Safeguarding our Global Commons

A Systems Change Lab to Monitor, Learn from, and Advance Transformational Change

SUMMARY

The coming three decades will witness dramatic change—for good or bad. If we fail to address climate change, the destruction of nature, and the social inequities that characterize our current economic model, we will be choosing a grim future. Alternatively, we have the choice of embarking upon a great reset that will lead humanity toward a healthier, more prosperous, more equitable, and more sustainable future. The decade of the 2020s will be decisive.

Moving onto the better path will not be possible through incremental shifts in policy and behavior. Achieving net zero emissions by mid-century and shifting to a "nature positive" path, while delivering the Sustainable Development Goals, will require enormous transitions across all major economic systems— energy, transportation, the built environment, food and rural systems, manufacturing, finance, and consumption.

In each of these areas, component transformations will be required. These range from the elimination of the internal combustion engine and solutions for the "hard-to-abate" steel, cement, and aviation sectors to the reform of the plastics industry and the restoration of 1 billion hectares of degraded land. It will also require the incorporation of climate and nature risks into all financial decisions and into the way we measure progress.

In all, there are perhaps 40 to 60 such "transformations." Given the scale of change required, we will need almost all of them to happen, and rapidly. Each will require a "system change" in the sense that they will generally necessitate government, corporate, and citizen engagement to overcome entrenched and vested interests in the existing system. They will require technological progress, policy changes, new accountabilities, and shifts in norms and behaviors.

Some of these transformations are already underway, and a few are progressing at a pace that enables positive tipping points to be crossed. Others are only just beginning, and some are stuck with little progress at all. Many of these transformations have expert communities supporting them, and some have vibrant multi-stakeholder leadership driving change forward.

But while there is information and activity in many areas, there is currently no focus on the overall picture. Which of these transitions are moving forward well? What are the hallmarks of successful transitions? How can lessons of success be transmitted across sectors? Which are the lagging transitions that require new approaches, political pressure, and greater urgency?

The proposed Systems Change Lab, a component of the Global Commons Alliance, is designed to address these questions. It will have three functions: monitoring progress made across each of the required transformations, distilling a rapidly evolving understanding of what constitutes and promotes systems change, and identifying critical gaps and mobilizing support for coalitions as they push toward tipping points to realize a more sustainable, equitable future.

The proposed Lab will be established in partnership with a network of leading institutions and will be guided and supported by a group of leading figures across the range of sectoral transitions, including political, corporate, nongovernmental organizations (NGOs), and scientific change agents all committed to dramatically accelerating these transformations

The inception phase of the Systems Change Lab was made possible by the generous support of the Global Environment Facility and builds upon the foundation of Steer, Waughray, et al. (2016), as well as discussions held under the Global Commons Alliance.

THE TRANSFORMATIONS WE NEED

We are living through a change of historic scale and scope. It is as significant as the change from hunter-gatherer to farmer, from farmer to machinist. Today, change is driven by technology and globalization. Today, we also face a convergence of crises. From unabated climate change and accelerating biodiversity losses to rising inequality and pervasive hunger, there is a burning need to address these crises.[1]

To avoid the worst climate impacts and build equitable, prosperous communities, we must ignite widespread change across our global systems: how we grow food, build cities, power industries, and move around. We must overhaul consumption patterns, financial systems, and economic policies, as well as how we plan for the future and measure progress. And if they are to be socially viable, these transformational changes must also improve equity and social inclusion.

More specifically, we must halve greenhouse gas (GHG) emissions in the next decade, halve them again between 2030 and 2040, and reach net zero emissions by mid-century. We must also end the destruction of the natural world and become "nature positive." As Christiana Figueres' Mission 2020 initiative states, we must imagine the future if we are to realize the radical change we need.[2]

We are at a crossroads. If we continue to invest in yesterday's economy, change will wash over us, undirected and unhinged. Global temperatures will rise, species will continue to be lost at a rate that is a thousand times the natural rate, and ecosystems will forever disappear. Alternatively, we can harness change and shape it to solve the world's greatest social and environmental challenges—to reduce poverty and hunger, to expand nutrition and energy access, to deliver equity and justice, and to safeguard our forests, land, fresh water, the ocean, and the climate.

In shifting to new development paths, we must address the fundamental drivers of today's environmental destruction, and do so in a way that enhances human well-being, creates new jobs, and strengthens equity.

Tables 1 and 2 summarize the major transformations required to achieve this future. For illustrative purposes and to encourage discussion, we identify nearly 50 specific shifts, but different taxonomies are clearly possible. Some of these transformations are "sectoral" in nature, calling for fundamental shifts in how we power our economies, produce goods and services, run our financial systems, and manage our land, waterways, and the ocean, and run our financial systems (Table 1). Others are broader imperatives, such as the way we measure progress, deliver services, ensure equity, and govern our shared Earth system (Table 2). This second group of transitions not only underpins the first set, but also sets conditions on how transitions must take place. Thus, for example, the radical shifts needed to protect nature, for example, must be undertaken in a manner that is just, inclusive, and enhances the well-being of vulnerable people. Put together, these shifts can transform the major systems that define humanity's relationship with the natural world.

Table 1 | Sectoral Transformations[3]

ENERGY

- Double the rate of improvement in energy efficiency
- Electrify transport, industry, and heating
- Decarbonize power
- Drive down the cost of energy storage
- Develop new fuels (e.g., hydrogen) and solutions for hard-to-abate sectors
- Scale up carbon removal and carbon capture and storage

TRANSPORT

- Eliminate the internal combustion engine
- Transition to new zero- or low-emissions fuels for heavy transport, shipping, and aviation
- Shift from road to rail and shipping
- Shift to public and shared transport, and to biking and walking

LAND, FOOD, AND FOREST MANAGEMENT

- Protect 30% of forests and other land by 2030
- Restore degraded landscapes
- Manage land sustainably to increase yields 40% by 2050 without expanding agricultural land or degrading ecosystems
- Halve food loss and waste by 2030
- Shift diets and ensure equitable access to nutritious food to feed 10 billion people by 2050
- Ensure supply chains are sustainable, including localizing value chains where possible
- Avoid overexploitation of terrestrial species
- Stop invasive species

OCEAN MANAGEMENT

- Ensure 30% of the ocean is fully protected by 2030
- Sustainably manage fisheries and aquaculture and avoid overexploitation of marine species
- Sharply reduce marine litter and pollution
- Stop invasive species

CITIES AND THE BUILT ENVIRONMENT

- Adopt compact urban design and transit-oriented development
- Ensure all new buildings are net zero carbon by 2030 and all existing buildings are decarbonized by 2050
- Shift to transport modes that have zero emissions and zero road deaths
- Transition to zero waste cities
- Make cities resilient

SUSTAINABLE PRODUCTION AND CONSUMPTION

- Adopt circular product design, production systems, and supply chains
- Use pure, nontoxic, and regenerative materials (e.g., in products and systems)
- Shift to circular business models and a sharing economy
- Shift consumption patterns to reduce waste and overconsumption

FINANCIAL SYSTEMS

- Measure, disclose, and manage climate and other types of environmental risks
- Scale up public climate finance
- Unlock private investment in sustainable infrastructure
- Extend financial services to underserved groups
- Price GHG emissions and other environmental externalities
- Eliminate harmful subsidies

FRESHWATER MANAGEMENT

- Perform comprehensive water assessments and management
- Radically improve water efficiency
- Protect and restore freshwater systems
- Avoid overexploitation of freshwater species
- Stop invasive species

Table 2 | Cross-Cutting Transformations Underpinning Sectoral Transformations

MEASURING PROGRESS

- Leverage the digital revolution and improve data systems, including tracking equity of progress
- Advocate for and accept new measures of progress

INCLUSION, EQUITY, AND THE JUST TRANSITION

- Provide universal access to basic services and opportunities
- Shift to defining prosperity by inclusive well-being
- Shift to a new decision-making model, with more inclusive and community-driven leadership

GOVERNANCE FOR THE GLOBAL COMMONS

- Make the global architecture (e.g., the United Nations, international agreements, multilateral development banks, and the World Trade Organization) more fit-for-purpose to address challenges
- Reset the social contract between government, corporations, and citizens

DELIVERING TRANSFORMATIONS

There is good news about the transformations that are required—we now know that they are possible, technically and economically. Recent evidence and research have introduced a new economic narrative, in which the language of costs and trade-offs has been replaced by that of benefits and opportunities for better lives and livelihoods.

Smart climate policies, for example, have been shown to drive greater resource efficiency, induce new technologies, and reduce risks. Combined, these can lead to greater economic dynamism, more jobs, better health, and a much better quality of life. The New Climate Economy, for example, has shown that bold climate action could yield US$26 trillion in economic benefits through 2030 compared with a business-as-usual approach.[4] Even the hardest to abate sectors have recently been found to be less hard than previously thought. The Energy Transitions Commission has demonstrated a pathway to reach net zero emissions by mid-century at a cost to the economy of less than 0.5% of global income.[5]

Almost all the transformations listed in Tables 1 and 2 require coordinated changed behaviors from a range of actors—governments, corporations, and citizens— across systems. Other drivers are also typically at play, such as technological progress, policy changes, and new accountabilities.

What Is Systems Change?

Put simply, a system represents a configuration of interdependent, interacting elements that work together to generate a particular outcome (e.g., how we produce food, how we move around the world, or how we power human society).[6] Systems change is a fundamental, sustained shift or a series of smaller changes that, taken together, disrupt the status quo system and lead to the formation of a new path.[7] Academics across disciplines, from biology to the social sciences, have analyzed this concept extensively, contributing to a well-established body of literature on systems change. Recently, experts have begun to connect findings from this work to today's environmental crises, identifying the systems changes needed to realize a more sustainable, equitable future. Some of their papers explore systems change within individual sectors or roles that specific decision-makers can play in driving these transitions, while others focus on transformations needed to achieve much larger changes.

Arbib and Seba, for example, argue that "we are on the cusp of the fastest, deepest, most consequential transformation of human civilization in history, a transformation every bit as significant as the move from foraging to cities and agriculture 10,000 years ago." Analyzing past disruptive changes, they offer a roadmap to avoid societal collapse and leverage this immense paradigm shift to benefit human society.[8] Victor et al. also synthesize the processes by which systems change have historically unfolded—starting with the advent of new technologies, followed by the diffusion of these innovations throughout markets,

and eventually, the reconfiguration of socioeconomic systems. This paper specifically applies these historical lessons to today's low-carbon transition, highlighting levers that governments and businesses can pull to accelerate deep decarbonization across high-emitting sectors.[9] Like Victor et al., the World Business Council for Sustainable Development examines past systems change to identify factors that spark and sustain transformation, outlining steps that businesses can take to steer the world toward a sustainable, equitable future by 2050.[10] Sachs et al. identify six transformations across social, political, and economic systems needed to achieve the Sustainable Development Goals and the Paris Agreement, and describe actions that

governments, businesses, civil society, and scientists must take to enable these transitions.[11] Grady et al. focus on how funders can support and evaluate strategies that drive these systems changes,[12] while Waddell identifies six lessons for enabling transformations by assessing existing environmental initiatives along two dimensions—their focus on destroying old paradigms or creating new systems and to what extent they prioritize confrontation over collaboration.[13]

Although definitions of systems change vary across these new studies, it is perhaps useful—at the risk of oversimplification—to describe a real example to illustrate the concept (Box 1).

Box 1 | An Example of Systems Change: Making Palm Oil Sustainable

Together, Indonesia and Malaysia produce 85% of the world's palm oil. Cultivation of this commodity drives tropical deforestation across Southeast Asia, accounting for nearly half of all tree cover loss in Indonesia from 2003 to 2015, and more than two thirds in Malaysia.[14] At first glance, solving this problem may seem quite simple: rather than cut down rainforests to make way for palm oil plantations, farmers could sustainably grow this commodity across millions of hectares of degraded land.[15] And with the right support, smallholders could employ existing technologies and practices to significantly increase productivity.[16] But a deeper look reveals that, absent a palm oil substitution, transitioning to sustainable palm oil poses a more complex challenge—one that will require mutually reinforcing actions undertaken by a wide range of actors around the world.

Thus far, this problem has proven intractable, with governments, corporations, international agencies, and organizations all investing considerable resources into sustainable palm oil. Yet these individual efforts, well-meaning as they may be, have failed to crack the issue. Instead, they have complicated efforts to govern the palm oil sector.

A permanent solution—one that halts deforestation, safeguards human rights, and shrinks the yield gap between larger-scale plantations and smallholders—will require a realignment of incentives, behaviors, and norms across the global value chain.[17] Consumers, retailers, manufacturers, traders, plantation owners, smallholder farmers, and central and local governments must work together to pursue a combination of actions.

Financial markets and importing countries' trade policies must reward deforestation-free, conflict-free palm oil. National governments should work with companies to standardize sustainability certification standards, as well as with local communities and civil society to strengthen tenure security and simplify processes to formalize land rights.[18]

Enforcement, often a missing link, cannot be overlooked. Local governments will need financial, technical, and human resources to monitor and enforce sustainable palm oil commitments, while scientific organizations should independently track deforestation and assess its links to palm oil production.

None of these agents can solve the problem alone, and there is no silver bullet. Collective action is needed to force the entire oil palm system to flip and create irreversible change.

The context for radical systems change today is mixed. On the positive side, there is greater leadership from the private sector and citizens than ever before. More than 1,000 companies have committed to decarbonize their supply chains (accounting for 7.7 gigatons of carbon emissions) in line with the Science-Based Targets initiative.[19] Citizens, often led by youth organizations, such as Fridays for Future[20] and the African Youth Initiative on Climate Change,[21] are demanding action with a vigor not seen since the first Earth Day half a century ago. Governments' policies are improving, but are nowhere near close to the pace required. The nations of the world appear ready to commit to protect 30% of all land and sea areas. A hundred and four countries have stated their intention to enhance ambition or action in their nationally determined contributions by 2021, and the European Union, Japan, and 20 other countries have committed to reach net zero emissions by 2050.[22] China—the world's largest single emitter of GHGs—has recently pledged to reach net zero emissions by 2060.[23] And roughly a quarter of total global emissions are now under a mandatory, albeit much too low, carbon price.[24]
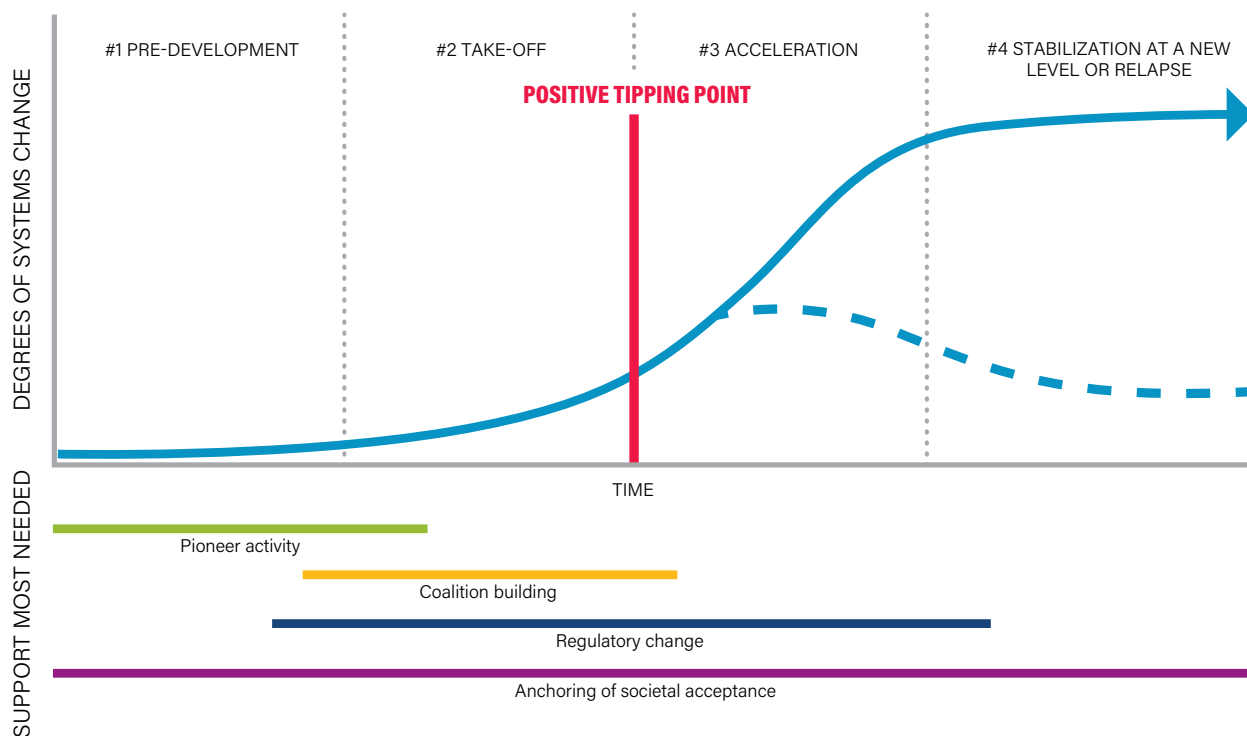
THE INGREDIENTS OF SYSTEMS CHANGE

The process of systems change, particularly those involving technological change, often follows the shape of an "S"—an irregular curve that depicts change occurring at different rates during different stages (Figure 1). Shifts that may seem impossible at first can quickly develop momentum and reach a tipping point at which they become the new normal.[25]

These successful paradigm shifts tend to ratchet up ambition over time, become more durable and difficult to reverse, and expand to impact a greater proportion of the population.[26] They also address the root causes of today's challenges and radically alter a system's current behavior.[27]

Yet the risk of relapse exists at any point along the curve, with the probability of reversal declining as the new system takes root. Ideally, interventions will be designed and implemented in ways that increase the odds of than (e.g., those beneficiaries of new green jobs), thereby strengthening the stability of the new system.

Figure 1 | Phases of Systems Change

Source: Adapted from ICAT 2020.

Historically, systems change has emerged from the convergence and interaction of many enabling factors. Although the precise ingredients of transformational, often nonlinear, change vary, some elements appear to be common. In one taxonomy, four sets of drivers are used to explain system change: agents of change, innovations, policies and institutions, and behavior change and social norms (Box 2).

In short, systems change is not about finding a single silver bullet; it's about consciously creating the right conditions for many forces to align. These drivers of change must come together in ways that expand the benefits of systems change beyond its initial advocates to reach new populations. Doing so can establish positive feedback loops that cultivate lasting, widespread support for the new paradigm.

It is also important to note the critical role that exogenous forces—unforeseen events and crises—play in systems change. They have the potential to create "wormholes" to transform our politics, policies, communities, and behavior. We must be prepared to seize these opportunities.

Box 2 | Ingredients of System Change

CHANGE AGENTS: Sustained, engaged leadership from governments, businesses, and civil society often drives systems change. While these champions can be found at the helm of governments, institutions, and companies, they need not be. Scientists, civil society and community leaders, entrepreneurs, and investors can also create effective movements and unleash change. Multi-stakeholder coalitions are often a powerful force, uniting leaders across sectors and levels of decision-making to both accelerate and sustain paradigm shifts.[28] Those who benefit from these transformations represent another yet critical constituency. Solar panel producers, for example, will advocate for the continued expansion of renewable energy and resist attempts to return to fossil fuels. Policies that expand the number of these beneficiaries deepen support for systems change.[29] In short, we need a *new* set of vested interests.

INNOVATIONS: From developing plant-based meat substitutes to establishing pay-as-you-go solar lighting schemes, technological gains can spur systems change.[30] These innovations, which broadly include new practices, approaches, and techniques, depend on society's knowledge base and skills. Investing in education, research and development, as well as networks that facilitate collaboration among experts, creates a strong foundation for innovation, while supporting pilot studies, experimental trials, and demonstrations enables early uptake of new solutions. Reaching a critical mass, however, often requires policies that help accelerate diffusion.[31]

POLICIES AND INSTITUTIONS: Change requires the right incentives and disincentives established through policies, laws, and regulations, and enforced by strong institutions. Tax rebates and increased access to low-cost finance can enable more sustainable decisions and behaviors, while carbon taxes, the elimination of fossil fuel subsidies, and import duties on high-emissions goods can discourage investments in business-as-usual growth. Retraining workers formerly employed in damaging sectors can ease disruptive transitions, and granting ownership of natural resources to local communities can spur conservation. In all of this, strong institutions play a critical role.[32]

BEHAVIOR CHANGE AND SOCIAL NORMS: Definitions of what is acceptable behavior can shift quite rapidly and can be transformative. Smoking in public is an example. Clear, actionable communication—messages from trusted sources that convey what's at stake and what must be done—deepens collective understanding and can change action. New understanding from behavioral science can "nudge" beliefs and actions. The COVID-19 pandemic is reminding us all that even seemingly small changes in behavior, such as wearing a mask or washing one's hands, can significantly affect the fates of nations. Together, increased awareness and behavior change, often cause shifts in social norms that underpin systems change.[33]

THE SYSTEMS CHANGE LAB

The transformations listed in Tables 1 and 2 are at very different stages of change. Some are accelerating more rapidly than anticipated (e.g., wind, solar, and plastics), although the pace is still not adequate, while others remain stubbornly off track (e.g., energy efficiency and new measures of progress). The annex provides a simple description of some of these transitions, illustrating the importance of the various drivers of change discussed in Box 2.

Given the imperative to accelerate these transitions, it is important that progress be measured, that the ingredients of change be understood and shared, and that coalitions for change be created, supported, and made accountable.

In view of this, the proposed Systems Change Lab would deliver on three interrelated objectives:

1. **Monitor.** There is great activity in some areas, and some good data, but the big picture of how and when we are poised to cross necessary positive tipping points is unclear. We need to take stock of where change is accelerating, or failing, on a regular basis.

2. **Learn and share.** We need to understand the ingredients for transformational change, what is working, what isn't, and why. We need to then share those lessons with the key change agents who can drive action.

3. **Nudge.** We need to identify where progress is weak—and then mobilize and equip messengers and coalitions to accelerate action.

In all these areas, the Lab would work closely with existing institutions and coalitions that are already deeply engaged in driving action.

Monitoring

Currently, there is no aggregator for measuring progress across all required shifts. Although efforts to track some of them exist, data gaps remain. Monitoring should focus primarily on outcomes (e.g., in the case of forest restoration, hectares restored), but it is also important to take stock of the forces that drive outcomes (e.g., land tenure rights, financial policies, political processes, and coalitions for change) if lessons are to be learned and progress unlocked.

The Systems Change Lab, partnering with data providers, will develop a tracking platform where required shifts across systems, and their drivers, will be monitored on a regular basis. For example, a recent paper (Lebling et al. 2020) has found that of 21 indicators related to realizing a 1.5°C trajectory, only two are on track to realize 2030 and 2050 global benchmarks. The Systems Change Lab would monitor our progress towards such indicators and many others, providing the first complete picture of progress. It will provide compelling evidence of major progress aligned with science (transformations in acceleration), identify gaps to address (transformations at risk), and reveal trends across systems.

Initial steps will involve identifying key indicators and benchmarks for each of the transformations listed in Tables 1 and 2, as well as those that support multiple transformations; identifying the most complete, accurate, and open source datasets associated with each indicator; and reaching out to organizations developing these datasets so the Lab can establish partnerships for data sharing. It should be noted that some of the transformations listed in Table 2—for example, the "just transition"—may not be monitored as stand-alone transformations but, rather, may not be monitored in the context of the transformations in Table 1, given that they underpin each sectoral transformation.

The monitoring system will be designed to provide information in different ways for a variety of users. It will also be portable (i.e., allows the data to be accessed in different places where it can meet users where they are). It can be integrated with the Global Commons Alliance's Earth Dashboard data. In the future, the Lab may be able to combine these data with real-time data that track political and societal realities on the ground. Later phases could also focus on monitoring at national and regional levels in key geographies.

Learning and Sharing

The Systems Change Lab will aim to instill confidence that systems change is possible. There have been tremendous gains in academia and elsewhere in understanding systems change, including the drivers of historical systems change, and we will by no means duplicate this work. However, we face several challenges. The literature on systems change is not always translated into an accessible language for decision-makers. There are also gaps in understanding the drivers of reaching tipping points for recent exponential changes, such as the rise of the youth climate action movement or public consciousness about plastic pollution.

The Systems Change Lab will address these gaps and translate the information into compelling narrative. In doing so, the Lab will partner with leading researchers and institutions to highlight case studies of historical systems change, drawing out ingredients of change in an accessible manner. Initial steps will be to determine case study research principles, especially in regard to making any claims about causality, to select criteria for identifying case studies, and to establish partnerships with researchers. Future phases could involve commissioning new research on a thematic basis (e.g., systems change in ocean management).

The Lab will also develop an annual "How Goes the Battle?" report that assesses the state of progress on the required transformations and provides clear, actionable data findings, accompanied by compelling data visualizations, that will depict the progress made and distill the ingredients for such change, the gaps that remain, and the major leaders and laggards.

Nudging and Campaigning

The Systems Change Lab will conduct outreach, engagement, and communication activities to bring findings from its monitoring and learning activities to help support many existing coalitions in their efforts to campaign and nudge. In doing so, it will help identify where there are gaps and work with partners to fill those, and co-ordinate around major

moments to ensure impactful engagement that can help accelerate the transformations. These critical moments and processes include, in the immediate term, the upcoming COP15 (biodiversity) and COP26 (climate change), High-Level Champions dialogues under the United Nations Framework Convention on Climate Change, the World Economic Forum (WEF), Food Summit, World Cities Summit, United Nations General Assembly, and Stockholm+50, among others.

For the transformations at greatest risk, the Systems Change Lab will partner with leading thinkers, coalitions, and funders, and will use a variety of means to assess gaps and barriers and to map the actors affecting each transformation. For example, the Lab will conduct systems mapping to better understand the various actors, relationships, vested interests, drivers, and barriers in select systems.

Complementing this exercise, through participatory dialogue and working with partners, the Lab will seek to identify solutions that will be transformational—that is, they will increase support over time, ratchet up ambitions to accomplish change, and become more durable. The Lab will also identify possible disruptors that could unlock systems change and will enlist top leaders and champions to advocate for such changes. All these efforts will be strengthened by strategic communities and outreach targeted to reach key actors and networks as we work toward major events and key moments.
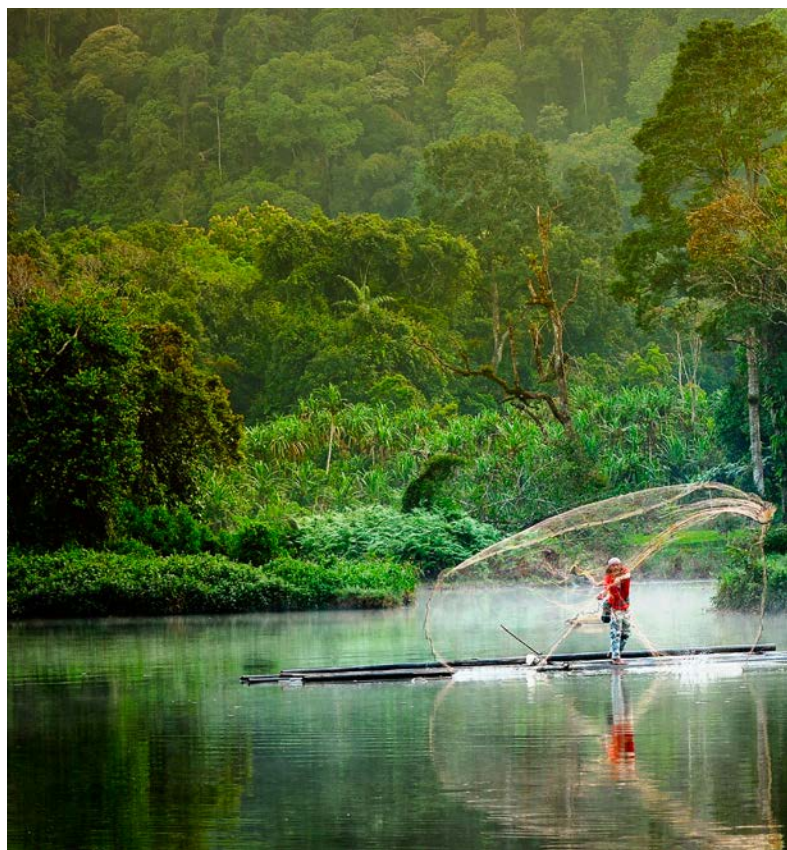
Governance of the Systems Change Lab

Throughout, the Systems Change Lab will work with diverse and visionary high-level champions and coalitions and rigorous technical experts who will together provide the intellectual firepower behind the operation. Top data providers can help us track progress toward the required transformations. Leading researchers can help distill and communicate drivers of change. Coalitions and champions can help us drive greater action.

In practice, this will entail several working groups and a Leadership Councill to ensure that the Lab is greater than the sum of its parts. More specifically, we will establish working groups for each of the broad sets of transformations, described in Tables 1 and 2, with a diversity of participating organizations. Working groups will validate indicators and dataset selection for the monitoring of transformations, select benchmarks and case studies, and will help develop influence strategies..

A high-level Leadership Council will help guide and advise the Systems Change Lab's efforts. We will work with leaders of coalitions to learn from them about what has successfully driven system change, hypothesize about what could trigger and sustain change in the future, and foster learning across systems.

The next phase of our work will be to identify such partners. We hope they would include leaders from broad-based organizations such as the Global Environment Facility, WEF, World Business Council for Sustainable Development, multilateral development banks, and the United Nations; specific coalitions for change in key sectors, such as the Energy Transitions Commission, C40 Cities, the Food and Land Use Coalition, and the Platform for Accelerating the Circular Economy; and leading NGOs and academic institutions, such as the World Wildlife Fund (WWF), the International Union for Conservation of Nature (IUCN), the Energy and Resources Institute, Potsdam Institute for Climate Impact Research, the University of Tokyo, Tsinghua University, and others. The Lab would thus have a distributed ownership model, in which these institutions would lead convenings and select research efforts. WRI and WEF have agreed to play a coordinating role.

CONCLUSION

An historic global reset is necessary and possible in this decisive decade. The current COVID pandemic may have opened the door to accelerate the shifts already underway. To achieve this, we need to take a hard look at our collective approach to addressing these urgent challenges. We need to work smarter and faster. We need to understand which interventions and movements are working, which aren't, and why. We need to then rapidly deploy resources to those initiatives poised for success and revise our approach where efforts are insufficient.

That's why we need a virtual "situation room" that monitors, learns from, and accelerates transformational change across key systems. Some of the shifts are already widely understood, with well-established coalitions of experts and decision-makers seeking to advance them. But for others, this is not the case. What's more, there's no single place where these shifts are tracked and totaled, where lessons can be learned and gaps identified.

We conclude by offering a way forward—a new Systems Change Lab for our world, in association with the Global Commons Alliance. This lab will act as a lighthouse for change agents working to address long-term structural challenges and will shine a spotlight on all leaders and laggards, illuminating the path forward for all the world to see.

ANNEX

Renewable Energy: We are fast approaching a tipping point for renewable energy generation and, before long, for energy storage, driven mostly by cost reductions—in turn driven by public policy. Coal-fired power is currently not competitive economically in many regions, and solar and wind energy now provide the cheapest power for 67% of the world.[34] The private sector is starting to see the benefits of shifting away from fossil fuels. Expanding power generation from renewables could produce $650 billion in business opportunities annually by 2030, as well as create millions of new jobs around the world.[35] A number of coalitions are working to decarbonize the power sector, including the Energy Transition Commission, the Deep Decarbonization Pathways Project, RE100, the Powering Past Coal Alliance, the Just Transition Centre, and the Platform for Coal Regions in Transition; there are significant efforts by the International Energy Agency and the International Renewable Energy Agency, and more at regional and national levels. However, globally we are far from having a large share of intermittent renewables power the grid. In 2018, solar energy accounted for just 2.1% of global power generation, while wind energy accounted for 4.8%.[36] And at the same time, fossil fuel subsidies are not being phased out fast enough.[37]

Energy Efficiency: If countries around the world adopted the right mix of energy efficiency policies over the next two decades, in line with the energy efficiency target of Sustainable Development Goal 7, they could deliver 40% of the GHG emissions cuts needed to achieve the Paris Agreement without any new technologies. Yet progress has stalled. Annual energy intensity rates have been declining gradually since 2015. In 2018, for example, they decreased at a slower rate (1.2%) for the third consecutive year. Public policy measures have struggled to establish and implement mandatory energy efficiency policies to reduce final energy use.[38] Several international alliances, many of which involve public-private sector collaboration, have formed to accelerate global efforts to improve energy efficiency. The Three Percent Club, a coalition of 15 countries and more than a dozen businesses and institutions, focuses on deploying existing efficiency technologies, while the Energy Efficiency Global Alliance and Global Commission for Urgent Action on Energy Efficiency present examples of multi-sectoral leadership initiatives. The Global Energy Efficiency Accelerator Platform of Sustainable Energy for All also seeks to scale up energy efficiency policies, actions, and investments.[39] Other sectoral initiatives and national agencies are also providing critical data and analysis that feed into global efforts. Key players include United for Efficiency, the Global Fuel Economy Initiative, the Industrial Energy Accelerator, the Building Efficiency Accelerator, the District Energy Initiative, the Global Alliance for Building and Construction, and the Cool Coalition.

Electric Vehicles: Internal combustion engines account for about 10% of GHG emissions globally and lead to air and noise pollution with significant health impacts.[40] Although some countries have made commitments to phase out conventional cars, the automobile market has not made the dramatic shift necessary to see substantial change. Yet significant progress to advance electric vehicles (EV) is underway in some countries. Between 2014 and 2019, the average annual growth of the EV market was 60% (and battery price has decreased by 85% since 2010).[41] To help generate this market growth, a number of entities—at least 66 countries, 71 cities or regions, and 48 companies—made announcements and adopted plans to phase out internal combustion engines and shift to zero-emissions vehicles.[42] Companies have banded together in groups, such as the Corporate Electric Vehicle Alliance and EV100, to make EVs more competitive in the market in terms of both cost and variety of models.[43] Organizations such as the International Council on Clean Transportation are providing grassroots organizing, research, and policy support for the elimination of internal combustion engines. As of 2019, 23 automobile manufacturers had introduced electric car models and set EV sales targets that were largely motivated by governments' strong policy signals (e.g., in China and Norway).[44] But deploying EVs at scale will require advances in new charging infrastructure, policy incentives, and tax credits.

Hard-to-Abate Sectors: So-called hard-to-abate sectors include heavy-duty transport (shipping, aviation, and heavy-duty road transport), and heavy industry (steel, chemicals, cement, and others). Across these sectors, companies rely on high-temperature heat or high energy density to power their operations— energy needs that electricity cannot easily replace; hence the term hard-to-abate. Together, these sectors account for almost a third of global annual carbon dioxide emissions, and they are expected to grow from 10 gigatonnes in 2019 to 16 gigatonnes by 2050 if current trends continue.[45] Encouraging research and development efforts, demonstration of industrial-scale projects, infrastructure investment, and early market and policy support are needed to realize this transition.[46] These can be complemented with a boost in consumer or institutional demand for greener materials (e.g., so-called green steel or green cement) through information campaigns or government procurement policies. Key coalitions are emerging to demonstrate that greening hard-to-abate sectors is feasible and not as expensive as was thought. The Energy Transitions Commission has conducted extensive research on these sectors, for example, and published the findings in its *Mission Possible* report. The European Clean Hydrogen Alliance and the coalitions such as the Clean Cement and Concrete Coalition, the Net-Zero Steel Initiative, and the Collaborative Innovation for Low-Carbon Emitting Technologies in Chemicals are working to lower emissions in hard-to-abate sectors.

Tropical Forest Supply Chains: Agricultural expansion is the primary driver of deforestation and forest degradation globally. Over the past three decades, the world has lost 420 million hectares of forest, and since 2015, an estimated 10 million hectares of forest have disappeared each year.[47] Commercial activities account for about 40% of this deforestation across developing countries, with just four commodities—beef, soybeans, palm oil, and wood products—responsible for nearly 113 million hectares of tropical forest loss from 2000 to 2012.[48] As conversion of forests into pastures, plantations, and croplands continues, so too do biodiversity losses, increases in carbon emissions, and the displacement of local communities. Protecting the world's remaining forests, as well as mitigating these harmful impacts, will require the private sector to eliminate deforestation from global supply chains.

Already, more than 480 companies with deforestation risks across their food and fiber supply chains have made 850 commitments to reducing deforestation associated with at least one commodity.[49] Yet most of these pledges, many of which were made in the context of the New York Declaration on Forests, the Consumer Goods Forum Zero Net Deforestation Commitment, and the Tropical Forest Alliance 2020, lack ambition.[50] Time-bound, verifiable, and zero-deforestation commitments that cover all of a company's commodities, sourcing regions, suppliers, and operations are needed to eradicate deforestation from supply chains. But less than 8% of 400 major companies' pledges align with this gold standard, and the majority of businesses have failed to set traceable, time-bound, and robust targets.[51]

Most commitments instead employ a combination of external guidelines and internal policies that establish conditions, incentives, or disincentives for upstream actors within companies' supply chains. Common tools adopted to achieve these pledges include securing certifications, such as those from the Forest Stewardship Council and the Roundtable for Sustainable Palm Oil; negotiating public-private agreements, including geographic moratoria such as the soy moratorium in the Brazilian Amazon; or creating company-specific sourcing criteria in sectors without certifications. But this diversity in strategies—and in how companies define deforestation-free supply chains—poses challenges to suppliers, who must now manage myriad complex procurement, traceability, and engagement approaches. Vague pledges and limited assistance for producers, particularly smallholders or small- to medium-scale growers, have also delayed implementation.[52] In fact, none of the most influential companies with forest-risk operations will fulfill their commitments to eliminate or reduce deforestation from their supply chains by 2020.[53]

Insufficient voluntary reporting, poor transparency, and a lack of common performance metrics currently limit efforts to assess existing pledges' implementation and subsequent impacts. New tools that monitor, verify, and report on companies' progress are fast emerging, including the Accountability Framework Initiative, Global Forest Watch Pro, the Proforest Soy Toolkit, the Sustainable Palm Oil Transparency Toolkit, and the Transparency for Sustainable Economies' (Trase) tool. Institutions involved in these efforts include CDP, Climate Focus, Forest Trends, Global Canopy (particularly its Forest 500 and Supply Chain Transparency Network initiatives), The Nature Conservancy, the Stockholm Environment Institute, the Tropical Forest Alliance, WRI, and WWF. But a comprehensive global assessment of supply chain commitments' impact on deforestation rates does not yet exist. Without this information, today's progress reports instead tally the total number of deforestation-free commitments and analyze companies' levels of ambition within these pledges.[54] Thus, significant data constraints and existing uncertainties limit the ability to assess progress toward this transition.

Landscape Restoration: Terrestrial ecosystems sequester almost a third of all anthropogenic carbon dioxide emissions, making it impossible to limit global temperature rise to 1.5°C absent a paradigm shift in how we manage land. In addition to halting deforestation and protecting forests and lands, we must restore our landscapes to improve air and water quality, control soil erosion, protect biodiversity, and sequester carbon. Across developing countries, restoration can raise smallholders' incomes by $35 billion to $40 billion annually within the next 15 years.[55]

The New York Declaration on Forests calls for restoring 150 million hectares of degraded lands by 2020 and 350 million hectares by 2030. It is estimated that meeting the 150 million hectare restoration goal alone would bring $85 billion per year in net benefits.[56] The Bonn Challenge includes almost 60 pledges from countries, subnational jurisdictions, and companies. Regional restoration initiatives, such as the African Forest Landscape Restoration Initiative and Initiative 20x20 in Latin America and the Caribbean, also contribute to meeting the Bonn Challenge goal. However, restoration is often happening outside natural forests and only about 18% of the 2020 goal has been met.[57] Data on restoration are self-reported by some countries (e.g., under the Bonn Challenge Barometer of the IUCN), but by only a fraction of those that have made a commitment. There is no independent assessment of restoration achieved and no progress toward restoration pledges being tracked on a regular basis.

Protect 30% of the Ocean by 2030: The ocean covers 70% of the Earth's surface, but it remains grossly under-protected. Areas designated or proposed for protection cover just 7.4% of the ocean, and when considering highly or fully protected areas, this number drops to 2.5%.[58] The Convention on Biological Diversity's (CBD's) Aichi Biodiversity Target 11 commits governments to protecting 10% of the marine environment by 2020. Further, more than 10,000 marine protected areas that currently exist differ substantially in the level of protection offered and the activities that are allowed. There is a need for effective implementation, monitoring, and management. Protecting 30% of the ocean by 2030 (30x30), a new target called for by the IUCN (with the scientific community rallying behind it), is anticipated to bring a range of environmental and economic benefits. The call for the 30x30 target also coincides with efforts to negotiate a legally binding international instrument to enable the protection and sustainable use of biodiverse areas that extend beyond national jurisdictions. Because of the widely projected positive socioeconomic and environmental benefits that come with greater levels of marine protection, numerous new stakeholder campaigns and coalitions have been launched to raise awareness and drive adoption of the 30% target. The Campaign for Nature (a coalition of more than 100 conservation organizations) and Antarctica 2020 are key examples. The United Kingdom is also leading the Global Ocean Alliance, a coalition of signatory countries calling for the adoption of the 30x30 ocean goal. The Alliance currently has 22 signatory countries, working toward the adoption of new ambitious global biodiversity targets under the CBD at the 15th Conference of Parties in 2021.

ENDNOTES

1   Nakicenovic et al., "Global Commons in the Anthropocene: World Development on a Stable and Resilient Planet."

2   "Mission 2020."

3   Some of these transformations overlap with others. Thus "new fuels and solutions for hard-to-abate sectors" under Energy overlaps with "transition to new zero- or low-emission fuels for heavy transport, shipping, and aviation" under Transport.

4   New Climate Economy, "Unlocking the Inclusive Growth Story of the 21st Century: Accelerating Climate Action in Urgent Times."

5   ETC, "Mission Possible: Reaching Net-Zero Carbon Emissions from Harder-to-Abate Sectors by Mid-Century."

6   Uren, "How to Take 'Systems Change' from Idea to Action."

7   ICAT, "Transformational Change Methodology: Assessing the Transformational Impacts of Policies and Actions."

8   Arbib and Seba, "Rethinking Humanity: Five Foundational Sector Disruptions, the Lifecycle of Civilizations, and the Coming Age of Freedom."

9   Victor, Geels, and Sharpe, "Accelerating the Low Carbon Transition: The Case for Stronger, More Targeted and Coordinated International Action."

10   WBCSD, "Unlocking Systems Transformation. Vision 2050 Issue Brief."

11   Sachs et al., "Six Transformations to Achieve the Sustainable Development Goals."

12   Grady et al., "Seeing, Facilitating, and Assessing Systems Change: Learnings from the Scaling Solutions toward Shifting Systems Initiative."

13   Waddell, "Four Strategies for Large Systems Change."

14   Pendrill et al., "Deforestation Displaced: Trade in Forest-Risk Commodities and the Prospects for a Global Forest Transition"; Varkkey, Tyson, and Choiruzzad, "Palm Oil Intensification and Expansion in Indonesia and Malaysia: Environmental and Socio-Political Factors Influencing Policy."

15   Gingold et al., "How to Identify Degraded Land for Sustainable Palm Oil in Indonesia."

16   Jelsma et al., "Unpacking Indonesia's Independent Oil Palm Smallholders: An Actor-Disaggregated Approach to Identifying Environmental and Social Performance Challenges."

17   Pacheco et al., "Governing Sustainable Palm Oil Supply: Disconnects, Complementarities, and Antagonisms between State Regulations and Private Standards."

18   Pacheco et al., "Governing Sustainable Palm Oil Supply: Disconnects, Complementarities, and Antagonisms between State Regulations and Private Standards"; Notess et al., "The Scramble for Land Rights: Reducing Inequity between Communities and Companies."

19   "Meet the Companies Already Setting Their Emissions Reduction Targets in Line with Climate Science."

20   "Fridays for Future."

21   "Welcome to A.Y.I.C.C."

22   Climate Watch, "2020 NDC Tracker."

23   Stern, "China's Historic Announcement on Net-Zero Emissions."

24   Métivier, Bultheel, and Postic, "Global Carbon Account 2018."

25   Victor, Geels, and Sharpe, "Accelerating the Low Carbon Transition: The Case for Stronger, More Targeted and Coordinated International Action."

26   Levin et al., "Overcoming the Tragedy of Super Wicked Problems: Constraining Our Future Selves to Ameliorate Global Climate Change."

27   Abercrombie, Harries, and Wharton, "Systems Change: A Guide to What It Is and How to Do It."

28   ICAT, "Transformational Change Methodology: Assessing the Transformational Impacts of Policies and Actions."

29   Levin et al., "Overcoming the Tragedy of Super Wicked Problems: Constraining Our Future Selves to Ameliorate Global Climate Change."

30   Attwood et al., "Playbook for Guiding Diners Toward Plant-Rich Dishes in Food Service"; AFI, "Inclusive Green Finance: A Survey of the Policy Landscape."

31   Victor, Geels, and Sharpe, "Accelerating the Low Carbon Transition: The Case for Stronger, More Targeted and Coordinated International Action."

32   ICAT, "Transformational Change Methodology: Assessing the Transformational Impacts of Policies and Actions."

33   WBCSD, "Unlocking Systems Transformation. Vision 2050 Issue Brief."

34 Henze, "Scale-up of Solar and Wind Puts Existing Coal, Gas at Risk."

35 WEF, "The Future of Nature and Business."

36 IEA, "World Gross Electricity Production, by Source, 2018."

37 IEA, "Low Fuel Prices Provide a Historic Opportunity to Phase out Fossil Fuel Consumption Subsidies."

38 IEA, "Energy Efficiency 2019."

39 Layke, International Efforts to Increase Energy Efficiency and Opportunities to Advance Energy.

40 Reitz et al., "IJER Editorial: The Future of the Internal Combustion Engine."

41 IEA, "Global EV Outlook 2020."

42 Ge et al., "Tracking Progress of the 2020 Climate Turning Point."

43 Cosgrove, "Corporate Electric Vehicle Alliance Aims to Accelerate EV Adoption."

44 Ge et al., "Tracking Progress of the 2020 Climate Turning Point."

45 ETC, "Mission Possible: Reaching Net-Zero Carbon Emissions from Harder-to-Abate Sectors by Mid-Century."

46 Åhman, "Unlocking the 'Hard to Abate' Sectors."

47 FAO, "The State of the World's Forests 2020."

48 Hosonuma et al., "An Assessment of Deforestation and Forest Degradation Drivers in Developing Countries."

49 NYDF Assessment Partners, "Protecting and Restoring Forests: A Story of Large Commitments yet Limited Progress. New York Declaration on Forests Five-Year Assessment Report."

50 Taylor and Streck, "Ending Tropical Deforestation: The Elusive Impact of the Deforestation-Free Supply Chain Movement."

51 NYDF Assessment Partners, "Protecting and Restoring Forests: A Story of Large Commitments yet Limited Progress. New York Declaration on Forests Five-Year Assessment Report"; Donofrio, Rothrock, and Leonard, "Zooming In: Companies, Commodities, & Traceability Commitments That Count, 2018."

52 Taylor and Streck, "Ending Tropical Deforestation: The Elusive Impact of the Deforestation-Free Supply Chain Movement."

53 NYDF Assessment Partners, "Protecting and Restoring Forests: A Story of Large Commitments yet Limited Progress. New York Declaration on Forests Five-Year Assessment Report."

54 Taylor and Streck, "Ending Tropical Deforestation: The Elusive Impact of the Deforestation-Free Supply Chain Movement."

55 NCE, "Unlocking the Inclusive Growth Story of the 21st Century: Accelerating Climate Action in Urgent Times."

56 Ding et al., "Roots of Prosperity: The Economics and Finance of Restoring Land."

57 NYDF Assessment Partners, "Protecting and Restoring Forests: A Story of Large Commitments yet Limited Progress. New York Declaration on Forests Five-Year Assessment Report."

58 Waldron et al., "Protecting 30% of the Planet for Nature: Costs, Benefits and Economic Implications."

REFERENCES

Abercrombie, Rob, Ellen Harries, and Rachel Wharton. "Systems Change: A Guide to What It Is and How to Do It." London: New Philanthropy Capital, 2015. https://www.thinknpc.org/resource-hub/systems-change-a-guide-to-what-it-is-and-how-to-do-it/.

AFI (Alliance for Financial Inclusion). "Inclusive Green Finance: A Survey of the Policy Landscape." Kuala Lumpur, Malaysia: Alliance for Financial Inclusion, 2019. https://www.afi-global.org/sites/default/files/publications/2019-06/AFI_IGF_report_AW_digital_1.pdf.

African Youth Initiative on Climate Change. "Welcome to A.Y.I.C.C." Accessed October 21, 2020. http://ayicc.africa/.

Åhman, Max. "Unlocking the 'Hard to Abate' Sectors." Washington, DC: World Resources Institute, 2020. https://www.wri.org/climate/expert-perspective/unlocking-hard-abate-sectors.

Arbib, James, and Tony Seba. "Rethinking Humanity: Five Foundational Sector Disruptions, the Lifecycle of Civilizations, and the Coming Age of Freedom." London, RethinkX, 2020. https://www.rethinkx.com/humanity.

Attwood, Sophie, Paula Voorheis, Cecelia Mercer, Karen Davies, and Daniel Vennard. "Playbook for Guiding Diners Toward Plant-Rich Dishes in Food Service." Washington, DC: World Resources Institute, 2020. https://www.wri.org/publication/playbook-guiding-diners-toward-plant-rich-dishes-food-service.

Climate Watch. "2020 NDC Tracker." Accessed October 15, 2020. https://www.climatewatchdata.org/2020-ndc-tracker.

Cosgrove, Anne. "Corporate Electric Vehicle Alliance Aims to Accelerate EV Adoption." Facility Executive (blog), January 22, 2020. https://facilityexecutive.com/2020/01/corporate-electric-vehicle-alliance-aims-to-accelerate-ev-adoption/.

Ding, Helen, Sofia Faruqi, Andrew Wu, Juan Carlos Altamirano, Andrés Anchondo Ortega, Michael Verdone, René Zamora Cristales, Robin Chazdon, and Walter Vergara. "Roots of Prosperity: The Economics and Finance of Restoring Land." Washington, DC: World Resources Institute, 2017. https://files.wri.org/s3fs-public/roots-of-prosperity_0.pdf.

Donofrio, Stephen, Philip Rothrock, and Jonathan Leonard. "Zooming In: Companies, Commodities, & Traceability Commitments That Count, 2018." Washington, DC: Forest Trends, 2018. https://www.forest-trends.org/wp-content/uploads/2018/04/doc_5748.pdf.

ETC (Energy Transitions Commission). "Mission Possible: Reaching Net-Zero Carbon Emissions from Harder-to-Abate Sectors by Mid-Century." London: Energy Transitions Commission, 2018. http://www.energy-transitions.org/sites/default/files/ETC_MissionPossible_FullReport.pdf.

FAO (Food and Agriculture Organization of the United Nations). "The State of the World's Forests 2020." Rome: Food and Agriculture Organization of the United Nations and United Nations Environment Programme., 2020. https://doi.org/10.4060/ca8642en.

Fridays for Future. "Fridays for Future." Accessed October 21, 2020. https://fridaysforfuture.org/.

Ge, Mengpin, Katie Lebling, Kelly Levin, and Johannes Friedrich. "Tracking Progress of the 2020 Climate Turning Point." Washington, DC: World Resources Institute, 2019. https://www.wri.org/publication/tracking-progress-2020-climate-turning-point.

Gingold, Beth, Fred Stolle, Pascal Douard, Anne Rosenbarger, Yohanes I. Ketut Deddy Muliastra, I. Made Sudana, Masita Dwi Mandini Manessa, Ari Murdimanto, Sebastianus Bagas Tiangga, and Cicilia Cicik Madusari. "How to Identify Degraded Land for Sustainable Palm Oil in Indonesia." Washington, DC: World Resources Institute. https://www.wri.org/publication/how-identify-degraded-land-sustainable-palm-oil-indonesia.

Grady, Heather, Michael Brown, Joanne Schneider, Kelly Diggins, and Naamah Paley Rose. "Seeing, Facilitating, and Assessing Systems Change: Learnings from the Scaling Solutions Toward Shifting Systems Initiative." New York: Rockefeller Philanthropy Advisors, 2020. https://www.rockpa.org/wp-content/uploads/2020/07/Rockefeller-Philanthropy-Advisors-Scaling-Solutions-Report.pdf.

Henze, Veronkia. "Scale-up of Solar and Wind Puts Existing Coal, Gas at Risk." Bloomberg New Energy Finance (blog), April 28, 2020. https://about.bnef.com/blog/scale-up-of-solar-and-wind-puts-existing-coal-gas-at-risk/#_ftn1.

Hosonuma, Noriko, Martin Herold, Veronique De Sy, Ruth S. De Fries, Maria Brockhaus, Louis Verchot, Arild Angelsen, and Erika Romijn. "An Assessment of Deforestation and Forest Degradation Drivers in Developing Countries." *Environmental Research Letters* 7, no. 4 (October 8, 2012). https://doi.org/10.1088/1748-9326/7/4/044009.

ICAT (Initiative for Climate Action Transparency). "Transformational Change Methodology: Assessing the Transformational Impacts of Policies and Actions." Washington, DC: World Resources Institute, 2020. https://climateactiontransparency.org/wp-content/uploads/2020/04/Transformational-Change-Assessment-Guide.pdf.

IEA (International Energy Agency). "Energy Efficiency 2019." Paris: International Energy Agency, 2019. https://www.iea.org/reports/energy-efficiency-2019.

———. "Global EV Outlook 2020." Paris: International Energy Agency, 2020. https://www.iea.org/reports/global-ev-outlook-2020.

———. "Low Fuel Prices Provide a Historic Opportunity to Phase Out Fossil Fuel Consumption Subsidies." International Energy Agency (blog), June 2, 2020. https://www.iea.org/articles/low-fuel-prices-provide-a-historic-opportunity-to-phase-out-fossil-fuel-consumption-subsidies.

———. "World Gross Electricity Production, by Source, 2018." Accessed July 23, 2020. https://www.iea.org/data-and-statistics/charts/world-gross-electricity-production-by-source-2018.

Jelsma, Idsert, G. C. Schoneveld, Annelies Zoomers, and A. C. M. van Westen. "Unpacking Indonesia's Independent Oil Palm Smallholders: An Actor-Disaggregated Approach to Identifying Environmental and Social Performance Challenges." *Land Use Policy* 69 (2017): 281–97. https://doi.org/10.1016/j.landusepol.2017.08.012.

Layke, Jennifer. International Efforts to Increase Energy Efficiency and Opportunities to Advance Energy, U.S. Senate Committee on Energy and Natural Resources (October 22, 2019). https://www.wri.org/publication/international-efforts-increase-energy-efficiency-opportunities-advance-energy-united-states.

Lebling, Katie, Mengpin Ge, Kelly Levin, Richard Waite, Johannes Friedrich, Cynthia Elliott, Christina Chan, Katie Ross, Fred Stolle, and Nancy Harris. "State of Climate Action: Assessing the Effort Needed to Get on Track." Washington, DC: World Resources Institute, 2020.

Levin, Kelly, Benjamin Cashore, Steven Bernstein, and Graeme Auld. "Overcoming the Tragedy of Super Wicked Problems: Constraining Our Future Selves to Ameliorate Global Climate Change." *Policy Sciences* 45, no. 2 (2012): 123–52. https://doi.org/10.1007/s11077-012-9151-0.

Métivier, Clément, Clément Bultheel, and Sébastien Postic. "Global Carbon Accounting 2018." Paris: Institute for Climate Economics, 2018. https://www.i4ce.org/wp-core/wp-content/uploads/2018/04/Global-Carbon-Account-2018_5p.pdf.

Mission 2020. "Mission 2020." Accessed October 26, 2020. https://mission2020.global/.

Nakicenovic, Nebojsa, Johan Rockström, Owen Gaffney, Caroline Zimm, and Pavel Kabat. "Global Commons in the Anthropocene: World Development on a Stable and Resilient Planet." Laxenburg: International Institute for Applied Systems Analysis, 2016. https://www.iucn.org/sites/dev/files/global_commons_in_the_anthropocene_iiasa_wp-16-019.pdf.

NCE (New Climate Economy). "Unlocking the Inclusive Growth Story of the 21st Century: Accelerating Climate Action in Urgent Times." Washington, DC: New Climate Economy, 2018. https://newclimateeconomy.report/2018.

Notess, Laura, Peter Veit, Iliana Monterroso, Andiko, Emmanuel Sulle, Anne M. Larson, Anne-Sophie Gindroz, Julia Quaedvlieg, and Andrew Williams. "The Scramble for Land Rights: Reducing Inequity between Communities and Companies." Washington, DC: World Resources Institute, 2018. https://www.wri.org/publication/scramble-for-land-rights.

NYDF Assessment Partners. "Protecting and Restoring Forests: A Story of Large Commitments yet Limited Progress. New York Declaration on Forests Five-Year Assessment Report." Amsterdam: Climate Focus, 2019. https://forestdeclaration.org/images/uploads/resource/2019NYDFReport.pdf.

Pacheco, Pablo, George Schoneveld, Ahmad Dermawan, Heru Komarudin, and Marcel Djama. "Governing Sustainable Palm Oil Supply: Disconnects, Complementarities, and Antagonisms between State Regulations and Private Standards." *Regulation & Governance* 14, no. 3 (2020): 568–98. https://doi.org/10.1111/rego.12220.

Pendrill, Florence, U. Martin Persson, Javier Godar, and Thomas Kastner. "Deforestation Displaced: Trade in Forest-Risk Commodities and the Prospects for a Global Forest Transition." *Environmental Research Letters* 14, no. 5 (2019). https://doi.org/10.1088/1748-9326/ab0d41.

Reitz, R. D., H. Ogawa, R. Payri, T. Fansler, S. Kokjohn, Y. Moriyoshi, A. K. Agarwal, et al. "IJER Editorial: The Future of the Internal Combustion Engine." *International Journal of Engine Research* 21, no. 1 (2020): 3–10. https://doi.org/10.1177/1468087419877990.

Sachs, Jeffrey D., Guido Schmidt-Traub, Mariana Mazzucato, Dirk Messner, Nebojsa Nakicenovic, and Johan Rockström. "Six Transformations to Achieve the Sustainable Development Goals." *Nature Sustainability* 2, no. 9 (2019): 805–14. https://doi.org/10.1038/s41893-019-0352-9.

Science-Based Targets. "Meet the Companies Already Setting Their Emissions Reduction Targets in Line with Climate Science." Accessed October 21, 2020. https://sciencebasedtargets.org/companies-taking-action/.

Steer, Andrew, Dominic Waughray, Gretchen Ellison, and Molly McGregor. "The Great Decoupling: Our Human Economic Footprint and the Global Environmental Commons." Generva: International Union for Conservation of Nature, 2016. https://www.iucn.org/sites/dev/files/the_great_decoupling_10_10_16.pdf.

Taylor, Rod, and Charlotte Streck. "Ending Tropical Deforestation: The Elusive Impact of the Deforestation-Free Supply Chain Movement." Washington, DC: World Resources Institute, 2018. https://www.wri.org/publication/ending-tropical-deforestation-elusive-impact-deforestation-free-supply-chain-movement.

Uren, Sally. "How to Take 'Systems Change' from Idea to Action." *GreenBiz*, September 24, 2019. https://www.greenbiz.com/article/how-take-systems-change-idea-action.

Varkkey, Helena, Adam Tyson, and Shofwan Al Banna Choiruzzad. "Palm Oil Intensification and Expansion in Indonesia and Malaysia: Environmental and Socio-Political Factors Influencing Policy." *Forest Policy and Economics* 92 (2018): 148–59. https://doi.org/10.1016/j.forpol.2018.05.002.

Victor, D. G., F. W. Geels, and S. Sharpe. "Accelerating the Low Carbon Transition: The Case for Stronger, More Targeted and Coordinated International Action." Washington, DC: Brookings Institution, 2019. https://www.brookings.edu/wp-content/uploads/2019/12/Coordinatedactionreport.pdf.

Waddell, Steve. "Four Strategies for Large Systems Change." Stanford, CA: Stanford Social Innovation Review, 2018. https://ssir.org/articles/entry/four_strategies_for_large_systems_change.

Waldron, Anthony, Vanessa Adams, James Allan, Andy Arnell, Greg Asner, Scott Atkinson, Alessandro Baccini, et al. "Protecting 30% of the Planet for Nature: Costs, Benefits and Economic Implications." Washington, DC: Campaign for Nature, 2020. https://www.conservation.cam.ac.uk/files/waldron_report_30_by_30_publish.pdf.

WBCSD (World Business Council for Sustainable Development). "Unlocking Systems Transformation: Vision 2050 Issue Brief." Geneva: World Business Council for Sustainable Development, 2020. https://www.wbcsd.org/Overview/Resources/General/Unlocking-systems-transformation.

WEF (World Economic Forum). "The Future of Nature and Business." Geneva: World Economic Forum, 2020. http://www3.weforum.org/docs/WEF_The_Future_Of_Nature_And_Business_2020.pdf.

ACKNOWLEDGMENTS

SUMMARY

Safeguarding our Global Commons
A Systems Change Lab to Monitor, Learn from, and Advance Transformational Change