,” prioritizing “ad-hoc problem-solving coalitions” in place of traditional intergovernmental fora.

Another intriguing possibility for the future, that cuts in the exact opposite direction, is that international relations becomes an outdated concept and is replaced by the idea “*that the political system needs to treat the world as a single space.*” Such a development could pave the way to more efficient multi-scale collaboration, cultural and educational exchanges to foster empathy, and potentially even a shift towards recognizing the legal rights of nature worldwide. Power could also move away from nation states altogether, as transnational corporations continue to amass wealth and influence and operate in ways that transcend borders and disregard national regulations.

● Emerging Development

Developments in national political landscapes may lead to increased tensions and/or to strengthened collaboration

We are currently witnessing a rise in populist political movements around the world. These developments could be accelerated and intensified as worsening climate impacts, food and water scarcity, mass migration, and declining employment all lead to greater fear of change. Insular decision-making and nationalist entrenchment could generate “*declining social capital and diminishing trust in governments*” (as well as other institutions), increasing polarization between different groups within nations, and increasing inequality. Such trends could continue to have a negative impact on international cooperation and the collaborative global governance of issues such as climate change.

Amid these shifts, however, there could be opportunities for transformational change. New ways to govern emerging technologies, which could include ideas about how benefits should be allocated more broadly, for example, through commons-oriented intellectual property regimes, could be developed. These might emphasize maximizing welfare overall and minimizing inequality—pushing towards “*governance for equity rather than for profit.*” New ways of thinking about energy systems could also emerge that focus on “*my energy first,*” prompting a shift towards local, sustainable energy sources to increase energy independence. Political change may emerge as a result of societal backlash. Groups may fight back against nationalist policies and strive to foster collaborative development. We could see reforms in public campaign financing to reduce the power of wealthy special interest groups, a new “*rational populism*” movement emphasizing carefully considered proposals that appeal to the masses while also prioritizing sustainability transformations, or even a shift towards participatory or direct democracy. Changes in the political landscape more conducive to climate mitigation could be supported by inexpensive communications technology, accessible data and decentralized information, and new alliances between public and private sector actors.

The role of science in public decision-making is another key area where different outcomes may emerge. On the one hand, there are signs of “*growing distrust in science and technology*” and “*declining trust in experts.*” This could be exacerbated in coming years by cyber-attacks further undermining trust in scientific institutions, as well as by scientists failing to “*consider the social impacts*” of policy advice. Conversely, new forms of governance might recognize the inherent need for “*actionable knowledge*” and rely increasingly on transdisciplinary scientific inputs and inclusive scientific assessments. New governance approaches of this sort could support co-designed science and policy strategies, convene multi-stakeholder expert committees, and co-develop systemic interventions. Scientists are increasingly active in the public sphere, employing social media and other fora to discuss and disseminate findings, often encouraged by funding agencies. This could further pave the way for transdisciplinary research projects, which integrate scientific research to create specific services, thus opening up new research and development opportunities, while also making science more accessible to the public.

● Emerging Development

Climate action strategies will be affected by whether organizations consider climate as they define profit and incorporate risks into decision-making

As our economy becomes increasingly digital, intangible, and interconnected, we might see corporations (and governments) employing *“integrated accounting to redefine profit including external costs”* and more explicitly incorporating environmental and social risks into investment decisions, with natural capital becoming a more central concern for business. Strategic investments in the short term could lead to a *“race to the top, driving faster climate action,”* and investments in developing country infrastructure could speed global decarbonization significantly.

Emerging technology could allow investment funds, banks, and the public sector to base decisions on considerations other than the purely financial. For example, big data and artificial intelligence *“could enable the convergence of climate science with policy and technology scenarios to yield decision-ready climate risk information,”* paving the way for lower-risk investment and policy decisions. Changes in the way financial incentives are structured may also have a strong impact. For example, rewarding patient capital investments in low-carbon technology through tax exemptions or credits could help ramp up such investments. Repricing climate change using insurance could be a successful strategy to set a price for climate risk across multiple policies. Including climate risks as an important factor in decision-making can also make green investments more cost-effective in the long-run. For example, investments into water infrastructure could focus on exploring *“blended engineering approaches”* combining traditional and green engineering with natural infrastructure to find the most efficient pathway to human water security with minimal trade-offs.

● Emerging Development

New considerations and contributions could reshape how climate policy is made

Mainstreaming climate policy across multiple governmental departments, or taking a *“whole government approach,”* could have positive benefits for improving success, for example by coupling policies to stop deforestation with those aimed at improving health outcomes and food security, such as within the Sustainable Development Goals (SDGs). Broadening the cultural diversity in decision-making could also be beneficial and be supported by ensuring that *“social inclusion models are embedded into all elements of decision-making and including justice in environmental policy.”* Integrating horizontal and vertical governance structures, for example more closely linking the work of separate departments operating on the same level while also strengthening ties across scales, could help make governments more resilient and more effective.

Should diversity in decision-making increase, however, it could become difficult to ensure that different perspectives are given equal weight, as access to data and technology is quite uneven. Giving diverse voices equal weight would also be important to avoid more powerful groups taking over the process. Furthermore, ostensibly more pressing policy issues or crises such as rising inequality, geopolitical tensions, or intensifying (cyber-) terrorist attacks, may distract from climate action or *“undermine action on sustainability”* more broadly. This could prove to be the case even when climate change is one of the underlying causes, for example, with mass migration. Ineffective governance mechanisms could also lead to the emergence of difficult-to-regulate informal economies in response to unmet *“local social, economic, environmental needs.”*

● Wildcard

Sharing innovations, software, and data might provide opportunities and new challenges

New approaches that seek to share innovations more widely by treating them as public goods—examples include open-source licensing of new technologies and public data repositories—have significant potential in terms of decarbonization. Opening up access could help to “*speed the diffusion of innovation in both renewables and hydrocarbon efficiency value chains*,” incentivizing broader use. It could lend support to the development of green infrastructure by making innovations available for all to use, and sharing lessons learned. Open, public data, in combination with improved measurement and monitoring technology, could make it “*hard to hide [pollution] sources and easier to forecast effects*.” This could also help to overcome issues faced in research with dispersed or incompatible data by enhancing and normalizing data sharing.

The open sharing of innovations and data does, however, carry risks. Some observers view open-source software and public databases as easier to hack, and the prevalence of the Internet of Things, and connected systems in general, could increase the impact of cyber-attacks. This combination could decrease confidence in open-source technologies and public data. Cyber-attacks could also accelerate the decline in trust in scientific institutions, create confusion amongst scientific communities, and even influence global geopolitics. They could also affect the pace of innovation itself: “*technology backlash from cyber-attacks (e.g. scandal over privacy infringement) can lead to a decline in innovation*.”

1.3 Accountability and financial responsibility

Question

How might accountability and financial responsibility evolve in the next 30 years and what might this mean for climate action strategies?

Collective response

Morality, in particular regarding who is obligated to pay whom, ought to matter. It isn't clear, however, that it will. Publicly-provided goods will come under increasing financial pressure as wealthier users opt out.

Summary of drivers

- Responsibility and accountability for climate impacts at different scales will have a significant influence on climate action strategies
- Continuing debate on historical responsibility and legacy emissions will have implications for whether international cooperation prospers or breaks down
- Emerging innovations may promote accountability and transparency, or may increase inequalities
- Riskier climate mitigation options, such as geo-engineering, may eventually have serious impacts both on reaching climate targets and on equality and equity

● Trend

● Emerging Development

● Wildcard

● Trend

Responsibility and accountability for climate impacts at different scales will have a significant influence on climate action strategies

Who should be held accountable for the immediate and direct impacts of fossil fuel use, climate change, and related environmental problems? Problems such as *“flooding, food insecurity, and air pollution are first and foremost seen as local issues”* and citizens may demand a rapid response from local governments, whereas national governments tend to be farther removed and slower to act. As climate impacts become more consequential, it is possible that the *“center of gravity for climate action could shift to the local scale,”* especially as the impacts of climate change become increasingly visible.

At the same time, local accountability may be accompanied by sharing of management responsibility across borders, since many environmental challenges (including climate change) are transboundary by nature. Furthermore, regional systems of governance cannot simply be overturned, regardless of demands from citizens for more local action. More streamlined and efficient transboundary management regimes may be possible through innovations such as increasingly accurate measuring and monitoring technology, through adopting common practices, and through the integration of cyber-physical systems, where management is augmented by AI. *“Carefully negotiating shared responsibility and transparency of resource management across borders”* and at different levels may be a crucial step to complement local approaches, as well as developing nested, polycentric governance approaches that can foster closer interaction of governance systems at different scales.

● Trend

Continuing debate on historical responsibility and legacy emissions will have implications for whether international cooperation prospers or breaks down

One way to think about historical responsibility for past greenhouse gas emissions is as a *“cumulative climate debt [based on] legacy emissions.”* In this line of thinking, some countries have developed their economies by capitalizing on cheap energy from fossil fuels to the detriment of the rest of the world. Many developing countries already make this case in international negotiations, but their arguments could become more vehement and they could begin to demand payment for the damages caused by those who have *“overdrawn their CO2 credit cards.”* There may also be social pressure from public actors and groups to force or shame countries (or corporations) into paying. One example might be viral hashtag campaigns such as *“#ClimateCriminal.”*

This could create a standoff, where developing countries are demanding payment and developed countries are simply unable to pay the full price without facing severe economic turbulence or are simply unwilling. Without reaching an agreement, international cooperation could suffer. These groups, however, could also come to an agreement in which developed countries pay some recompense for their historical emissions to help developing countries fund decarbonization efforts. Developed countries could agree to use innovation-sharing as a form of payment, for example, in the realm of renewable energy technologies. *“New international processes set up beyond UNFCCC strengthen effective regional collaboration,”* and might complement or improve upon existing mechanisms to address the issue of historical responsibility.

● Emerging Development

Emerging innovations may promote accountability and transparency, or may increase inequities

Emerging technological innovations have the potential to revolutionize how consumers and producers interact. The Internet of Things, AI, and Blockchain all offer the promise of drastically *“improving the efficiency and transparency of supply chains.”* This could shed light on wasteful production and distribution processes, enable tracking of protected species and limit biopiracy, and allow consumers to monitor supply chains and demand more sustainable products. Consumers would thus have the tools to hold corporations accountable. Corporations could begin exploring new and innovative pathways to add value to products and services, and *“take on a more integrated, macro-economic role on climate”* mitigation and adaptation. Narrowing the space between science and business could support this transition, encouraging corporations to collaborate with scientists in fostering sustainable business practices.

On the other hand, some innovations may have unintended negative side-effects. One of the most ubiquitous examples is the potential of AI to destroy jobs, leading to *“technological unemployment.”* Another example is how the increasing decentralization of service provision for electric power may have catastrophic impacts on equity via the so-called *“Utility Death Spiral.”* As electricity users increasingly produce their own power and go off-the-grid, utility companies will face declining profits and raise costs for other users. This will prompt additional users, beginning with those most financially well-off, to invest in their own power production, yielding additional price increases. The last to switch from energy provided by traditional utility companies in this situation would be those with the least available capital to cover the initial costs of switching over. The same dynamic could play out for other infrastructure-based services, such as water, sanitation, waste, and transportation, particularly in situations where traditionally wealthier users have subsidized services for lower-income customers. This raises questions regarding who will be responsible for ensuring equity when new technologies are deployed and highlights the need for forward-looking strategies to consider side-effects.

● Wildcard

Riskier climate mitigation options, such as geo-engineering, may eventually have serious impacts both on reaching climate targets and on equality and equity

As climate impacts become increasingly severe, pressure to consider more extreme solutions is likely to grow, in particular if greenhouse gas emissions reductions remain inadequate. A breakdown in negotiations on addressing historical responsibility for emissions could exacerbate the shift towards higher-risk, lower-cost *“band-aid”* options, such as solar geo-engineering.

One possibility is that *“a single country, a small group of countries, or even a wealthy individual may take matters into their own hands and unilaterally deploy solar geo-engineering without appropriate governance.”* This could lead to international conflicts and uncertain side effects that may disproportionately affect vulnerable populations that are least able to protect themselves, reinforcing inequalities. Furthermore, society could become reliant on geo-engineering, thus delaying mitigation action since impacts may be ignored as long as geo-engineering is continued. On the other hand, international organizations could forge an agreement on responsible use of geo-engineering, outlining governance mechanisms before they are needed.

1.4 Culture and social norms

Question

How might cultural and social norms change in the next 30 years and what might this mean for climate action strategies?

Collective response

Social norms grow out of the predominant economic system. Current trends are exacerbating inequality. Technologies are not neutral—they propagate positive or negative human behavior. It will require conscious and determined intervention to bend the curve toward sustainability.

Summary of drivers

- The use of new technologies will impact the success of different sustainability strategies
- Shifts in food production and consumption patterns will affect culture and sustainability
- Changing economic paradigms and measures of growth could lead to a complete redesign of climate action strategies
- Transformations in behavior and lifestyles could require re-evaluating priorities for climate action
- The evolution of human values may eventually lead to a transition to a circular economy

● Trend

● Emerging Development

● Wildcard

● Trend ►

The use of new technologies will impact the success of different sustainability strategies

New technologies may have lasting impacts on society and on sustainability, but these are often difficult to predict in advance. As a result, “*humility in technological foresight*” is warranted. Automated vehicles, combined with the emerging business model of “*mobility-as-a-service*,” could significantly challenge individual car ownership as the aspirational model for personal transport. Clothing and textiles may be redesigned with sustainability in mind—fully biodegradable, with heating and cooling incorporated. Replacements for plastics, especially single-use plastics, could help overcome our collective “*plastic dependence*.” Smart home technologies may decrease energy use, and biotechnologies such as algae for material production and fuel could revolutionize the way we produce and consume resources. 3D printing could overhaul the way material items are produced, or we might see a shift towards dematerialization, or an “*absolute reduction in the quantity of materials required to serve economic functions in a society*.” 3D printing, in combination with innovations in industrial processes and the development of new types of raw materials, could also change the face of heavy industry. Potential changes could include the development of lower-impact alternatives to cement, increased efficiency and decreased invasiveness of mining practices,

or more streamlined production of wind turbines. Delays in the emergence of these types of innovations could, in some cases, lead to infrastructure lock-in and slow the transition to sustainability in resource-intensive sectors.

Technology could also reinvent how business is done. High fidelity teleconferencing may reduce or replace business travel—though only if the cost of flying increases significantly, service-based business models could limit material consumption, new manufacturing processes could emerge in response to resource scarcity, or technology could foster a *“transition from oil economy to bio economy [with regards to] fuel, food, and materials.”* While such advances have a high potential for encouraging sustainable business, technologies that enable sustainability could also fail to take hold in light of continued bias toward long-established practices.

Technology developments that seem set to have an influence in one direction may also end up having unexpected consequences that boomerang the other way. Given their potential impact on society, the governance of emerging technologies is a central concern. Will emerging technologies increase or decrease inequality? In the case of energy, strategies for *“increased efficiency and decreased cost profiles of lower-emissions options can actually lead to increased demand and consumption,”* in particular when cost, as the single most important determinant of consumption, falls so low that it triggers significantly increased energy demand. The same could hold true for investments in health care, where increasing lifespans can lead to higher energy demand in the long run. Similarly, advances in AI could yield more efficient processes, but the emissions reduction benefits could be undercut by increases in overall consumption. Despite these potential drivers of greater consumption, there is evidence that factors such as increased consumer education and smart technology can reduce consumption over time.

● Trend ►

Shifts in food production and consumption patterns will impact culture and sustainability

Investments in agricultural technology promise to yield climate co-benefits. For example, lab-grown meats, genetic engineering, and ocean and land fertilization could simultaneously reduce carbon-intensity, increase soil carbon storage, increase crop yields (and food security) and improve health outcomes. Domestic agricultural policies could reinforce these trends by focusing on co-benefits between health and environmental systems and could be enhanced by broad shifts in the palate tastes and preferences of citizens. A related potential development could be a *“significant rise in vegan or vegetarian diets around the world”* which are increasingly seen as both healthy and sustainable. But another trend could push in the opposite direction; as developing countries grow, many are shifting *“toward increasingly Westernized diets”* as a demonstration of wealth—consuming more energy-intensive, less healthy food, and losing the cultural heritage inherent in their culinary history.

Climate variability could also overhaul the global food production system. Which crops can be produced where has a significant impact on local diets as well as on lifestyles, food security, and health. Urbanization may make local, city-based food production more common, as inhabitants see first-hand the cost of being dependent on food imports and the risk of cities turning into *“food deserts.”* In addition, some communities—including for example indigenous herder societies—could risk losing their traditional ways of life by transitioning away from animal-based diets. Efforts to promote such a transition may well be considered morally and ethically questionable.

● Emerging Development

Changing economic paradigms and measures of growth could lead to a complete redesign of climate action strategies

There are already signals that the current economic system, which has led to significant inequality as well as environmental degradation, is not sustainable in the long term. Many hold that it should be replaced with an arrangement that *“enhances natural life support systems”* and in which *“morality prevails over strict legality.”* Alternatively, others have denounced relying only on morality as opposed to institutionalized legal systems given the potential of multiple contested moral systems vying for control, the possibility of empowering opaque or even corrupt *“moral”* leaders, and in particular the risk that insufficiently reliable and stable legal systems could increase inequality and inequity. One option might be that future systems integrate moral and legal concerns, systematically considering principles of fairness and equity, for example, when considering and enacting new regulations. De-growth or zero growth movements may become the norm out of necessity, as other systems become increasingly unsustainable. The concept of the green economy, based on the notion that economic growth could be decoupled from ecological and climatic changes, has gained prominence in the aftermath of the global financial crisis. Market-based systems, which have yielded the type of competition that has led to numerous tragedy-of-the-commons situations, could be replaced by a win-win decision making model emphasizing the need to find systems-level solutions in collaboration with a broader diversity of stakeholders.

Figuring out how exactly this might be accomplished is a critical area of study. Exploring the potential of alternative measures of economic growth is no longer a marginal topic, but rather, one increasingly addressed in academia and beyond. Moving towards a measure of growth that emphasizes *“happiness, natural capital, [...] or other sustainable well-being indicators”* could be encouraged by strategic support from governments and philanthropists.

● Emerging Development

Transformations in behavior and lifestyles could require re-evaluating priorities for climate action

A key determinant of whether a new economic paradigm prevails is whether people internalize this shift and change their behaviors. To what extent will people adopt meaningful lifestyle changes in the decade ahead? Teaching about new behaviors and more sustainable lifestyle choices in educational curricula could tip the scales in favor of sustainability. *“Rethinking the ideal of sufficiency and the good life could prioritize social images and lifestyles which remain within planetary boundaries.”* This could include making high-consuming, high-waste lifestyles socially unacceptable, as evidenced, for example, by government regulation banning single-use plastic in the European Union, a recent development that could significantly reduce demand for low-density petrochemicals. Encouraging education of women and girls and prioritizing education on climate change and sustainable development could have multiple co-benefits for limiting population growth and increasing workforce participation. There are strong factors pushing back against cultural changes that would reduce consumption, however, including the increasing ease of remote consumption via online shopping and on-demand delivery infrastructure.

Many believe that a first step towards motivating lifestyle changes on a broader scale would be to connect inequality more explicitly with emissions and to emphasize equity as *“a precursor to solving challenges and seizing opportunities related to climate change.”* This could foster a stronger push to make cheap, but clean, forms of energy available to lower-income households, recognizing that much of the world’s affluence was built on the back of cheap fossil fuel energy. This would be important to ensure that lifestyle changes that encourage a more sustainable world are possible not only for the wealthy but also are accessible worldwide.

● Wildcard

The evolution of human values may eventually lead to a transition to a circular economy

A number of crises, due to resource scarcity and asset-price correction for example, are likely to erupt in coming years. The ways in which society will respond to such crises is uncertain, but one possibility could be a renewed focus on recycling and reuse, such that *“circular economy principles [may] become the ‘norm’ across industries and global value chains.”* Innovations such as the Internet of Things and advances in how Blockchain is used could help to streamline the inherently *“complex global system for supply and use of materials”* and improve tracking, thereby removing excuses for unsustainable consumer choices. Government interventions could encourage this transformation, for example through regulatory incentives, taxes, or fees to encourage a circular economy at scale, or legislation to stop the use of single-use materials altogether.

It is also possible, however, that society may react to resource crises with fear and resignation. Many may feel that incremental changes are simply insufficient and forgo the attempt.

2 SECTION

FOUR POTENTIAL SCENARIOS

Scenarios are stories about the future. They should not be interpreted as predictions. Instead, they are descriptions of possible ways the world could evolve.⁵ The scenarios presented below describe different possible futures that pose challenges—and offer opportunities—for decarbonization between now and 2050. They were developed from ideas drawn directly from inputs provided by participants in the online exercise.

The exercise resulted in five scenarios—alternative futures that might unfold in the world over the next 30 years. In this report, we expand upon the four scenarios deemed most valuable to providing insights for developing forward-looking strategies for climate action. We chose not to focus on the fifth scenario that emerged from the exercise: Trust Returns. This fifth scenario conformed roughly to what many people hope becomes our future. For example, it describes a world where institutions and governance structures remain flexible enough to be adapted and revitalized to cope with the increasing challenges posed by climate change. Since this scenario outlines a positive narrative, many actors may already be planning for such a future, implicitly or explicitly. As such, the Trust Returns scenario does not shed light on blind spots and gaps in current thinking. Instead of building out that scenario in full, we have chosen to focus on these four scenarios:

- **Hollowed Out**
- **National Rivals**
- **Connected Communities and Cities**
- **Consumers in Charge**

Figure 1 illustrates the general conditions underlying these scenarios and the relationship between them, and summarizes each scenario in terms of power, conflict, economics, and innovation.

5 Wilkinson, A. and Kupers, R. May 2013. Living in the Futures. Harvard Business Review.

Figure 1. ClimateWorks Futures CoLab Scenarios*



* The fifth scenario which emerged from the exercise, Trust Returns, is not elaborated on here. This scenario features a broader power base, where citizens from around the world engage more strongly in decision-making, and a mixture of local and global identities, including emphasis on smaller-scale grassroots organization with a view towards the global implications of everyday actions.

In the next sections, we examine each of the four scenarios, beginning with an overview of the main driving forces and the general conditions occurring in that world between now and 2050. We then explore in more detail from the perspective of the four key areas relevant to climate action: public engagement and mobilization; decision-making and power; transparency and responsibility; culture and social norms.

2.1 Hollowed out

Hollowed Out is a world characterized by heightened inequality. As technological developments take over more aspects of everyday life, in the 2020s power (and wealth) becomes vested in a small number of executives who control capital, resources, and algorithms. The ascendance of this group creates a narrow power base. This elite is not content with heading up large corporations—they have broader ambitions to *“govern society in place of elected officials [leading to] private governance,”* which begins to take shape at the start of the 2030s.

While the lives of the elite grow more comfortable, life for most people becomes more precarious. Middle income jobs in all sectors of the economy are severely disrupted by automation. Developing countries are affected the most, as basic manufacturing and service level employment is hit hard. National tax bases diminish, while public services, social safety nets, and infrastructure suffer. Some people gain a degree of security and affiliation by aligning with one of the few technology ecosystems that span the globe. As regular jobs become less available, many turn to virtual worlds for their entertainment.

Greenhouse gas emissions peak and then even slowly decrease in the medium-term into the early 2040s, since the wealthy elite have access to renewables and private micro-grids. Most people no longer have resources for mass consumption, travel, and other high-emissions activities, relying instead on more local and virtual experiences and forms of entertainment. Foreign aid is cut as elites let developing countries face growing crises on their own. While many become resigned, a sizeable minority look for new affiliations and values in a hollowed-out world.

Public Engagement and Mobilization

Extreme inequality, a lack of employment opportunities, corruption, and climate change impacts (which make traditional subsistence lifestyles challenging) lead to strong objective motivations for public engagement and mobilization to change the system. But as power is increasingly vested narrowly in a small number of elites and as cultures become more individualized, it becomes difficult to motivate large numbers of people to campaign for change. Furthermore, *“given the extent of inequality (with many people struggling to survive) and the lack of resources to fund such movements, progress is slow and participation for many people is difficult.”*

Movements that do arise use new communication technologies and social media to organize. These technologies also enable citizens from around the world to develop a global identity and to align the goals of various movements. As data surveillance is prevalent, networks are careful not to become too radical in their demands for change, in case their movements are blocked. More successful mobilization campaigns appeal to the values of the wealthy elite. They encourage participation through local innovation and competition, for example by promoting small-scale experiments and prizes.

Over time, local organizations form alliances across the globe which strive to improve health and education outcomes, increase food and water security, and provide at least some public services with the limited resources available to them. Improved sensor technology supports these alliances in efforts to publicize air and water quality issues and advocate for improvement.

Decision-Making and Power

Political, corporate and technology elites maintain control over most resources—physical, financial, and especially digital. *“By using this power to restrict access to resources, they further cement their own position.”*

As elites grow in power, many national and local governments lose their legitimacy and influence. It is hard to run a country (or a city) in 2040 without access to traffic data, pollution

trends, and economic information. This data is now held by powerful tech companies and banks, so governments are forced to align with the values of the algorithm owners. This is a natural development for nations with autocratic systems, but it is a wrenching change for liberal democracies.

Governments that choose to go it alone are unable to deal with growing problems such as migration, poverty, food insecurity, and deteriorating infrastructure, including grid infrastructure. The wealthy elite are left to fill the gap left by floundering authorities, and privatized services become commonplace. Governments that find ways to work with elites and control masses of data are able to work effectively. China's government, for example, enhances its power and influence, as it has decades of experience in working closely with large, influential high-tech organizations.

As climate concerns mount, the most powerful elite-driven corporations see advantages to greening their operations and make progress towards mitigation. They focus their attention on low-carbon innovation, seeing it as the dominant version of corporate social responsibility.

In the latter part of this scenario, as some elites worry more about governance of society, *"a new class of innovators and entrepreneurs emerge focused on unique and disruptive business models."* These innovators and entrepreneurs gain political power by appealing to the elites, but then use their power to counter the prevailing trends and begin to address rampant inequalities. They endeavor to restructure their business strategies to emphasize environmental and social justice. This begins a slow process of re-engaging with a public that has been removed from decision-making for decades. Blockchain technologies and machine learning are harnessed to enable smarter energy usage. Over time, distributed peer-to-peer renewable energy grids are developed, providing cheap and equitable access to carbon-free electricity off the traditional grid.

Accountability and Financial Responsibility

Foreign aid through traditional channels falls sharply, as governments choose to spend their dwindling capital closer to home. Many developing countries find themselves in dire straits as they strive to deal with worsening environmental conditions and increasing poverty, along with reduced financial and technological assistance.

Despite a world rich in information, it becomes more *"difficult to assess the transparency of supply chains."* As elites grow more powerful, many resist calls for greater oversight of their operations. Following multiple attempted cyber-attacks, corporate leaders react by restricting access to repositories of information, software, and innovations.

In a highly individualized world with low trust in institutions, it becomes common for wealthy elites to embark on unilateral innovations aimed at solving large-scale problems. Investments in space travel and discrete solar geo-engineering activities rise sharply, affecting communities in unforeseen ways.

Over time, bottom-up movements striving to overturn opaque governance begin to take responsibility for crumbling infrastructure and many other services that have suffered under the rule of global elites.

Culture and Social Norms

Lifestyles and behavior are driven by extremes, with a small number of wealthy individuals (and their close circles) consuming most resources and the rest of the world's population battling it out for the remains. Cultures shift towards a more competitive, individual existence, with only isolated instances of cooperation. As environmental conditions worsen, elites *"build private and exclusive compounds isolated from worsening environmental conditions"* and the rest of the planet. The most ambitious are planning seriously to colonize Mars.

2.2 National rivals

National Rivals is a world where nation states begin in the 2020s to eschew international agreements and cooperation, leading to hostility, conflict, and the devastation of the global commons. Government actions are geared toward ensuring the security and compliance of domestic populations. Power is mostly vested narrowly in large, resource-rich nations that can maintain a unitary identity and mission—primarily autocratic states. A *“growing number of refugees and migrants are at high risk due to their unofficial status and the lack of global recognition of their plight.”*

As countries strive for greater strategic independence, many begin to pursue *“green industrial policies”* as a source of competitive advantage. Throughout the 2020s and 2030s, nations invest heavily in both renewables and other available domestic sources to achieve energy security, and some shift toward a bio-based economy to capitalize on locally available resources and avoid relying on imports. In a hostile world, rivals find themselves in a *“race to the top”* as they strive to achieve full energy and resource independence and develop more sustainable practices in doing so. However, without international collaboration, climate impacts worsen. While those with the most power and resources at their disposal can isolate themselves from deteriorating environmental conditions, as multiple tipping points are surpassed, this becomes increasingly difficult. Eventually, extreme measures must be considered to protect those in power both from climate impacts as well as from the adverse effects of an increasingly disaffected and fractious populace. From the 2040s onward, research and development increasingly focuses on geo-engineering and carbon removal mechanisms, which become seen as fixes to halt or lessen climate impacts. Many nations invest heavily in minimizing the risks of deploying geo-engineering within their borders, without much consideration of the risk to others.

Public Engagement and Mobilization

High inequality between countries prompts social movements that begin in lower-income states but spread as citizens of higher-income countries become more aware of the suffering of others through communications technology and virtual experiences. Resistance groups emphasize *“compassion and empathy [as guiding principles] in a last-ditch effort to save humanity.”*

Underground societies emerge in response to increasingly authoritarian national governance, attempting self-governance at the local scale (but out of sight of surveillance) and creating black markets which begin to spread and merge with compassionate resistance movements. Due to the breakdown in international relations and ensuing strict border policies, many of these networks remain constrained by national boundaries and identities remain rooted in local- or national-scale experience.

Decision-Making and Power

National leaders push their own interests and agendas, sometimes collaborating, but mostly engaging in hostile rivalry and conflict with one another. Decisions are made with national priorities at the forefront; some generate net benefits for the planet, such as promoting green energy policy to secure energy independence, but many prove damaging, for example refusing to export food and water despite rampant *“malnutrition and outright starvation in many parts of the world.”*

Borders and boundaries are strengthened, causing tensions and anguish to those forced to flee due to environmental conditions and public health crises. Global trade becomes limited, and trust between countries is at an all-time low. Global corporations are the last bastion of international cooperation and fight to keep it alive, but eventually give into political pressure, and most restructure into national units.

Given the lack of cooperation at the global scale, progress on reducing emissions is patchy. During times of outright conflict, reducing emissions is, at best, a secondary consideration. In periods of tension but not active hostility, nations ramp up investment in alternative energy and other technologies in search of a competitive advantage over others. Investment in increasingly aged grid infrastructure suffers, as attention is on policing borders rather than internal infrastructure. As increasingly desperate nations begin unilaterally experimenting with large-scale deployment of geo-engineering and carbon removal mechanisms closer to 2050, without coordination between them, unpredictable and catastrophic effects may occur.

Partly as a result, a “*my energy first*” discourse emerges which emphasizes transitions to locally-feasible renewables as a means to secure energy sources. Locally produced bio-based products become more commonplace because of advances in chemical engineering. Though increasing military expenditures stress national budgets, national governments see sustainability transformations as a new form of space race, investing heavily in research aimed at alternative energy and suspending fossil fuel resource extraction. As climate impacts become more dire, due to the lack of cooperation between nation states, investments in adaptation measures rise in richer countries that can afford them. Eventually, as existing adaptation measures become increasingly insufficient and the cost of adequate protection from climate impacts rises, governments begin to prioritize geo-engineering and carbon extraction options.

Accountability and Financial Responsibility

Years of limited-to-no global cooperation make countries increasingly secretive and unwilling to share information with one another. This breakdown in global cooperation also leads to limited technology transfer between countries, slowing the pace of technological innovation and reducing the spread of new energy technologies. Paranoid leaders cause mistrust to rise and conflicts to escalate quickly. As the role of global corporations is increasingly limited to the national scale, transparency in supply chains actually increases; as supply chains become more limited in scope, they also become easier to monitor and track.

International agreements become relegated to the annals of history, and actions such as geo-engineering or ocean fertilization are taken by countries with little consideration of consequences outside their borders. Domains that were previously subject to international agreements are now fiercely contested, as nation states fight to secure scarce resources. Ocean mining becomes common, Arctic shipping lanes are disrupted by conflict, and Antarctica becomes a new battleground as Chinese, Russian and American militaries use drones and autonomous ships to fight over territory.

Culture and Social Norms

National cultures and traditions are dominant and are strongly pushed by governments looking for ways to build national pride amid difficult economic times. Populations are encouraged to buy local and national products, and they often have few other options, since imports are expensive due to protectionist policies.

Life for immigrants and refugees is dangerous and uncertain. It becomes difficult for refugees to find any safe haven, as they are typically housed in border camps with little hope of international cooperation to find solutions. Immigrants' rights are steadily eroded, to the point where many have become stateless and unregistered. As populist rhetoric is normalized, xenophobia becomes more common and socially accepted.

There are very few global social norms, in contrast to the hopes that many held in the early years of the 21st century. Now, cultures and values are notably different from nation to nation. Only networks of “*underground societies and resistance movements*” maintain some semblance of contact between countries.

2.3 Connected communities and cities

Connected Communities and Cities is a world where national governments are unable to cope with the economic, social and environmental challenges of the 2020s, so people look instead to their local areas—communities and cities—for leadership. The trend of urbanization, prevalent in the fastest growing countries since the 1990s, continues. Cities and local areas have one major advantage over larger scale national governance—they can be flexible in the way that they organize their systems. As national power recedes, cities have the scope to experiment with new governance structures that are better suited to local characteristics. Local identities flourish alongside increasingly strong communities.

Some communities invest heavily in intelligence in their pursuit of becoming a “*smart city*.” Others decide to eschew most technology to make their communities more liveable. Technology developments allow for efficient economic activity at a smaller scale; for example, 3-D printing and decentralized power grids enable local manufacturing and energy production. Societal transformations toward sustainability also take place—people consume less meat, for example, and support investments in finding alternative, more efficient sources of protein.

Despite the overall trend of urbanization, and the many benefits of using a local approach to address challenges, not all urban areas thrive. Many cities will be highly susceptible to climate risks, for example, with millions in the 2020s and 2030s exposed to “*climate and environmental hazards including flooding due to rising sea levels as many cities are located at the coastlines*.” Furthermore, “*increasing heat waves in cities (intensity, duration, and extent) make vulnerable populations highly exposed*.” Greater disease burdens, including for example an “*explosion of communicable illnesses*,” is another risk in dense urban settlements where inhabitants’ immune systems may already be weakened due to pollution exposure. Inequalities will be exacerbated, as some citizens and some cities are more vulnerable to these effects and less equipped to respond effectively than others. Some cities in the Global South struggle to adapt to the rapid pace of change given resource constraints. Cities will also face the challenge of managing rising inequality within their urban areas and between cities and rural areas (which become merely providers of natural resources and cheap labor to cities).

Public Engagement and Mobilization

This is a world of enthusiastic public engagement, as people feel that they have a voice in their local communities. “*Social movements ... become institutionalized as political parties at the city level*.” Technology is harnessed to promote mass engagement in decision-making. Youth movements—focused on concerns like environmental justice, gender equality, education, and health—become platforms where the local leaders of tomorrow can emerge.

Resilience and solidarity become central points around which people mobilize, and this encourages development of green infrastructure, urban food production, investments in smart cities, and urban emissions reductions. Such changes are born out of an increased sense of solidarity in the face of climate change as a unifying challenge across communities. For some cities, progress is slow, since legacy infrastructure is expensive to replace. But many local communities manage to become “*seedbeds for co-creation and co-transformation*,” with new forms of governance and collaboration emerging via art, spirituality, and mindfulness. A form of peer pressure is exerted to overcome, to some extent, the free rider problem.

The most effective responses integrate rural and urban communities into collaborative, decentralized networks, spurred on by public engagement pushing for innovation and technology sharing, risk- and opportunity-sharing mechanisms, and coordination of local governance priorities and strategies. As the trend of urbanization accelerates, as it is expected to do in coming years, the influx of rural inhabitants to urban centers maintain ties

with their rural communities and, empowered by strong local leaders advocating for recent immigrants, mobilize to ensure that the relationship between urban and rural populations is optimized without leaving rural areas behind. This includes incorporating elements of rural culture and traditions into urban lifestyles, and eventually paves the way for the collaborative management of coupled urban-rural systems. The use of AI to design and optimize such networks from a systems approach generates efficiency, on an ethical basis, on an unprecedented scale.

Decision-Making and Power

Strong local leadership becomes the center of decision-making and power in this scenario. Some leaders are ambitious, seeking nothing short of systemic urban transformation. Others are more modest, trying to make needed changes at an incremental pace. Advances in communication technology are harnessed to enable direct, participatory democracy, broadening the power base as more inclusive decision-making processes are developed.

Some local authorities are able to grow their tax revenue in novel ways and to use their influence *“to pressure corporations [operating within city limits] into decreasing emissions and other harmful environmental practices.”* While corporations still operate across multiple cities and across the globe in this scenario, the increasing concentration of power in urban centers, and the increasingly open and transparent communication and coordination between them, enables cities to band together to resist a corporate *“race to the bottom.”* Public-private partnerships become increasingly important, helping to drive research and innovation in strategically important directions, and to enable access to emerging technologies.

However, rural areas are at risk of being left behind in this scenario. Due to urbanization and growing urban populations, city leaders have comparatively more power and influence. As a result, the interests of rural inhabitants are often under-represented, and people who live in the countryside risk being *“neglected from many of the services and communities present in cities.”* In a worst-case scenario, *“rural areas may simply become massive resource extraction hubs.”*

The tension between local action and a global-scale problem such as climate change is a significant barrier to mitigation. While multiple positive changes take place locally, coordinating global action among a larger number of local actors proves even more difficult than having nation states negotiate in international fora. Overcoming this barrier could require rethinking current governance arrangements such as the United Nations Framework Convention on Climate Change. One possible alternative model could rely on virtual communication tools to foster deliberation among a larger number of diverse community-level leaders. Another (and not mutually exclusive) option would be to embark upon a complete upheaval of current governance structures, creating a nested, polycentric global governance regime better suited to a world with different power dynamics. This could feature knowledge transfers between cities, scaled up to state-, national-, regional-, and eventually global-level coordination.

Accountability and Financial Responsibility

Decisions made locally are tested with greater scrutiny, and local leaders are held more accountable than national leaders for immediate climate impacts. While still complex, decision-making at a local scale allows proponents to openly acknowledge and debate the trade-offs inherent in policy-making, for example between different interest groups, or between sectoral gains and losses. Facilitated by new forms of communication technology, as well as by higher levels of education, citizens become more involved than ever before in local governance, participating directly in making it transparent and accessible. Improved sensor technologies allow citizens direct access to information about air and water quality and to hold local leaders accountable—particularly important in the face of increasing urbanization. Local citizens also push for increased transparency in corporate activities, using their *“collective purchasing power as leverage to make demands for sustainable practices.”*

While there is much progress and experimentation in new ways of governing, not all cities are able to cope. For some cities, the flow of people into urban areas leads to a sprawling informal economy, difficult to regulate and highly opaque.

Culture and Social Norms

As power and responsibility shifts to cities, there is a wide variation in their economic and social experiences. Without the regulating factor of national government, inequality between places increases as wealthier, first-mover cities adapt earlier. Others *“bear the brunt of the passive neglect or active hostility to climate change action by the national (or state) government, and their populations will lack the surplus wealth, time, energy, education, and resources to fight back”*. Social justice becomes a major ethical problem as inequalities persist and are, in some cases, exacerbated.

Gentrification becomes a major issue as well, as lower-income individuals get priced out of city centers, with detrimental effects on the cultural heritage of many groups.

2.4 Consumers in charge

This is a world in which billions reach middle-class status by the 2020s, fueling a global economy focused on consumption growth. Global corporations are the most powerful entities in this world. They satisfy the demands of these consumers through innovation, for example in mobile computing technology, making it easier for people to access products, services and information drawn from around the world. As global economic growth continues, governments largely stay out of the way, allowing corporations to operate freely across borders.

The consumer boom of the 2020s encourages material-based patterns of economic activity and diets increasingly revolve around processed foods, meat products, and refined sugars. The growing middle-class demand automobiles, air travel, refrigerators, internet access, and same-day package delivery. The increased pressure on energy and resources spurs some innovation, but mostly leads to scarcity and resource depletion. By the late 2020s, excessive consumption leads to damaging pollution and congestion in major cities. Asset-price correction and other drivers lead to a global financial crisis, with impacts on quality of life around the world, on global trade, and on investments in innovation. Alongside this, extreme weather events devastate economic centers of power in Asia, Europe and the United States.

Recovery and rebuilding efforts continue into the late-2030s, and a movement emerges that takes a hard look at economic growth and the levels and type of consumption required across the world. There is a growing realization of a severe mismatch between consumption in different places. Leaders from all walks of life—religion, culture, business and government—step up. Together, they strive for *“balanced consumption”* making resources more accessible to those who consume too little and discouraging excessive consumption by those who consume too much. Based on public pressure, consumption-based emissions accounting emerges as the dominant paradigm, further supporting this more globally balanced approach to consumption. As citizens face related pressures and threats around the world, a global identity begins to emerge with its roots in consumption mentality, but eventually expanding toward more sustainable, longer-term thinking by the 2040s.

This push toward a different model for consumption is reinforced and supported by consumers themselves. Having suffered in the environmental and economic disasters of the late 2020s and early 2030s, they actively seek out products, services and experiences that use less energy and fewer resources. New services are set up to calculate and rate the ecological footprint of a product instantly, *“providing consumers with real-time information*

on the products they consume” and allowing them to make purchasing decisions based on these values. Consumers also increase their support for businesses that provide accessible, appropriate products to low-income consumers in order to “avoid inequality and poverty traps.” All businesses—from start-ups to global corporations—innovate and redesign their operations and businesses toward a circular economy model. Empowered by technology to render supply chains more transparent and distributed sensors to monitor local air quality and climate conditions, consumers themselves emerge as powerful in this scenario; even though corporations may have had the power at some point, power ends up distributed broadly amongst consumers all around the world.

Public Engagement and Mobilization

In the early years of this scenario, public engagement is motivated primarily in response to the negative effects of continuing (and increasing) overconsumption—in particular resource scarcity, leading to pollution and public health crises. Over time, as resource scarcity gets worse and health crises become more regular and damaging, social movements arise to push for a more sustainable, natural existence and healthier lifestyles. Successful movements are those that start early, based on weak signals of change. Movements that mobilize later find that they are often too late to reverse consumption patterns, especially in developing countries, where the resources to make a shift to sustainable consumption are lacking.

In broad terms, many movements become mainstream. Consumers push toward more sustainable consumption and call for a “just transition” to new patterns of economic activity. As the middle class grows, education improves, creating a generation that is far better placed to understand the negative impacts of overconsumption. They create a mass consumer movement to encourage a shift toward “dematerialization” or consumption of non-tangible goods.

Further, such movements find that the most powerful message is one around balanced consumption. This phrase recognizes that the global economic system is already remarkably productive, and progress can occur by rethinking the nature of relationships within it and recognizing that “most of the world is under-consuming food, resources, and energy.” For example, balancing energy consumption could mean ensuring that those who have not been consuming enough to maintain a sustainable and healthy lifestyle are able to have more, and those over-consuming energy (primarily wealthier households) better understand the need for restraint and greener energy alternatives. Overall this creates a more efficient and effective global system, and the message of balanced consumption as a rallying cry for movements is more appealing and potent than one based more narrowly on stopping overconsumption.

Decision-Making and Power

During the 2020s, power shifts toward global corporations as they become more influential in serving the needs of the growing consumer class. The relationship between governments and corporations varies across the world (with different approaches in China, Europe and the United States), but the general trend is toward more corporate influence.

As climate and financial crises hit in the late 2020s, decision-making becomes increasingly reactive. Corporations and governments scramble to invest in fixes, as their focus turns to emergency response and disaster preparedness. Some corporations look to invest in ambitious technology schemes around geo-engineering and bioengineering.

Over time, many in society begin to realize that solutions will not only come through technological investments and fixes. Just transitions, they discover, require mechanisms to protect workers, the poor, and vulnerable groups. Some corporations resist and lobby against social protections that threaten profits. Instead, they argue for greater privatization and market liberalization in order to rekindle growth following the crises.

Most consumers, however, align with corporations that acknowledge a more fundamental change is needed and promote more sustainable policies. Over time, it becomes mainstream for

organizations to integrate climate risks into decision-making and “*impose voluntary mitigation strategies*.” New business models emerge, led by start-ups and young business leaders, which emphasize services over material goods, localized production, and for-benefit rather than for-profit strategies. Corporations look to rebalance their own activities, with more sustainable offerings in developed markets and a far greater emphasis on boosting consumption in poor areas. More national governments and statistical agencies move away from Gross Domestic Product as a measure of growth and toward more sustainable well-being indicators.

By 2040, in some countries, corporations become willing to partner with governments around policies that would have seemed implausible three decades ago: major tax reform to tax externalities rather than labor, wealth redistribution, and “*including representatives for the future in governments*.”

Accountability and Financial Responsibility

Corporate supply chains become more integrated as they serve billions more consumers around the world. But the crises of the late 2020s (e.g. financial crisis, infectious diseases, devastation of ports from storm surges) create major disruptions for the existing global system of trade.

As they rebuild in the 2030s, corporations reshape their supply chains, using AI to manage the whole, complex system of production and consumption more effectively “*through dis-embedded and disinterested intelligence*.” Real-time information makes the process transparent, and consumers can access data to guide their purchase decisions.

Smarter, more responsive logistics and production arrangements help to restructure the global economy toward the new set of emerging values around environmental and social responsibility.

Culture and Social Norms

In the early years of this scenario, material consumption and technology fixes best represent the prevailing culture—largely an individualistic, acquisitive set of values. Diets that include large quantities of meat and processed foods are seen as a status symbol associated with having reached the middle class. As societies realize that the root of the problem lies in consumption patterns, there is a transition toward new social norms and cultural practices, particularly those emphasizing a more connected, systemic outlook; a responsible relationship to natural resources; and reuse and fixing of goods rather than disposing of them. Lifestyle and behavioral changes follow suit which are in line with these norms.

Emerging values regarding more sustainable consumption pave the way toward a “*shift to a fully circular economy*” while also supporting sharing economy principles. It is important to note that, for many societies without access to an abundance of resources, sharing and circular economy principles are already the norm, with re-use of resources and sharing limited transportation a matter of necessity rather than a matter of convenience. That being said, communities with greater or growing access to resources may still require a push to enable this type of lifestyle change. If there is a shift in social norms, significant public support for technological innovations that facilitate the transition to a circular economy may well follow. Furthermore, the shift toward non-tangible consumption and decreased consumption of meat and processed foods leads to improved health outcomes as well as sustainability. Recognition of these co-occurring benefits helps to further embed sustainable consumption as a social norm.

3 SECTION

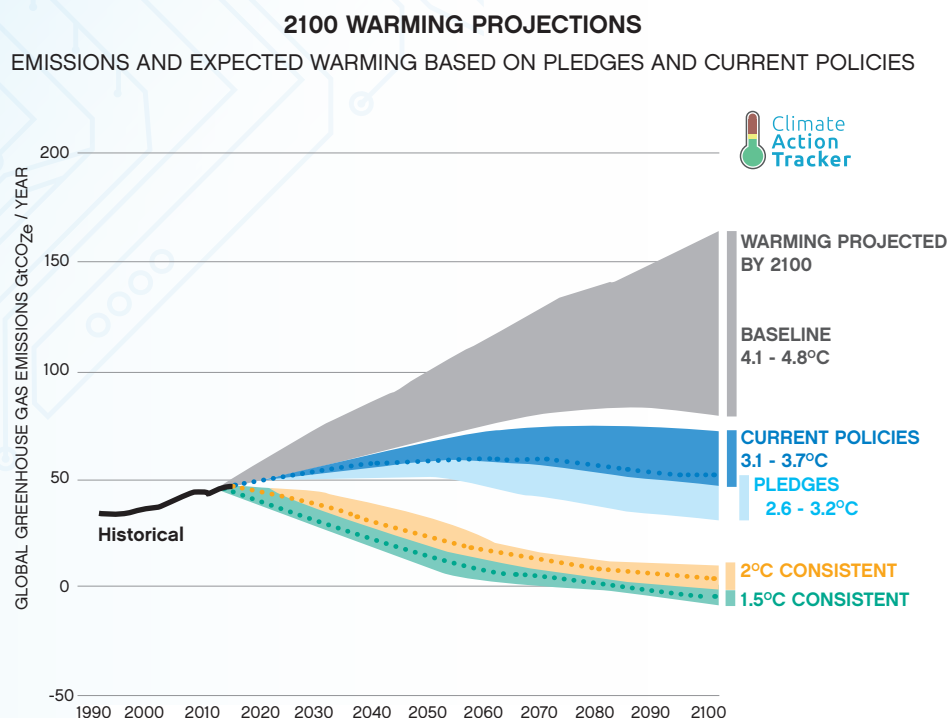
CLIMATE MITIGATION PHILANTHROPY

In this section, we explore some of the possible ramifications of the different future worlds identified in the ClimateWorks Futures CoLab exercise for current strategies employed in climate mitigation philanthropy. This section is not intended to serve as a guide, but rather, as a thought exercise for how different programs and strategies may fare in an uncertain future, and to shed light on challenges and opportunities for current and future action.

3.1 Current focus areas for climate mitigation philanthropy

Climate mitigation philanthropy has coalesced broadly around achieving the goals of the Paris Agreement. This entails holding the increase in global average temperatures this century to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C. Over the last few years, the global context and policy landscape has continued to evolve. Figure 2 below summarizes the projected aggregate global progress toward meeting the goals of the Paris Agreement.

Figure 2. Emissions and expected warming based on pledges and current policies [Climate Action Tracker, 2018]



Looking ahead to possible alternative futures, climate mitigation philanthropy must consider the following current trends and notable patterns.

1. After three years of flat emissions, 2017 saw a rise in energy-related CO2 emissions.
2. The continued rapid deployment and falling costs of clean energy technology are heartening, though thus far only four of 38 analyzed technologies in various sectors by the International Energy Agency are on track for what is needed to meet long-term climate goals.⁶
3. Despite clear signals on the inevitable long-term shift away from coal, there is a bifurcation of governments that continue with thermal coal expansion and others that are committing to phase out coal completely.
4. 2017 was the second-worst year on record for tropical tree cover loss, eclipsed only by 2016. In total, the tropics experienced 15.8 million hectares (39.0 million acres) of tree cover loss in 2017, an area the size of Bangladesh.⁷
5. Subnational and non-state action are gaining prominence as mechanisms to support implementation of national-level policy work, as well as further reducing the emissions gap by several gigatons CO2 eq per year.
6. Climate mitigation philanthropy is growing, but resources are not commensurate with the scale of the challenge posed by climate change and still represent less than two percent of philanthropic foundation giving.

It is with these trends in mind that we must explore the four alternative futures highlighted by the ClimateWorks Futures CoLab exercise, extrapolating what these trends may mean for future climate action efforts.

3.2 Four scenarios: implications for climate action

The following pages outline a set of key implications for climate mitigation efforts that potentially stem from each alternative future. We assess where current assumptions or strategies are at risk of being undermined in a given scenario versus which of these assumptions and strategies would remain valid, as well as what new threats and opportunities we believe are likely to emerge in each scenario. In looking across these four categories, we can better think about what steps we can take now to forestall the most significant threats, and how we might best capitalize on emerging opportunities.

Hollowed out

Summary: In this alternative future, while there are still valid technology-driven pathways offering low- or zero-carbon solutions, many of the challenges relate to increasingly unequal political power, with limited means for public engagement around climate action and influence by independent actors. Technological advances may also provide unanticipated opportunities, in particular around efficiency, logistics, and life cycle analysis of embedded carbon in supply chains.

6 International Energy Agency, Tracking Clean Energy Progress, May 2018

7 Global Forest Watch, "2017 was the Second-Worst Year on Record for Tropical Tree Cover Loss," June 2018

At Risk	Still Valid
Grassroots engagement as everyone may be plugged in and tuned out. Bots could increasingly drown out fact-based, human storytelling. NGO influence: Increasing consolidation of political and economic power could undercut traditional advocacy. Government capacity: There will be fewer government resources to go around if taxation systems don't keep pace with changes. Open flow of trade and technology: Climate models count on diffusion of advanced technology across borders.	Zero emission vehicles (ZEVs) will continue to drive down costs; the public will also have more mobility options (including ride-share, car-share, bike-share, etc.). Phasing out fossil fuels and phasing in sustainable energy sources still driven by changing economics and pursuit of increased energy security. New opportunities may accelerate this transition. We can expect major leaps forward on super-efficient appliances, such as refrigeration, air conditioning, and heating, among others. New developments in nanomaterials will drive down the cost of carbon removal via direct-air capture, and CRISPR can increase capacity for natural systems to remove and store carbon.
Emerging Threats	New Opportunities
Greater economic inequality, including rampant unemployment and underemployment, means we may need other ways to provide sustenance and to prevent political disruption or even violent outbreaks. The ability to exploit near-earth orbit and the solar system will engender new conflicts in space. Competing government priorities may shift environment to a lower position. This may be accompanied by a lack of coordination between government and the private sector. Declining influence of labor as a political constituency, especially in developed economies. Ever-growing data management and security issues may threaten or distract from a variety of climate action strategies. Geo-engineering emerges as a compelling response to climate impacts. Threat level depends on the governance systems in place.	There are a number of ways AI might reduce greenhouse gas emissions, reduce transaction costs, pave the way for circular economies, sharing, and higher utilization ("AI for Good"). For example, ongoing advances in information technology could improve: - Smart mobility services, traffic management and freight movement - Climate forecasting and effective adaptation - Food production and distribution - "Efficiency first" infrastructure Distributed peer-to-peer renewable energy grids with cheap and equitable access to electricity. Life cycle analyses with greater transparency regarding embedded carbon are promising. Satellite applications for managing forests and carbon sinks (like methane leakage ideas) could transform monitoring and planning.

National rivals

Summary: In this alternative future, multilateral efforts at progress would likely unravel over time, leaving the main drivers of climate progress to come from national self-interest. There would still be some serious tailwinds for action on renewables and even energy efficiency, from an energy security perspective, but trade barriers will limit both the sharing of new technologies as well as other options for connected carbon markets, and higher military expenditures will stress the availability of budgets for energy investment. New challenges may also arise, particularly around security of the power grid and competition for raw materials for new technologies.

At Risk	Still Valid
Multilateral agreements and related timetables (e.g. Paris Agreement, ICAO, Kigali phase-down) may come undone. Multilateral and even bilateral financing and climate-friendly foreign aid would dry up and halt progress on decarbonization in many parts of the world. Protectionism creates barriers for technology transfer. Cross-border carbon trading. Greater military expenditures and lower growth due to protectionism stress national budgets.	Renewables, especially for energy security and independence. National-level plans and policies that depend on a more top-down approach to implementation. Green growth plans focused on domestic industry. Corporate commitments to monitor and track supply chains and reduce emissions over time. State and city leadership when working in partnerships with national governments. Energy efficiency driven by needs to ensure energy security, minimize fuel shortages, or both.
Emerging Threats	New Opportunities
The “my energy first” mindset may lead to a resurgence in fossil fuel use in countries and markets where they are plentiful; petro-states may push to produce and sell as much oil as possible while they still can. Explosion in surveillance technology may stifle political movements calling for increased action on climate threats. Attacks on electrical grids, both physical and cyber, will lead to greater uncertainty and costs to try to maintain grid reliability. We may see hoarding and shortage of noble metals vital to advanced energy, transport, and emissions control systems. Reversion to primitive energy sources may threaten the most easily accessible forests and reverse trends in deforestation.	Technology and advances from spillovers from new “Manhattan” projects or increases in investment in research and development could be possible. Explosion in drone technology leading to “eyes everywhere” could also allow for emissions monitoring and transparency in support of climate action. Smarter, more productive agricultural practices focused on food security could emerge, including engineered proteins. Potential for greater emphasis on distributed generation as more households pursue energy security by moving “off the grid.” Military may emerge as advocate for greater adaptation and mitigation, given first-hand understanding of dangers of climate change.

Connected communities and cities

Summary: In this alternative future, with a decentralization of power, strategies that focus on international or multilateral policy-making may lose efficacy, and the implementation of large-scale national-level policies may not go as planned. Many core efforts, such as renewables, energy efficiency, and ZEVs, however, would still remain valid. As cities increasingly become testbeds of different types of policies and practices, some may exacerbate inequality and tensions, while some others may take leadership roles, all amidst a more engaged citizenry.

At Risk	Still Valid
International cooperation and agreements (e.g. UNFCCC negotiations) might lose efficacy if they don't include cities, states, regions, etc. National, macroeconomic policies that depend on more distributed implementation could be at risk. It may become difficult to marshal capital and/or political support for large, expensive, society-wide climate-beneficial undertakings such as high-speed rail or integrated electrical grids.	Renewables, especially distributed forms of energy generation. Energy efficiency, driven by a desire to conserve local resources. ZEVs, especially shared versions owned and controlled by localized fleets. City-based strategies, as well as state and provincial level policy actions. Corporate commitments, particularly in partnerships with local governments.
Emerging Threats	New Opportunities
Many cities and regions may end up 'left behind' as climate impacts become more severe. Further shifts to walled communities, leaving less unified, less resourced people(s) behind. Growing power imbalance between urban and rural citizens. Coordinating and connecting climate action among a higher number of local actors. City-based strategies that provide amenities for the rich may exacerbate inequality.	New forms of citizen engagement are possible that build on advances in communications and information technologies. Localized "leave it in the ground" or "100% clean" legislation, or even local approaches to carbon taxes. Accelerated growth of the sharing economy, including mobility services and major appliances, leading to reduced energy consumption overall. Changes in social values toward meaning and connectedness, creating potential for reducing consumption. Novel types of trans-boundary cooperation given community-based actions for climate mitigation.

Consumers in charge

Summary: In this alternative future, given a surge in consumption, there are risks that countries will not meet their near-term international pledges and emissions reductions targets and locking in of wasteful behavioral norms. As the pendulum swings in the 2030s, however, there may be new opportunities to redefine global agreements, investor agendas, and corporate social responsibility. While there may be pressure for accelerated carbon removal or geo-engineering, circular economy strategies and increased citizen and consumer awareness may both lead to rapid declines in subsequent emissions.

At Risk	Still Valid
Near-term peaking emissions, as surging consumption ensures we do not meet 2020 climate targets or Paris Agreement targets. Consumer preferences in the short term may lock-in future emissions pathways and reduce opportunities for more sustainable consumption. Increased consumption patterns put growing pressure on land and ecosystems for food and natural resources. Corporate disclosure efforts may not affect non-consumer-facing companies that can fly below the radar, avoiding meaningful emissions reductions.	Engaging with consumer behavior as an effective lever toward climate action. Despite failure to meet 2020 or 2025 targets, international agreements to lower global emissions re-emerge as key in the 2030s and 2040s. Energy efficiency becomes valued more highly as wealthier consumers demand the same level of energy services in a decarbonized economy. Increased private investment in renewable energy, as it enables corporations to make and meet environmental promises. Supply chains able to manage complex system of production and consumption more effectively.
Emerging Threats	New Opportunities
Spikes in emissions continuing through the 2030s will render 2°C and near-2°C pathways infeasible without massive negative emissions or geo-engineering. Social and environmental protections are dependent upon powerful corporations continuing to cooperate with governments. Increasing AI threatens job security, though after 2030 this threat is at least temporarily addressed by improved social protections.	Increased citizen awareness and engagement builds political will for climate action by governments and corporations. Circular economy strategies gain tremendous ground. A higher societal valuation of the natural world and ecosystem services provides further boost to efforts to manage deforestation and land carbon sinks. Consumer awareness creates heightened opportunity to decarbonize diets while also improving human health outcomes. Consumption-based emissions accounting offers opportunities to understand true individual and national carbon footprints.

3.3 Conclusions and next steps

Over the past decade, climate mitigation philanthropy has focused on seizing the best near-term opportunities to reduce clean technology costs, lock-in greenhouse gas emissions reductions, and protect key carbon sinks, mindful of what is required through 2030 to meet a well-below 2°C goal. Given the findings of the recently released IPCC Special Report on Global Warming of 1.5°C,⁸ allowing warming to exceed 1.5°C could have even more significant impacts than previously thought, and urgent action to avoid this can no longer be delayed. Recent progress is heartening, but as evidenced in the Special Report, we still have a significant challenge ahead. Global climate goals require that emissions peak by 2020, then make a steady and steep decline through 2050, seeing net-zero emissions after mid-century (which will require carbon removal), and negative emissions subsequently.

This ClimateWorks Futures CoLab exercise is not meant to predict specific futures that climate philanthropy must address now. Rather, it was designed to probe at the multiplicity of possible futures out to 2050. This will help all actors (researchers, analysts, advocates, campaigners, etc.) to stress-test strategies and programs against a range of scenarios and to see emerging trends that, regardless of precise outcomes, may affect future efforts at climate action. What strategies remain robust? How do these scenarios challenge current efforts? What specific challenges might be faced in different regions of the world in the different scenarios?

Common themes and conclusions

Across all futures, there is a clear case for an acceleration in the deployment of renewable energy, and distributed generation technologies are likely to become more and more diffuse. While past efforts at energy efficiency have lagged behind potential savings, this exercise shows that many key drivers toward energy efficiency may yet grow stronger over time. Strategies to support renewable energy and energy efficiency, appear robust across all futures explored and are likely to only become more fundamental to climate action over time.

We also see the importance of aligned economic and political conditions underlying all of the scenarios. Even if prices are such that cleaner options are the smarter choice, strong incumbents can promote fiscal and regulatory policy that supports emissions-intensive industries and energy sources, and erects barriers to prevent the transformation to a clean economy. As costs for low-carbon options continue to decline, we must remember that economics are a necessary but insufficient condition for widespread market adoption and a more sophisticated approach to the political economy of the transition is required.

The shift to clean low-carbon transportation systems looks likely to continue, though growing resistance from entrenched interests will continue to require diligent efforts to counter misinformation, inform key policy actions, and expand the coalition of interest groups demanding action. Further action will be needed to ensure legitimate concerns for equity, access, and labor are managed properly so that we can expand the co-benefits of this transition and convert would be opponents to clean transport advocates. Progress on the most carbon-intensive form of travel, flying, remains challenging across all futures, given the technological difficulty of decarbonizing the sector and the rapidly growing demand for air travel in some scenarios.

In all scenarios, we can assume a continued rapid progression of communications and information technologies—though the distribution of access to these technologies and their

8 Intergovernmental Panel on Climate Change (IPCC). “Global Warming of 1.5°C, an IPCC special report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of the strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty.” Draft version available online: <http://www.ipcc.ch/report/sr15/>

use differs markedly between more and less egalitarian scenarios, with different implications. We also see that some challenges of AI and automation, such as polarized labor markets and increased inequality, might ultimately be transformed into opportunities that require new approaches to just governance and the development of improved decision support systems and policies.

Even in those scenarios where a higher level of equality is assumed, we are still grappling with inequality within and between different cities or states. Global and local inequality creates grievances that can stymie action on longer-term efforts including climate change mitigation. In both of the scenarios where local and nationalist identities dominate, climate action becomes harder due to the failure of the global commons. There are still opportunities, however, for local, climate-positive actions due to the decentralized and local nature of some renewable energy supplies and more widespread deployment of low-cost sensor technologies that will provide real-time access to relevant data and information.

Finally, many of the trends identified in the process of developing this report are in fact responses to the climate impacts we are already beginning to see. Even for actors focused on climate mitigation efforts, it will be essential to pay attention to the early impacts of climate change and the geopolitical issues it will create in the coming years. The lines between economic drivers and climate drivers will only blur further in the future, and this is an evident threat across all scenarios in different ways.

Further questions for consideration

- What do these common themes mean for philanthropic strategies for climate change mitigation?
- What questions will require more attention and research in the coming years?
- How might developments in AI/automation lead to economic and societal dislocation, or to a new world of opportunity and efficiency gains?
- How much can/should climate mitigation philanthropy engage in just transition and equitable transition issues, and in what capacity?
- What risks might existing climate mitigation strategies face in a world with rapidly increasing and extreme inequality?"
- How might processes for making and shaping policy change in a world where the balance of power shifts among actor groups at multiple scales?
- What might be the implications for mitigation strategies in a future characterized by rapidly increasing consumption that exceeds current projections?
- What novel opportunities for decarbonization between now and 2050 emerged from this exercise?

APPENDIX

PROCESS AND PARTICIPANTS

The ClimateWorks Futures CoLab exercise was an online, interactive scenario development process that took place over four weeks, from July 9 to August 3, 2018. It included 154 participants from 38 countries. The purpose of the exercise was to explore possible futures that could emerge between now and 2050 and identify relevant implications for climate mitigation strategies and programs.

About the process

Participants engaged via a bespoke, facilitated online scenario process developed by the Futures CoLab team. In the first week, participants brainstormed drivers of change—factors with the potential to shape the world over the next 30 years. Participants submitted titles and short descriptions of drivers into one of six categories: social, technological, environmental, economic, political, and international relations. Given the large number of drivers submitted, the Futures CoLab team grouped drivers prior to week two.

In the second week, participants voted on the groups of drivers they thought would have the most significant impact on the future, regardless of probability. They also combined groups of drivers into storylines, short narratives about a possible future based on combinations that could co-occur or reinforce one another. After participants voted on the groups of drivers and contributed storylines, the Futures CoLab team developed scenario axes, each of which outlined how the world might develop in sharply different ways along a key dimension.

In week three, participants critiqued and refined these scenario axes, with substantial discussion occurring. These discussions, the central questions they raised, as well as the inputs from the first two weeks—in particular the storylines contributed during week two—provided the materials the Futures CoLab team used to sketch the outlines of five potential scenarios.

In the fourth and final week, participants fleshed out these five scenarios by responding to a set of guiding questions. The responses brought these potential future worlds to life in greater detail and also highlighted relevant implications for climate action strategies in general and climate philanthropy in particular.

About the participants

A total of 410 individuals were invited to participate, including many members of the Future Earth expert community as well as participants at the ClimateWorks Foundation 2050 Today event held on June 14-15, 2018. A total of 154 of these invitees agreed to participate from around the world, with a slight skew toward developed countries; more than 70 percent were from North America and Europe, with the remainder from Asia/Pacific, Latin America, and Africa (see Figure 3). The timing of the exercise during the summer holiday period made it difficult for many people who wanted to participate to engage. A variety of sectors were represented, including academia, civil society organizations, national labs and think tanks, business, and government (see Figure 4). Approximately one-third of participants were female and two-thirds male.

Figure 3. Participants by region

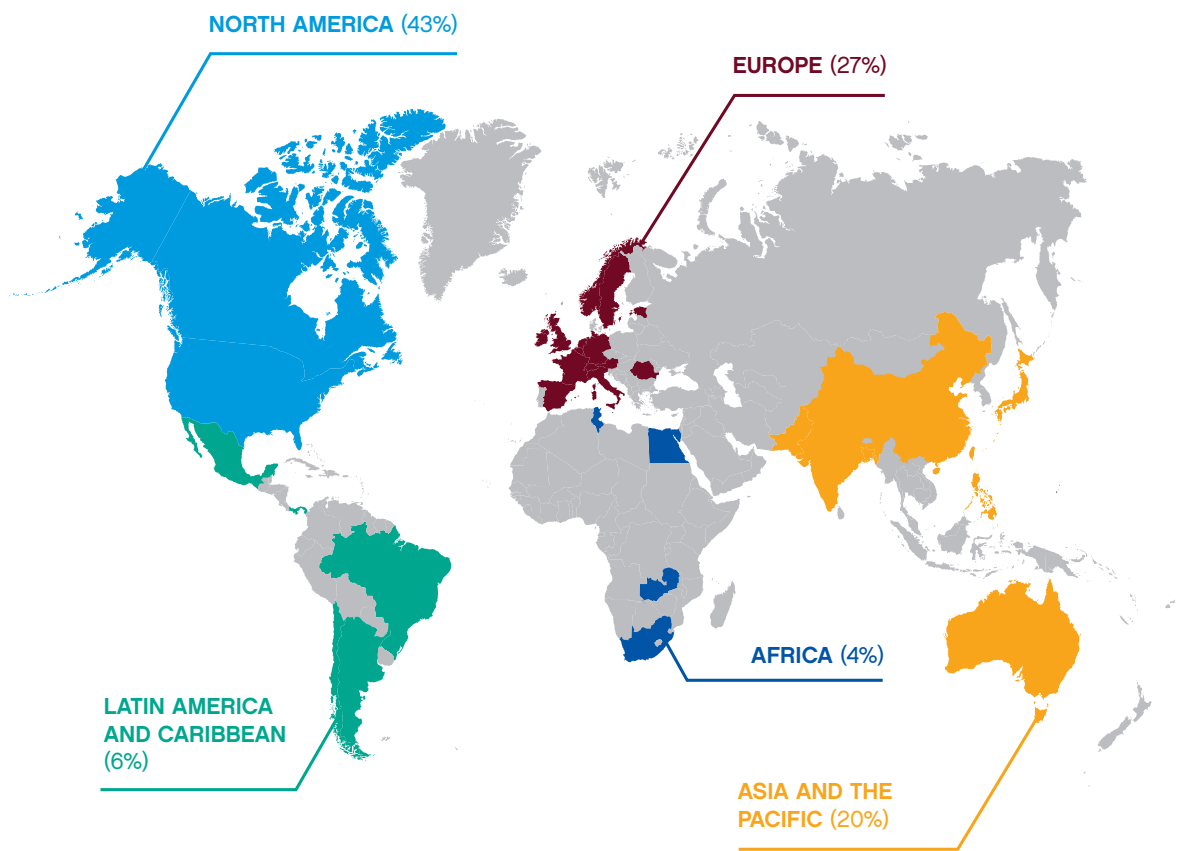
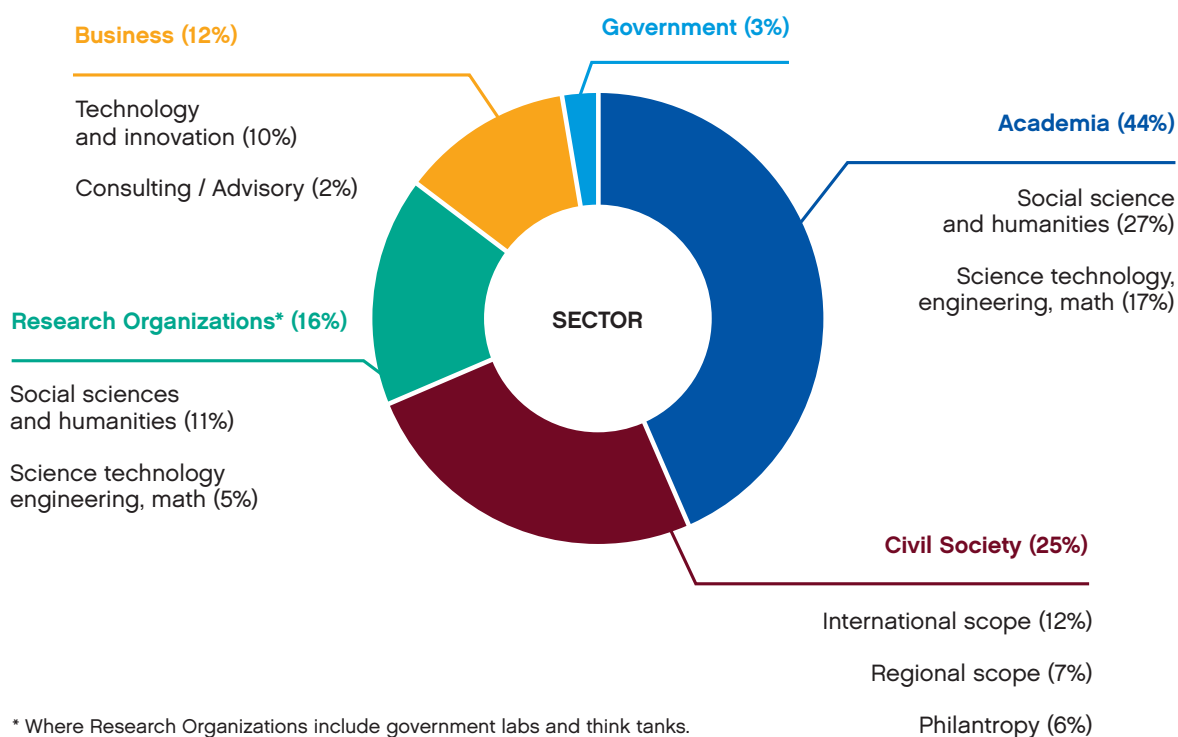


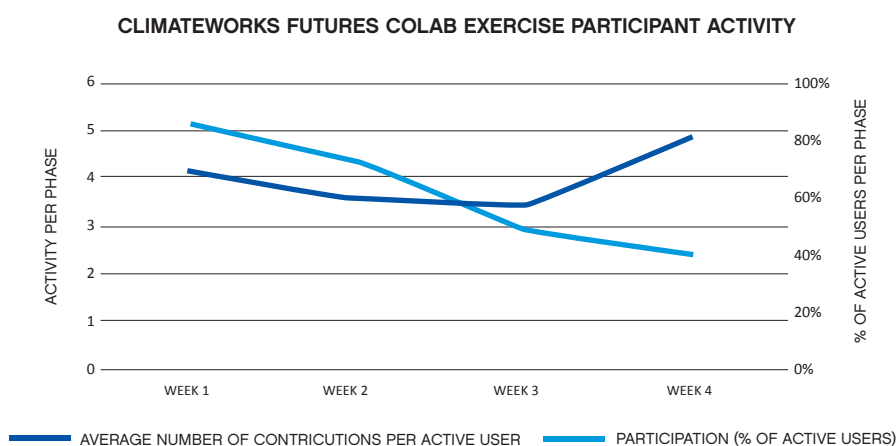
Figure 4. Participants by sector



Integrating multiple perspectives, from a diversity of participants, is a major advantage of conducting a scenario development exercise online. Participants from different walks of life provided very different inputs into the process at different stages. For example, in early phases, participants from developing countries tended to emphasize the central role indigenous and local knowledge should play in mitigation, the need for multi-scale approaches, and the potential for informal governance regimes to emerge in coming years.

Activity levels varied across the four weeks of the exercise. Analysis of active participants (those who contributed at least once during the four-week exercise, a group comprising 76% of participants) showed that nearly all contributed during the first week, with smaller numbers contributing during each subsequent phase (see Figure 5). The group that remained active during later parts of the exercise made an average of nearly five contributions each during the final week. The fall-off in participation may have been due to timing: the final two weeks of the exercise occurred during late July and early August, when many participants were on vacation.

Figure 5. Activity level across the exercise



Evaluation and feedback

Following up on the exercise, participants were sent an evaluation survey, and 27% responded. Over three-quarters of respondents reported that they spent more than one hour participating weekly, and approximately the same number enjoyed participating. Some comments included: *“the exercise [was] very participative and open, allowing a broad range of views to be considered,”* and *“it was interesting to see initial suggestions across a wide range of domains then filtered into a manageable set of considerations.”*

Though participants were satisfied overall, some suggested that the quality and quantity of dialogue between participants could be strengthened. One noted that “a deeper understanding would have been achieved having members discuss in real time via a chat channel.” and another proposed that future exercises could “shift toward commenting on others’ suggestions, rather than posting one’s own.”

LIST OF PARTICIPANTS

A partial list of participants in the ClimateWorks Futures CoLab exercise is provided below.

Prof. Imran Ahmad , Australian National University	Rebecca Herst , U. of Massachusetts, Boston	Prof. Roberto F. Rañola, Jr. , U. of the Philippines Los Baños
Carlo Altamirano , Arizona State University	Prof. Cecilia Hidalgo , U. of Buenos Aires	Prof. Christopher Rapley , University College London
Prof. Xuemei Bai , Australian National University and Beijing Normal University	Alice Hill , Hoover Institution	Prof. Mark Reed , Newcastle University
Marjory Blumenthal , RAND Corporation	Prof. Jochen Jaeger , Concordia University	Prof. Thomas Reuter , U. of Melbourne
Dr. Christopher Bren d'Amour , Yale University	Dr. Ravi Jain , Amazon	Dr. Isabel Rosa , Bangor University
Dr. Austin Brown , U. of California, Davis	Dr. Pedro Jaureguiberry , Universidad Nacional de Córdoba, CONICET	Dr. Bas van Ruijven , International Institute for Applied System Analysis
Prof. Stephen Chambers , London School of Economics and Political Science	Tim Johnson , Aviation Environment Federation	Prof. Marc Saner , U. of Ottawa
Dr. Sander Chan , German Development Institute	Dr. Ann-Kathrin Koessler , U. of Osnabrück	Dr. Michelle Scobie , University of the West Indies
Dr. Kung-Yueh Camyale Chao , International Climate Development Institute	Dr. Martin Kowarsch , Mercator Research Institute on Global Commons and Climate Change	Alicia Seiger , Stanford Steyer-Taylor Center for Energy Policy and Finance
Prof. William C. Clark , Harvard University	Amy Larkin , RESOLVE Energy Shift and Nature Means Business	Dr. Robert Simon , Protect Our Power
Prof. Maurie Cohen , New Jersey Institute of Technology and Tellus Institute	Sylvia Lee , Facebook	Navjot Bir Singh , Centre for Youth and Social Development
Hélène Côté , U. de Québec à Chicoutimi	Prof. Diana Liverman , U. of Arizona	Dr. Mark Stafford-Smith , Commonwealth Scientific and Industrial Research Organisation
Dr. Roger Cremades , Hemholtz-Zentrum Geesthacht	Dr. Michael Mastrandrea , Near Zero	Dr. Asuncion Lera St.Clair , DNV GL
Prof. Narendra N. Dalei , U. of Petroleum and Energy Studies	Dr. Nilson Ariel Espino Méndez , SUMA Arquitectos	Prof. Masa Sugiyama , U. of Tokyo
Dr. Paul Dewick , U. of Manchester	Prof. Marie-Jean Meurs , U. de Québec à Montréal	Dr. Joseph Tembo , Copperbelt University
Dr. Diana Dogaru , National Academy of Romania	Dr. Sergio Missana , Climate Parliament and Stanford University Santiago Program	Alison Tickell , Julie's Bicycle
Dr. Thomas E. Downing , Global Climate Adaptation Partnership	Ina Möller , Lund University	Nigel Topping , We Mean Business
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Dr. Jaqueline da Luz Ferreira , Instituto Escolhas	Prof. Normand Mousseau , U. de Montréal and Institut de l'Énergie Trottier	Brad Townsend , Center for Climate and Energy Solutions
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