SDG ACTION

SUSTAINABLE DEVELOPMENT SOLUTIONS NETWORK
A GLOBAL INITIATIVE FOR THE UNITED NATIONS

CLIMATE ACTION EDITION 2021

Practical knowledge for a fairer, safer, sustainable world

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UN WOMEN

GENERATION EQUALITY

UN Women/ Joe Saad

UN Women/ Ryan Brown

BECAUSE CLIMATE JUSTICE IS GENDER JUSTICE

A changing climate affects us all but women are disproportionately at risk.

Climate action must be by, and for, women.

With work on climate-resilient agriculture, and a drive to an inclusive and regenerative green economy led by women and girls, diverse stakeholders are committing to action.

https://www.unwomen.org/en
https://forum.generationequality.org/.

UN Women Vietnam / Lai Dien Dam

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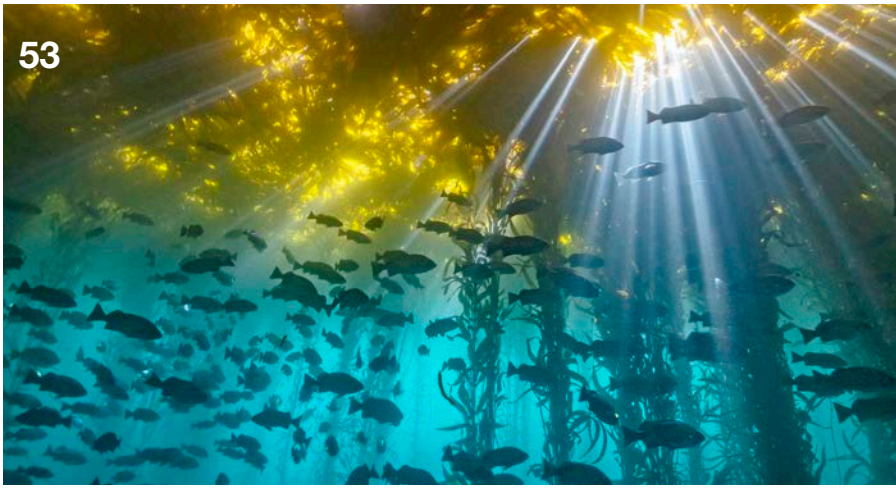
Cover image:
Aapa mires (peatlands) in northern Finland. Globally, peatlands are the largest terrestrial carbon store, holding 42% of all soil carbon. © Karl Ander Adami/Alamy

MEASUREMENT



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Today is the day

A global consensus on the scale of the climate crisis is emerging. Governments are starting to make the right noises. But we lack and need action, now

By Amina J. Mohammed, Deputy Secretary-General, United Nations; Chair, United Nations Sustainable Development Group

The continuing disastrous rise in greenhouse gases in the Earth's atmosphere is an urgent incentive to act. Governments representing two-thirds of global emissions and 70% of the global economy have pledged to reach net-zero carbon emissions by mid-century. They are joined by rapidly growing numbers of cities, businesses, large investors, and institutions of higher education that are setting near-term targets and developing plans to deliver on their pledges. These commitments represent a growing global consensus that the climate emergency necessitates maximum ambition and contribution from all stakeholders. Yet emissions continue to climb.

Today is the day to do everything possible to reduce emissions and stop global temperature increase. It is the day to adapt, respond, and build resilience to climate disruption that is going to get worse. It is the day to come together across the globe – from villages and cities to schools and universities, farms, factory floors, and corporate boardrooms – to solve the climate crisis.

Our collective ambition must unlock real, credible, and verifiable climate action that will get us to the critical 2030 milestone: a 45% reduction in greenhouse gas emissions from 2010 levels. This is what is needed to reach net-zero emissions by 2050 and that is essential if we are to limit global temperature increase to 1.5ºC above preindustrial averages.

Every pledge from stakeholders around the world for net-zero emissions

◂ Veraval, India. Women and children evacuate ahead of Cyclone Tauktae. The cyclone displaced over 200,000 people, killed 174, with a further 81 missing, and caused damage estimated at USD 2.12 billion

must be accompanied by a clear plan to get there, with interim targets and immediate steps implemented to achieve them.

Three key priorities

The Secretary-General has called for three major priorities for climate action.

First, we must work to limit warming to 1.5ºC. This means no new coal after 2021 and an end to coal by 2030 in developed countries and by 2040 everywhere, shifting subsidies from fossil fuels to renewable energy and putting a price on carbon. And as we plan for the economy of the future, we need to ensure that the transition benefits workers and communities in key sectors and geographies who will be particularly affected.

The International Labour Organization has estimated that the transition to a green economy will create 18 million more jobs than will be lost. It will be critical to work closely with affected communities and provide information, skills, access to jobs, and social protection to ensure a just transition.

The second priority is a breakthrough on adaptation and resilience, supported by at least 50% of all climate finance. Adaptation can no longer be the neglected half of the climate equation, as storms, floods, droughts, wildfires, and heatwaves intensify. In 2020, climate-related disasters internally displaced more than 30 million people, three times the number displaced by conflict. We must scale up support for resilience-building, preparedness, early warning, response, and recovery. Despite the urgent need, overall climate finance falls well short of what is needed, with just 25% currently dedicated to adaptation.

> ***// The bottom line is that all finance flows must be consistent with net-zero greenhouse gas emissions and climate-resilient development***

The third priority is for developed countries to deliver a credible solidarity package to developing countries, including on debt, vaccine access, and meeting and surpassing the goal of USD 100 billion per year in climate finance. They must also ensure that finance flows to all developing countries. It is essential that multilateral development banks and other development finance institutions align their portfolios with the goals of the Paris Agreement and set targets to allocate at least 50% of their climate finance to adaptation. The African Development Bank has already shown the way.

The bottom line is that all finance flows must be consistent with net-zero greenhouse gas emissions and climate-resilient development. All financial actors must set verifiable short-term targets that cover their entire portfolios to shift them away from high-emission investments to a climate-resilient and net-zero economy, along with timelines to implement their pledges.

The contributors to this publication join a chorus of voices showing the scale of what is needed, that bold action is possible, and that it must be credible and verifiable. They also show the strong connections between climate action and achieving the Sustainable Development Goals, including through jobs and livelihood diversification, gender equality, improvements to health and social safety nets, education, access to technology, finance and insurance, and more.

These connection points are all the more crucial as so many countries and communities struggle to recover from the ongoing devastating impacts of the COVID-19 pandemic. Economic recovery plans offer a generational opportunity to put climate action at the heart of recovery efforts.

Ultimately, the only way to move forward is to do so together. Governments, cities, companies, and financial institutions around the world are taking action. Young people, women, indigenous peoples, and local communities are leading the way. The social movement to end the climate crisis is demanding faster, more ambitious action and is holding all to account.

This decade will define the course of people and the planet far into the future, and it must be a Decade of Action. The United Nations will continue to work with governments and all stakeholders to bring about an inclusive, resilient, and net-zero world. ■

Knowledge can set us free

The world economy is unjust and selfish. Its flaws are stifling effective climate action. We must empower the next generation to shape the future, unencumbered by the distorted priorities that currently prevail

By Jeffrey D. Sachs, Director, Center for Sustainable Development, Columbia University; President, UN Sustainable Development Solutions Network

The UN Sustainable Development Solutions Network (SDSN) reached out to global leaders across all sectors of society – business, academia, politics, and civil society – to put forward key climate and sustainable development solutions in advance of COP26. The resulting short essays collected in this volume are wonderful: direct, powerful, succinct, and cogent. They spell out a roadmap for action from people who are on the frontlines of the battle for sustainable development.

And a battle it is. The global economy produces wealth but it does not produce sustainable development. The world output of some USD 100 trillion per year is enough to meet our needs and to protect the Earth for all, including future generations, but it is poorly allocated.

Much of the USD 100 trillion in output is destructive of the Earth itself, leading to catastrophic climate change, loss of biodiversity, mega-pollution, and increasing frequency of emerging diseases, not least of which is the COVID-19 pandemic. Much of the USD 100 trillion goes to the world's richest people and countries, leaving billions of people in chronic deprivation.

The world economy is capitalistic – meaning that it is directed by vast private wealth and oriented around further wealth accumulation. Yes, this global system succeeds in producing wealth, but not in producing it inclusively or sustainably. We speak about social inclusion but produce social exclusion. Of course, that is an old story, but it continues today despite countless promises, declarations, and goals to the contrary.

The recommendations herein focus appropriately on technical solutions, such as the shift from fossil fuels to renewable energy; policy solutions, such as new regulatory standards; and ethical solutions, such as moving beyond wealth accumulation as the organizing principle for the world economy. The recommendations focus on top-down solutions for what governments should do to set guardrails and to protect the weak, and bottom-up solutions for what communities, educators, individuals, and especially youth should do to bring about an urgent and significant change in global direction.

> ***"Young people are not yet ensnared in the structures of power that hold back needed change.... they can break free of the grips of shortsightedness***

These short essays are best read together in one sitting, as they are highly complementary and thus best taken as a package. Some of the authors suggest that private business and finance can be a force for good, while others bemoan greenwashing and call for rigorous top-down government regulations. Many of the authors focus on the rapid transition from fossil fuels to renewable energy, while another group adds the crucial dimension of nature-based solutions, such as

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▲ Climate activist Greta Thunberg addresses the Fridays for Future protest held in Milan during the Pre-COP26 Summit

increasing carbon in the soils, trees, grasslands, and other ecozones. Many essays emphasize the need for metrics and data that are harmonized, science-based, timely, and georeferenced, and that can be used to guide governments, financial markets, and businesses, and hold them accountable for their action (or inaction).

The power of education

We face a huge puzzle. How can the world as a whole drive the needed changes to produce social justice for the poor and sustainability for the planet, when our dominant social and economic systems are so clearly driven by the quest for financial wealth and power?

One consistent answer in these essays is to empower young people to build the sustainable development economy and society of the future. Young people are not yet ensnared in the structures of power that hold back needed change. Young people have the time horizon of the 21st century and beyond, while the rich and the powerful today are generally older and shortsighted, whether because of age, lack of education and training in sustainable development, or the focus on the next quarterly report or the next election. Young people can break free of the grips of shortsightedness.

It is for this reason that the SDSN is especially devoted to global education for sustainable development (as enshrined in Target 4.7). Knowledge can set us free – whether it is the scientific knowledge of climate change; the technical knowledge of green and digital economies; the policy knowledge of regulation, carbon pricing, and public investment spending; or the moral knowledge of doing what is right, not merely what is expedient.

And it is for this reason that SDSN is so proud to present this year's second edition of SDG Action, themed on climate solutions, with deepest gratitude to the world leaders who have shared their profound insights and given their time to help the world understand our challenges and pathways to the future we want. ■

© Nicolas Economou/Reuters

No more chances

World leaders must take decisive, collective action at COP26 to avoid planetary catastrophe

By His Excellency Shaukat Aziz, former Prime Minister of Pakistan (2004 to 2007)

Climate change poses an existential threat to our planet – and today its effect is more obvious to the naked eye than ever. The fossil fuel emissions caused by human activities over the last 200 years have sped up their rate to an alarming degree.

◂ August 2021, people board a ferry to escape wildfire on the Greek island of Evia. As global temperatures rise, wildfires are becoming more frequent and more intense. 1.3 metric gigatons of carbon dioxide were released by burning forests in the month, the worst affected regions being California and Siberia

It is hard to predict the full scale of the effect this will have on the world. What we know for certain, however, is that although some improvements have been made, the current speed of progress is not enough. We need to redouble our efforts to manage the challenges of emissions and create a cleaner world for ourselves and coming generations. Warm words and commitments alone will not get us there – policymakers must act fast to safeguard our future.

This argument is about much more than just the environment. A shift in global temperature or sea levels affect so many different parts of policymaking – from healthcare to housing to the economy. It inevitably brings disruption to people's livelihoods, and is a strain on every aspect of society.

All of which means that our work on non-carbon generation now needs to be placed on a war footing. A comprehensive strategy to achieve environmentally sustainable growth while meeting the targets we have already set ourselves is urgently needed. Major carbon-emitting countries in particular must take collective action to reduce emissions and build a world economy that is primarily based on green energy. This approach will not only help save our environment. In the process, it will also create jobs and boost living standards.

To do this, we must do more to develop and harness newer, cleaner technology, such as hydropower – and rely less on fossil fuels. We need to harness the power of both the wind and the sea as much as we can. We also need to refine nuclear power production, building on some recent technological breakthroughs that offer the promise of clean yet powerful energy.

Access to affordable, reliable, and modern energy sources should be widened, as well as expanding infrastructure and upgrading technology for all in developing countries. All this requires more investment into the development of research and innovation in the sustainability sector, to encourage these technologies not only to become available, but also cheaper to harness.

It is also important for countries to pool their research and development and combine their knowledge – encouraging cross-country cooperation and setting the best minds around the world to work together in solving this global challenge.

A substantial shift

Making a substantial shift towards using new green technology on a significantly widespread scale involves policymakers using several possible levers. Tighter regulations on carbon emissions and other environmental impacts are one example.

> ***"Major carbon-emitting countries in particular must take collective action to reduce emissions and build a world economy that is primarily based on green energy***

Another is for governments to provide clear incentives to companies that build to the highest modern standard of sustainability – whether that is through tax breaks or subsidies. Many countries are already enacting such policies. However, they will face roadblocks unless they have buy-in from all parts of society to mitigate the potential effects on business and added cost to consumers.

Such change cannot be simply imposed top-down – a concerted effort is first needed to get all important stakeholders on board. This must be coupled with ongoing wider education about the benefits of these policies. Not only governments but civil society, charities, and the private sector all

have an important role to play in this process.

Change will not happen overnight. As well as expanding our use of cleaner energy sources, we also have to work on treating the emissions that are brought about through existing power generation. More needs to be done to treat these emissions and neutralize them before they are released into the environment – all of which requires investment and inclusion in strategic policymaking.

greenhouse gases, and other pollution. All of which will only be more costly in the long run.

All of this requires a global effort: no one country can tackle the problem of climate change alone. It needs real, collective action, and engaging the right players to take the crisis seriously requires a concerted effort in high-level engagement and diplomacy. Real, meaningful change requires difficult decisions – and a lot of political will – to be carried through. The moment

> ***"It is time to renew our linkages with one another. Connectivity is the true safeguard of peace – when done properly it will help shore up a level of trust, which will be invaluable in the event of any future tension***

The world's population is growing rapidly, and developing countries in particular are witnessing a demographics boom. This of course places an additional strain on our planet, particularly when those countries turn to using cheaper, more polluting forms of energy production as they expand. We need a concerted effort to promote cleaner methods of growth, as well as making them both viable and affordable. This will allow developing countries with fast-growing populations to see the twin benefits of prosperity and a cleaner, more sustainable planet.

We also need to be quicker to specify greener standards in new developments, to build for a more sustainable future. Making our cities more sustainable will have a significant effect on curbing global warming. Policymakers can set tighter targets for developments, and demand that contractors change their procurement policies to be more eco-friendly – even if it means extra up-front cost.

Because, if this is not done properly, the harmful environmental impacts of large-scale infrastructure development can include deforestation, soil and water pollution, emissions of

calls for strategic leadership, from people who have the necessary global clout, to galvanize and encourage other countries to make substantive commitments.

Despite this, unfortunately, we have seen years of considerable distance between the major global powers, leading to an overall crisis of cooperation. We see more and more countries operating in small silos or smaller trading blocs – thereby turning the clock back on global connectivity and the benefits it brings.

Global relations

The major powers of the world have been growing further and further apart. Cooperation between the five permanent members of the UN Security Council (P5) had already been at a low point for years, well before the pandemic.

The coronavirus crisis that has engulfed the world only risks exacerbating this situation, as so many governments turned to look inward as a result. And without cooperation at the highest level – without the P5 countries all cohesively working together – it will be impossible to tackle climate change in any meaningful way.

It is time to renew our linkages with one another. Connectivity is the true safeguard of peace – when done properly it will help shore up a level of trust, which will be invaluable in the event of any future tension. While no two countries' interests will ever be fully aligned and tensions can surface, a multipolar world is better than a unipolar one. Countries must find a way of working with each other, so we can all play our part in the battle of controlling emissions.

Improving these global relations will only be addressed with good governance and, above all, effective leadership. Unfortunately, the world today has a leadership deficit. We need more powers to come to the table, to boost their influence and contribute to global affairs – and help to address the complex challenges we collectively face.

It does not help that, for years, the UN has been missing in action. Institutions like this, which were established more than 50 years ago, need urgent reform to be able to move with the times and be able to effectively reflect the global reality.

The UN has to start playing a more active role when it comes to climate change – for example, it should do more to monitor, measure targets and countries' progress, and finally to penalize those who violate them.

As we look towards the COP26 summit in Glasgow, we need to make the most of an opportunity which has been denied to us throughout the pandemic.

Finally, major world powers look set to be in the same room together with one broad item on the agenda – how to meet our agreed emissions targets, and to do even more to tackle the quickly escalating climate emergency.

It is an encouraging step that US President Biden has committed to be there in person. Now it is time for all major carbon-emitting countries to take joint action to reduce emissions and build a world economy based on green energy. In this, collective, coordinated action is key to achieving a more sustainable and viable future. ■

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Accelerating change for 1.5°C

Leaders across government, civil society, and the private sector must support the rapid, exponential growth of low and zero-emissions technologies if the world is to achieve the Paris goals

By Sophie Boehm, Research Associate, Climate Program, World Resources Institute (WRI); Joel Jaeger, Research Associate, Climate Program, WRI; Hanna Fekete, Partner, NewClimate Institute; Ryan Wilson, Climate and Energy Policy Analyst, Climate Analytics; Katie Lebling, Associate, Climate Program, WRI; Kelly Levin, Chief of Science, Data, and Systems Change, Bezos Earth Fund

As the mounting headlines on heatwaves, wildfires, melting ice caps, and floods make clear, the speed and scale of global efforts to mitigate climate change have proven woefully inadequate in addressing the challenge at hand (see Table 1). Rapid, far-reaching transitions of unprecedented scale across power, transport, buildings, industry, land use, coastal zone management, and agriculture, as well as the immediate scale-up of technological carbon dioxide removal and climate finance, are now needed to limit global temperature rise to 1.5°C. And, as the latest science from the Intergovernmental Panel on Climate Change shows, our window of time to avoid the worst impacts of climate change is closing rapidly. This decade is our make-or-break opportunity to steer the world towards a net-zero greenhouse gas (GHG) emissions future.

The encouraging news is that we're not starting from a standstill. Increasingly dynamic climate action is occurring within a handful of sectors, across some regions, and from individual companies, cities, states, investors, and civil society organizations. For example, several low-emissions technologies, including wind and solar power, have experienced rapid, non-linear growth over the past two decades, and sales of electric vehicles (EVs) have also increased dramatically since 2015.

These bright spots show us what's possible when decision-makers deploy the many resources and tools at their disposal to accelerate the transitions needed to halt global temperature rise.

▲ Solar photovoltaic panels on a floating community in Cambodia. The 1.5°C warming target requires the global rate of solar-power installation to accelerate

TABLE 1: Assessment of progress towards 2030 targets aligned with limiting global warming to 1.5°C by sector

Power	Increase the share of renewables in electricity generation to 55–90%.
	Lower the share of unabated coal in electricity generation to 0–2.5%. Reduce carbon intensity of electricity generation to 50–125 gCO_2/kWh.
Buildings	Decrease the energy intensity of operations in key countries and regions by 20–30% in residential buildings and by 10–30% in commercial buildings, relative to 2015.
	Reduce the carbon intensity of operations in select regions by 45–65% in residential buildings and by 65–75% in commercial buildings, relative to 2015. Increase buildings' retrofitting rate to 2.5–3.5% annually.
Industry	Increase the share of electricity in the industry sector's final energy demand to 35%.
	Build and operate 20 low-carbon commercial steel facilities, with each producing at least 1 million tonnes annually. Boost green hydrogen production capacity to 0.23–3.5 Mt (25 GW cumulative electrolyzer capacity) by 2026.
	Reduce carbon intensity of global cement production by 40%, relative to 2015. Reduce carbon intensity of global steel production by 25–30%, relative to 2015.
Transport	Increase the share of EVs to 75–95% of total annual LDV sales. Boost the share of BEVs and FCEVs to reach 75% of global annual bus sales by 2025.
	Expand the share of EVs to account for 20–40% of total LDV fleet. Increase the share of BEVs and FCEVs to 8% of global annual MHDV sales by 2025. Raise the share of low-emissions fuels in the transport sector to 15%. Increase SAF's share of global aviation fuel supply to 10%. Raise ZEF's share of international shipping fuel to 5%.
	Reduce the percentage of trips made by private LDVs to between 4% and 14% below BAU levels.
	Reduce the carbon intensity of land-based passenger transport to 35–60 gCO_2/pkm.
Tech CDR	Scale up technological carbon removal to 75 $MtCO_2$ annually.
Land use and coastal zone management	Reforest 259 Mha of land, relative to 2018. Remove 3.0 $GtCO_2$ annually through reforestation. Restore 7 Mha of coastal wetlands, relative to 2018.
	Reduce the rate of deforestation by 70%, relative to 2018.
	Reduce degradation and destruction of peatlands by 70%, relative to 2018. Restore 22 Mha of peatlands, relative to 2018. Reduce the conversion of coastal wetlands by 70%, relative to 2018.
Agriculture	Increase ruminant meat productivity per hectare by 27%, relative to 2017. Reduce ruminant meat consumption in high-consuming regions to 79 kcal/capita/day. Increase crop yields by 18%, relative to 2017.
	Reduce agricultural production emissions by 22%, relative to 2017.
	Reduce share of food loss by 50%, relative to 2016. Reduce per capita food waste by 50%, relative to 2019.
Finance	Phase out public financing for fossil fuels, including subsidies, by 2030, with G7 countries and international financial institutions achieving this by 2025.
	Increase total climate finance flows to $5 trillion per year. Raise public climate finance flows to at least $1.25 trillion per year. Boost private climate finance flows to at least $3.75 trillion per year.
	Ensure that a carbon price of at least $135/$tCO_2e$ covers the majority of the world's GHG emissions.
	Jurisdictions representing three-quarters of global emissions mandate TCFD-aligned climate risk reporting, and all of the world's 2,000 largest public companies report on climate risk in line with TCFD recommendations.

See the State of Climate Action 2021: Systems Transformations Required to Limit Global Warming to 1.5°C for more information on our assessment of progress.

On track	The rate of change is at or above the pace required to achieve the 2030 benchmarks
Off track	The rate of change is heading in the right direction at a promising but insufficient pace
Well off track	The rate of change is heading in the right direction but well below the required pace for 2030
Stagnant, step change needed	Historical change has stagnated
Wrong direction, u-turn needed	Historical change is heading in the wrong direction
Insufficient data	Data are insufficient to assess the rate of historical change relative to the gap in action

Such faster-than-expected progress can also occur when system-wide transitions are driven primarily by the advent and widespread adoption of new technologies, which historically have tended to follow an S-curve trajectory of growth (Figure 1). Initially, rates of adoption are quite low as entrepreneurs develop and pilot new innovations but then increase exponentially as these technologies reach a tipping point and begin to diffuse across society. After reaching a maximum speed, growth eventually slows down again as adoption approaches a saturation point.

After crossing a positive tipping point, positive, self-amplifying feedbacks can switch on and help accelerate adoption by driving down costs, enhancing performance of new low and zero-emissions technologies, and increasing social acceptance. Learning-by-doing in manufacturing, for example, can generate progressive advances that lead to more efficient production processes.

Reaching economies of scale, meanwhile, enables companies to distribute the high costs of improvements across a wider customer base. Similarly, as complementary technologies (such as batteries) become increasingly available, they can boost functionality and accelerate uptake of new entrants (such as EVs). These gains allow once-radical innovations' industries to expand their market share, deepen their political influence, and amass the resources needed to petition for more favorable policies.

More supportive policies, in turn, can reshape the financial landscape in ways that incentivize investors to channel capital back into these new technologies. These reinforcing feedbacks accelerate adoption, help niche innovations to supplant incumbent technologies (Figure 2), and in doing so, spur durable transformational change.

Supporting the S-curve

However, while the potential for rapid, non-linear change exists across many sectors, there is no guarantee that low and zero-emissions technologies will follow an S-curve. To catalyze, accelerate, and sustain the technology-driven transitions required to limit global warming to 1.5°C, decision-makers across both the public and private sectors must provide the right support at the right time, such as:

- **Investments in research and development to help emerging low and zero-emissions technologies come to market**. Channeling funding into designing, testing, and implementing demonstration projects of new technologies – for example, novel, low-carbon cements, steel produced using green hydrogen, and low-emissions fuels for road transport, aviation, and shipping – will be particularly important for decarbonizing the hard-to-abate heavy industry and transport sectors. Similar investments will also be needed to scale up technological carbon removal by developing new approaches and refining existing ones to optimize technologies and bring down costs.
- **Financing for complementary technologies to support widespread adoption of low and zero-emissions innovations.** Investments in complementary technologies, such as batteries for EVs or comprehensive charging networks, will prove critical in boosting adoption of low-carbon transportation technologies and in effectively integrating variable renewables, such as wind and solar, into electricity grids. Without these complementary technologies, new decarbonization innovations will likely struggle to reach positive tipping points.
- **Leadership from key change agents.** Establishing national climate targets, corporate commitments to reduce emissions, or announcements to phase out emissions-intensive technologies can help new technologies displace incumbents. In the power sector, for instance, ambitious coal phaseout targets from all countries are needed to send a strong signal to industry and avoid further carbon lock-in. Similarly, national commitments to retrofitting buildings can help guide a complex diverse community of actors towards decarbonizing the built environment.
- **The right combination of incentives and disincentives.** These market-based instruments, such as public procurement policies, reformation of fossil fuel subsidies, or pricing carbon, will prove critical to increasing adoption of new technologies across all sectors, as well as reducing use of emissions-intensive existing technologies.
- **A stable regulatory environment that supports adoption for technologies beginning to diffuse.** From renewable energy portfolio standards to building efficiency requirements that support uptake of heat pumps, command-and-control regulations can not only mandate adoption of low-emissions technologies, but also provide the stable regulatory environment the private sector needs to switch to decarbonization technologies.

FIGURE 1: S-curve

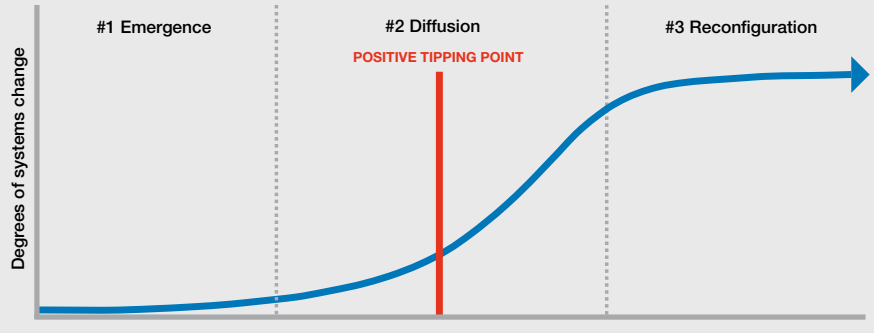
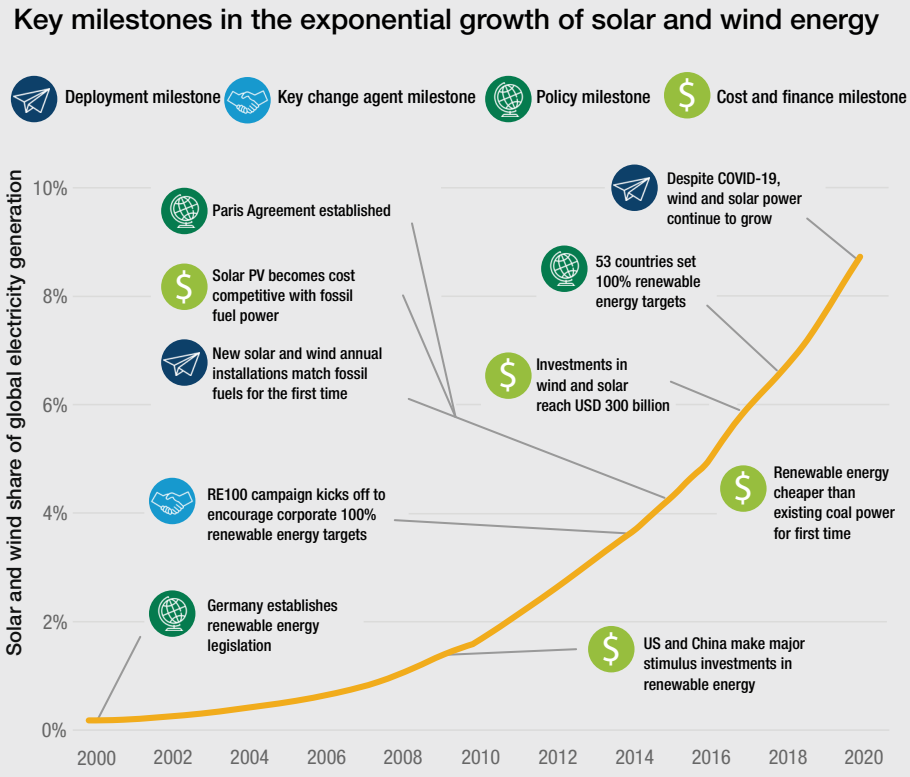


FIGURE 2: The rapid growth of solar and wind

From 2010 to 2020, the share of solar and wind power in global electricity generation grew from 1.7% to 8.7% – far higher than what mainstream energy models predicted. Falling costs have been the biggest factor, which have been driven by the self-amplifying feedbacks described above

For example, for each time the amount of solar capacity worldwide has doubled, the price of installing solar power has fallen by 34%. Renewable energy tax credits and subsidies, feed-in tariffs, and other policy support have all helped reduce costs, increase private sector confidence, and spur deployment. Key milestones in the growth of solar and wind energy are shown in Figure 2.



To limit warming to 1.5°C, this rapid growth will need to accelerate even more. A new analysis finds that the countries with mature solar and wind markets where growth rates have stabilized at the steepest part of an S-curve are still not growing fast enough to meet the goals under the Paris Agreement on average.

Only in a few countries has renewable energy growth been fast enough, including Chile for solar, and Iceland, Portugal, and Brazil for wind. Governments should set targets and requirements for renewable energy, including in end-use sectors like heating and cooling, industry, and transportation, and increase the flexibility of the electric grid to prepare it for high levels of renewable generation. ■

This case study draws heavily on "Explaining the Exponential Growth of Renewable Energy."

Other transformations will be critical

While these technology-driven transitions will prove critical to mitigating climate change, so too will transformations that may prove less likely to follow the S-curve dynamics, such as changing agricultural management practices or curtailing food loss and waste. Efforts to spur these changes will require a different set of measures that focus not on supporting technological development and adoption, but instead on:

- halting harmful practices like deforestation
- scaling up beneficial activities, such as reforestation or peatland rewetting
- triggering changes in behavior and social norms, such as those required to shift to more sustainable diets
- strengthening institutions to improve enforcement of existing laws and regulations

Conclusion

There is no guarantee of what exactly will spur rapid, non-linear growth of climate action across the globe, but it is clear that all hands on deck will be needed to stay below 1.5°C. The year ahead offers a tremendous opportunity to accelerate the systems transformations needed to avoid the worst climate impacts. These actions can be neither incremental nor delayed – we must seize this moment to secure a net-zero GHG emissions future for all. ■

This article draws heavily on the "State of Climate Action 2021: Systems Transformations Required to Limit Global Warming to 1.5°C," produced under the Systems Change Lab.

Prince Sultan Bin Abdulaziz International Prize for Water

Recognizing Innovation

Winners for the 9th Award (2020)

Creativity Prize

Creativity Prize

1) The team of Dr. Benjamin S. Hsiao and Dr. Priyanka Sharma, (Stony Brook University, New York, USA)
for the development of adsorbents, coagulants and membrane materials from sustainable, biomass-sourced nanocellulose fibres along with numerous practical applications that promise to provide effective water purification for off-grid communities of the developing world.

2) The team of Dr. Sherif El-Safty (National Institute for Materials Science, Japan)
for developing novel nano-materials in hierarchal and micrometric monoliths to achieve a nano-filtration/capture/detection process that quantitatively detects and selectively removes a wide range of water contaminants in a single step. A diverse range of these materials, which are conducive to mass-scale production, provides nano-filtration membranes and filters for water management applications, including purification, remediation, and the monitoring of hazard levels.

Surface Water Prize

Surface Water Prize

Dr. Zbigniew Kundzewicz (Polish Academy of Sciences, Poznan)
for advancing our understanding of the relationship between flood risk, river flow, and climate change.

Groundwater Prize

Groundwater Prize

Dr. J. Jaime Gómez-Hernández (Universitat Politècnica de València, Spain)
for pioneering work on solving the "inverse problem" in hydrogeology.

Alternative Water Resources Prize

Alternative Water Resources Prize

Dr. Peng Wang (King Abdullah University of Science and Technology, Thuwal, Saudi Arabia)
for work at the forefront of solar-evaporation water production technology.

Water Management & Protection Prize

Water Management and Protection Prize

Dr. Jay R. Lund (University of California Davis, USA)
for the development of the CALVIN water supply optimization model that couples traditional water-supply criteria with economic considerations.

Nominations are open for the 10th Award. Nominations can be made online until 31 December 2021.

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Power from the people

Communities, not bureaucracies, will be the driving force to turn the aspirations of the Paris Agreement into reality

By Laurence Tubiana, CEO, European Climate Foundation; Co-Chair, SDSN Leadership Council

Our utopias are too technocratic. From electric vehicles to clean air to "smart cities" – listening to climate experts, you would think a typical family spends their dinner discussing infrastructure and CO_2.

There's another way to look at the abstract 2050 goals of the Paris Agreement. Rather than imagine the world we want, let's accept we do not yet know how we will get there.

There is no sole silver-bullet solution we can touch, or cling to. Not carbon removal, not geo-engineering, not "electrifying everything." Versions of these could potentially play a role, but none of them will save us in isolation.

The task ahead is punishing and complex. It involves new social contracts between individuals and their institutions; new definitions of growth – and risk; it will redraw the contours of our daily lives.

Lastly, we are dangerously late to it. Once we accept this, the problem remains daunting. And yet it looks clearer. How will we maintain the energy to make societal strides that are so profound they have never been imagined, let alone achieved?

The only asset we can reliably bet on, one still critically undervalued,

◂ Discussions at the citizens' convention on climate, a French experiment in democratic involvement in policy-making. The convention's proposals had strong popular support

is this: community. To explore the potential of new community-based forms of democracy would be a critical innovation, and a multiplier of other conventional forms of innovation – financial, technological, and beyond.

I believe communities are always ahead of bureaucracies. Citizens' assemblies, participatory budgeting, ramping up cooperatives across markets – these are only some examples of communities' potential for bracing ingenuity.

We will succeed at the transition if we achieve it with one another. For states to try to impose it with straitjacket solutions is a certain bid for failure.

Germany's experience with renewable energy cooperatives, for example, shows that community acceptance of windfarms is dramatically higher when people have a chance to co-own and invest in them. The sector represents an investment of 3.2 billion euros in 2020 alone, mobilized by 200,000 members. The EU's clean energy package has since introduced the need for such "energy communities" in legislation, hoping to galvanize similar success across the continent.

In France, the citizens' convention on climate – a government response to the gilets jaunes protests – brought together a randomized selection of 150 citizens from across the territory to prepare, over months-long working groups, a host of grassroots recommendations to the state. While the government's commitment to those proposals has been disappointingly uneven since, polls show that virtually all the proposals were supported by most of the country. In this bittersweet outcome, we see both the potential and the obvious institutional obstacles that must be revisited.

One thing is certain: participatory democracy in France has been buoyed by the initiative, from community-led municipal budgets to more local citizens' conventions across the country.

Communities, from small towns to peer groups, are also the most effective at taking their governments to court – and winning – over their liability to keep citizens safe. Recently, a group of 32 concerned citizens in Jakarta won a ruling that the Indonesian government was failing to uphold the right to clean air. Time and again, the law is siding with the people against politicians and organized interests, and advancing climate ambition further than our leaders have dared.

When we brokered the Paris Agreement, we recognized that no single treaty could ever govern the climate response. Rather, we needed a text that could gradually pull the international climate regime into its orbit, and become its organizing principle. This required the broadest buy-in possible: governments, cities, asset managers, businesses, civil society. We strived to be as inclusive as possible, and the resulting accord was community-powered multilateralism at its best.

The road since has not been straightforward, nor will it likely ever be. The Paris targets exist within a broad social compact, one where the relations between human societies and nature are rebalanced. They are underpinned by a diplomatic space in perpetual tension, between cooperation and competition.

In an equation this complex, it is liberating to observe that community is always ahead of the formal diplomatic track. We could even speak here of "communities of practice" – such as the financial sector, where the biggest pension funds have been instrumental in accelerating net-zero norms and decisively divesting from fossils. The individuals who decide these portfolios are not parties to the Paris Agreement, and yet they have seen the future and adopted its logic. That was the idea. With the right goals and settings, people get on with it.

Innovation isn't always capital-intensive. Most prototypes do not pass the stress test of reality. The best ideas are community-intensive. Therein lies our best hope. ■

> ***"We will succeed at the transition if we achieve it with one another. For states to try to impose it with straitjacket solutions is a certain bid for failure***

On the brink of the abyss

As the UN Secretary-General warns, humanity is facing a cascade of crises. COP26 will be the moment of truth for climate and all countries must step up

By Miguel Ruiz Cabañas Izquierdo, Director, SDGs Initiative, Tecnológico de Monterrey; Co-Chair, SDSN Mexico

On the third Tuesday of September this year, as is the case every year, the 76th session of the United Nations General Assembly began in New York. Secretary-General António Guterres opened the high-level segment, which included heads of state, heads of government and foreign ministers, with a dramatic speech:

"I am here to sound the alarm: the world must wake up. We are on the edge of an abyss – and moving in the wrong direction. Our world has never been more threatened. Or more divided. We face the greatest cascade of crises in our lifetimes. The COVID-19 pandemic has supersized glaring inequalities. The climate crisis is pummeling the planet. Upheaval from Afghanistan to Ethiopia to Yemen and beyond has thwarted peace. A surge of mistrust and misinformation is polarizing people and paralyzing societies. Human rights are under fire. Science is under assault. And economic lifelines for the most vulnerable are coming too little and too late – if they come at all. Solidarity is missing in action – just when we need it most."

For Guterres – uniquely placed to appreciate the global situation as a whole – the current landscape is characterized by six gaps or divisions that must be closed to achieve a better world:

- the gap of peace
- the gap of climate
- the division between rich and poor
- gender inequality
- the digital divide
- the generational breach

His diagnosis is not only dramatic, but grim. Only a renewed multilateralism, which is absent today, can prevent a further deterioration of the global situation.

After reviewing the uneven responses between countries with and without access to vaccines to cope with the COVID-19 crisis, Guterres stressed that the climate crisis is getting worse every day. Of course, every effort must be made to close the six gaps identified in Our Common Agenda. But of the six, the climate emergency is undoubtedly the most urgent – and perhaps the most serious.

The Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), published in August 2021, confirms that we are in an unprecedented climate emergency. There are records of climatic catastrophes in all regions of the world. However, there is hope. Scientists believe that we still have time to ensure that the global temperature does not rise by more than 1.5°C as agreed within the Paris Agreement of 2015, of which Mexico is a party.

But there is very little time to act. Emissions of greenhouse gases (GHGs) that cause climate change must fall by 45% by 2030, in just eight and a half years' time. But if countries do not make more efforts to reduce their emissions, and the current trend persists, we will have the opposite: a 16% increase in those emissions by 2030.

"That would condemn us to a hellscape of temperature rises of at least 2.7°C above pre-industrial levels," Guterres warns, meaning more droughts, fires, and floods. To complete this perilous picture, it should be noted that developed countries have not fulfilled their commitment to transfer USD 100 billion a year to developing countries to help them with their climate change mitigation and adaptation programs. According to the Organisation for Economic Co-operation and Development (OECD), there is at least a USD 20 billion deficit.

For this reason, COP26 in November will be the moment of truth. At that meeting, all countries, including Mexico, will have to formalize their nationally determined contributions

▲ Floods in La Lima, Honduras after Hurricane Eta, which caused extensive damage and loss of life across Central America, the Caribbean, and US. Rising temperatures are giving hurricanes greater energy and extended longevity after landfall

(NDCs) to reduce their GHG emissions that cause climate change.

The best way to reduce these emissions is to accelerate the energy transition to clean energy, such as solar, wind, and geothermal, since the energy sector accounts for 60% of global emissions. A second action is to make radical changes to countries' food systems, since they produce 30% of global emissions (indeed, the UN recently convened a special conference on this subject).

It is unrealistic to assume that the major producers and consumers of oil, gas, and coal will cease to do so within the next eight years, even though clean energies are already competing on price with fossil fuels, and their prices are expected to continue to fall. Radical reductions in emissions can only be achieved through a combination of several strategies:

- a gradual shift from fossil energy sources to clean energy, especially at local and community level
- nature-based solutions such as reforestation and mangrove expansion
- maximizing energy efficiency to promote energy savings and avoid waste
- preventing gas leakage, such as methane in oil wells and livestock activities

Mexico is considered as a developing country. Therefore, under Article 2 of the Paris Agreement, it is not obliged to completely eliminate its emissions (that is, to achieve climate neutrality) by 2050, as most developed countries and many developing countries have already committed themselves to. But it has also not shown a greater willingness to increase national efforts to reduce its emissions beyond the commitments announced in 2016.

In practice, Mexico's current energy policy favors the use of fossil fuels over clean ones. It is a pity, because all the leading economies of the 21st century, including Korea, China, the United States, India, Japan, and the EU countries, are accelerating their energy transition to new sources of clean energy, not only to combat climate change, but also to make their economies more competitive.

It is essential that Mexico sets a date by which it will achieve climate neutrality, be it in 2050 or 2060, and issue a law on the matter. Otherwise, we will remain spectators of the global energy revolution that is now underway. We will continue to live in our ancestral backwardness, contributing little to saving the planet, one of the most important causes of humankind. Mexico will be, to be frank, an irrelevant actor at the international table. ■

Learning from COVID to deliver a transformative COP

The experience of COVID has fundamentally changed our understanding of country risks. These lessons need to shape and drive COP26

By Carlo Papa, Managing Director, Enel Foundation, and Alessandro Terzulli, Chief Economist, SACE (the Italian Export Credit Agency)

In a few days, the world will be heading to Glasgow for the 26th UN Climate Change Conference of the Parties (COP26). The one-year postponement left us with a year of reflection on how to make Glasgow a real turning point in the climate change fight.

Forward-thinking governments and institutions such as the EU are making significant progress on climate action at home, as handling the COVID-19 storm tails off. Around the world, several stakeholders are taking into account climate diplomacy and investing in climate.

The pandemic has magnified the risks already present at both public and business level. During the crisis, we have been able to ponder the links between social factors and the effects of the virus along different patterns of wealth distribution, clearly defining the present situation as a syndemic rather than a pandemic. It is a syndemic that has ushered in a "new normal" for humanity, characterized by two phenomena:

- an unconcealed climate crisis, directly or indirectly affecting health and healthcare systems, alongside worsening global inequality, triggering an array of physical risks for our socio-economic systems – from Europe's floods to wildfires in the Americas, from droughts in Africa to tropical storms in Asia – with climate and weather-related disasters surging

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fivefold over 50 years
- a progressively rapid energy transition, entailing positive effects on the very same variables – health, inequality, planetary boundaries – that are negatively impacted by climate change

From the many lessons learned from COVID-19, there is a tremendous opportunity to reconsider the way we measure systemic risks in finance, including new and more fitting dimensions and parameters. There is also the need to look at new methodologies.

More than a decade ago, a report by the Commission on the Measurement of Economic Performance and Social Progress (CMEPSP) reminded us of the problems of using gross domestic product (GDP) as a unidimensional measure of macroeconomic progress and proxy for economic well-being.

Yet, this was by no means a new critique. Simon Kuznets – one of the main originators of GDP in the 1930s – was already aware of GDP's limitations and believed it was not a proxy for wealth on its own.

Today, we have come a long way. In 2018, the Nobel Prize in economic sciences was awarded for integrating climate change and technological innovations into long-run macroeconomic analysis. A year later, the prize went for work on an experimental approach to alleviating global poverty. The "prosperity puzzle" is currently top of the agenda of international institutions. Yet, in 2021, the risks and opportunities associated with messing up the puzzle – or precisely how to solve it – are still not widely considered and properly calculated.

◂ Offshore and onshore wind power in the Netherlands. It is imperative that all countries, on all fronts, actively pursue the transition from fossil fuels

Ensuring equitable wealth distribution by fighting climate change and speeding up the just energy transition are indispensable pre-conditions to ensure prosperity for all in the new normal. They have become relevant targets for some nations and forward-thinking companies. But the risks related to falling short on those targets have not yet become part of the more traditional country risk classification methodologies, while only a few are reconsidering the role the state can play.

> ***"From the many lessons learned from COVID-19, there is a tremendous opportunity to reconsider the way we measure systemic risks in finance***

COP26 is a critical moment in driving investment decisions to tackle climate change effects (and the related socio-economic inequalities) and enable the energy transition. We believe it is vital to find suitable ways to embed climate action into economic and business practice. We have tested a method to improve traditional country risk methodologies by reconsidering and eventually eliminating four fundamental biases. These are:
- a slow-bureaucratic state versus a dynamic private sector
- GDP as a proxy of wealth
- significant weather events categorized as extreme and exceptional
- the energy system as a commodity

As mentioned, the magnifying effect of COVID is helping us to re-examine these biases. Together, the Italian export credit agency SACE and the Enel Foundation have worked to build an advanced risks and opportunities model at the country level that allows more precise assessments and enables the formulation of more effective investment plans to ensure sustainable development for all. The model also highlights, and hopefully avoids, any losses deriving from risks of non-payment, and political risks associated with foreign direct investments. We have reached four key conclusions, explained in turn below.

Entrepreneurial state

Over the last 12 months, the world has come to appreciate the benefits of an entrepreneurial state and active supranational organization – as hundreds of new vaccine research efforts and massive vaccination campaigns can demonstrate, or looking at the role the EU is taking in transitioning into green energy with the Fit for 55 legislative package. States are playing an essential role in enabling radical transformation to ensure a sustainable future for all.

Clearly, the COVID-19 fight and the energy transition are not the only realms in which we can observe public institutions creating value for society. If we look, for example, at climate change research, nearly all the literature sees public institutions in a leadership role. Indeed, to build back better we need to remember the important role all stakeholders can play, from public entities to private businesses. However, we must avoid the downfall of excessive government interference in market mechanisms. States should leverage debt for stronger physical and digital infrastructures and forward-looking scientific research, rather than support unproductive subsidies.

Wealth

For around a decade, economists have debated how to accurately define and measure "inequality." This has seen less reliance placed on measures such as income or consumer expenditure and a move toward more holistic data sets, such as the 11 parameters taken into

account by the OECD Better Life Index. Traditional data is now considered alongside subjective well-being measurements such as the Cantril self-anchoring striving scale.

Yet, as recently reaffirmed by the Club of Rome, "societal needs are still unmet, economic gains are shared unequally and the social contract is eroding." It is precisely to start measuring the risks raised by this progressive erosion, exacerbated by the COVID crisis and climate change, that we propose to monitor wealth, starting with demographic and income composite measurements as a baseline, with health, education, and jobs as essential instruments to ensure well-being over time.

New normal

Traditional country risk classification methodologies recognize climate change effects – such as cyclones, floods, and tidal waves – as cases of force majeure. In this, they fail to recognize that we are in a new normal where such events are indeed extreme, but are no longer exceptional. Indeed, the dynamic of relevant loss events related to climate and weather shows a substantial growth since 1980, and disasters around the globe in 2021 confirm such a progression.

If we observe the convergence between the different degrees of anthropization (the rapid growth of megacities and related resources) and the geo-localization of natural loss events, it becomes clear how the risk is growing substantially. Analyzing all those data – and many more that the scientific community is monitoring, from CO_2 emissions to the shrinkage of glaciers from the Andes to the Alps – it is clear that a new normal condition is here to stay. It is a condition in which humanity around the world must operate, characterized by increased hazard exposure and vulnerability.

This new normal, we believe, has to more decisively make its way out of the scientific realm and supranational organization into government cabinet and boardrooms globally. It must now be systematically factored into country risks assessment.

To serve this purpose, the Enel Foundation and SACE have initiated the monitoring of some of the main climate hazards (such as floods and heatwaves). These have been determined principally by high temperature, hydrogeological fragility, and storms – and considering communities' vulnerability in their given environmental and socio-economic context.

To complete our risk profiling per country, we run scenario analysis, starting with historical data and projecting up to 2050 and 2100. This shows to what extent climate change makes weather extremes the new normal. This confirms that we should reconsider the concept of force majeure related to meteorological events in risk analysis (although it will no doubt still be debated in court). This is precisely because extreme events are no longer unforeseeable, and to a certain extent are not unavoidable. Rather, they can somehow be considered the result of human inaction in achieving a lower footprint on the Earth and building a climate-proof society.

Energy transition

The International Energy Agency has confirmed in its forecast the extent to which the COVID crisis has influenced the energy sector globally – probably more than any other crisis in modern times. Oil prices have fallen below zero for the first time in history and are bouncing back in a perennial volatility. Forward-looking electricity players have started to eclipse the big oil majors by multiplying their renewable-energy capacity and transforming the grid to prepare for a full-electric future. We have come to learn that energy systems no longer fit any more completely within the commodity-based paradigm we were all used to.

Classical energy "supply, demand, and storage" schemes at a system level are being partially replaced by the possibility of decoupling energy production and usage from fuel availability and cost – with relevant market and geopolitical consequences. Indeed, in pure market terms, increasingly cheaper renewable power compares to any new electricity capacity based on fossil fuels – even without factoring negative externalities of the latter – and is decisively attracting investments.

At country level, the transition will reduce the dependency on importing fuel, thanks to local renewable energy resources. At a global level, it will trigger a re-balancing in material flows and international relationships.

However, only the active pursuit of the energy transition on all fronts – from policy to regulation, from health to education – will allow countries to benefit most from this opportunity, especially as they recover from the COVID crisis. Precisely to start assessing the rising risks of slow progress on the energy transition race – exacerbated by the COVID crisis and climate change – and the opportunities ahead of a decisive move toward the transition, we decided to monitor five variables:

- fossil fuels
- greenhouse gas emissions
- energy efficiency
- electrification
- renewable generation

The first two are included to establish a baseline of stranded or potentially stranded assets, and flow or stock pollution. The final three variables are the essential elements to ensure a successful energy transition over time.

Conclusion

The proposed new mindset on country risks and opportunities modeling will, in our humble opinion, accelerate the recovery.

We believe nations can build consensus for COP26 to define a turning point in measuring the new normal conditions we are living in. We can better mitigate and adapt to climate change, and leverage the tremendous opportunities generated by the energy transition policy and movements. ■

Getting everyone to act

The reasons for climate inaction are many and varied. We need a range of strategies to ensure that everyone – from the concerned to the skeptical – takes the action our planet needs to survive

By Jiaying Zhao, Associate Professor, Canada Research Chair in Behavioral Sustainability, University of British Columbia (UBC); Rumi Naito, PhD Candidate, UBC; Yu Luo, PhD Candidate, UBC; Nigel Deans, MSc student, UBC

We need everyone to act on climate change, now. Despite growing concerns about climate change worldwide, only a small fraction of the population has taken action. How can we scale up climate action and collectively address the current climate crises?

For global challenges like climate change, no single intervention works for everyone. This is because people hold different, sometimes opposing, views on climate change, and their reasons for inaction are different. What we need, then, is a comprehensive set of interventions that target different subsets of the population, from the most concerned about climate change to the skeptics. It is critical that no one is left behind.

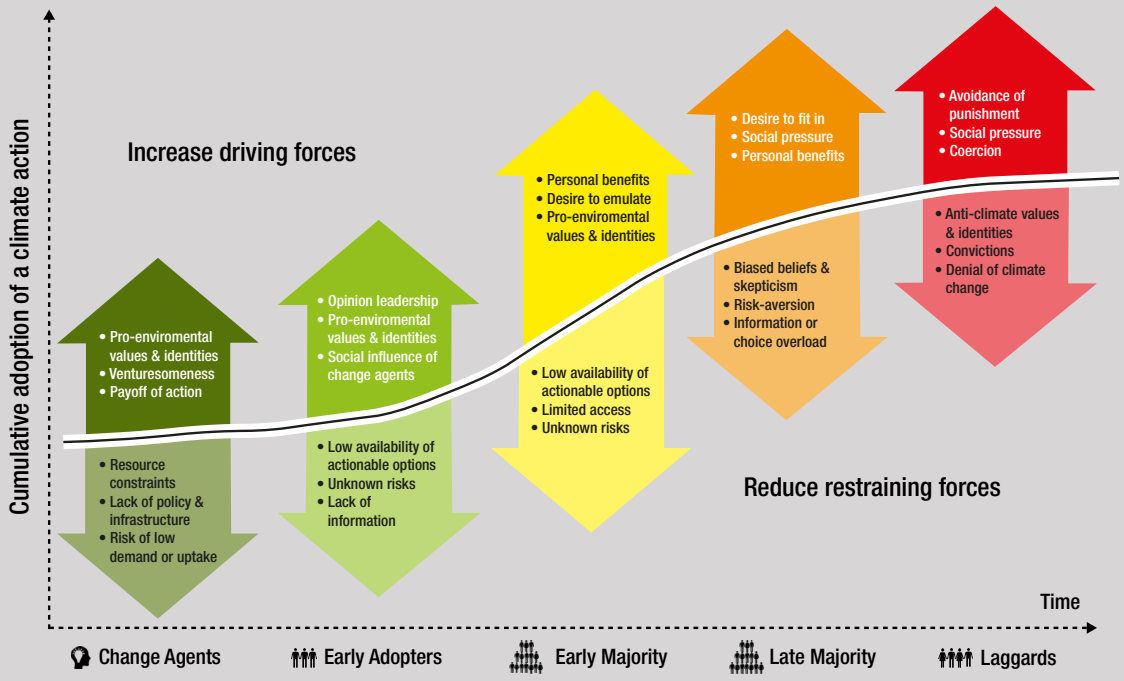
Social diffusion of climate action

We propose an integrative approach that describes the diffusion of climate action across an entire population (see Figure 1). This approach provides a recipe for enabling a variety of climate actions, including private individual actions (such as flying less), social signaling actions (such as sharing climate change information), and civic actions (such as signing petitions). For a given climate action, this framework:

- segments the population based on the adoption rate of the action

FIGURE 1: A social diffusion approach

This approach identifies the key driving forces and restraining forces behind climate action for change agents, early adopters, early majority, late majority, and laggards. Each force, indicated by a bullet point within a group, is separate from other forces, and can be changed by appropriate behavioral interventions.



Source: Zhao et al

into distinct groups of people, from change agents, early adopters, and the early majority, to the late majority and laggards (diffusion of innovation theory)
- identifies the forces that drive and restrain the action within each group (force field analysis)
- proposes appropriate interventions to increase the driving forces and to reduce the restraining forces behind the action for each group

The approach offers a comprehensive set of solutions that target distinct groups of people within a given population. In the next section, we describe the distinct groups, the forces, and the interventions for scaling up climate action.

Change agents

Change agents create conditions necessary for the widespread adoption of climate action. They include policymakers, activists, NGOs, and innovators of climate-friendly technology and products.

Change agents are driven by pro-environmental values and identities, venturesomeness, and the potential payoff of the action. However, their actions are restrained by the absence of resources, existing infrastructure and policies, and by the risk of low demand or uptake of their ideas or innovations.

Change agents can benefit from individual interventions that reinforce their values and identities, and systemic interventions that provide resources and policy support.

Early adopters

Early adopters are the first to adopt a climate action when it becomes viable (for example, the first ones to purchase a plant-based hamburger).

Like change agents, they are driven by pro-environmental values and identities, and by a desire to signal their fast adoption of the action to their social circles. These individuals are strongly influenced by change agents through personal, social, or professional connections. The restraining forces they face include low availability, unknown risks, and lack of information about the action.

To encourage early adoption, individual interventions include reinforcing values and identities and increasing social signaling power. Systemic interventions such as increasing availability and accessibility of the action, and disclosing its risks and information are most effective for this group.

Early majority

This group follows suit and engages in climate action promoted by early adopters.

However, its driving forces are different, involving personal benefits of the action (for example, health benefits or cost savings of eating less meat), a desire to emulate early adopters, and somewhat weaker pro-environmental values and identities.

Those in the early majority group face similar restraining forces to early adopters: low availability of and limited access to actionable options, and unknown risks of the action. Change agents, early adopters, and those in the early majority make up half of the population.

For the early majority, driving forces can be enhanced by individual interventions that involve role model endorsements, reinforcement of values and identities, and social recognition for taking climate action. Restraining forces can be reduced by individual interventions that provide more information about the action, use ownership framing, or reminders. Systemic interventions include increasing the availability of and access to actionable options and disclosing risks of the action on a large scale.

Late majority

The late majority will adopt climate actions because they want to fit in with the rest (herd mentality). They also experience considerable pressure from their social networks.

Like the early majority, these individuals are partly motivated by personal benefits of the action.

Their barriers include biased beliefs, skepticism from insufficient evidence, tendencies to avoid risks, too much information, and too many available actionable options.

To enable climate action in this group, individual interventions that use social norms, peer pressure, and peer influence can increase the driving forces. Reducing restraining forces involves providing information or social support from trusted sources. Systemic interventions can reduce restraining forces by providing incentives and rewards for taking climate action, making the action easy and affordable, making the action the default, disincentivizing inaction, and making

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▲ Residential properties next to an oil refinery in Whiting, Indiana, US. Climate change disbelief tends to correlate with economic dependence on fossil fuels. This segment of the population presents the greatest challenge and requires tailored engagement

non-climate-friendly options more difficult.

Laggards

The laggards are the most reluctant to act and the most resistant to behavioral intervention. Their resistance to climate action is due to strong values, identities, and convictions that challenge the validity of climate action and the reality of climate change itself.

Their eventual climate action is driven by the avoidance of punishment, significant pressure from their peers, and coercion through laws and mandates. For many of these individuals, their resistance to climate action is reinforced by the inaction of the people in their social circles who also hold similar values, beliefs, and convictions.

Individual interventions can use peer role models to deliver messages and to endorse climate action. Systemic interventions that involve mandates and penalties for inaction are better suited for this group. Those in the late majority and the laggards make up the remaining 50% of the population and are often overlooked by behavior change interventions.

Call to action

This approach offers a blueprint for practitioners, researchers, and policymakers to mobilize climate actions in ways that address the diverse motivations and barriers of each segment of a population. To prevent the worst effects of climate change, we should acknowledge the different groups of people, the distinct forces affecting climate action, and tailor interventions to each group. ■

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Empowering change

Leaders must take bold climate policy action and mobilize sustainability skill-building in young people to catalyze urgent change for the planet

By Debra Rowe, President, US Partnership for Education for Sustainable Development

Good news! People are worried. I know that sounds bizarre or even funny, but it is good news that people are seriously worried about climate change now. Their worrying is motivating them to get out of their comfort zone and help create the bigger changes we need.

More good news! We already have many of the solutions to meet the short-term, science-based targets designed to prevent the worst impacts of climate change. There is no valid reason to sit in doom and gloom, because the cost-effective and successful technologies, financial models, and policies to meet this decade's goals already exist.

We will need some technology breakthroughs and additional financing to get all the way to net zero, but the science-based climate targets for 2030 are viable now.

◂ Students march for the Global Climate Strike during the Pre-COP26 Summit in Milan

Don't believe me? Read the International Energy Agency (IEA) report, Net Zero by 2050, as just one example of many analyses.

These solutions also create higher quality of life for billions of people across the planet while protecting the life-sustaining ecosystems we need for present and future generations. As a facilitator of sustainability networks across the globe and a professor of renewable energies, energy efficiency, and sustainable development for 40 years, I am so glad to share with you that many of the solutions are here, and to suggest how you can implement them.

As a leader, you are well positioned to become a climate hero! It is time to encourage and embrace these positive changes to decrease unnecessary human suffering. Psychology tells us change is uncomfortable, even positive change. So I suggest to all world leaders: use the information available from the climate and energy experts to help you shift from your negative discomfort about climate disasters into feeling positive as you make the large changes we all urgently need. The potential is so exciting!

Policies to leverage change

Imagine a better future where we have clean energies, vibrant economies, better health, and higher quality of life across the planet. Imagine that the leaders of today are remembered for implementing these solutions and averting a global disaster! Look to the future with enthusiasm for what we can do today. Keep the focus on bringing solutions to scale. Work on larger systemic change and deep decarbonization – we are past the time for small pilot projects.

Use policies as leverage for broader change. As the IEA says in Net Zero by 2050, we have a small window to implement solutions and prevent unnecessary climate tragedy. The IEA provides a roadmap for the bold actions we can and must do now, and explains that a "… primary aim is to inform the decisions made by policy makers, who have the greatest scope to move the world closer to its climate goals."

While policymaking is crucial, we know that organizations often lack the budget or human capacity needed. More good news! There is another great asset to help make these solutions happen – our young adults.

A substantial percentage of the world's youth are well aware of our sustainability challenges and the potential solutions. Students tend to feel a lot of doom and gloom about climate change if they are not participating in the solutions. They will hold governments and businesses accountable for our actions, but they are also enthusiastic about contributing. They want to work on real-world initiatives through applied research and projects.

> ***"Good news! We already have many of the solutions to meet the short-term, science-based targets designed to prevent the worst impacts of climate change***

Research shows these pedagogies also improve learning. To expand global climate action, use international initiatives like For Good and EPIC-N to connect higher education students with communities and improve the human capacity for progress toward our climate goals.

Students can connect with communities locally and remotely to work on both mitigation and adaptation while learning to become effective changemakers. They can help put into place compassionate mutual aid structures to assist with the transition to a more sustainable clean energy future.

As you continue to act boldly, you will be so proud of the legacy you leave for future generations. Empower your staff and all your stakeholders to implement the deep decarbonization solutions. Reach out to the United Nations Sustainable Development Solutions Network (SDSN) and the higher education networks for sustainability, and we will assist you with applied research and project implementation.

The networks for sustainability across higher education want to assist all countries in creating and scaling the solutions. If someone fails to provide the help you need, reach out to others. It feels so good to be creating a better future rather than lingering in the worry, the frustration, and the doom and gloom.

Great news! We are going to have lots of jobs in this improved green and sustainable economy. The UN Environment Programme and a wide variety of experts contributed to the creation of a global guidance document on green career pathways for educational organizations. The document provides insights and resources to update curricula and activities to prepare students to be part of a more inclusive workforce and a green economy. It is a one-stop shop of resources.

In summary, do more with a focus on scaling up systemic solutions for deep decarbonization. Utilize policies and involve students. Celebrate each step of progress and act for rapid change because it is crucial. Be inspired by understanding the better society within our grasp. Reach for your potential and be a climate hero! ■

With thanks to Evangeline Mengelkoch, Meagan Helton and Aaditi Lele for their feedback on this article.

Women are the key to nature-based climate action

Nature-based solutions are increasingly recognized as a critical part of climate action. Key to their success will be the greater involvement of women

By Bineta Diop, African Union Special Envoy on Women, Peace, and Security

Nature's key role in combating climate change cannot be overemphasized. Nature-based solutions are easy to use, and highly effective in improving community livelihoods and resilience to climate change. Moreover, they have the potential to tackle both climate mitigation and adaptation challenges at relatively low cost, while delivering multiple additional benefits for people and nature.

Women have long faced a greater burden from a changing climate compared with men. Women mostly rely on natural resources for their livelihoods, while their care-giving roles in traditional communities further exacerbate already-existing inequalities.

In July 2018, a women-led joint solidarity mission by the African Union Commission and United Nations to the Lake Chad Basin and the Sahel region recognized how climate change has triggered conflict and how this has affected the women in the region, compounding poverty and marginalization. The vicious circle of climate change and conflict needs to be tackled to mitigate the effects of climate change on women.

The eruption of the COVID-19 pandemic risks accelerating the crises of climate change and nature loss that humankind already faced before the pandemic. The resulting socio-economic impacts of coronavirus, meanwhile, are exacerbating inequality and poverty. According to the World Bank, the pandemic led to 97 million more people being in poverty in 2020.

A crucial role

Despite women being disproportionately affected by climate change, there often is not a deep recognition of the crucial role they can play in climate change adaptation and mitigation. Women are crucial when it comes to accelerating the implementation of nature-based solutions to climate change, as they deeply rely on the environment to support their livelihoods – hence their motivation to conserve it. While there has been some progress already, much more must be done to ensure that the needs, perspectives, and ideas of women are included in climate action to create just, effective, and sustainable solutions. Women leadership matters in this ecosystem.

This requires scaling up multi-stakeholder partnerships and platforms that foster and support nature-based solutions to climate change. A good example of this is the investment in women's actions within Africa's Great Green Wall initiative, a bold vision to restore 100 million hectares of degraded land across the continent, and championed by the African Union.

Scaling up the specific recognition of women as key decision-makers, stakeholders, educators, carers, and experts across sectors can lead to successful, long-term solutions to climate change. Investing in participatory, multi-stakeholder, and multi-sectorial Climate Change Gender Action Plans can also help countries to develop comprehensive action that integrates gender concerns and builds on women's unique knowledge and perspectives.

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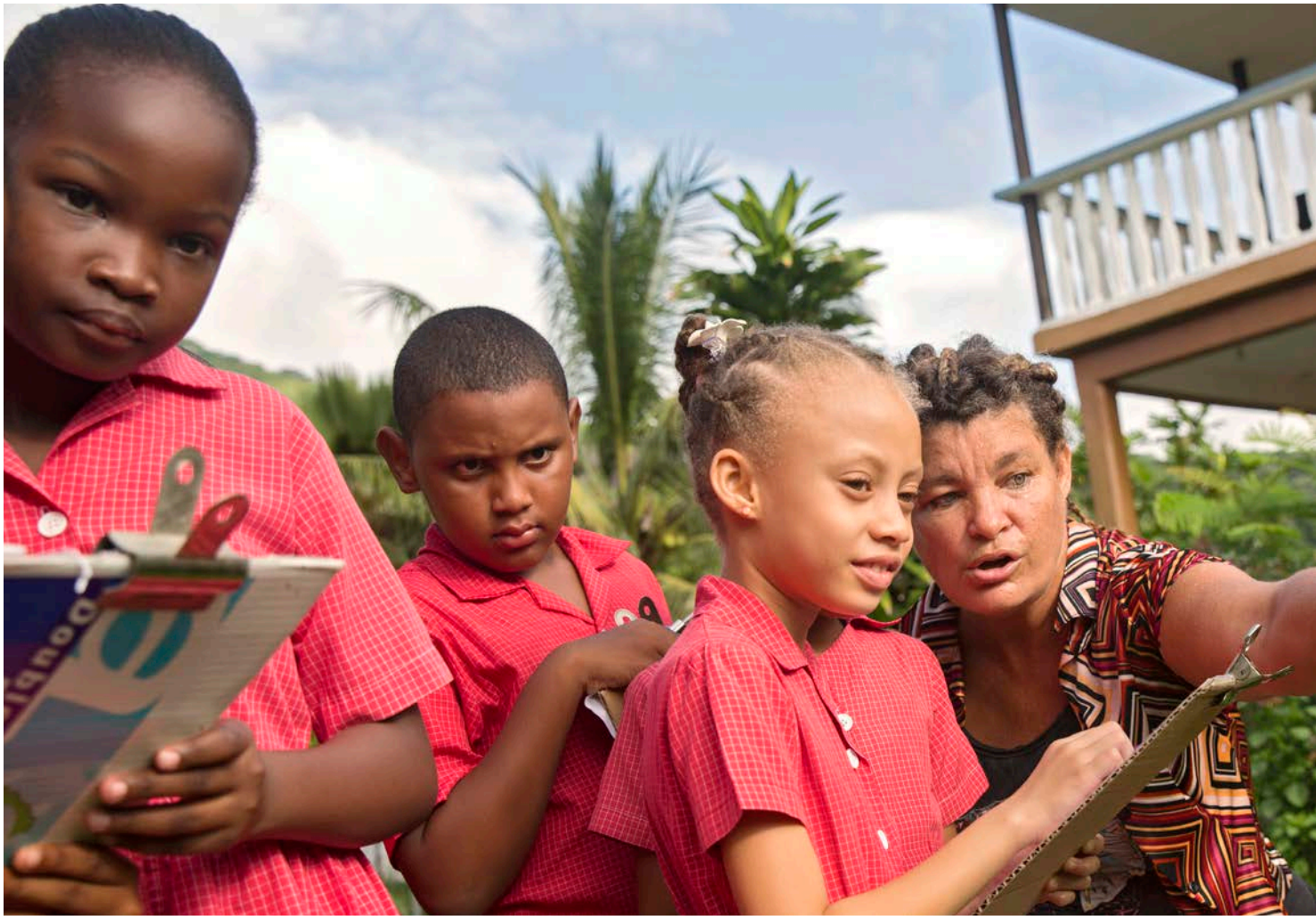
▲ Women in Neves, São Tomé and Príncipe clean up the Rio Provaz basin. Climate change and loss of tropical rainforest is threatening the water supply upon which the town depends

We also need networks – such as the UN Sustainable Development Solutions Network – that champion solution-oriented research into climate action that includes nature-based solutions. These networks create a platform for sharing best practice and lessons learnt, therefore narrowing the knowledge gap in climate change mitigation solutions.

Capacity-building is also essential in ensuring women's participation and leadership in tackling climate change. We therefore need governments and the private sector to invest in outreach, education, and training on technological innovations and nature-based solutions to climate change. Many stakeholders, including women, require further enlightenment on the benefits of nature-based solutions, coupled with technological innovations and the opportunities to implement them correctly. These initiatives can strengthen women's roles as decision-makers and experts.

A key condition for a gender-focused approach is to recognize that any discussion must be backed by data and effectively measured. Gender-disaggregated data is essential in ensuring inclusive climate policies. Therefore, government mechanisms responsible for data need to ensure that reliable, gender-disaggregated data is being collected at all levels.

Declaring 2020 to 2030 the Decade of African Women's Financial and Economic Inclusion also provides an opportunity to accelerate sustainable solutions for the world's biggest challenges, such as poverty, aligned with the Sustainable Development Goals. Given the effect of climate conditions on these, the decisions and investments made on gender-related climate conditions, particularly over the next couple of years, can have far-reaching consequences on the successes of our collective ambitions. ■



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Developing the climate citizens of tomorrow

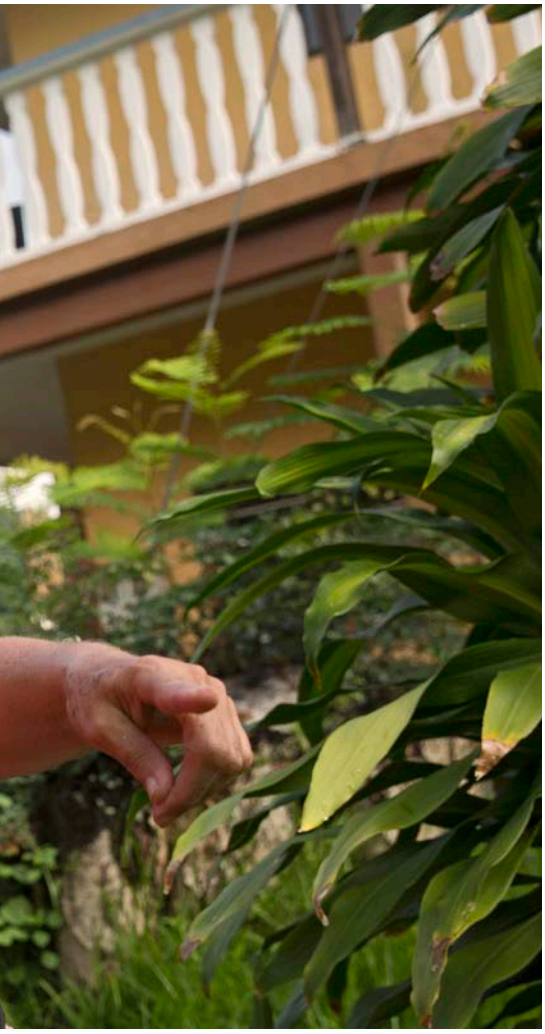
Never has education been more vital as a force for positive change. Learning must inspire and empower the next generation to tackle climate change head on

By Olli-Pekka Heinonen, Director General, International Baccalaureate Organization

If the COVID-19 pandemic – and the battle to bring it under control – has taught us anything, it is that global crises require global solutions. This particular war is not yet won, but the victory, when it comes, will be because humankind worked together.

This collaboration includes – importantly, for the purposes of this article – very many different academic and intellectual disciplines. Scientists have of course correctly taken much of the credit, but the collective effort would not have been possible without statisticians, human geographers, economists, behavioral scientists, and communicators. Many others too, no doubt.

They have needed to work together, to listen to one another, to cross-



◂ A school-based wildlife club in the Seychelles learning about mangroves

fertilize ideas, and to collectively problem-solve.

If such a diverse team is needed to take on COVID-19, just imagine the coalition of skills, disciplines, and thinking we will need if humanity is to tackle the climate crisis before it is too late.

Developing the citizens of tomorrow capable of the kind of collaboration and thinking we will need if climate catastrophe is to be averted is, at least in part, the responsibility of today's schools, teachers, and educators.

Educationists will never meet this tremendous responsibility unless we step back and take a moment to work out the curriculum and assessment model we need for this challenge. They must be given the relevant educational tools to do the huge job we are asking of them.

Interdisciplinary learning – and transdisciplinary learning – is a key part of this toolkit: problems of this magnitude simply cannot be solved through one lens. But teaching and learning must also be based on a cycle of inquiry, action, and reflection, and with prominence given to active participation.

Beyond breaking down the silos of individual subjects, the future of curriculum design needs to focus on three areas to ensure the next generation is ready to tackle climate change head on:

We must have a curriculum that is designed with the specific challenge in mind

Sustainability must be a key feature of courses and disciplines. This includes the natural sciences, geography, design technology, economics, and business management, but others too. We advocate for a sustainable planet and ask students to consider how the relationship between people, planet, and growth is central to this and how siloed subjects interrelate.

We must prioritize education in action

Curricula in the future must foster an organic link between in-classroom learning and sustainable action in the community, so that students support sustainability in practical ways. The curriculum of the future must contextualize learning with the time, place, and community within which the school is situated. Authenticity of learning is key: students must understand how their learning can manifest itself in the real world.

We must foster young people as "agents of change"

Curriculum and pedagogy should inspire learners, as global citizens, to make a difference and contribute to society. We must promote the importance of "principled action" in terms of making responsible choices and exploring the ethical dimension of decisions to act or not to act. Students must be encouraged to explore global and local issues in a way that empowers them to be not just aware, but engaged. They must be encouraged to explore their own agency – what they themselves can do to make the change we need.

> ***"The pedagogy and curriculum of the future needs to create opportunities for learners to inquire about, and contribute their voice to, the future of humanity***

The pedagogy and curriculum of the future needs to create opportunities for learners to inquire about, and contribute their voice to, the future of humanity. It should allow young people to make connections between subjects and disciplines. It should also create opportunities for them to make connections between their values and passions and those of the communities around them.

Throughout history, schools and teachers have evolved to tackle many of the problems facing human society. The climate emergency is surely the biggest problem of them all. It's time for education to pivot again. The final aim of education should be flourishing: human flourishing of current and future generations and flourishing of all living on Earth. ■

A new trustee for the global commons

27 years after its operations were suspended, a reimagined UN Trusteeship Council could find new purpose as a force for action on climate change

By Ramu Damodaran, Senior Advisor, University for Peace

Among the most impressive characteristics of the Charter of the United Nations is its ability to harmonize lofty lyricism with precision of point. Take Article 85, for instance, which reads:

"1. The functions of the United Nations with regard to trusteeship agreements for all areas not designated as strategic, including the approval of the terms of the trusteeship agreements and of their alteration or amendment, shall be exercised by the General Assembly.

2. The Trusteeship Council, operating under the authority of the General Assembly, shall assist the General Assembly in carrying out these functions."

While the article, in the context of the chapter on the international trusteeship system within which it is located, does refer to the physical trust territories that existed in 1945, the use of the word "areas" rather than "territories" allows it to lend itself to a wholly new sector of imagination and endeavor, now that its original decolonization mission concluded more than a quarter century ago. It is a sector whose possibilities UN Secretary-General António Guterres seized in his September 2021 report Our Common Agenda, suggesting that the Council be repurposed to an intergovernmental body for intergenerational issues.

Guterres writes:

"Previous commissions and secretaries-general, along with some Member States, have proposed a repurposing of the Council to enhance the governance of the global commons. Building on these ideas, and as part of the follow-up to Our Common Agenda, I invite States to consider making the Council available as a multi-stakeholder body to tackle emerging challenges and, especially, to serve as a deliberative forum to act on behalf of succeeding generations. Among other tasks, it could issue advice and guidance with respect to long-term governance of the global commons, delivery of global public goods and managing global public risks."

If such a renewed Trusteeship Council – a trustee of the global commons, including climate and the environment, a trustee of global public goods, including digital access and opportunity, a trustee of protection from global public risks such as a pandemic – is to be effective in "unlocking decisive action," in Jeffrey Sachs's phrase, how should it function?

This contribution attempts to offer some ideas in this regard, particularly in addressing climate change, whose increasingly alacritous pace has proceeded in parallel with the history of the United Nations itself.

First, let's return to a phrase from the United Nations Charter. It should be "a centre for harmonizing the actions of nations in the attainment of… common ends." A repurposed Trusteeship Council's focus should be on global action, not deliberation. The United Nations, and its General Assembly in particular, have been the fount of decisive global resolution, but less so of concerted action. This would be an opportunity to demarcate the terrain of the two principal organs between the articulation of ideas and the framing of policy.

Second, the Council should be a receptor for the stimulus of evidence-based documentation upon which such action can be premised. The Intergovernmental Panel on Climate Change (IPCC) is one example of such a source of fact without prescription of policy. What the IPCC has done in the environmental and meteorological field over the past third of a century could be enhanced by other convening alliances, notably the Sustainable Development Solutions Network (SDSN).

These alliances could gather, collate, and make coherent the data on the specific concerns that require global action, leaving the initiation of such action to the Council. In this way, the

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▲ There are precedents for intergovernmental organizations to safeguard global commons. The Commission for the Conservation of Antarctic Marine Living Resources was established in 1982 to preserve marine life and environmental integrity in and near Antarctica

Council would not have to devote time and responsibility to listen to individual experts or organizations, yet would retain the immense benefit of the experts' wisdom distilled in a manageable manner.

Third, the Council should build upon the universality of national objectives manifest in the Sustainable Development Goals. Just as no risk, notably climate change, is individual to a particular nation, so too should no nation exempt itself from agreed global action in the conduct of its domestic policies.

Fourth, it should build a robust consultative mechanism with international financial institutions and sources of private funding to address some of the immediate economic hardships that particular countries may face in their joining such global action.

And fifth, in the spirit of Our Common Agenda, the Council should act also as a trustee of the future. Here, global action will need to be preventive rather than corrective and, to that extent, more difficult to win agreement on. But if the Council were to emerge as a body to which scientifically sustained projections on future areas of human achievement and vulnerability can be presented and acted upon – particularly in the overarching area of climate and all the sectors dependent upon it – it can truly go from being a forum to a force.

A single forum

It will be a force that summons the energies of the range of UN agencies and offices engaged in global risk management. On climate alone we have the World Meteorological Organization in Geneva, the UN Environment Programme in Nairobi, the secretariat of the UN Framework Convention on Climate Change in Bonn, the secretariat of the UN Convention on Biological Diversity in Montreal, and the UN Development Programme in New York.

Then there are the many other agencies, including those dedicated to food and health, whose work is affected by climate change. There are other principal United Nations organs, such as the Economic and Social Council with its charter mandate that it "may make or initiate studies and reports with respect to international economic, social, cultural, educational, health, and related matters and may make recommendations with respect to any such matters to the General Assembly to the Members of the United Nations, and to the specialized agencies concerned."

And there is the vast aggregate of scholarship, civil society advocacy, and affected business enterprise that commands a compelling constituency.

It is not "system wide coherence" that the United Nations has long debated and sought, but a single, empowered forum to cohere the many venues cited above – and more. Can the flashing red light on the edge of the abyss, footsteps away (to mix António Guterres's metaphors), demand anything less? ■

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Ramping up tech for green energy

The exponential growth of clean-energy access in Africa has amply demonstrated the benefits and potential of technology transfer. Now investment must be scaled up to match the level of opportunity skill-building in young people to catalyze urgent change for the planet

◂ Installing an off-grid solar power system at a home in the Nakivale Refugee Settlement in Uganda

By Rose Mwebaza, Director, UN Climate Technology Centre and Network (CTCN)

The UN General Assembly declared 2014 to 2024 as the Decade for Sustainable Energy for All. This resolution emphasized the importance of improving access to reliable, affordable, economically viable, socially acceptable, and environmentally sound energy services and resources for sustainable development. The resolution further highlighted the importance of energy efficiency, increasing the share of renewable energy and cleaner, energy-efficient technologies.

The UN General Assembly Declaration is intended to strengthen Goal 7 of the Sustainable Development Goals (SDGs), whose main objective is to achieve affordable and clean energy for all by 2030. Given the importance that the UN General Assembly has attached to sustainable energy for all, what solutions would be transformative in unlocking global action to achieving it?

The transformational impact of technology transfer

One of the critical solutions to the global energy crisis is technology transfer and acquisition. In Katowice, Poland at COP24 in 2018, Parties to the UN Framework Convention on Climate Change (UNFCCC) adopted the technology framework under Article 10 of the 2015 Paris Agreement. Article 10, paragraph 1 of the Paris Agreement states: "Parties share a long-term vision on the importance of fully realizing technology development and transfer in order to improve resilience to climate change and to reduce greenhouse gas emissions."

Article 10 of the Paris Agreement on the Technology Mechanism is well aligned to SDG 17, which includes targets for access to and sharing of technology for sustainable development. Targets 17.6-17.8 of SDG 17 are devoted to enhancing:

- North, South–South, and triangular regional and international cooperation and access to science, technology, and innovation
- knowledge sharing
- the promotion, development, transfer, and diffusion of environmentally sound technologies to developing countries

Digital technologies

Digital technologies offer the greatest potential for access to sustainable energy in developing countries. Digital can play a critical role in transformations that unlock global climate action in the efforts of developing countries to transition to low-carbon energy pathways to meet the targets of SDG 7, which aims to ensure access to affordable, reliable, sustainable, and modern energy for all.

For example, Africa has the ability to leapfrog into a sustainable, energy-secure future. The region is witnessing exponential growth in energy access, partly because Africa is now able to leapfrog the inefficient and unsustainable use of energy

"Digital technologies offer the greatest potential for access to sustainable energy in developing countries… they can play a critical role in transformations that unlock global climate action

The Paris Agreement established a technology framework to provide overarching guidance to the Technology Mechanism. Together, the Technology Mechanism and the technology framework through the UN Climate Technology Centre and Network (CTCN) have supported over 358 technology transfer projects in 106 countries.

commodities that characterised the energy boom in China and Southeast Asia for a combination of technological, regulatory, and financial reasons.

Digital systems can enable demand response that, through continuous monitoring of the energy system, can optimize the balance between demand and supply. This demand response,

together with storage systems, increases the flexibility of the overall system, thus permitting an increasing share of renewables, particularly variable and uncertain sources like solar and wind.

In addition, Africa's successful experiment with information and communications technology (ICT) means that mobile networks can be used to efficiently support the penetration of renewables-based decentralized energy systems, especially in rural areas covered by mobile networks but not reached by electricity infrastructure.

In these areas, companies can implement business models based on the pay-as-you-go model, which can be applied to the remote management of standalone renewables systems. Mobile phones can be used as payment tools, thus overcoming the absence of a traditional "physical" banking system and providing customers with the possibility of using standalone units, like rooftop photovoltaic (PV) panels.

Customers can pay through their mobile phones in regular installments, giving them eventual ownership of the PV installation. Alternatively, customers can pay a given fee for energy services that allows them to consume the electricity generated without paying significant connection fees at the start, which was previously customary.

In this way, companies are also able to undertake remote monitoring of devices: collecting data on user payments, activating or deactivating services or devices, and so on. This makes the existing mobile infrastructure an effective option to facilitate access to different energy services and bolster penetration of renewables-based solutions.

In addition, the possibility of digitally connecting single energy-production units like household rooftop PV systems with consumption assets like electrical appliances, electric vehicles, and industrial production systems would enable the development of local energy communities of consumers and an evolution beyond the traditional categorization into producers, retailers, and consumers.

From an operational point of view, digital sensors generate a significant amount of data and provide real-time information regarding the key functional parameters of power plants and the status of networks. These data are helpful in enhancing efficiency of energy systems – for example, by reducing transmission and distribution losses, whose average value in 2018 in Africa was equal to 16%, and higher than 20% in countries like Ethiopia, Kenya, and Ghana. These data can also lower operating and maintenance costs, allowing for predictive maintenance and decreasing unplanned outages.

Better monitoring, improved maintenance, and increased operational life of the infrastructure ensure that they will be operated and maintained in a more effective way over time. Improved operation is also predicted to generate significant monetary savings, which the International Energy Agency (IEA) quantifies at USD 80 billion per year at the global level between 2016 and 2040.

A new, sustainable mix for energy systems

Globally, 1.3 billion people are without electricity and 2.6 billion people in developing countries still use traditional biomass for cooking and heating. Sub-Saharan Africa alone is home to 759 million people without electricity. Therefore, global transformative action on sustainable energy access should focus on developing countries, especially in sub-Saharan Africa.

The resurgence of renewable energy potential in sub-Saharan Africa presents unprecedented opportunities for further and enhanced energy access on the continent. Africa could harness these opportunities to be one of the leading actors in the global energy transition, with the resultant promise of enhanced social, economic, and sustainable development benefits.

Even under the most modest estimations, Africa's renewable energy potential for PV could lead to electricity production of about 660,000 terawatt hours per year (TWh/y), roughly a thousand times current consumption (equal to 652 TWh/y). This potential is mainly located in eastern and southern Africa (220,000 TWh/y and 160,000 TWh/y respectively), followed by northern Africa (about 110,000 TWh/y), western Africa (100,000 TWh/y), and central Africa (60,000 TWh/y). Similarly, the potential for concentrated solar power (CSP) is estimated at 470,000 TWh/y continent-wide.[1]

The critical role of finance in the energy transition

There can be no transformational technology impacts without increased finance for sustainable energy. Access to finance for the required energy transition as envisioned by SDG 7 continues to be elusive, especially in developing countries. Sustainable finance is critical not only for the energy transition, but also for the technological and systems innovation that is required to facilitate that transition. However, there is a huge gap between funds that are currently available and those required to finance sustainable energy for all.

The UN SDG proposed road map to 2030 states that annual investments of around USD 35 billion per year could bring electricity access to those who currently lack it in sub-Saharan Africa. USD 25 billion a year can help 2.6 billion people gain access to clean cooking between now and 2030. The required investments represent only a small fraction of the needed multi-trillion-dollar global energy investments, and would bring huge benefits to one third of the world's population.

Therefore, international financial flows need to be scaled up to increasingly target those countries falling furthest behind in reaching SDG 7. Indeed, the COVID-19 pandemic has increased investors' risk perception and shifted public funding priorities in developing countries. International public financial flows are more critical than ever to leverage the investment levels needed to achieve SDG 7. ■

Southeast Asia: high growth, low carbon?

Southeast Asia is a center of both economic and emissions growth. Its efforts to decarbonize will have a huge impact on both regional and global progress on climate action

By Guntur Sutiyono, Country Lead, Indonesia, ClimateWorks Australia; Jannata Giwangkara, Senior Project Manager, Energy Systems, ClimateWorks Australia; Jatna Supriatna, Chairman, Research Center for Climate Change, University of Indonesia; Suyoto Ngartep Mustajab, Chancellor, United in Diversity; and Zakki Hakim, Director, Action Labs, United in Diversity

The Intergovernmental Panel on Climate Change's Sixth Assessment Report, published in August 2021, could not be clearer: we are in a growing global climate crisis.

According to the report, the world may reach or exceed an average temperature increase of 1.5°C by the early 2030s, a decade earlier than previously forecast. The consensus is that action matters, and that to stabilize the climate and avoid triggering tipping points, CO_2 emissions must reach net zero by 2050.

▲ Floating solar photovoltaic panels at the Da Mi hydro power plant in Vietnam. Southeast Asia needs to decouple its economic growth from carbon consumption

Mitigating climate change has become more pressing than ever in

Southeast Asia. From 2010 to 2018 the region recorded the world's third highest emissions growth, accounting for about 7% of global emissions by 2018. The region, meanwhile, represents about 8% of global population.

If Southeast Asia insists on building fossil fuel-based energy systems, that will mean locking in high-carbon infrastructure for the long term, making the region more prone to climate change impacts. Framing the issue positively, Southeast Asian countries have more to gain than lose from coordinated energy and climate actions. As the International Energy Agency points out, the many socio-economic benefits of action for the region include energy cost savings, job creation, and reductions in air pollution and greenhouse gas (GHG) emissions.

> ***If Southeast Asia insists on building fossil fuel-based energy systems, that will mean locking in high-carbon infrastructure for the long term, making the region more prone to climate change impacts***

There is much to applaud in the region's current efforts to move towards net-zero emissions (NZE). Indonesia has set its NZE target for 2060, while Singapore and Laos have proposed targets for 2050. Cambodia and Myanmar are currently discussing achieving carbon neutrality by 2050, whereas Thailand is aiming at NZE by 2065 to 2070.

The story should not be exclusive to Southeast Asia. So what lessons can this region share with other developing countries?

NZE: not just possible, also socio-economically desirable

With energy demand increasing by 60% over the last 15 years, and with more than 80% of its energy coming from fossil fuels, Southeast Asia has become a global focal point over the need to cut emissions. Population growth, rising income levels, and subsequent development gains in the region have driven its emissions growth, especially from the electricity and heat sectors. If the current addiction to coal continues, it will overtake natural gas as the main power source by 2030, and will account for almost 50% of the region's projected emissions of 2.4 $GtCO_2e$ in 2040.

Increasing renewable energy ambition and removing fossil fuel subsidies and incentives provide a ticket to advance Southeast Asian economies in the next few years. The region will gain 3% of its gross domestic product (GDP) between 2019 and 2050 due to a substantial increase in renewable energy net exports, while the global GDP gain is around 2%. Moreover, the region's major economies (Vietnam, Indonesia, and the Philippines) are already showing clear comparative advantages in manufacturing and exporting low-carbon technologies.

For Southeast Asia to claim leadership in emissions reduction through an energy transition, a regional collaboration is required. We can see such collaboration in examples like the Association of Southeast Asian Nations' (ASEAN) Plan of Action for Energy Cooperation 2016 to 2025 (APAEC). Through this, numerous regional initiatives are underway in line with the ASEAN-wide renewable energy targets.

Furthermore, thanks to agreements such as the Regional Comprehensive Economic Partnership (RCEP) and critical trading partner commitments to net zero, ASEAN, as a trading bloc, has an opportunity to transform its economy. This will be spearheaded by ASEAN's comparative advantages and capacities in green technology, supporting the region to become a global green technology chain hub.

Unlocking decisive actions: three key takeaways

This year, the UN Sustainable Development Solutions Network (SDSN) initiated a regional collaboration, the ASEAN Green Future (AGF) project. AGF brings together experts from think tanks, academia, and civil society organizations, many working closely with governments, to develop ambitious yet achievable climate solutions. Through this collaborative effort, Southeast Asian countries are recommending climate solutions that can be applied in the region and beyond.

The first solution is to fast-track power sector decarbonization by switching to renewables. This action is urgently needed, given the planned expansion of coal-fired power plants (CFPPs) in ASEAN countries, with more than 95 GW already in the pipeline (see Figure 1, data from Global Energy Monitor's Global Coal Plant Tracker).

Already under discussion is a coal retirement mechanism to speed up the closure of currently operating CFPPs. Governments must urgently agree a plan to retire coal – this will be essential for setting the financing mechanism to achieve the transition. In addition, advances in renewable technologies, economies of scale, and growing local expertise will help increase the uptake in sustainable energy across the region.

Second, we must switch to zero-emission fuels. This includes the electrification of transport and industry, or using other zero-emissions fuels (such as green hydrogen) where electrification is not possible. The shift to electric vehicles is particularly crucial for Southeast Asia, where road transport is the number one driver of the toxic air pollution that is a key cause of premature deaths.

Third, it is vital that developing countries integrate a just transition into their decarbonization pathways. This

will ensure that the energy transition remains human centric, does not create regional inequality, and that sufficient funding is allocated.

Another important element will be the adoption of nature-based solutions to sequester carbon and strengthen resilience. This is especially important to support the role of the agriculture, forestry, and land-use sector as a net and natural carbon sink, on top of the decarbonizing efforts in the power sector.

With the ongoing share of GHG emissions coming from energy, policymakers across Southeast Asia have been intensifying their efforts to ensure a secure, affordable, and more sustainable pathway for the sector.

The region's abundant renewable energy sources should provide a more affordable and sustainable electricity supply, and move the region away from its current high-risk status as a net fuel importer.

A successful clean energy transition in this region would also set the future energy, economic, and climate trajectory for the rest of the world to follow. ■

// Policymakers across Southeast Asia have been intensifying their efforts to ensure a secure, affordable, and more sustainable pathway for the sector

FIGURE 1:
The coal pipeline in 8 ASEAN Member States (AMS), excluding Brunei and Singapore

Source: Author analysis with data from Global Energy Monitor's Global Coal Plant Tracker, August 2021

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No country left behind

All countries need to work towards the Paris Agreement, but for developing countries this can present technological and logistical challenges. How can international partnerships help all countries contribute to and benefit from this common cause?

By Robert Bradley, Director of Knowledge and Learning, NDC Partnership Support Unit

When you work on climate change and development, every year you wonder whether this will finally be the one that scares everyone into action. The past year has once again been one of the hottest in history. As wildfires choked Western skies, the Intergovernmental Panel on Climate Change released its latest report confirming how far we are from keeping under 1.5 degrees above pre industrial levels, and just how dire the reckoning will be. We read this report while hunkered down under a global pandemic. If this isn't the year to scare your pants off… well, there's always next year.

Faced with impacts of this scale and urgency, thousands of organizations are focusing on big technological shifts or the need to mobilize finance on a grand scale. This is excellent news. No single organization or even country could hope to bring all the technical expertise, financial resources, or regional experience needed.

But this plethora of actors brings its own challenges. For those working in developing country ministries, the phone never stops ringing. How to deal with

◂ Children on their way to a Christmas celebration in Funafuti, Tuvalu. This section of the island is reclaimed land, a countermeasure to rising sea levels. If levels continue to rise at current rates, Tuvalu will be uninhabitable in 50 to 100 years

dozens of potential partners offering different solutions and support? How to pursue a national strategy with so many ideas on offer? For donors and implementing partners it can be just as tricky. That roadmap for a zero-carbon transport system you're developing could be just the same as the one another partner is delivering for a different ministry. Or worse, it could be different. In a world of finite resources, we must be able to get partners contributing where they add the most comparative advantage.

Meanwhile, what about integrating climate action with development? Environment ministries may have visionary plans for low-carbon, resilient development, but if ministries of finance or planning aren't on board, these are unlikely to have much traction. These are typically the ministries charged with meeting the SDGs. If we want to bring SDGs and climate together, then the relevant ministries both need to own the plans.

Working together we can achieve more. Everyone would agree with this premise in principle, but it's tough to put it into effect. Institutional incentives and national politics often push people, however dedicated and well meaning, to compete rather than cooperate. And then there is the sheer time it can take to work with multiple counterparts. Planning workshops, stakeholder consultations, partner meetings – these all take time and often money.

Partnership platform

Nevertheless, the costs of not cooperating are far greater. Which is why a group of governments and institutions – currently almost 200 in total – set up the NDC Partnership. The Partnership is not a separate platform, but a mechanism that lets members and other partners work together transparently and efficiently to support countries with their action on nationally determined contributions (NDCs).

Developing country governments request support for their NDC actions through both environment ministries and finance or planning ministries, to ensure that the proposed actions align with core development priorities. Based on these requests, the Partnership enables interested partners, from multilateral development banks and UN agencies to specialist NGOs, to align around a single, public plan approved by the government.

For governments, this means they can ensure strategic ownership of the implementation plans and reduce the burden of engaging different partners bilaterally. For international partners, the Partnership's open process reduces potential duplication and allows them to focus where their expertise and resources will have the biggest impact.

Less than five years after its launch, the Partnership is working in this way with around 80 countries, with more than 120 partners providing support. Together these countries account for over 15% of emissions today, and this share will increase dramatically without action. They laudably aspire to provide their people with jobs, healthcare, modern energy services, and all the other goods that we collectively describe as development. If they do that the same way today's developed economies did, it's game over for the climate. It is in everyone's interest to support them in finding a greener path to prosperity.

Just as importantly, they are home to more than 2.2 billion people, for many of whom the deadly impacts of climate change loom large. They include small island states and coastal countries facing rising sea levels; arid countries with water resources under stress; food producers vulnerable to flooding and soil erosion. Climate impacts will be piled on top of other stresses. Their lives matter and smart climate policy can help.

The Partnership mobilizes support for both adaptation and mitigation, as well as providing economic advisors to support integration of climate action and post-COVID recovery. Through the Partnership, 67 countries have had support in developing new or updated NDCs to present before COP26. All are presenting more ambitious mitigation and adaptation measures, more robust consultation and analysis, or both. All this is a testament to the willingness of countries to act, and of international partners to work more collaboratively in support than ever before.

There is a mountain still to climb. But under the leadership of its co-chairs, Jamaica and the UK, the Partnership will be using COP26 to make the case that effective cooperation is more than an aspiration. It is indispensable if we are to meet the climate challenge. With a tried and tested mechanism for cooperation, members can scale up their support and countries can more confidently raise ambition. If so, perhaps we can face a less hair-raising outlook next year. ■

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A digital revolution to tackle climate change

Digital has a huge role to play in reaching a net-zero world. Alongside advancements in tech, we need bold, radical policy action to close the global digital divide

By Syed Munir Khasru, Chairman, Institute for Policy, Advocacy, and Governance (IPAG) and Co-chair, G20 Task Force on Digital Transformation, G20 Leadership Summit 2021

The COVID-19 pandemic has triggered a global digital transformation. Economies, particularly developed ones, continue to function behind screens, through home deliveries and online payment systems. Businesses and offices operate online, while children receive education via interactive group video call platforms. As governments in these developed countries have intervened to impose physical social distancing, many people have worked from home and interactions have become digital.

While digital platforms and online-based activities surged during the pandemic, fossil fuel consumption and carbon emissions plummeted, due to the lockdowns, travel restrictions, and other forms of immobilities. With less physical interference by humans, the natural world was able to flourish. Cities previously plagued with high levels of air pollution saw skies clear as the air freed itself from carbon. Reduced human activities led to increased fish and animal activities on seashores and riverbeds. Nature was rejuvenating itself without human interaction, and the climate slightly restored.

Challenges for climate-vulnerable countries

While developed nations rapidly moved to digital platforms during the pandemic, numerous developing and least developed countries (LDCs) could not afford to do the same at a similar scale, thus producing fewer positive climate contributions. Ironically, the 48 most climate-vulnerable countries – representing the Climate Vulnerable

◂ A fisherman in General Santos City, Philippines, using electronic Catch Documentation and Traceability (eCDT). Fish are traced from catch to consumption, helping to protect marine environments and the livelihoods of those who depend on them

Forum (CVF) – are almost all developing countries or LDCs. However, the CVF nations – under the current Bangladesh Presidency – are trying to pursue other nations to keep their climate promises: be it the nationally determined contributions (NDCs) of the Paris Agreement or the USD 100 billion of climate finance pledged per year by developed countries.

The CVF did not stop fighting for climate change, despite the ongoing COVID-19 pandemic. The CVF Presidency has been encouraging other member CVF countries to develop climate action plans for the decade and also has created the CVF-COP26 solidarity to pressure the Conference of the Parties' (COP) nations to commit to their NDCs ahead of the Glasgow summit. The CVF also hosted the first-ever finance summit of the V20 (a sub-group representing the 20 most vulnerable countries) to discuss alternate financial arrangements for their climate adaptation actions.

Technology-empowered green energy for achieving climate goals

To obtain the maximum advantage from technological progress, technological aspects need to be incorporated into policymaking. The COP21 Paris Agreement commitment to limit global warming to well below 2°C compared with pre-industrial times is a difficult target to achieve unless countries take significant and rapid actions. The digital transformation drive might just be the key to achieve that.

Digital technology itself has the potential to cut global emissions by 15%, according to the World Economic Forum. The rapid growth in digital economies around the world as a result of the pandemic could therefore make a significant contribution to climate action.

Indeed, the digital economy, driven by a boom of internet-based economic activities, resulted in a significant reduction in carbon emissions during the pandemic. Just as power plants are transforming from carbon-exhausting fossil fuels to renewable energies, digitally transformed economies have the potential to be not only carbon neutral but also carbon negative as they only consume electricity for power. Numerous countries are moving to renewable energy as part of their NDCs and other climate commitments.

India is spearheading the development of renewable energy through solar-based power plants, co-leading the International Solar Alliance with France. Even China, one of the largest carbon emitters, has pledged to stop building coal-based power plants.

While economies like India and China move towards more climate-friendly technological policies, and developed economies invest heavily in green energy, LDCs and low-income developing countries struggle to introduce technology-driven, climate-friendly policies and actions. LDCs and low-income countries should have access to the opportunities arising from digital transformation, especially given the drive to digital that the pandemic has unleashed.

Need for a global, holistic, multi-stakeholder approach

As major economic activities go digital – be they work, school, or commerce – the need for travel will reduce, significantly cutting carbon emissions. Even data centers, one of the lynchpins of the digital economy, are becoming more climate-friendly, with many now carbon neutral or committing to be soon. The Swedish EcoDataCenter, meanwhile, is the world's first carbon-negative data center running entirely on renewable energy. It gives a peek at how a digital world of the future has the potential to be climate-friendly if we use technology to our advantage.

While developed economies enjoy climate-friendly technological advancements, there needs to be policy-driven actions for developing countries and LDCs – particularly nations of the CVF. Technological advancements in developing countries and LDCs need to be subsidized and supported by government policies, in addition to existing climate measures such as CVF countries' own climate prosperity plans. Developing countries and LDCs need subsidy funding from the USD 100 billion climate finance pledge.

The governments of the developing countries and LDCs also need to partner with the corporate sector to facilitate digital transformation, be it an adaptation to the core business or as part of corporate social responsibility activities. Tech giants like Google and Facebook have already offered some staff the option to work from home long term, while many others are considering a hybrid model. Governments have the opportunity to support home working, online education, and e-commerce through adopting the right policies and commissioning projects to build both digital infrastructure and capacity.

If policies support these post-pandemic digital transformations, technological advancements would be much more sustainable for the climate of both developed and developing economies. Both sets of countries will need to find a way to complement each other's initiatives and efforts in a manner that is just, fair, and equitable towards tackling climate change effects. In that process, technology can be a cost-effective harbinger of providing climate-friendly solutions that can be achieved with fewer resources and more accessibility.

One of the few good things that the pandemic has done is to give us a glimpse of what that may look like. Now the challenge is on us. We must scale it up so that technological advancements and policy reforms reinforce and not frustrate each other. Through this, climate-friendly policies can be reinvigorated by the new generation of digital transformation technologies. ■

Innovating with green hydrogen in the United Arab Emirates

Dubai Electricity and Water Authority (DEWA) is using green hydrogen to accelerate the shift towards a low-carbon economy

The United Arab Emirates (UAE) is one of the world's leading countries in renewable energy. Its pioneering innovations are driven by the vision of the UAE's leadership: His Highness Khalifa bin Zayed bin Sultan Al Nahyan, president of the UAE; His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai; and His Highness Sheikh Mohamed bin Zayed Al Nahyan, Crown Prince of Abu Dhabi and Deputy Supreme Commander of the UAE Armed Forces.

This vision seeks to strengthen the UAE's leadership across various fields and protect its natural resources.

UAE's innovations in sustainable development are key to tackling climate change and mitigating the impact of global warming. The country also seeks to ensure people's happiness and well-being and provide solutions to development challenges.

One such recent innovation has been to explore the potential of hydrogen as an environmentally friendly energy carrier. Now, a new pilot project seeks to demonstrate how green hydrogen produced from renewables can support a reliable and affordable energy system with a low-carbon footprint.

The initiative aims to support the national economy and sustainable development in the UAE, in line with the country's directives for the next 50 years.

DEWA's green hydrogen project

His Highness Sheikh Ahmed bin Saeed Al Maktoum, Chairman of the Dubai Supreme Council of Energy, inaugurated the Green Hydrogen project at the Mohammed bin Rashid Al Maktoum Solar Park in Dubai on

◀ Sheikh Ahmed bin Saeed Al Maktoum, Chairman of the Dubai Supreme Council of Energy and Chairman of the Expo 2020 Dubai Higher Committee, inaugurates the Green Hydrogen project at the Mohammed bin Rashid Al Maktoum Solar Park, Dubai

19 May 2021 in collaboration with Siemens Energy and Expo 2020 Dubai. The pilot project is the first of its kind in the Middle East and North Africa to produce eco-friendly hydrogen using renewable energy.

One of the challenges of green hydrogen is to ensure it can economically compete with fossil-fuel-powered hydrogen. Production costs of green hydrogen are currently between USD 3 and USD 6.5 per kilogram. To be competitive, costs will need to fall to less than USD 1. To achieve this goal, production must be scaled up. DEWA's pilot project will pave the way for higher production in the future.

The project will also bolster efforts to diversify energy sources, supporting the Dubai Clean Energy Strategy 2050 to provide 75% of Dubai's total power capacity from clean energy sources by 2050. It will also promote investment in renewables, by supporting innovation, research, and development in energy storage.

Demonstrating green hydrogen's potential

Through the project, DEWA intends to demonstrate the viability of solar powered green hydrogen production and large-scale storage over a long period. It will also look at how hydrogen can generate power as well as its use in a variety of applications.

DEWA's system will enable it to use hydrogen for electricity buffering, which is the making up of shortfalls in power caused by the intermittency of renewable energy production. The hydrogen can also be used in gas motors, gas turbines, and fuel cells to power applications. DEWA views the use of green hydrogen for re-electrification as having the potential to increase the uptake of solar power.

Another objective is to explore the possible use of green hydrogen in buses, trucks, and trains. Indeed, DEWA is exploring another pilot project specifically for green mobility using hydrogen.

Hydrogen has other industrial uses. It can be used as a feedstock for chemical production for ammonia, synthetic fuels, and green chemicals, as well as a reducing agent for the steel industry. It can also produce heat for industrial processes and can be mixed in gas transport pipelines for commercial and residential use. Hydrogen can also be exported directly or as part of these chemicals. DEWA's green hydrogen plant has also been built to accommodate future applications and test platforms for different uses of hydrogen.

DEWA and the Sustainable Development Goals

DEWA has made considerable effort since 2016 to align with the Sustainable Development Goals (SDGs) and support efforts for their effective delivery by Dubai. The Green Hydrogen project directly and indirectly contributes to SDGs 7, 11, 12, and 13.

In addition, a key part of DEWA's innovation, research, and development is focused on supporting the SDGs. By doing cutting-edge research on solutions adapted to Dubai's climate, DEWA is leading the region. This includes creating a hub for innovation in renewable energy, diversification, and energy efficiency.

DEWA's research and development efforts respond to the UAE leadership's call for decisive action to diversify energy sources and increase efficiency of power generation and distribution systems, drastically reducing greenhouse gas emissions.

Through the Green Hydrogen project, DEWA is supporting the SDGs by exploring the potential of hydrogen to revolutionize the power and transportation sector in Dubai. It represents one of the pillars of a sustainable future that depends on accelerating the transition to carbon neutrality and supporting the green economy, for generations to come. ■

Green, blue or grey H_2?

There are three main classifications of hydrogen (H_2), based on how it is produced and the respective carbon emissions of the process:

- Green hydrogen, which is of interest for DEWA in line with Dubai Clean Energy Strategy 2050, is produced by electrolysis using renewable energy sources.
- Blue hydrogen is produced using fossil fuels with full or partial carbon capture.
- Grey hydrogen is produced using fossil fuels without carbon capture.

Green hydrogen will help accelerate the transition to carbon neutrality and will play an indispensable role in the green economy.

It is currently the focus of global attention because it possesses several rare qualities as a zero emissions fuel:

- it can act as a store for surplus renewable power generation;
- it can provide greater range than battery-powered transport;
- it can balance intermittency in power generated from solar and wind;
- it can be used as a substitute for coal in steel production and to capture carbon dioxide generated in manufacturing concrete.

هيئة كهرباء ومياه دبي
Dubai Electricity & Water Authority

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Healthy soils hold onto carbon

It is frequently claimed that the growing human population can not be fed without destroying the climate. This is a fallacy. Applying sustainable soil management techniques has the potential to reduce current agricultural emissions by a third

◂ Indigenous communities of Thaqo Pampa in Bolivia collect soil eroded by the Arque River to create plots of fertile land

By Eduardo Mansur, Director of the Office of Climate Change, Biodiversity and Environment, Food and Agriculture Organization (FAO) and Ronald Vargas, Secretary, Global Soil Partnership, FAO

Is it possible to provide healthy and nutritious food for a growing global population with changing food habits, and at the same time protect our planet and reduce greenhouse gas (GHG) emissions?

The answer is yes: it is not only possible but urgently needed.

According to the FAO global soil organic carbon (GSOC) sequestration map, sustainably managed soils have the potential to offset as much as 34% of global agricultural GHG emissions annually, sequestering up to 0.56 petagrams of carbon – or 2.05 gigatons of CO_2 equivalent.

Soil organic carbon is the carbon stored in soil organic matter. It is crucial to soil health, fertility, and food production – making its preservation and restoration essential for sustainable development.

Described as "more than just a map," the GSOC map indicates potential carbon sequestration hotspots. These are areas where intensifying sustainable soil management practices will have a larger impact on GHG mitigation and help build the resilience of agriculture production systems, bringing us closer to potential offsetting targets, with plenty of co-benefits.

Latest reports show that due to unsustainable management practices, agri-food systems contribute to around one third of global GHG emissions, are a primary driver of biodiversity loss, and are responsible for up to 70% of freshwater withdrawals. Furthermore, 33% of agricultural land is degraded, with 25% being severely degraded. FAO's findings reveal that improved sustainable soil management practices are part of the solution to the climate crisis, and at the same time promote biodiversity conservation, groundwater storage, ecosystem restoration, and better livelihoods.

At a moment when young people are demanding that economies urgently decarbonize and reach the ambitious goals of the Paris Agreement, these findings are timelier than ever.

A recent study on countries' commitments to soil organic carbon in their nationally determined contributions (NDCs) revealed that, in spite of the important role of soils in climate change mitigation and adaptation, most countries do not reflect this in their climate-related planning. Even fewer consider the co-benefits of increasing soil organic carbon.

The Koronivia Joint Work on Agriculture, the program under the United Nations Framework Convention on Climate Change (UNFCCC) focusing on agriculture and food security, provides an opportunity to clearly recognize that healthy soils are a "no-regrets" option to address climate change (while providing multiple other benefits) which is ready to be deployed.

Wide-ranging benefits

Investing in healthy soils brings many benefits, including climate-related ones. It will increase productivity, healthier food production, water storage and biodiversity conservation, making agri-food systems more sustainable and resilient – and part of the solution to the climate crisis.

The key players are the farmers who can make a difference by adopting sustainable agricultural and soil management practices. However, farmers should not be the ones absorbing the costs and risks of the transition. They need technical support and financial incentives to engage in good practice. Policy and planning frameworks, then, must provide the enticements required for change at scale.

With the right policies and incentives in place, innovative agriculture and food systems can make a huge contribution to global challenges. But only if we also expand and accelerate action in other major areas.

We must reduce GHG emissions by:

- halting deforestation and degradation
- sustainably managing livestock
- sustainably managing and optimizing the use of manure and chemical fertilizers
- significantly reducing food loss and waste

> ***"The key players are the farmers who can make a difference by adopting sustainable agricultural and soil management practices. However, farmers should not be the ones absorbing the costs and risks of the transition***

We must sequester carbon through conservation, sustainable management, and enhancement of permanent vegetation (forests, rangelands) and soil health.

And we must strengthen agri-food systems through adaptation to climate change and building resilience to shocks and stress.

Few sectors in the economy offer better opportunities to combine cost-effective mitigation and adaptation measures than agri-food sectors, once sustainable practices are adopted. Increasing and capturing carbon in agricultural soils and continued sustainable soil management practices are effective ways of reducing GHG emissions from agriculture. Soils rich in carbon are healthier and more fertile, and therefore beneficial to farmers and to the environment. ■

Healthy land, healthy planet

A worldwide movement to protect, manage, and restore the land will have fast and wide-ranging benefits. It must be the centerpiece of our global redesign

By Ibrahim Thiaw, Under-Secretary-General and Executive Secretary of the United Nations Convention to Combat Desertification (UNCCD)

To bring runaway human-induced climate change under control and deliver the Sustainable Development Goals (SDG) agenda to reduce poverty and restore nature, we need to deliver fast results rather than long-term promises, and we need to prioritize low-cost interventions with multiple positive and lasting outcomes. The global movement for healthy land hits both these marks.

To ensure healthy land across the globe, we need to follow the three pillars of land degradation neutrality:

- treating land as a limiting factor in development and land use
- improving the use of existing land
- recovering what has been lost

The UN Convention to Combat Desertification's (UNCCD) 'Global Land Outlook', currently in preparation, lays out a compelling case for such an approach.

Business-as-usual scenarios to 2050 show an increase in degraded land the size of South America and a massive spike in greenhouse gas (GHG) emissions. Given how badly we are already suffering from climate change and how quickly it is accelerating, the business-as-usual scenario is unthinkable.

Instead, we should restore two billion hectares of all types of land, and expand protected areas to 50% of global land area. This restoration scenario shows a gain in natural land the size of India and Pakistan, a 13% reduction in carbon emissions, and an increase of up to 10% of crop yields in many developing countries.

This is an ambitious goal, yet we must be ambitious given the depths of the crisis engulfing our planet. The higher we set our targets, the more impact we make, even if we fall short. This goal appears more achievable when we consider the promises already made on restoring land, which cover about one billion hectares. If we deliver during the UN Decade on Ecosystem Restoration, we will be well on our way.

Restoring just 150 million hectares of degraded agricultural land could generate USD 85 billion for national and local economies. That means USD 30 to 40 billion a year in additional income for smallholder farmers and increased food security for close to 200 million people. All of this while decreasing greenhouse gas emissions, which must be halved by 2030 to stay on the least-cost pathway to limiting global warming this century to 1.5°C.

Ambitious targets

We must be ambitious. We must be greedy for success and strive to hit the most ambitious targets. We need deep transformations to unlock decisive action through a global movement for healthy land.

We need environmental, economic, and social policies – at all levels – that are aligned with land degradation neutrality. The 608 million farming families across the globe could become climate and biodiversity stewards if we back policies with subsidies and incentives that overcome the start-up costs of switching to regenerative and sound agro-ecological practices. We can create an army of land stewards if we support inclusive and gender-equitable land governance that secures land tenure, particularly for the most vulnerable.

Just as we need policy transformations, we need financial innovations, such as carbon pricing, that are land degradation neutral and

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▲ Tending tree seedlings in a nursery in Kholy-Alpha, Senegal, as part of the Great Green Wall Initiative (GGW). The GGW aims to halt the spread of the Sahara and reclaim 100 million hectares of degraded land by 2030

net nature positive. Debt swaps for nature and climate can incentivize action. Novel financial instruments and policy portfolios that expand financial inclusion, social protection, and adaptive safety nets will further empower people to manage land sustainably.

Technology can also be a major enabler of change by forcing companies with unsustainable practices to change their ways. Full transparency and full consumer access to sustainable value chain information through block chain technology at the scan of a barcode could enable transformative change through the power of choice in the hands of consumers.

As climate change begins to hit wealthy nations and citizens harder, both are being made more aware and afraid. Technology can allow them to know how to make the choices that protect the land, and their own futures.

Of course, healthy land alone will not be enough to cool our planet. It must be combined with rapid decarbonization, sustainable production and consumption, and a transition to a circular economy, but healthy, sustainable, and productive land can be the centerpiece of our global redesign.

We have everything we need for this redesign in COVID-19 recovery packages; in the Paris Agreement, although governments need to strengthen and implement their climate promises; in the UN Decade on Ecosystem Restoration; in the emerging biodiversity framework that will set targets on how we manage and protect nature for years to come; and, perhaps most importantly, in the growing awareness and desire for change that has swept the globe in recent years.

If we unite these disparate approaches into a global movement to protect, manage, and restore the land, we will make a big contribution to a cooler, greener, and more prosperous planet, and create time and space for the wider transformations that all societies must undertake.

If ever there was a no-brainer solution to the many challenges humanity faces, it is this. ■

National goals via local action

Sizeable, impactful climate action can also be achieved through small, coordinated actions by individuals. Students at Osun State University, Nigeria, are learning to make their own contribution to combating climate change in a program that can be replicated across the education system

By Labode Popoola, Professor of Forest Economics and Sustainable Development, University of Ibadan, Nigeria; Vice-Chancellor, Osun State University; and Director, Sustainable Development Solutions Network Nigeria

There are myriad mitigation and adaptation approaches aimed at addressing changing climate scenarios. One that has proved to be cost-effective and workable is afforestation and reforestation.

This practice has been widely promoted at Osun State University, Nigeria, where newly enrolled students are matched with horticulturists who guide them in planting tree seedlings.

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◂ Cola gigantea in Nigerian rainforest. Nigeria has suffered extreme deforestation, losing over a third of its rainforest in the 15 years prior to 2005

Each seedling is nurtured by the students until they leave the institution.

As is well known, trees serve as major carbon sinks and thus help to improve air quality while at the same time greening the environment. One of the key goals of this approach is for young people to understand and embrace carbon offset initiatives while in the university and even after they graduate.

This approach has the potential to help in achieving the key strategies and recommendations of the Department of Climate Change (DCC) of the Federal Ministry of Environment in Nigeria.

At a recent two-day forum, Nigeria's Second Biennial Update Report was validated. The forum, which was organized by the DCC in collaboration with the United Nations Development Programme (UNDP), came up with some key recommendations that can benefit from the Osun State University Matriculation Tree Planting Campaign. These include:

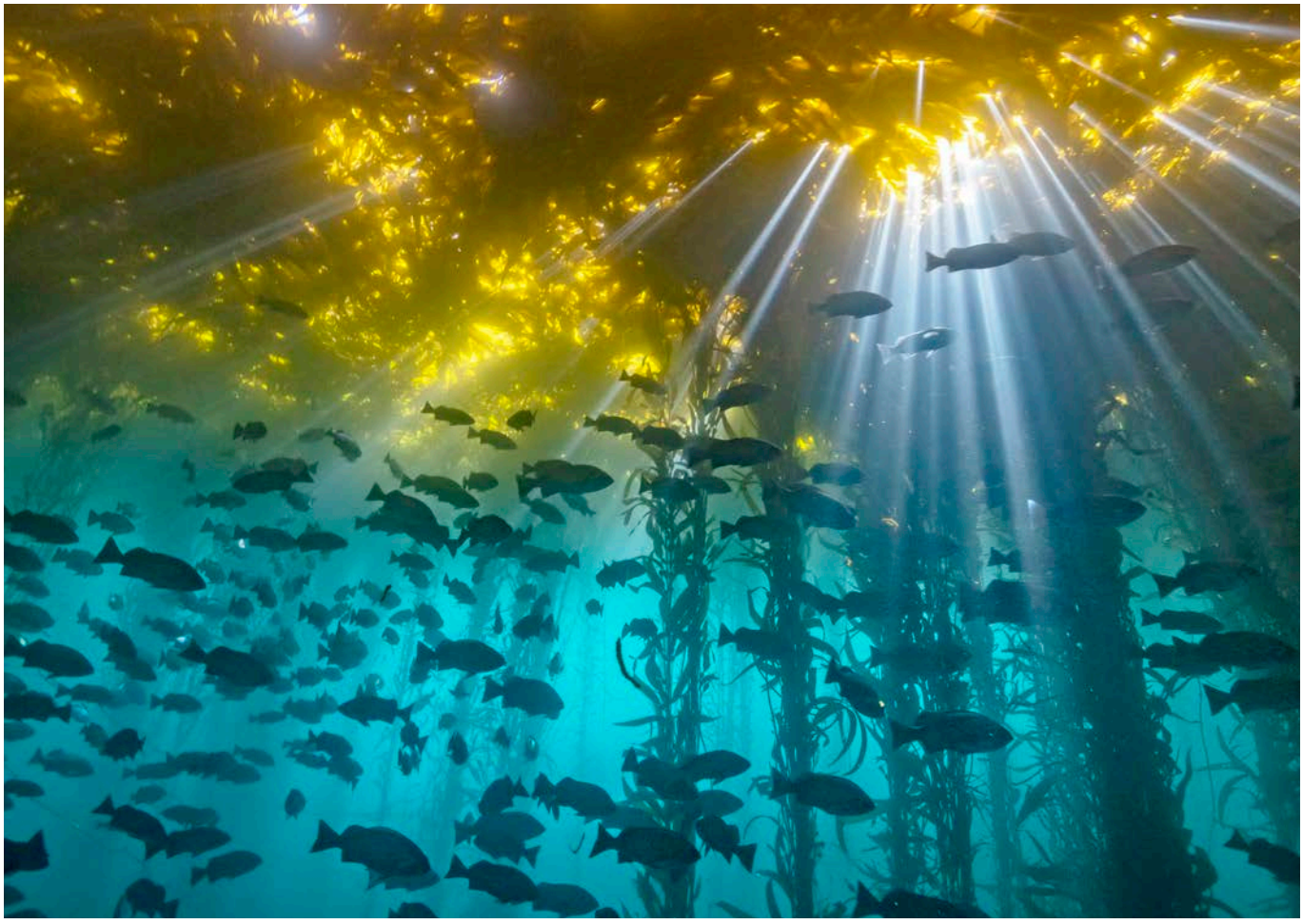
- Future efforts should focus on developing national emission factors for improved quantitative analysis in the long term.
- The DCC should write to stakeholders to identify qualified and relevant officers to act as focal points on climate change for ministries, departments, and agencies (MDAs).
- There should be capacity building of stakeholders for standardized data gathering.
- All stakeholders from national and sub-national levels should be involved in active data-gathering.
- There should be a fully established national measuring, reporting, and verification (MRV) mechanism in synergy with the states.

A key goal of the leadership of Osun State University is to help in developing efficient MRV systems that can be used across the country. So, a greater collaboration is being facilitated with the relevant government MDAs. This will help to provide a more valid greenhouse gas emission inventory.

The tangible output of the Matriculation Tree Planting Campaign which commenced in 2018 is an estimated 4,000 trees of various species and ages annually. In four years, about 16,000 seedlings were planted with a survival rate of about 80%. If this project is sustained, it has the potential of enhancing the environmental service functions of trees on the university campuses.

Already, this has created huge awareness among our students about a nature-based approach to attaining some of the 17 Sustainable Development Goals as they eagerly nurture the seedlings and trees.

Nigeria has about 170 universities, 60 polytechnics, and 152 colleges of education. The impact of replicating this approach to greening our landscape in Nigeria and elsewhere can only be imagined. It is cost-effective, reliable, sustainable, and no negative impacts are envisaged. In the next five years, Osun State University will need to estimate the quantum of carbon sequestered as a result of this project. ■



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Removing CO_2

Removing atmospheric CO_2 is essential to achieving the 1.5°C goal formulated in Paris. However, the main technologies under development are unlikely to sequester carbon dioxide at the massive scale required. We need to urgently explore new avenues, and invest particularly in ocean-based solutions

By Michael Gerrard, Andrew Sabin Professor of Professional Practice, Columbia Law School

The Intergovernmental Panel on Climate Change (IPCC) tells us that unless we keep global average temperatures within 1.5°C of pre-industrial conditions, catastrophic climate impacts will occur. We are now around 1.1°C, and we already see unprecedented heatwaves, wildfires, intense precipitation, and other impacts, all leading to a large loss of life and massive property damage. Staying within 1.5°C is now generally acknowledged to require net-zero greenhouse gas (GHG) emissions by about 2050.

All agree that the top priority is reducing fossil fuel emissions. However, that will not be enough.

▲ Kelp forest in the Monterey Bay National Marine Sanctuary, US. Kelp is being evaluated by numerous research projects to assess its potential for large-scale carbon dioxide removal

Complete elimination of GHG emissions seems impossible. The world cannot completely decarbonize. Some industrial and transportation

activities will still emit GHGs. Not all electricity generation everywhere in the world will move to renewables or nuclear by 2050. Much agricultural activity (including livestock) emits GHGs that are difficult to completely eliminate. Moreover, as the world continues to warm, there will be more wildfires, which are a rapidly growing source of GHGs and are nullifying many efforts to reduce fossil fuel emissions. Some important natural sinks of GHGs, most notably the Amazon rainforest, appear to be losing much of their ability to counteract GHG emissions.

Therefore, net-zero emissions will likely require the removal of a considerable amount of carbon dioxide from the atmosphere. The IPCC has repeatedly insisted that large-scale carbon dioxide removal (CDR) is needed to stay within the 1.5°C goal. It did so in its 2018 report on the importance of staying within 1.5°C and in the Sixth Assessment Report of 2021.

Removing carbon dioxide from the atmosphere would help to:

- make up for a fraction of the current inadequacy of decarbonization efforts;
- neutralize the residual emissions (for example, from agriculture) that would occur even if fossil fuel use were virtually eliminated;
- correct overshoots (the almost certain exceedance of carbon budgets until adequate GHG emission reductions are achieved);
- in the long term, stabilize the climate by moving us from our current levels (about 412 parts per million of CO_2) closer to a more desirable level, possibly around 350 ppm.

Technological options

Several technologies have been discussed to remove carbon dioxide from the atmosphere. Three of the most prominent of these are:

- bioenergy with carbon capture and storage (BECCS) – burning biomass; capturing and storing or utilizing the generated CO_2; and utilizing the produced energy;
- afforestation and reforestation (AF/RF) – planting new forests on lands that have historically not contained forests, or on lands that had previously been forests but that had been converted to other uses;
- direct air capture and storage (DACS) – chemical process by which carbon dioxide is captured directly from the ambient air, with subsequent storage.

All three of these approaches have great potential but also major limitations. BECCS has never been deployed at a commercial scale, and it requires growing an enormous quantity of biomass so that it can be burned, utilizing vast amounts of land. AF/RF requires a large amount of land to grow trees.

Both BECCS and AF/RF would potentially need to take over huge amounts of acreage now used for agriculture, thereby reducing food supply and increasing food prices – problems that climate change will make worse because of higher temperatures, drought, spread of pests, and other impacts.

How all this land would be acquired, and who would pay whom to acquire it, are unresolved. BECCS also requires large inputs of water and fertilizer, which in turn require large inputs of natural gas or mined ores (for example, phosphate). BECCS also demands considerable energy inputs.

Direct air capture is promising, but it has not yet been demonstrated at scale. The largest DAC plant in the world opened in Iceland in September 2021, promising to capture 4,000 metric tons per year of carbon dioxide. Human activities generate about 43 billion metric tons per year of carbon dioxide, so around 10 million such plants would be needed to absorb such emissions.

The cost of DAC has been estimated anywhere from a little below USD 100 per ton to USD 1,000 per ton. Of course, as the technology develops, the scale of units should go way up and the price should go way down, and the emissions that need to be absorbed should drop considerably, but the challenge remains formidable.

For all these reasons – especially the demand for land, water, and energy – there are real limitations on the amount of CDR that can be achieved on the planet without itself causing severe environmental and human disruption. BECCS and DACS also involve great technological uncertainty.

CDR 2.0

In sum, we do not know if BECCS, AF/RF, and DACS, or even all in combination, would be able to achieve carbon dioxide removal at the enormous scale necessary, and at a bearable environmental and economic cost. Therefore, while we explore these techniques, we have to look for additional options for CDR.

Several of the additional options involve the use of the oceans. They have virtually unlimited capacity to store carbon dioxide. Their use would avoid conflicts over competing uses of land, and would not be as subject to not-in-my-backyard opposition as land-based methods. Some of the techniques could reduce ocean acidification – the evil twin of climate change.

Among the options at the early stages of development are:

- artificial upwelling and downwelling
- electrochemical ocean CDR
- seaweed cultivation
- iron, nitrogen, and phosphorus fertilization
- ocean alkalinity enhancement

Each of these has its own technical and environmental challenges. But the urgency of removing carbon dioxide from the atmosphere while slashing fossil fuel emissions at a mind-boggling scale, compel rapid progress with research and development.

Hopefully this work will show that some of these CDR technologies will be effective, economical, and environmentally acceptable, and can be deployed at the necessary scale. ■

The power of photosynthesis

All IPCC models to stay within the 1.5ºC limit call for net negative CO_2 emissions. Fortunately, the technologies we require can be found in nature

By Tom L. Richard, Professor of Agricultural and Biological Engineering, and Director, Institutes of Energy and the Environment, Penn State University

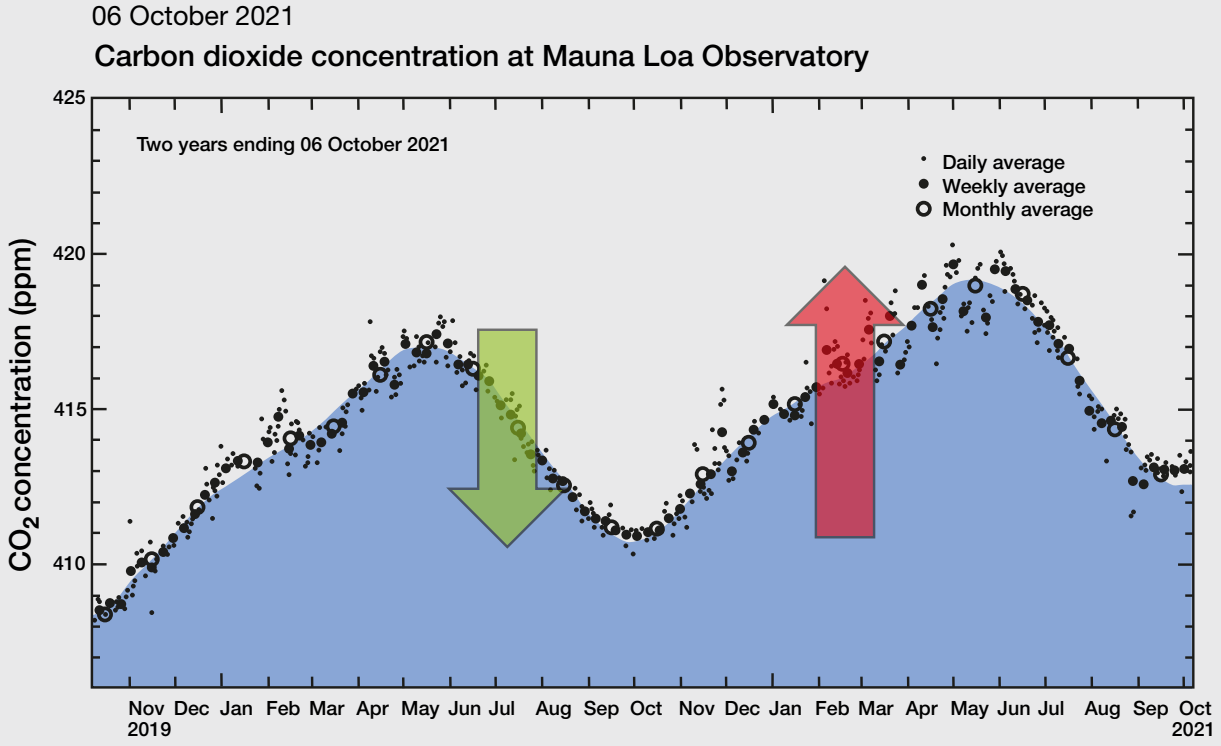
Across the globe, the fires, floods, and droughts of 2021 are clear evidence that there is already too much carbon dioxide in the atmosphere. Getting to zero emissions with solar and wind is no longer enough – we now need to reverse climate change and draw down atmospheric carbon.

Fortunately, our planet is blessed with a 3.5-billion-year-old biotechnology that does exactly this. It runs entirely on solar energy, and its byproducts are not toxic waste, but rather oxygen to breathe, clean water to drink, and healthy soil to grow food. Photosynthesis captures dilute CO_2 from the atmosphere (currently nearing 420 parts per million, or 0.000420) and concentrates it as plant biomass that is roughly 50% carbon (0.50), overcoming entropy with efficient metabolic pathways unlocked by billions of years of evolution.

Each year, plants absorb about 10 times as much CO_2 from the atmosphere as all the fossil fuel emissions combined. However, most mature ecosystems are in a steady state, meaning that carbon previously captured by photosynthesis is decomposing as plants, animals, and microbes die, releasing back to the atmosphere gigatons of CO_2 that are roughly equivalent to all of the current year's carbon uptake.

In a good year there might be a net carbon benefit as forests grow and soil

FIGURE 1: The power of photosynthesis



Source: https://keelingcurve.ucsd.edu/

organic matter accumulates, while in other years deforestation and fires can erase those carbon gains. Each spring the plants in the northern hemisphere actually do reverse climate change, and by October they have drawn down global CO_2 concentrations by six or seven parts per million. But then, in the dark of winter, decomposition plus fossil carbon emissions again begin to have the upper hand (see Figure 1). The Earth breathes.

Tilting the balance

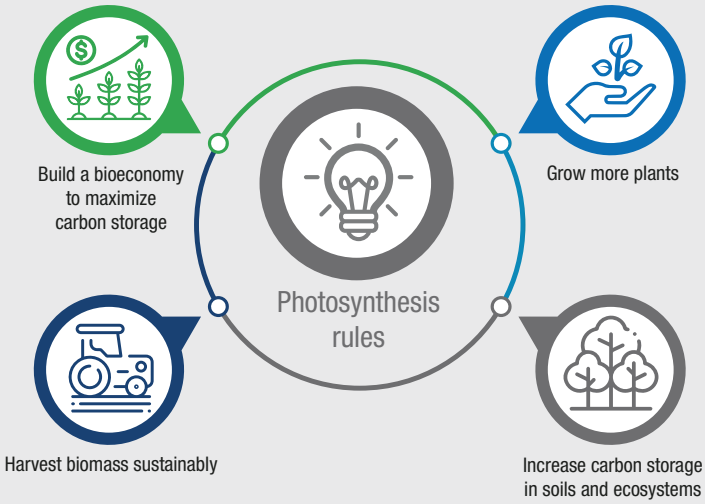
This massive cycle of carbon uptake by photosynthesis and carbon release by respiration occurs in backyard gardens, farms, forests, and grasslands across the globe. About half of this primary plant production is already managed by humans, and thus offers us an opportunity to tilt the balance in our favor. We can either encourage more photosynthesis, perhaps with fossil-free fertilizers or irrigation water, or we can discourage respiration. And it is the latter option, short-circuiting respiration and putting that carbon in other places, that we will focus on.

First, care must be taken to assure sufficient carbon inputs to the soil. Over the centuries soil has lost over 100 Gt of carbon, and replenishing that soil carbon makes economic as well as environmental sense. Plants transfer about half of the carbon they capture in their leaves into the soil, and it is also important to maintain a layer of plant residue on the soil surface to control erosion. Farmers and foresters should maximize the retention of that carbon in the soil.

But over 80% of the carbon in plant biomass that decomposes on the soil surface will end up directly in the atmosphere, so harvesting aboveground biomass for other uses is key.

Trees are a great carbon sink as they are growing, especially young forests, and we can keep them in that rapidly growing state by selective and sustainable harvests. Grasslands do an even better job of getting carbon into the soil, but do not accumulate much carbon above ground. Recognizing the importance of natural ecosystems for biodiversity and ecosystem health, we do not want to harvest everything or everywhere. But if we are going to harness the power of photosynthesis as a climate solution, we need to recognize that every molecule of plant-captured carbon is precious, and develop systems to retain that carbon at gigaton scales.

Photosynthesis rules



Source: Author

Sustainable harvest of aboveground biomass from grasses, trees, or crop residues can provide feedstocks for bioenergy, biochemicals, and biomaterials, displacing fossil carbon. But to reverse climate change, we need to get much of that carbon harvested from ecosystems out of circulation and into materials, back to soil, or deep underground.

While burning biomass for energy immediately releases that carbon back to the atmosphere, if the carbon dioxide in the flue gas is captured, that captured CO_2 can be stored in geologic reservoirs. Capturing CO_2 remains expensive, but is an important target for RD&D. Many of the biochemical and thermochemical routes to biochemicals

© Louis Putzel/CIFOR

▲ Afforestation patches subsidized by the Conversion of Cropland to Forest Program: Red Earth Township, Dongquan County, Yunnan Province, China. Xinjiang barley is growing in the foreground

and biofuels produce concentrated CO_2 as a byproduct, either as off-gas from fermentation or as a side stream from gas cleanup options.

These CO_2 byproducts are often at concentrations close to 100%, while the solids in fermentation byproducts and biochar represent additional concentrated carbon resources. Those carbon byproduct streams are often 50% or more of the total carbon flowing to the main fuel and chemical products, so injecting that carbon into geologic storage or returning solids to farmland can therefore roughly double the carbon-negative benefits of the biofuel or biochemical system.

Biomaterials can be an impressive option for carbon removal. Wood has long been used as timber for buildings and heirloom furniture, and we need more such long-lived products, like newer bioplastics and biocomposites. Using this biomass carbon in applications that substitute for concrete, steel, or petroleum-based plastics, the combination of offsets for fossil carbon and long-term carbon removal can realize a two-to-five-times greater carbon benefit than leaving a tree in the forest.

Manufacturing long-lived products from biomass, and directing biomass CO_2 into geologic carbon storage represent long-term carbon removal. Both eliminate the risks of fires, pests, and land use change that can destroy carbon stored in natural ecosystems.

A sustainable bioeconomy

As we decarbonize the fossil economy, we must also find ways to leverage photosynthesis to recarbonize ecosystems and industry. If we want a climate-positive world, we are going to need a carbon-negative bioeconomy.

Building a sustainable bioeconomy based on photosynthesis can realize negative carbon emissions at the needed scale, but we need to demonstrate that potential and put the financial, technology, and workforce development programs in place now if we are going to achieve a just transition. ■

Less is more: plugging the climate financing gap

Funding for polluting projects remains alarmingly high. We need to urgently switch this finance toward sustainable projects. The relatively cheap cost of action now compared with the economic disaster of inaction is a math "no brainer" – and the time to act is now

By Vanessa Fajans-Turner, Executive Director, BankFWD, and Principal, Investable Oceans; former Managing Director, SDG Financing, UN SDSN

The stakes for climate action have risen ever higher this year, even as the window for action to lower the stakes has shrunk. The United Nations' Intergovernmental Panel on Climate Change (IPCC), the world's most authoritative climate science body and host to the world's highest-level climate talk – the 26th Conference of Parties (COP26) – says that we are unequivocally headed toward climate catastrophe within two decades.

To counter this, all eyes are on global leaders' efforts to mobilize increased quantities of climate finance, loosely defined as funding for activities that reduce emissions and/or increase climate resilience. Their immediate goal is to fulfill the USD 100 billion per year commitment that developed nations made to fund climate mitigation and adaptation needs in developing countries.

The Paris Agreement also prioritizes "making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development" (Paris Agreement Article 2.1[c]). Yet the effort to mobilize USD 100 billion in climate finance is largely divorced from efforts to decrease negative climate financing for high-emissions sectors like fossil fuels. The bottom line is this: global commitments to climate finance at home or abroad cannot achieve Paris alignment or a 1.5°C scenario until they are matched by proportional and science-informed commitments to decrease fossil fuel finance.

Net climate finance

To optimize the impact of each hard-fought dollar world leaders raise for the climate, climate finance tallies should integrate net climate finance totals in addition to absolute totals. The success or failure of finance mobilization efforts would then reflect a more accurate snapshot of global financing trends by indicating whether positive climate finance (defined by the Rocky Mountain Institute as finance for activities that reduce emissions and/or increase resilience) approaches or exceeds negative climate finance (finance for activities that increase emissions and/or reduce resilience).

Increasing net climate finance is undoubtedly a larger lift than increasing absolute climate finance. To be successful, public, private, and multilateral mobilization efforts will entail improved coherence across activities on both sides of the climate ledger, first to increase positive climate finance and, second, to reduce negative climate finance that undermines it.

This article summarizes the clearest steps for addressing the increasingly urgent priority of reducing negative climate financing totals, steps with the potential to unlock hundreds of billions to be allocated to fill positive climate financing gaps.

The cost of averting climate catastrophe

Estimates by the UN Sustainable Development Solutions Network and World Bank suggest that the annual cost of achieving the Sustainable Development Goals (SDGs) falls between USD 5 and 7 trillion. Of this, the latest IPCC cost models indicate that the world needs to spend at least USD 1.5 trillion per year to achieve global climate targets that align with a 1.5°C scenario.

What is the climate financing gap, and how can the world fill it?

The current state of climate finance

As a category, sustainable finance lacks a universal definition or set of criteria. Broadly speaking, it refers to financing that flows to companies and projects that purport to align with the SDGs and/or meet a range of positive environmental, social, and governance (ESG) indicators.

The underlying integrity of sustainability and ESG-qualifying financing is limited by the shortage of quality input and reporting data. A proliferation of frameworks and governance structures are emerging to address this challenge (see p.66 and "Aligning business and finance with sustainable development" by

Lisa and Jeffrey Sachs). Even so, it is undoubtedly trending upwards, reportedly accounting for roughly one third of global assets in 2020, amounting to over USD 35 trillion across Europe, the US, Canada, Australia, and Japan. These figures amount to a 15% increase over 2018 levels and a 55% increase over those in 2016.

As a sub-category of sustainable finance, climate finance also lacks a standard definition with which all stakeholders agree. The Climate Policy Institute (CPI), which accounts for multilateral, public, and private climate finance, reports that positive climate finance is trending up, totaling approximately USD 632 billion in 2020. According to Pitchbook, global investors have already successfully raised as many climate-focused funds in 2021 as they had over the previous five years combined.

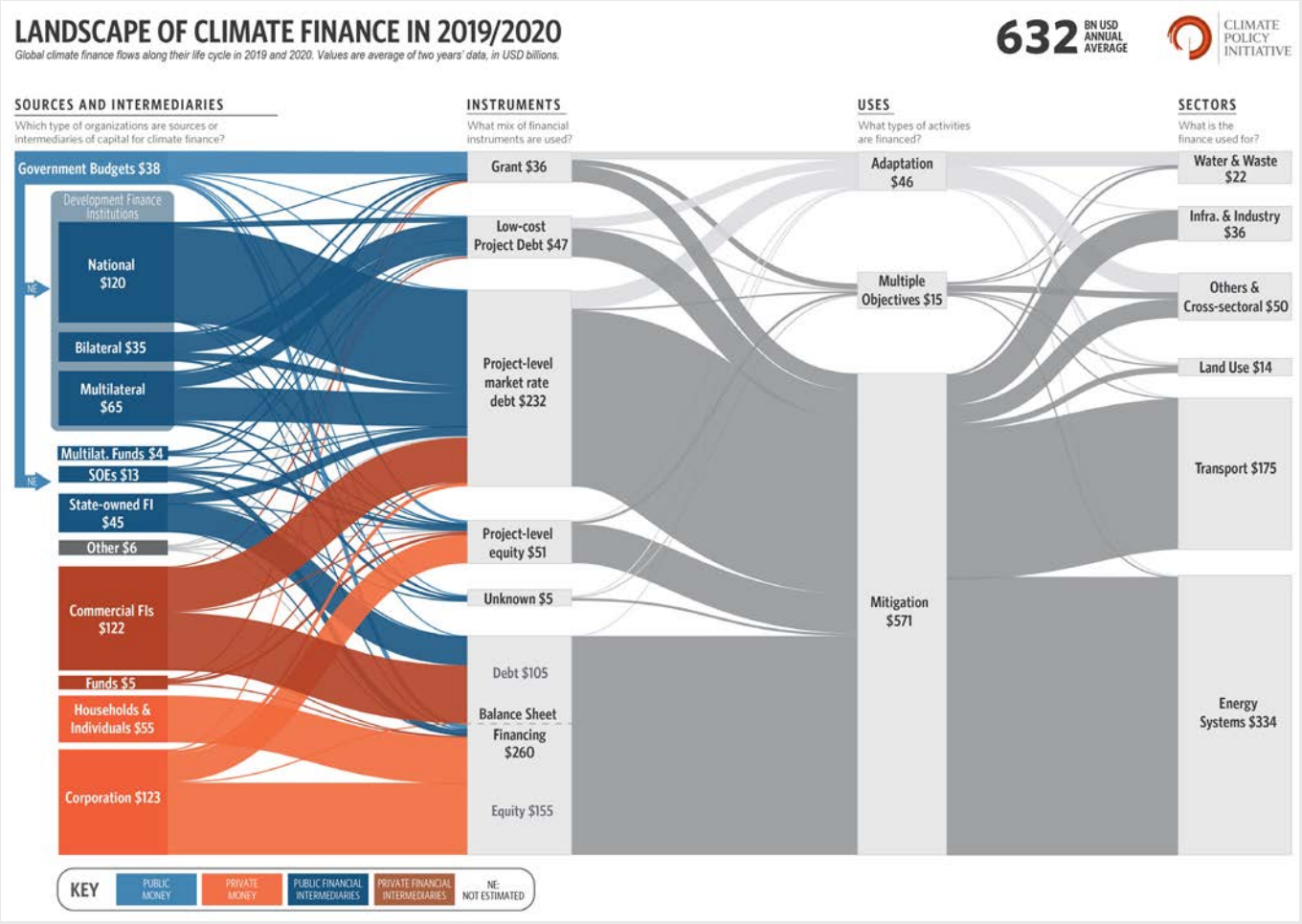
However, negative climate finance far exceeds it, with USD 781 billion going to fossil fuel companies from private banks. When accounting for multilateral banks, sovereign wealth funds, and private equity financing, negative climate financing totals are much larger.

A quick calculation indicates that 2018's net climate finance was in the red, totaling minus-USD 241 billion. Now, in 2021, it continues to be heavily skewed toward unsustainable projects, so much so that the International Energy Agency (IEA) issued a stark warning in its 2021 World Energy Investment Outlook: "The USD 750 billion that is expected to be spent on clean energy technologies and efficiency worldwide in 2021 remains far below what is required in climate-driven scenarios. Clean energy investment would need to double in the 2020s to maintain temperatures well below a 2°C rise and more than triple in order to keep the door open for a 1.5°C stabilisation."

There is a wide range of policy and financial instruments that governments can consider for mobilizing the large sums necessary to fill the climate, and broader SDGs', financing gap.

Skewing climate finance toward positive

By the end of 2021, over two thirds of global GDP will be generated in places with established or proposed net-zero emission goals. As measurement,



Source: Climate Policy Initiative

disclosure, and accountability systems take root across the financial industry, efforts to ensure their transparency and rigor will help to increase accountability and drive reductions in negative climate finance. By taking the steps outlined below, national and corporate actors could unlock approximately USD 400 billion per year of current fossil fuel financing and reallocate it to positive climate channels.

if it is to meet its Paris Agreement goals. In spite of this, the financing community continues to drive the climate crisis, with banks still financing new coal projects even as they announce net-zero and sustainable finance commitments.

Banks have loaned or invested USD 3.8 trillion to fossil fuel companies and projects in the five years since global leaders signed the 2015 Paris Climate Accord, committing the signatories to reduce their carbon emissions by 45% by 2030 and net-zero by 2050. About USD 1.5 trillion of this finance, or approximately USD 300 billion annually, has gone directly to companies taking on the majority of new projects.

To date, no major global bank has committed to phasing out its fossil fuel finance, nor has any agreed not to fund new fossil fuel projects that locks in emissions decades from now, when the world is meant to be decarbonized.

To mitigate this, national governments should legislate against new fossil fuel exploration and extraction activities on public lands, as the US has in the Arctic Refuge, and move to fine, tax, or otherwise penalize corporate actors who persist in financing unsustainable activities beyond their reach.

This could unlock upwards of USD 300 billion per year to reallocate as positive climate finance.

"As measurement, disclosure and accountability systems take root across the financial industry, efforts to ensure their transparency and rigor will help to increase accountability and drive reductions in negative climate finance

1. End fossil fuel subsidies

As developed countries struggle to meet their USD 100 billion climate finance commitment to developing countries this year, a subset of these same countries continue to provide USD 88 billion annual subsidies to fossil fuels (of which the US accounted for USD 20 billion). Moreover, fossil fuel-intensive sectors received approximately USD 170 billion to respond to COVID during just the first eight months of 2020.

This year, G7 leaders reiterated their previous commitments to phase out "inefficient" fossil fuel subsidies by 2025, though there has been little progress to-date. The Brookings Institute is one of several respected institutions that has outlined recommendations for rich countries to dismantle their entangled networks of subsidies. Time is of the essence.

This could unlock upwards of USD 88 billion per year in global public finance for direct reallocation to fulfill developed countries' USD 100 billion climate finance commitment to developing countries.

2. End fossil fuel expansion

The UN and IEA confirm that the world must end all fossil fuel expansion now

3. Increase the costs of negative climate finance

There are a range of tax interventions that lawmakers can levy on bad actors to disincentivize the volume of funds still flowing to fossil fuels and other negative climate targets. A globally coordinated carbon tax would be effective both in raising revenues for climate finance and in reducing emissions, as stated in an SDSN report on the SDG financing gap in 2019.

Carbon pricing initiatives currently cover 46 national jurisdictions and 28 subnational jurisdictions, representing 20.1% of global GHG emissions. These generated approximately USD 82 billion in revenue in 2018, according to the World Bank's Carbon Pricing Dashboard. The annual emissions of high-income countries currently stand at approximately 40% of the world's emissions, or roughly 14 billion tons of CO_2 per year (IPCC, 2019).

If just USD 4 per ton were earmarked for positive climate finance, the revenues would amount to more than USD 50 billion per year. The estimated social cost of carbon is currently set by the Biden administration at USD 51 per ton, far higher than USD 4 per ton, and is a number the administration is expected to significantly increase.

4. Build up a positive climate finance constituency

Given the entrenched special interests behind public and private fossil fuel finance, civil society initiatives – like US-focused BankFWD, UK-based Make My Money Matter, and global Bank.Green – play an important role in growing constituent and consumer demand for politicians and banks that align their financing with the Paris Agreement.

Conclusion

The impacts of climate change will reduce global economic output by 11% to 14% by 2050, the equivalent of up to USD 23 trillion in losses.

Globally, governments have spent an estimated USD 16 trillion on the COVID-19 crisis. This has saved millions of lives. We now have an opportunity to save hundreds of millions of lives by committing just a fraction of this sum annually to finance a more stable, sustainable, and just future by endeavoring to limit warming to 1.5°C.

Do the math. ■

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Investing in nature

Australia has a significant opportunity to be a solution provider in nature-based investment. However, the present economic system does not include the value of ecosystems, despite the fact that ecosystem health is essential to our very survival. An Australian program seeks to address this challenge

By John Thwaites, Professorial Fellow, Monash University; Chair, Monash Sustainable Development Institute and ClimateWorks Australia; Co-Chair, SDSN Leadership Council; and Liam Walsh, System Lead, Food, Land & Oceans, ClimateWorks Australia

Humanity relies on our land and oceans to provide us with the food we eat and the fresh water we draw to irrigate our crops. Natural systems are home to a dazzling diversity of life that collectively contributes to and supports key planetary processes. However, the pressure on these systems is becoming extreme, and this will profoundly affect human progress and well-being.

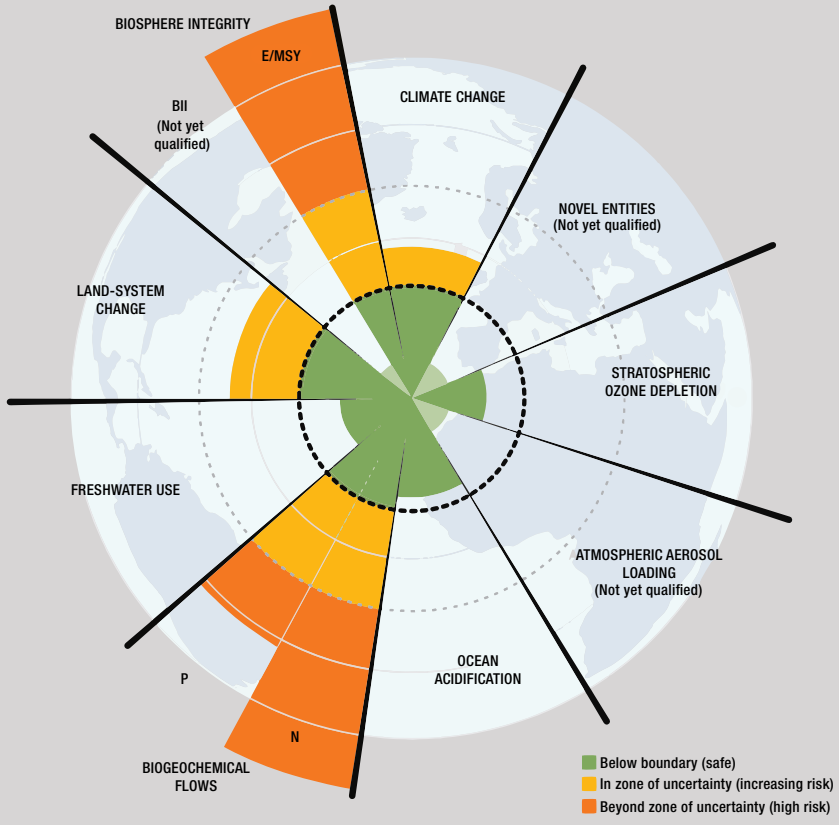
The scientific "planetary boundaries" concept identifies nine limits within which humans can continue to survive and thrive, including climate change, biodiversity, and land system change. With four of those nine boundaries now crossed because of human activity, we need to fundamentally change the way we value nature. Protecting and restoring natural systems is essential to achieving many, if not all, of our Sustainable Development Goals (SDGs).

A new relationship with nature: investing in natural capital

Our land and oceans are unique, because unlike other systems, activities on land and in the ocean are both a source of greenhouse gas emissions

▲ Mangrove-lined estuaries in front of Hinchinbrook Island, Queensland, Australia. The island is the largest on the Great Barrier Reef

FIGURE 1: The planetary boundaries



Source: J. Lokrantz/Azote based on Steffen et al. 2015

and a potential solution to the climate crisis. They represent one of the biggest opportunities for slowing and turning around climate and ecological breakdown.

Increasingly, key elements in our land and ocean systems are being referred to as "natural capital." Natural capital was first referred to in the 1970s, becoming widely used by ecological economists from the 1990s. It is most commonly defined as the world's stock of natural resources – which includes geology, soils, air, water, and all living organisms – and the services they provide. There are many types of natural capital that provide goods and services for people. Mangrove ecosystems are a great example. Pound for pound, these dense coastal forests store more carbon than land-based tropical rainforests, as well as providing breeding grounds for marine biodiversity and protection against extreme weather events. These natural assets therefore represent a major opportunity to achieve climate outcomes and many of the SDGs.

Yet traditional economic thinking has failed to take account of the rapid depletion of the natural world and all the goods and services that nature provides. Our present economic system does not include the value of our ecosystems or the concept of investing in nature. Australia has an enormous opportunity to be a solution provider in nature-based investment. The ability to measure and value our "natural capital" has been identified as a key solution for achieving future sustainability goals.

As demonstrated by the Stockholm Resilience Centre in the figure of the "wedding cake" (Figure 2), achieving a number of the SDGs will depend on increasing the stock of natural capital both on land and at sea.

How can farmers measure their natural capital?

One of the biggest challenges we face is around incentives and new financing solutions for the enhancement or maintenance of natural capital.

While most land managers and farmers recognise the need to protect different types of natural capital, like trees, water resources, and the soil underpinning their production systems, the time and cost required to do so is often a barrier. It can also be hard to see the benefit of protecting natural systems on their properties without incurring significant cost or loss of income. Financial institutions and major businesses want to ensure that land is being managed sustainably and have a strong interest in developing new financial instruments that incentivize land managers to better manage their landscapes.

The measurement of natural capital is a crucial step on the path to develop new financing solutions. Proper measurement can help land managers to understand the state of natural capital assets on their land and demonstrate to investors, buyers, and consumers of agricultural products how these assets are improving over time. Measurement could enable the provision of new sustainability-linked loans for land managers who improve natural assets on their land and in turn provide benefits to the wider community.

Worldwide, there are many programs in development which focus on measuring and accounting for natural capital. For farmers and land managers on the ground, however, this poses a risk of inconsistent approaches or duplication of measurement methods, which could lead to a confusing market and a burden on land managers. Added burdens of time and cost of natural capital measurement can also make it difficult for farmers and land managers to even begin to work out how to access financial incentives and environmental markets.

Natural capital measurement programs currently exist. However, they

are often focused on a single element of natural capital (such as carbon or biodiversity) or differ in their underlying measures and methodologies. There is a need for a harmonized framework that enables consistent measurement.

The Natural Capital Investment Initiative (NCII) in Australia is seeking to overcome this challenge, with the development of a new and unique resource. Titled the Natural Capital Measurement Catalogue, this resource outlines a comprehensive set of natural capital measures for farmers and land managers to measure the natural capital on their property.

Incorporating a diverse range of sources and perspectives, including government, food supply chain, industry bodies, financial institutions, research, agriculture technology providers, and certification programs, the catalogue aims to create a common language for more consistent natural capital measurement at scale. While it is comprehensive, covering all elements of natural capital, the catalogue is also designed so users can easily identify and use only the specific measures that suit their individual objectives.

The catalogue also acknowledges that farmers and land managers have different levels of resourcing to measure natural capital. It therefore covers a range of methods for specific measures, and supports users to increase the sophistication of their measuring over time. The catalogue will be piloted on farms to demonstrate how measurement of natural assets can be linked to new financial incentives.

Natural capital is fast gaining the attention of governments, corporations, and major financial institutions alike, with organisations looking to become more "nature positive." The recently launched Taskforce on Nature-related Financial Disclosures (TNFD) will soon require organisations to incorporate nature-related risks and opportunities into their decision-making processes. The Natural Capital Measurement Catalogue will play a critical role in ensuring the Australian market is ready for such requirements, and will also share lessons learned on natural capital and its role in sustainable food and land-use systems with the rest of the world. ■

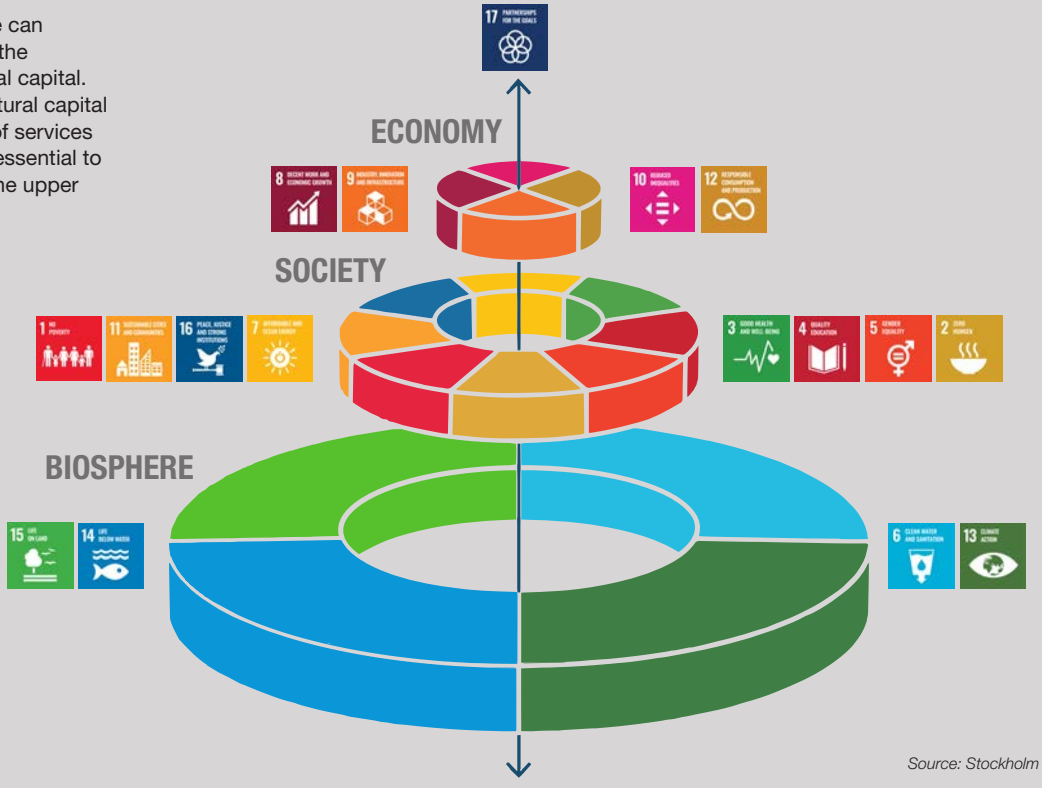
Footnote: The Natural Capital Investment Initiative (NCII) is being led by ClimateWorks Australia (working within the Monash Sustainable Development Institute), supported by the National Australia Bank.

NCII forms part of Land Use Futures (LUF), a multi-year program that is working to develop analysis and advice on what a sustainable food and land-use system looks like for Australia and how it might be achieved.

Land Use Futures is connected to the global Food and Land Use Coalition (FOLU) led by the UN Sustainable Development Solutions Network, World Business Council for Sustainable Development, World Resources Institute, SYSTEMIQ, and others.

FIGURE 2: The dependence of the SDGs on our biosphere

Our biosphere can be viewed as the planet's natural capital. Enhancing natural capital and the flow of services it provides is essential to the SDGs in the upper layers.



Source: Stockholm Resilience Centre

A watershed for climate change stewardship?

Investors are losing patience with companies that are slow to act on climate. Through active stewardship, they can bring the laggards on to a 1.5ºC path

Bruce Duguid
Head of Stewardship, EOS at Federated Hermes (EOS)

Of the 17 global Sustainable Development Goals (SDGs) for 2030, set out by the UN General Assembly in 2015, SDG 13 includes arguably some of the most challenging milestones to reach. Goal 13 relates to climate action: specifically, taking "urgent action to combat climate change and its impacts."

The year 2021 may come to be viewed as a watershed for climate change and investor stewardship, with a Dutch court decision against Royal Dutch Shell, activist fund Engine No. 1's proxy contest with Exxon, and majority support for a shareholder climate resolution at Chevron all occurring in May. With other recent developments, such as the International Energy Agency's Net Zero by 2050 report – and COP26 now upon us – have we reached a tipping point for climate stewardship?

If we needed more evidence that the pandemic has served as a wake-up call on climate for businesses, investors, policymakers, and individuals, this year's voting season emphatically provided that. Mainstream sentiment has shifted, and the momentum is with investors calling for faster action on climate change.

We have seen this in the growing number of investment managers – including the international business of Federated Hermes – committing to net zero as part of the Net Zero Asset Managers Initiative.[1] Signatories pledge to work with their clients to reach a goal of net-zero greenhouse gas emissions by 2050 or sooner, in line with wider efforts to limit global warming to 1.5°C. With 128 signatories and around USD 43 trillion in assets, the initiative is close to representing almost half the global asset management sector in terms of total funds managed. Meanwhile, the UN-convened Net Zero Asset Owners Alliance has attracted over 40 institutional investors, representing over USD 6.6 trillion.

With climate transition votes on the agenda for the first time at some 18 annual shareholder meetings, the stage was set for a busy season of scrutinizing

the fine detail of companies' transition strategies. Aside from the growing investor concern, there is regulatory and societal pressure on companies to align more quickly with the goals of the Paris Agreement, but as yet no established consensus or unified framework to guide an assessment of how aligned companies are. This presented investors with an analytical challenge and allowed some companies to win votes for transition plans that in our view had significant gaps or were misaligned.

Central banks, policymakers, and other financial standard setters are now cognizant that climate change poses a systemic risk – one that could be far more severe than the economic hit from the pandemic. Addressing it will require a multi-faceted response – from cutting carbon emissions and improving the assessment and reporting of climate risks, to reducing the impact from issues such as deforestation, and rewiring the global financial system to support the transition to a low-carbon economy.

Votes on climate transition plans

This voting season saw a series of formal shareholder votes on companies' climate transition plans in the US, Canada, the UK, France, and Spain, among others. This followed attempts in recent years to improve investor scrutiny of companies' actions on climate, and reflected the rapid expansion in company commitments to achieving net-zero emissions.

While we were supportive of the idea in principle, we had some initial concerns about the concept. The high level of support for transition plans suggests these concerns were justified. There is a tendency for investors to vote in line with management, which may suggest they do not have the technical skills or the time to evaluate plans properly. One of the biggest dilemmas is how to balance the absolute performance of the company in terms of its commitments and how Paris-aligned these are, against its general momentum on climate.

We decided to apply a more rigorous approach in our assessment of transition plans, setting a robust standard of alignment to the Paris Agreement goals for companies to pass. This meant that we recommended voting against some high-profile names, including Total, Glencore, Shell, and Aena.[2]

To an extent, high levels of investor support for such plans should have been expected as most of the companies targeted were considered "leading" on the climate transition in their sector. However, few companies came out of the process unscathed, given the public scrutiny. More investors are asking for such votes as an accountability mechanism, and we are seeing more large asset managers backing shareholder proposals calling for scope 3 targets or supporting shareholder-proposed directors with a view to improving the company's stance on climate change. However, there is still work to do to ensure that more investors understand what it takes to be Paris-aligned.

Leaders and laggards

In March, Climate Action 100+ issued its net-zero benchmark for the world's largest carbon emitters.[3] This defined the key indicators of success for business alignment with a net-zero emissions future and the Paris Agreement goals.

The benchmark, which we reviewed and commented on in the design phase, set clear engagement priorities to drive faster climate action. However, the benchmark assessments showed that no company had fully disclosed how it would achieve its goals to become a net-zero business by 2050 or sooner. The plan is to refine and expand the benchmark over time and it is likely to become a key test for companies. EOS has continued its leadership on climate change engagement and voting by developing and testing its own assessments of companies and reflecting this in its voting recommendations.

We have had a formal climate change voting policy in place since 2019, using the Transition Pathway Initiative (TPI) scoring system. While valuable, this assessment is reasonably limited in scope and in 2021 we expanded our policy to draw on a broader assessment of companies' actions.

The EOS climate voting policy contains a number of components that target different parts of the system, where we believe a company's actions to be materially misaligned with the goals of the Paris Agreement, including companies contributing to coal expansion and deforestation.

Given the growing momentum on this issue and with COP26 now upon us, companies stubbornly refusing to accept that climate change is something that they must address will be increasingly exposed – and vulnerable to accelerated policy changes and lawsuits. Investors are losing patience with the laggards, and a company's failure to pick up the pace could prove value destructive. This could happen sooner than some companies seem to think. ■

1. www.netzeroassetmanagers.org

2. Please refer to page 21 in our Q2 2021 Public Engagement Report for more details – www.hermes-investment.com/stewardship/eos-insights

3. www.climateaction100.org/news/climate-action-100-issues-its-first-ever-net-zero-company-benchmark-of-the-worlds-largest-corporate-emitters

SDSN and its publisher thank Federated Hermes for its generous support for this publication

Sustainable finance: raising its game

We've seen laudable commitments on sustainable finance. But numerous gaps need to be addressed before the financial system will fully play a central role in a sustainable future

By Bella Tonkonogy, Associate Director, Climate Finance, Climate Policy Initiative

The financial system lies at the heart of a sustainable future, particularly in the wake of the COVID-19 pandemic. Financial actors, including governments, central banks, financial supervisors, development finance institutions, commercial banks, asset owners, asset managers, and insurers, must work together to create a financial ecosystem that accurately prices risk and rewards sustainability, thus supporting the move towards a sustainable, net-zero future.

As economies move from relief to recovery, extensive evidence suggests that meeting the Sustainable Development Goals (SDGs) and Paris Agreement objectives could bring widespread economic, health, and employment benefits. It could also improve economic and financial stability, and reduce inequality, post-COVID.

Restoring nature and biodiversity are job-intensive activities and can help regions hard hit by the economic crisis. The International Monetary Fund recently estimated the multiplier effect for green spending, including clean energy and biodiversity conservation, to be two to seven times greater than non-green spending. The Global Commission on the Economy and Climate found in 2018 that a low-carbon growth path could result in cumulative social and economic benefits exceeding USD 25 trillion between 2018 and 2030 compared with business as usual.

In 2019 the Global Commission on Adaptation found that a USD 1.8 trillion investment to strengthen resilience between 2020 and 2030 could bring USD 7.1 trillion in net benefits.

But big questions still to answer

Financial actors have formed coalitions to promote sustainable finance, with many reaffirming commitments in the wake of COVID-19. However, while many of these, such as the Net Zero Asset Owners Alliance, make commitments to align finance with the Paris Agreement and SDGs, there remain important questions:

1. How do we assess the integrity of commitments and track progress towards meeting them?
Despite an accelerating pace of sustainability and net-zero pronouncements by a range of actors, there is no universally accepted framework of what robust commitments should include and against which to measure progress. Increasing integrity and accountability can be positively reinforcing.

There is also currently no organization that is tracking the sustainability progress of the financial system overall, nor analyzing the impact (separately and in aggregate) of the commitments. Similarly, the many institutions that have not made commitments are also not routinely identified and tracked.

2. How do we coordinate across public and private financial actors to achieve systems-level results?
While the Glasgow Financial Alliance for Net Zero (GFANZ) initiative aims to be an overarching coalition umbrella for the private sector, there is still no multi-sectoral coalition or international forum that allows for the regular exchange of ideas and knowledge between the public and private sectors towards meaningful ambition.

3. How do we incorporate commitments and ambition on intersecting social and environmental issues that affect our ability to reach climate change goals?
Addressing climate adaptation, biodiversity and nature, pollution, just transition, and the needs of developing economies will reinforce climate change goals, but to date no action framework has effectively brought together these issues.

Framework for Sustainable Finance Integrity

Climate Policy Initiative – advised by leading personnel and organizations from each segment of the financial ecosystem, including insurers, commercial banks, development banks, asset managers, civil society, and government representatives across Asia, Africa, Europe, and the Americas – has developed a draft Framework for Sustainable Finance Integrity, outlining the necessary action that all financial institutions must begin to pursue

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▲ Zemun district of Belgrade, Serbia and the river Danube, which is the backbone to the country's water systems. Serbia recently raised its first green bond to fund the upgrade of its water management, as well as a variety of climate adaptation and mitigation projects

immediately. This framework provides a universal set of sustainability guardrails across the financial system:

- encouraging ambition to deliver meaningful sustainability and net-zero results
- contributing to a clear pathway for more coordinated action
- creating metrics against which to track progress
- reinforcing the multiplier effect these actions will have on the real economy

The framework outlines the current leading practices across financial actors in the public and private sectors and the actions necessary to deliver results as demanded by science.

Among the metrics, financial institutions should be:

Setting targets:

- setting targets for net zero by 2050, with interim, science-based targets according to the Intergovernmental Panel on Climate Change's no or low-overshoot scenarios, at latest by 2030
- setting complementary targets to support biodiversity, just transition, and climate resilience

Implementing:

- implementing "whole of institution" approaches, including via mandates, governance, executive compensation, and performance management, as well as operations
- eliminating finance for new coal projects immediately and phasing out all coal finance by 2030 in OECD countries and 2040 globally
- phasing out all fossil fuel financing that does not have a credible transition plan
- dramatically increasing climate-friendly investments, especially for developing economies
- promoting net-zero-aligned climate policies and engaging proactively with clients and investees to align to net zero

Disclosing:

- disclosing activities and results in line with global standards
- supporting mandatory disclosure

This is what the science, and our current situation, demands. While some of these actions will take more time to implement than others, each action above could be initiated in every organization with the right leadership and incentives. ■

Social risk and the need for community support

Development finance institutions (DFIs) continue to finance investment projects that risk impoverishing rural communities. They need to ensure at-risk communities have access to the technical support they need to navigate complex investment processes

By Erin Kitchell, Director, Global Programs, Namati, and Sam Szoke-Burke, Senior Legal Researcher, Columbia Center on Sustainable Investment

Representatives from hundreds of DFIs gathered at the Finance in Common Summit on 19 and 20 October 2021 to strategize and coordinate on ways to advance sustainable development. The COVID-19 crisis is driving attention to the need for a more just and inclusive recovery, with many in the private sector expanding how they think about sustainability to include a renewed focus on inclusiveness and social justice.

Now is a critical moment for DFIs to create a compelling and actionable vision for how they will advance the Sustainable Development Goals (SDGs), including reducing poverty and promoting food security. To achieve these goals, DFIs must improve their investments' performance on human rights.

Land-based investments carry significant social and financial risks

Progressive environmental, social, and governance (ESG) standards recognize the importance of community involvement in decision-making but can be challenging to implement in practice. While land and natural resource investment projects often promise the potential to reduce poverty, their negative impacts can have the opposite effect for the communities located near investment sites. This concerning dynamic occurs despite the right of communities to shape decisions about when and how an investment happens. In particular, power asymmetries between communities and operating companies can undermine the potential for meaningful consultation and sustained dialogue.

To be an empowered counterparty, each community needs the same access to information and legal and technical assistance that is readily available to companies. For example, communities need support to:

- understand the highly technical contents of environmental impact assessments and permits
- deliberate and make collective decisions in an inclusive manner
- make use of grievance mechanisms when a harm occurs

To improve outcomes for local communities, DFIs must require their clients to ensure that affected communities can access support from lawyers, scientists, and other experts to participate fully in investment processes.

Facilitating independent support will not only protect communities, but also stands to benefit companies. Making such support available can help companies to build trusting relationships with host communities and to obtain – and maintain – social license to operate.

Operating companies that fail to appropriately engage communities, on the other hand, face the tangible risk of costly disputes with communities that can cause operating delays, project failure, and accompanying financial and reputational risks:

- Tenure risk could massively increase operating costs – as much as 29 times over a normal baseline scenario – and even cause outright abandonment of an up-and-running operation.
- Companies that rate poorly on human rights can expect the incidence of material credit events (such as halts to operations, regulator inquiries or enforcement actions, and lawsuits) to be up to 60 times higher than for companies with good performance ratings.
- A 2021 report showed that the financial damage due to social risk is four times higher than the cost of proactive risk mitigation. By setting aside as little as 2% of the initial project costs, investors can avoid losses due to delays and conflict that reduce the net value of the investment by 25% to 35% on average.

DFIs can strengthen ESG and risk-adjusted return by enabling community access to independent technical support

DFIs have made some advances in their ESG performance and set

important norms on community rights as part of their due diligence practices. Performance standards include requirements for consultation and community participation, and DFIs and their clients alike have established accountability mechanisms to resolve grievances. Yet implementation gaps remain and community participation in decision-making about the investment project continues to be a major blind spot.

Enabling communities to access independent technical support can address these gaps, leading to more inclusive decision-making and responsive project design, and preventing avoidable conflicts. Giving communities a meaningful say in the investments that affect them is also crucial to aligning investment with the SDGs. More responsive investment processes that address their concerns can advance a wide range of broader development objectives, creating more economic opportunities for rural communities (SDGs 1 and 2) while encouraging more sustainable land use (SDG 15) and water management (SDG 6). Communities who receive support can better access and understand information about the project and engage more effectively in sustained dialogue with operating companies.

DFIs can use their leverage to secure support for all affected communities by requiring their clients to:

1. make sure communities have independent legal and technical support as a guiding principle in ESG standards and a compliance requirement in due diligence and auditing procedures – access to support is particularly important at key moments such as initial consultations and during dispute resolution and grievance redress processes
2. earmark a small fraction of the loan amount to cover the costs of community support

These requirements would signal a clear commitment to participatory processes while establishing mechanisms for compliance and monitoring that are sustainable over time. In addition, these commitments would reinforce and support the implementation of DFIs' existing performance standards.

Finally, they could also improve investments' bottom line by preventing harm to communities and addressing disputes and grievances proactively before they escalate.

Toward a pooled fund for community technical assistance

To be effective and viewed as legitimate, technical support for communities needs to be directly accountable to communities and procured and financed in ways that preserve independence from operating companies.

We're aiming to build the architecture for a pooled fund for community legal and technical support. The fund would function as an independent facility that would receive contributions and pay out grants for communities to get the support they need. Doing so can help to connect communities to qualified local support providers while maintaining independence. It would also enable DFIs to easily check compliance with requirements for meaningful consultation while offering a third-party mechanism for monitoring on-the-ground implementation of ESG standards.

DFIs' important sustainability mandates make them uniquely placed to identify and advance modes of investment that respect community rights and promote sustainable development. Yet on the current trajectory, they risk leaving many project-affected communities behind. One critical measure within reach for DFIs is to lead by example and require their clients to cover the cost of community technical support. ■

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◂ Indigenous Munduruku people occupy the São Manoel hydroelectric dam in Brazil in an attempt to halt its construction

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Remaking capitalism

Capitalism and sustainability are on a collision course, one that threatens to destroy both the market system and the planet. To head off the impending crash, we must end environmental externalities and make polluters pay for the harm they cause. Standardizing corporate ESG reporting offers a path toward clarity on the environmental harms that need to be addressed

By Daniel C. Esty, Hillhouse Professor of Environmental Law and Policy, Yale University; Co-Chair, SDSN USA

Planetary boundaries now loom, including most notably the risk of overloading our atmosphere with greenhouse gases (GHGs). This reality imposes a sustainability imperative on all of us, requiring new rules of engagement for business. Simply put, we must learn to live within the safe operating space of the Earth's biophysical and ecological systems to avoid life-threatening environmental damage.

A commitment to sustainable development – the requirements for which the 2015 UN Sustainable Development Goals spelled out in detail – has been ratified by 193 nations as the foundation for a world in which both humans and nature might flourish.

But the idea of living within boundaries has proven easier said than done. Fundamentally, a sustainable future requires an economic system that promotes conservation of natural resources and protection of our critical Earth systems, while ensuring long-term economic opportunity for all. Instead, our current market economy produces an enormous amount of

◂ Fracking operations in Jefferson County, Ohio, US. A blowout at a well in neighboring Belmont County in 2018 was responsible for one of the largest methane leaks in US history: more methane than the entire oil and gas industries of France or Norway release annually. The fracking industry has heavily promoted its gas as a climate-friendly "bridging" fuel

pollution and waste that threatens to cause climate change and other environmental damage. We need to make sustainability a core principle of our 21st century economy – and undergird this commitment with a legal framework that prohibits the spillover of environmental harms onto others.

End externalities

Conceptually, sustainability requires a new foundation for capitalism that takes seriously the Polluter Pays Principle and prohibits – as economists would say – uninternalized externalities. No longer should pollution be accepted as the necessary byproduct of industrial production and justified on a benefit–cost basis. In cases where pollution is truly unavoidable, harms inflicted on others should be paid for in full – as should the exploitation of natural resources.

Many international environmental agreements invoke the Polluter Pays Principle, and governments across the world claim to have built their environmental policies on this concept. In practice, however, commitments to internalize environmental externalities are often ignored in favor of emissions limits set by benefit–cost analyses.

But this legal framework gives businesses a license to pollute and leaves more than seven billion people across the planet breathing unhealthy air and nearly a billion people without access to safe drinking water. And all 7.9 billion global citizens face climate change risks as GHGs rise to dangerous levels.

New rules for business

Companies have long understood their mission to be maximizing shareholder value, often taking to an extreme Milton Friedman's doctrine of shareholder primacy and the suggestion that any business practice not deemed illegal is legitimate as a pathway to greater profits. This theory advances corporate gain at societal expense, as pollution is rarely fully regulated, nor is the extraction of water, minerals, timber, or other natural resources charged for in full. Consequently, the doctrine of shareholder primacy, combined with incomplete government regulation and the propensity to underprice natural resources, has led to widespread unsustainable business practices. Simply put, our current structure of capitalism privileges profits over human needs and environmental integrity.

Fortunately, many business leaders have come to understand (and accept) that attitudes are changing. A new theory of corporate purpose has emerged, centered on stakeholder responsibility. This revised understanding of the role of corporations provides a basis for changing the ground rules of business – most importantly, moving to an expectation that companies will not spill environmental harms onto others.

Insofar as corporations are legal constructs of society, companies owe a duty not just to their owners but also to their customers, suppliers, and employees – as well as to the communities in which they operate and society more generally. But even as the notion has taken root that corporations should be held to a standard higher than the Friedman doctrine would suggest, the path from the status quo of pervasive, environmentally harmful business practices to a sustainable future – in which these damaging practices stop, and residual harms are fully paid for – remains undefined.

We now have an opportunity to blaze that trail, building on the Big Data revolution that has swept across society, and the growing interest in sustainable investing and more robust corporate environmental, social, and governance (ESG) reporting.

Improved corporate sustainability metrics and reporting

To make the "no uninternalized externalities" principle effective, we must be able to identify and measure GHG emissions; air, water, and soil pollution; natural resource use; and other environmental impacts.

An important first step in this direction would be to require companies to report comprehensively and consistently on their ESG performance, including their emissions and resource use. While some corporate ESG data exists today, much of what is available is self-reported and aggregated by private data companies without independent verification.

This leads to methodological inconsistencies and untrustworthy metrics that in turn create difficulties in doing company-to-company or industry-to-industry comparisons. These reliability issues foster a lack of trust in the data and a lack of confidence that the true sustainability leaders (and laggards) have been identified. Because so many of the existing ESG metrics are self-reported, companies can (and frequently do) cherry-pick their data to create the illusion that they are more sustainable than they really are – a process known as greenwashing.

While these challenges complicate adoption of a "no uninternalized externalities" rule, the solution is clear: we need a transparent and trustworthy framework of ESG metrics that facilitates benchmarking and accurate tracking of emissions and other environmental impacts.

The shortcomings of the existing regime of voluntary corporate reporting and private data collection efforts make clear that a comprehensive and rigorous ESG framework can only be established through a government-defined mandatory sustainability reporting structure backed by the threat of legal penalties for misreporting.

A few places, notably France and the EU more broadly, have specified new ESG disclosure rules and some countries – including Kenya, the United States, Switzerland, Germany, Finland, and the Netherlands – have expanded requirements under consideration. Yet none of these proposals offers the basis for a full-fledged structure of sustainability reporting on which a commitment to end externalities could be built.

Other entities such as the Global Reporting Initiative and the World Economic Forum have proposed new ESG frameworks, but a broader consensus on a common set of metrics and underlying methodologies is needed to underpin the transformation of environmental rules proposed here.

> ***"To ensure that our global society does not crash through planetary boundaries and damage life-sustaining Earth systems, the foundations of our market economy must be reimagined, and then rebuilt***

Toward a sustainable market economy

Full, validated ESG data would provide the analytic foundation for a sustainable market economy. Specifically, better metrics on corporate emissions and natural resource use could help the world move to full implementation of the Polluter Pays Principle and a broad-based commitment to end uninternalized externalities.

Government-mandated corporate ESG reporting would provide a mechanism for getting the data needed to gauge and price environmental harms. Even before governments have tightened regulatory requirements and made companies pay for their environmental impacts, the presence of reliable ESG data would allow sustainability-minded investors to buy shares in those companies. This would help to move the world toward a clean energy economy and sustainable future and to steer capital away from enterprises whose profitability depends on imposing environmental burdens on society.

The transparency provided by a comprehensive ESG database with high-quality data on emissions and resource consumption would highlight the companies and industries that enjoy special interest status and environmental privileges unavailable to others as a result of campaign contributions and lobbying that torque policy outcomes.

Publicly available ESG information would furthermore provide evidence and support to opposition political leaders, the media, NGOs, and competitors to call out the unfairness of allowing environmental miscreants to carry on with their damaging practices. This would also put direct pressure on any environmental ministries or agencies that were slow to hold these polluters accountable.

Conclusion

Today's structure of capitalism is on a collision course with the sustainability imperative. To ensure that our global society does not crash through planetary boundaries and damage life-sustaining Earth systems, the foundations of our market economy must be reimagined, and then rebuilt.

Essential to this rebuilding is the implementation of a "no uninternalized externalities" rule that severely limits pollution. For proper tracking (and subsequent internalization) of externalities, a robust framework of mandatory corporate sustainability disclosure offers great promise. ■

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Aligning corporate ambition with the SDGs

While companies have embraced the aims of the SDGs, embedding them into their business operations is another matter entirely. The optional nature of the SDGs is one key challenge, but the greatest hurdle is understanding how to apply SDG indicators to day-to-day business operations

By Martha McPherson, Sustainability Director, Design Portfolio

We are pushing against an open door. Awareness is rocketing, supported by an increasingly sophisticated investor community – as well as by educational initiatives like the United Nations Sustainable Development Solutions Network (SDSN) – of the strategic role that the United Nations (UN) Sustainable Development Goals (SDGs) can play in the ecological transition of the business world. This realization is being writ large in the numbers-and-narrative world of annual and sustainability reporting. Companies, increasingly mandated to disclose against climate risk and mitigation, nature-related events, and energy use, are honing their climate change and sustainability strategies. They recognize the financial need to move to business models that are both feasible and profitable in a greener economy.

Chief executive officers (CEOs), chief financial officers (CFOs), and (increasingly) chief sustainability officers are gravitating towards internationally important frameworks like the SDGs,

◂ Harvesting palm oil at a cooperative in East Kalimantan, Indonesia. Between 1980 and 2014, global palm oil production increased from 4.5 million metric tons to 70 million metric tons. Corporate sustainability claims are hard to reconcile with the scale of deforestation

both as a "plug and play" structure for guiding strategy, and to signal their engagement with the global political, economic, and scientific discussions making front-page news.

Business momentum towards the SDGs is strong. The headline figures (from KPMG's 2020 survey of sustainability reporting) are impressive: the SDGs were launched in 2015, and by 2017, a full 43% of Europe's top 250 companies were connecting their business activity with the SDGs in their reporting. The number in 2020 was 72% – a further jump and an objectively high number given that the SDGs are broadly voluntary. But there is still a long way to full coverage, and small to mid-size companies, with less regulatory and investor pressure on reporting, will be the slow tail of adoption.

But quality is more important than quantity. The devil is in the detail, and here we see a drop in ambition and outcomes. The same KPMG report flags that "SDG reporting is mostly unbalanced and often disconnected from business goals."

The SDGs are frequently mentioned in the front end of corporate reporting, but do not always have an impact on the back end – where all the year-on-year financials are stored. The bold and beautiful SDG roundel is not being materially linked to the business model, or to current and future drivers of value in the business.

Indeed, by far the most prioritized SDG reported on by the KPMG sample is SDG 8 – promotion of inclusive and sustainable economic growth, full and productive employment, and decent work for all – a target which many companies will feel is embedded in their current activities and requires little or no additional action. Accusations of "SDG washing" or "rainbow washing" are increasingly prevalent. Investors and consumers alike are becoming more savvy at understanding what constitutes a genuine embedding of the SDGs, and what is just lip service.

Guidance on reporting and implementation

There are two underlying issues at play, which I hear every day in discussion with clients who want to take on the SDGs in a meaningful way to meet the urgency of climate change.

First: while the SDGs are certainly "best practice" alignment areas, they are not mandatory in most national reporting. This makes them a "nice to have" rather than a "must have" in the manner of specific and targeted climate legislation – such as the reporting requirements of the Task Force on Climate-related Financial Disclosures (TCFD) or Streamlined Energy and Carbon Reporting (SECR) in the United Kingdom, or Article 173 in France.

> ***"Investors and consumers alike are becoming more savvy at understanding what constitutes a genuine embedding of the SDGs, and what is just lip service***

With the best will in the world, this can lead to deprioritization of the SDGs as a framework, and puts them at one remove from best practice climate reporting. This is a problem, as the SDGs' "no one left behind" mantra provides a strong steer towards a just transition and a people-based approach that more energy-and-carbon-only frameworks overlook.

The second issue is that, while the accessibility of the SDGs at the top level lends them easily to corporate imagination, once you get down to the nuts and bolts of the SDG indicators, and start to work through their implementation in the day-to-day – it is not so straightforward.

Companies are not clear how they can actively contribute to indicator-level commitments like "13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries," and cannot see clearly how to achieve the goals via their business models.

There are some incredible SDG-led innovations in public policy and in business alike. The Welsh government has the SDGs at the heart of its Commission for the Well-being of Future Generations, a revolutionary approach which brings the voice of young and unborn people to long-term decision-making. I have personally been part of innovative work with the Biscay regional government to develop a world-first local corporate tax policy aligned with the SDGs, and know how exciting it is to be part of a project that is co-created by government, business, and the SDG research community.

Innovation is needed to bring together the policy-led SDGs with business ambition. As a starting point, we could set out the following questions:

- is there a way in which the SDGs can be better linked to existing reporting standards, but not in a manner that creates an extra burden – and thus more rainbow-washing bear traps – for companies?
- can the scientific and sustainability community provide guidance for the implementation of the goals at indicator level – or devise a more accessible taxonomy for the business community?

With more information sharing, better feedback loops from government to business, and an ambition to harness the momentum of the goals, we can surely work to build the SDGs more deeply into the green transition. ■

Setting robust corporate greenhouse gas reduction targets

Businesses are increasingly claiming to support climate action but many struggle to make substantive change. A systematic approach can help businesses set robust greenhouse gas reduction targets and navigate the use of carbon credits

By Pankaj Bhatia, Deputy Director, Climate; Global Director, GHG Protocol, World Resources Institute (WRI), David Burns, Natural Climate Solutions Policy Lead, WRI, and David Rich, Senior Associate, WRI

Setting corporate targets aligned with a 1.5°C pathway

Companies should set targets with an overall objective of reducing total cumulative greenhouse gas (GHG) emissions in line with global reductions needed to limit warming to 1.5°C. In this context it is important for companies to follow recommendations for setting targets as provided by the Greenhouse Gas Protocol, including in its new Land Sector and Removals Guidance (forthcoming in 2022).

Companies can support this objective through several key target design elements, including:

Completeness: Set a comprehensive target boundary that includes all GHG emissions and all scopes (scope 1, scope 2, and scope 3 emissions, including all scope 3 reporting categories), with separate targets by scope. Scope 1 emissions are the direct emissions from company-owned or controlled operations. Scope 2 emissions are indirect emissions related to consumption of purchased electricity, and scope 3 emissions are all other emissions in the company's value chain.

Transparency: Set separate targets for emissions and removals, rather than setting a single net target, to maintain a focus on reducing cumulative emissions to the atmosphere, while separately increasing CO_2 removals.

Relevance: Avoid leakage or negative spillovers, where actions taken to reduce emissions or increase removals within the company's target boundary lead to increases in emissions or decreases in removals outside the target boundary. For companies in land-based sectors, this includes reducing pressure for deforestation globally by reducing land occupation and improving land use efficiency.

Ambition: Set a GHG emission-reduction target to decarbonize scope 1, scope 2, and scope 3 emissions in line with a 1.5°C pathway. Set a separate removal or net target in line with the global need to increase removals as part of a 1.5°C pathway.

External compensation or contributions: In addition to meeting GHG reduction targets and separate removal or net targets through internal mitigation across the company's scope 1, 2, and 3 inventory, companies should invest in external compensation or contributions to achieve additional mitigation outside the scope 1, 2, and 3 target boundary. This should only serve as a supplement to the company's GHG reduction and removal targets, to help reach the global 1.5°C goal. Additional principles for carbon credit use are described in the next section.

Use of natural climate solution credits aligned with a 1.5°C pathway

Natural climate solutions (NCS) may support up to one-third of the required mitigation for a below 1.5°C pathway by 2030 at cost-effective prices, while simultaneously providing multiple social and environmental benefits, including critical ecosystem services.

Despite this potential, current financing for NCS remains woefully inadequate to reach the estimated USD 10 to 100 billion needed for deployment by 2030. As countries and companies race to reach net zero by 2050, corporate investments in voluntary carbon markets will play an increasingly important role in scaling up the finance needed for NCS.

Ensuring positive outcomes that enhance climate ambition and increase overall mitigation while protecting, restoring, and sustainably managing natural ecosystems through corporate carbon finance will be contingent on two overarching principles:

1. Demand for NCS credits must accelerate, not dilute, the pace of global emissions reductions by supplementing and not substituting for own operations and value chain emissions reductions.

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◂ The new South Beach complex in Singapore has been designed to be environmentally sustainable. Its structure funnels wind to help cool occupants and minimize the use of air conditioning

2. The supply of credits must represent emissions reductions and removals that meet high standards of social and environmental integrity. This entails Paris-aligned levels of ambition, additionality, permanence, avoidance of negative spillovers and double counting, and respecting the rights and livelihoods of indigenous and local communities while safeguarding biodiversity.

To meet these principles, corporations seeking to purchase NCS credits should apply "guardrails" related to:

- demand (ensuring credits enhance the pace of global emission reductions)
- supply (ensuring good results on the ground, including via the preferential sourcing of jurisdictional credits once available)
- transactions (supporting the development of market mechanisms with high integrity and robust governance that avoid double counting between countries, companies, or other entities)

Application of these guardrails will enable corporations to confidently invest in NCS credits, providing critical financing to real, additional, and verified mitigation outcomes, while making credible and widely acceptable associated claims. For companies on a science-based reduction pathway aligned with 1.5°C, we envision two broad categories of NCS credit use:

1. To compensate for annual unabated emissions through the purchase of high-quality credits backed by a corresponding adjustment from the host country.

2. To contribute to the climate ambition of the host jurisdiction through the purchase of high-quality credits which are not backed by a corresponding adjustment.

Neither should detract from the company meeting its own value chain GHG reduction targets, but these should allow for additional recognition related to compensation or contributions.

The former necessitates application of all guardrails, and the latter requires supply-side guardrails at minimum. Corporations should not seek to merely reduce their own inventory, but to contribute to broader global efforts to limit warming below 1.5°C. In either case, companies should pursue emissions reductions or removal credits, depending on which has the greater marginal benefit globally.

One requirement for companies compensating annual unabated emissions is the need to secure a corresponding adjustment from the host country (necessary to avoid the risk of double claiming). This entails reaching a successful outcome in the ongoing Paris Agreement Article 6 negotiations. Until countries can issue corresponding adjustments, all credits should be considered de facto mitigation contribution credits beyond a brief transition period (for example, after 2025).

Companies wishing to pursue compensation should therefore urge governments to reach agreement on Article 6 at COP26 or reframe their ambition toward contributing to global net-zero efforts. The World Resources Institute will soon be providing further related guidance, including additional details on the guardrails described above. ■

This paper represents the views of the authors, based on ongoing and evolving work. It is not intended to represent the views or positions of the Greenhouse Gas Protocol or the World Resources Institute.

Helping farmers adapt to climate change

The Life ADA project, launched in Italy in autumn 2020, provides practical support to the sector to face the challenges of climate change

Italy's economic losses from climate extremes are among the worst in the EU, according to the European Environment Agency. Predicted changes in climate over the next few decades will strongly influence the development of Europe's agricultural sector and its production dynamics.

Agricultural practices have always adapted to changes in weather. Yet, the scale of climate change, the increasing frequency of extreme weather events, and the difficulty in predicting future climate scenarios present huge challenges to farmers. Climate change directly impacts agricultural yields, putting at risk farmers' revenue and their survival as viable businesses. This in, turn, threatens revenue throughout the entire value chain. There is an urgent need, therefore, to implement climate change adaptation strategies, both at the farm and value chain level. Farmers, especially small and medium-sized operators, are highly exposed. They need to know which adaptative measures to implement locally.

Climate change also threatens how food quality requirements are maintained along the value chain. Specialized agriculture is predicated on quality assurance, often linked to the characteristics of a particular

territory. It is therefore highly exposed to climate risk. EU and Italian agriculture is characterized by a wide range of such high-value foods that boast high levels of quality in terms of food safety, and nutritional, cultural, and heritage value.

Consumer demand is pushing towards products with geographical indication (GI) or organic quality marks. Yet climate change could mean that many of these products may cease to exist, or will require new innovations in production to survive.

While insurance allows farmers to manage the economic risks of extreme events, the scale of climate change means many risks may be too expensive to insure. Insurers must play a triple role:

- as risk carriers, through the traditional role of risk transfer;
- as risk managers, to boost communities' resilience by fostering customers' capacity-building, and incentivizing virtuous risk reduction and adaptive interventions;
- as investors, to fund climate change adaptation.

Life ADA project

Those considerations have led UnipolSai Assicurazioni, Italy's leader in non-life insurance, to launch Life ADA (ADaptation in Agriculture). This innovative, multi-stakeholder project aims to transfer knowledge to farmers and producer organizations on climate scenarios, risk management and adaptive measures to enhance their capacity to tackle current and future climate risks.

A web-based tool will support farmers' decision-making processes in shaping efficient adaptation plans at both the farm and supply-chain level. The project will also support farmers' capacity to plan and invest in adaptive interventions by framing a coherent policy strategy at regional level. And, by building capacity on risk reduction, the project will foster insurer innovation in maintaining farmers' insurability in the long-term.

Life ADA will focus on three value chains:

- dairy (Parmigiano cheese)
- fruit and vegetables
- wine

Combined, these sectors represent 40% of Italy's agricultural revenue and almost 20% of the country's farmers.

UnipolSai Assicurazioni will coordinate the project, together with two scientific institutes (ARPAE and CREA-PB), two agricultural trade organizations (CIA Agricoltori Italiani and Legacoop Agroalimatare Nord Italia), a big data and innovation company (Leithà), an environmental NGO (Circolo Festambiente) and a region (Emilia-Romagna). The project is co-funded by the European Commission under the LIFE financial instrument.

Life ADA enters its pilot experimentation phase in Emilia-Romagna in autumn 2021. It will then be rolled out across Italy in 2022. The project runs until December 2023. ■

From 2020 to 2023: the estimated impact of Life ADA

Lower emissions
-1% CO_2
-2% NH_3

Less consumption
-5% water consumption
-5% energy consumption

Improved resilience
+3% resilience of the population to floods
+17% sustainable management of agricultural areas

For more information, visit:
www.lifeada.eu/en/

ADA
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Planet before profit

Marketing and lobbying in support of bogus "green" solutions is undermining global efforts to halt climate change. The UN must step in to convene an intergovernmental scientific panel to evaluate corporate environmental claims

By Rajat Panwar, Associate Professor, College of Forestry, Oregon State University, USA

Private sector corporations know that society is desperate for climate solutions and that they have prodigious opportunities to advance business interests if their actions appear to help the climate cause. Unsurprisingly, corporations have flooded markets with a vast range of "green" products and business practices, which they aggressively project as the panacea to halt climate change. I believe this unbridled proliferation of corporate climate "solutions" is dangerous and must stop.

From my perspective, the constant influx of new "green" products and practices is a deliberate corporate approach to first create and then sustain a favorable image. Capricious solutions give the public a repeated sense of optimism while making it practically impossible for the scientific community to timely assess – and accordingly educate the public – what these products or processes can deliver at scale.

The process repeatedly follows the same predictable pattern. First, corporations engage scientists to conduct a limited-scope environmental impact assessment (EIA) of their prototype products or business practices. Then, in the name of translating scientific findings to "easy to understand" corporate communication reports and policy briefings, critical assumptions and boundary conditions of EIAs are dropped to construe – well, fabricate – a generalizable narrative. At this point, a product or business practice is aggressively branded as the

◂ Harvested spruce in Fort McMurray, Canada. The forest fires in the region have highlighted the dangers of simplistic, commercial approaches to forestry. After the wetlands were drained and replaced with forestry, the wildfires have been more frequent, more intense and have released carbon that was sequestered in the peat over thousands of years

panacea for our environmental woes. By the time the research community empirically assesses whether that product or practice actually delivered any environmental benefits, the menu has changed. And so this cycle repeats.

This process is evident in the forest sector, which I study. Years ago, many forestry corporations aggressively promoted wood-based bioenergy for its environmental benefits, which were estimated using limited-scope EIAs. They then pushed for favorable policy changes and, in fact, largely succeeded. Years later, we are beginning to understand that this approach was an ecological folly. It has resulted in a wide range of adverse environmental impacts on water, air, and soil quality as well as on biodiversity. Many scholars, who were not listened to, had already predicted this.

Instead of learning from this failed experiment and conducting holistic and global-scale EIAs for future projects, forestry corporations are now repeating the same story with their new offering: mass timber, a special type of engineered wood.

Many life-cycle assessment (LCA) studies conducted primarily in northern Europe and North America show that buildings made of mass timber are environmentally friendlier than those made of alternative materials. Some studies dispute these results, but forestry corporations are aggressively pushing mass timber as the panacea to decarbonize the building sector using those limited-scope LCA studies that bolster their case.

Meanwhile, we do not understand the consequences of mass timber adoption at a global scale. Apprehensions abound that it will enhance the need for monocrop plantations and likely exacerbate illegal wood trade in many parts of the world. Turning a blind eye to these serious concerns, forestry corporations are aggressively seeking to establish mass timber as the new poster child of sustainable buildings.

This story is not unique to forestry. Cherry-picking slices of scientific findings and abusing them as lobbying tools is a common form of corporate environmental hypocrisy. Green economy, circular economy, sharing economy, regenerative economy, bioeconomy, net-zero emissions, nature-based solutions, science-based targets – as a society, we are incessantly inundated with new and exciting labels and narratives that give a false sense of precision, objectivity, and optimism. Colloquially speaking, we are strung along.

// Scientists must be watchful and courageous in publicly calling out corporations if scientific findings are manipulated even in the slightest manner

Scientific veracity

Fleeting corporate climate "solutions" have two perilous effects. First, they prevent society from authentically reflecting upon its unsustainable ways of living and the economic structures that reinforce these lifestyles. Thus, they distract us from searching for substantive actions. Second, by manipulating scientific research, they also insidiously erode the legitimacy of science, scientists, and academic institutions.

When the public sees that an approach, allegedly claimed to be scientifically well-proven, fails to deliver desired results or causes harm, science is subjected to ridicule. Scholars conducting isolated EIAs (for example, through LCA or other tools) rarely recognize how flagrantly their limited-scope studies are misconstrued to advance corporate agendas. Even if they do, many often let it slide, due, in part, to their reliance on industry funding to sustain their research programs.

In the final analysis, an unbridled proliferation of ephemeral corporate climate "solutions" is a dangerous hypocrisy that must stop. As a matter of professional responsibility, scientists must be watchful and courageous in publicly calling out corporations if scientific findings are manipulated even in the slightest manner. Just as corporations require scientists to sign non-disclosure agreements in collaborative research, scientists must have corporations sign full-disclosure agreements requiring them to include all caveats and contingencies in any corporate communication related to those scientific findings.

We also need an intergovernmental research unit, under the auspices of the UN, tasked with vetting and verifying the scientific veracity of corporate climate claims at a global scale. Scientific veracity must be assessed both quantitatively (such as with interdisciplinary modeling) and qualitatively (for example, with forward-looking, anticipatory policy analyses).

I emphasize the need for qualitative analyses because EIAs typically ignore that "all that matters cannot be counted, and not all that can be counted matters."

In this crucial Decade of Action, we must devise robust mechanisms to end the corporate environmental hypocrisy that is preventing us from taking substantive actions, and also systematically diminishing the credibility of science. I call upon the UN to convene an intergovernmental scientific panel to correct this course. ■

Government's role in private-sector climate action

Conventional wisdom is that business resents regulation: this is not always the case when it comes to climate. A sizeable number of G20 businesses are calling on their governments to set clear, ambitious policies and regulation that will protect the 1.5ºC climate goal

By María Mendiluce, CEO,
We Mean Business Coalition

Contrary to the private sector's conventional stance on regulations, we have seen a surge in businesses calling out for more regulations on the world stage. Aiming at the attention generated around the G20 and COP26, hundreds of businesses will be looking for increased climate policy ambition following the "code red for humanity" warning from the last IPCC report. In fact, over 600 companies operating across the G20 nations in September urged governments to redirect public spending towards keeping the 1.5ºC climate goal within reach.

The businesses, representing over USD 2.5 trillion in revenue and employing more than 8.5 million people worldwide, signed an open letter to the G20 leaders. The signatories, which included Unilever, Netflix, Volvo Cars, Iberdrola, and Natura&Co, spanned sectors from power and transport to fashion and construction.

It is because the science is very clear. To limit global warming to 1.5ºC, they know the world needs to collectively halve global emissions by 2030. This is the decisive decade for climate.

Halving emissions in the next eight years globally will be challenging, but there are many solutions available today that will put the world on track. However, public policies and fiscal frameworks are often not advancing at the right pace to achieve it.

Hence, the hundreds of businesses that signed the letter, many of which are already taking action aligned with limiting warming to 1.5ºC, will be watching closely for government signals on climate action that will support their own ongoing efforts to transform their businesses and rapidly reduce emissions.

Some will be looking to see whether their calls for policies like investment in electric vehicles (EVs) infrastructure, ending coal financing, and support for renewables, or meaningful carbon prices, have been heard.

Others will be following the debate on reporting, noting whether other countries are following the G7's endorsement of mandatory climate-related financial disclosure back in June.

Going all in

Every signal that governments give now on climate is crucial. The policies that follow these signals will define how fast businesses can go "all in."

For businesses all over the world, regardless of size or sector, going all in means bringing their entire workforce along by embedding their climate plans in the company plans and incentives scheme. It also requires working with their supply chain to embed these same values.

In practice, going all in means working towards science-based targets aligned with limiting global temperature rise to 1.5ºC. To achieve these targets, businesses are investing in scaling up existing technologies like using renewable power across their operations and switching to electric fleets. In doing so they are contributing to help both renewable and EV technologies to surge up the s-curve of growth at the pace required to halve emissions this decade.

Simultaneously, they are innovating and working with their suppliers or customers to create demand signals that will lead to the development of low-carbon solutions that don't yet exist and will be required in the

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▲ Arçelik, the Turkish white-goods manufacturer, has been recognized in WEF's Global Lighthouse Network of leaders in smart and sustainable manufacturing. The company has been carbon neutral (scope 1 and 2) since 2019

2030s. And, vitally, they are calling on governments to set the policies that will create a supportive environment for them and their peers to go faster.

Among those companies going all in are Levi Strauss & Co. They are already sourcing 76% renewable electricity across their owned and operated facilities en route to 100% by 2025. And Siemens, whose 50,000-strong global vehicle fleet will be 100% electrified by 2030. Unilever, meanwhile, is investing in hydrogen innovation to help decarbonize its factories alongside working towards a deforestation-free supply chain by 2030.

This level of voluntary corporate action is impressive. But it's not enough to successfully halve global emissions by 2030. For that we need governments to also go all in and raise their ambition, which will create the right economic conditions and policy frameworks for all businesses to act.

There are some absolute must-haves for governments. In the power sector, it requires ending coal financing, phasing out fossil fuel subsidies, and investing in energy efficiency and a smart grid infrastructure to integrate massive amounts of renewable energy. While for transport, more stringent emission standards for all road vehicles, the promotion of fuel efficiency, and the shift from cars and trucks to low-emission transport modes remain critical. Commitments to 100% sales of zero-emission vehicles (ZEVs) by 2035 for new light-duty vehicles and investments in infrastructure for reliable and seamless EV charging for all are also essential.

Where solutions don't yet exist to decarbonize sectors like heavy industry, food, and agriculture, governments have a key role in incentivizing the wave of transformative innovation needed to find them. Now's the time to cut the incentives that are currently still making it worthwhile to continue with those polluting business activities or unsustainable farming practices that, if they continue beyond this decade, will take us away from a resilient, safe, and secure future.

With government backing for halving global emissions by 2030 – which ensures that national plans are aligned with 1.5ºC – businesses will move faster. Mandatory reporting alongside the right financial frameworks and the removal of subsidies for fossil fuels will make clear that investing in low-carbon technologies is the right way to go.

The right government signals from the G20 and at COP26 followed up with the right policy framework will provide the certainty needed to generate a spiral of positive climate action in the business community. ■

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Translating knowledge into action

We are fortunate to possess an abundance of data that alerts us to the nature and potential impact of climate threats and that can also guide our response. We are not effectively using this knowledge. The human barriers slowing progress must be removed

By Claire Melamed, CEO, Global Partnership for Sustainable Development Data

The ability to collect and share knowledge is what differentiates humans from most of the other animal species on the planet. We have the power to understand our world in the aggregate, collecting data that goes far beyond any individual experience, and the power to combine insights from the present and the past to plan for the future.

Data is a tool for change. It is temperature data that shows beyond doubt the undeniable reality of a warming world, and mortality data that shows the terrible price being paid. Data is how we develop solutions: in Senegal, data means the government can track and tackle deforestation, can

◂ Children take part in a disaster drill in Dhaka, Bangladesh. The data needed to respond to climate change is readily obtainable; it only requires political will and finance to use it effectively

get the right crops to farmers suffering the effects of a changing climate, and can manage increasingly scarce water resources.

Right now we have more data on our changing climate available than ever before. We should have the clearest possible picture of what to do and how to do it, and there should be no justification for delay or compromise with the reality of environmental breakdown.

But instead we are seeing a flood of misinformation which hampers effective campaigning; policies based on short-term commercial imperatives rather than social interests; and politicians still able to get an audience for outdated and disproven arguments about the relative costs and benefits of effective action.

We can't lay all the blame for political stalemate at the door of poor data, but we are not helping ourselves. We are not pooling this incredible resource, created by centuries of human ingenuity and discovery, and using it to create shared understanding and drive urgent action, or putting it at the service of all those who want to create change.

> ***Institutional rivalries, commercial interests, and political inertia keep us from harnessing the full might of data to tackle the climate crisis. These require political solutions***

Reliable global climate data relies on a good data collection system in every country, but across Africa, only one quarter of observation stations are reporting data that meets international standards. Even where the data exists, official inertia and complacency can mean it is not used, risking lives as warnings are ignored.

We keep trying to fix this problem by creating just one more data platform, one more app, one more search tool. But that's not the solution.

Human barriers

The barriers to fully using the power of data to fight climate are human, not technical. It is institutional rivalries, commercial interests, and political inertia that keep us from harnessing the full might of data to tackle the climate crisis.

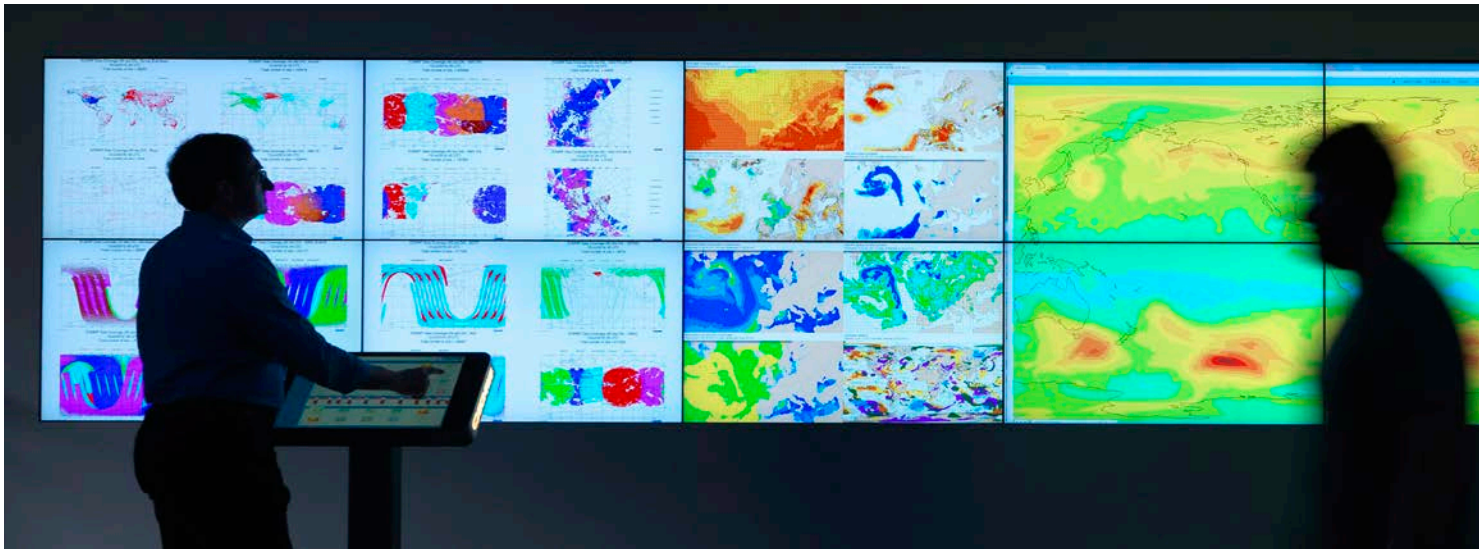
These are hard problems to solve, and require political solutions. Using the power of data to fight climate, tackle misinformation and drive political action requires three things:

Money: A UN/World Bank survey suggested that in two-thirds of low and lower-middle income countries, statistical agencies lack sufficient resources to meet their data needs. Despite the huge new opportunities of the data revolution, funding for data from external sources has remained almost static for nearly 10 years.

Leadership: Institutions both inside and outside of government hoard data because they think that it gives them power. Companies hoard data in the name of commercial advantage. We need to shift the culture from data hoarding to data collaboration, to bring the full power of data to bear on climate change. This means leadership from the top, creating incentives to manage data in ways that make it shareable and easily combined, and incentives to use the data that is available to inform decisions, even if it isn't what the leadership wants to hear.

Skills: People can only do the things they know how to do. Many institutions suffer skills gaps, as investments in education lag behind the developments in technology. Once gained, skills are not being combined in ways that can bring the combination of technical and human insights to bear on creating data systems that are accessible and useful to those who can use them to solve problems. We need education and training programs that increase technical and non-technical data skills at the same time, and encourage people to see all sides of the data challenge.

It is knowledge translated into action that will save us from climate change. It is indefensible that we are not using the world's best knowledge to solve this worst of problems. For all our sakes, this must change. ■



Reliable climate monitoring is essential for SDG success

COP26 will inspire new efforts to reach the ambitious SDG targets by 2030. Earth observation data from Copernicus will help us achieve these goals

Samantha Burgess
Deputy Director of the Copernicus Climate Change Service at the European Centre for Medium-Range Weather Forecasts (ECMWF)

With renewed efforts from governments and society striving to accelerate progress towards the Sustainable Development Goals (SDGs), reliable climate monitoring is essential.

The Copernicus Climate Change Service (C3S) is part of the EU's flagship Earth monitoring program and it is implemented by the European Centre for Medium-Range Weather Forecasts (ECMWF). Using a network of satellites, in situ sensors around the planet, and state-of-the-art modeling systems, it provides governments, businesses, and society with data, innovative tools, and services to help make sense of the changing climate.

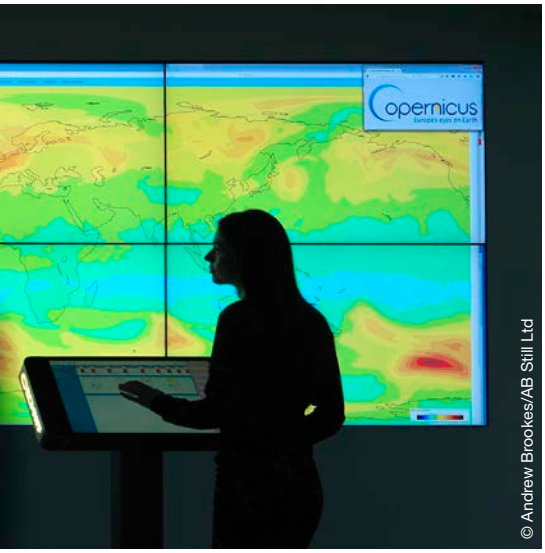
Dr Samantha Burgess, Deputy Director of the Copernicus Climate Change Service at ECMWF, explains more about their work and how it can support climate initiatives around the world:

Each year, new records are broken regarding the global climate, and the devastating impacts are evident in the heatwaves, wildfires, and flooding seen increasingly around the world. From your vantage point at the Copernicus Climate Change Service, what does the future hold if we continue along the current trajectory?

We can say without doubt that the atmosphere is warmer and wetter than it otherwise would have been without human-driven climate change. The effects of greenhouse gases and other emissions from industry, transport, and development are painfully clear. That said, it is important to remember the distinction between weather and climate. Weather – extreme or otherwise – is what we experience on a daily, weekly, and seasonal basis; climate is the average of that weather in a particular location. So, although these devastating impacts are due to weather events, they are becoming more frequent and more intense over time, and monitoring these changes is an essential activity within C3S.

Another point to bear in mind is the difference between climate change and climate variability: the Arctic has extremely high variability in both time and space, yet is still warming at more than twice the rate of the global average.

C3S contributed data to the latest IPCC assessment report published in August, which highlighted that the risk of climate change impacts grow in proportion to the level of global warming. This includes the frequency and intensity of



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extreme weather events like marine heatwaves, heavy precipitation, droughts, and cyclones. It also means further reductions in Arctic sea ice, permafrost, and snow cover, which all contribute further to overall climate change. Until we reach net-zero emissions, expect more temperature, extreme rainfall, and drought records to be broken.

With all that in mind, what do you think or hope can be achieved at COP26?
We are now almost two years into the UN's Decade of Action, and COP26 will give a fresh impetus for the world to come together to reach our climate targets. Many governments have expressed strong interest in global coordination to commit to a joint net-zero pathway. The scientific evidence in the last IPCC assessment couldn't be clearer.

COP26 is an important opportunity to turn these international pledges into genuine climate action and try to bring about some meaningful change before the next IPCC report. C3S has an important role by providing free, accurate, and reliable climate monitoring data to support national action and track progress.

The UN set ambitious targets with the SDGs. How can Copernicus help achieve them?
Ultimately, the SDG targets are much harder to achieve in the face of the societal, economic, and environmental risks associated with climate change. Earth observation data, products, monitoring, tools, and services provided by the European Commission's Copernicus services on how the atmosphere, land, ocean, and climate are changing are essential.

This data can be used to inform business and policy decisions on understanding current climate risk and how to mitigate and adapt to future climate risk. Aside from direct climate monitoring, our data is used to create new tools which help drive real progress toward the SDGs, whether at a local or national level. We already work with individuals and organizations across a wide range of sectors who make use of these resources. This is really inspiring, and we welcome new collaborators to get in touch.

All Copernicus data is free and open access and is available through cloud resources like the Climate Data Store, hosted by ECMWF. Copernicus services like C3S are heavily influenced by the requirements of our users, whether they come from scientific research, the private sector, or are drafting future policy at local, regional, or international scales.

Our data and services are built upon the best available science and technology and we work closely with both international and national meteorological and hydrological agencies such as the World Meteorological Organization.

The clear consensus is that we need to cut our CO_2 emissions drastically and quickly. What role can Copernicus play here?
The Copernicus program is heading into an exciting next phase, as new satellites, science, and other technologies will give us more data and increase our understanding and monitoring of the climate system even further.

One new component being developed by ECMWF, the Copernicus Atmosphere Monitoring Service (CAMS) and many partners, will include monitoring and verification of anthropogenic – human-made – CO_2 emissions. Our analysis of these measurements will support future "global stock-takes," helping countries to track progress against their emission-reduction goals, as outlined in the 2015 Paris Agreement.

Attendees at COP26 won't need convincing about the importance of bringing down emissions. How can the work of Copernicus help convince those who don't believe that the risks of climate change outweigh the costs of action?
The extreme weather events we've observed over the last few months highlight the very high costs of climate change to infrastructure and society. And you only need to read reports such as the UN's "WMO Atlas of Mortality and Economic Losses from Weather, Climate and Water Extremes," to understand the losses we've already experienced over recent decades – both human and financial.

With further climate change, the risks and costs only increase. Financial, legal, and energy companies are also realizing that ignoring climate change is a bad investment, and we're seeing some promising changes across society.

At Copernicus, we analyze and report on the climate, with summaries every month, using the best science and some of the most powerful supercomputers in the world. What we do is free and open, fully traceable, and our data is similar to that used by the IPCC for their assessments. ■

EUROPEAN UNION
Copernicus Europe's eyes on Earth
IMPLEMENTED BY ECMWF

SDSN and its publisher thank the European Centre for Medium-Range Weather Forecasts for its generous support for this publication

Data for climate action

Without accurate data on emissions, we cannot take actions to curb them – countries must do more on monitoring and reporting

By Grayson Fuller, Senior Analyst, United Nations Sustainable Development Solutions Network (SDSN)

As global thought leaders devise solutions to tackle the climate crisis, whether they be technological, political, or ecological, these solutions must all have one thing in common – a solid founding on data and statistics.

While great progress has been made in measuring and tracking key emissions, we need further, faster action. There are a variety of techniques for estimating such data, such as remote sensing technology, models based on energy use and emissions factors, and on-site measurements that are modeled to larger territories.

However, many countries do not regularly submit inventory data to the UN Framework Convention on Climate Change (UNFCCC) and the way data is reported is not always standardized – the methods countries use to estimate emissions may not match the UNFCCC reporting guidelines for national agencies tasked with inventorying emissions.

Eurostat, the statistical service of the EU Commission, is not able to provide harmonized estimates of phosphorus and nitrogen emissions in agricultural land for European countries because not all countries report on the same sources of emissions or the same types of land. It is essential that all countries continue to invest in their capacity not only to monitor emissions but to report them in a harmonized and standardized way.

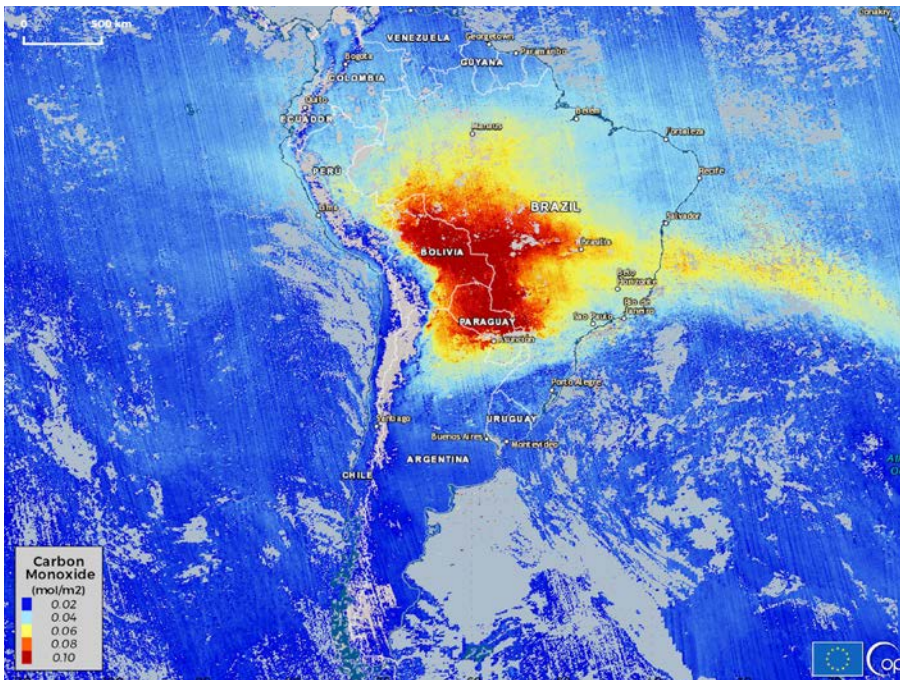
In addition to territorial emissions, countries must make urgent progress in monitoring their consumption-based emissions, or what the United Nations Sustainable Development Solutions Network (SDSN) refers to as "spillover effects" in our annual Sustainable Development Report. While many European countries do indeed show declining CO_2 emissions in their territory, this decline does not account for emissions outsourced to developing countries that manufacture European imports. There are initiatives at universities and research centers to quantify and monitor these impacts, notably using multi-region input-output databases, but their resources are limited given the scale and urgency of the problem.

Finally, it is important not only to have robust data, but also precise targets against which countries can benchmark these data. Having clear, time-bound, quantitative targets for indicators of environmental harms allows countries to:

- determine if their rate of progress is sufficient
- identify where their greatest priorities lie

While extensive modeling work had yielded some estimates for per capita targets of CO_2 emission equivalents for different warming scenarios, we lack clear scientific consensus on targets for other drivers of climate change.

If we cannot accurately measure harms to the environment, it will not be possible for countries to take decisive action to improve. ■



◂ Measuring the carbon monoxide released by wildfires in South America. These observations from the Copernicus Sentinel-5P satellite show the emissions from fires in the Pantanal, the world's largest wetland

© Finnish Government

◂ Sanna Marin, center, the Finnish Prime Minister. Finland is the best performing country on the SDGs, according to SDG Index

Eyes on the target

Setting long-term goals and targets towards achieving sustainability can induce more immediate advantages too

By Norichika Kanie, Professor, Keio University; Director, xSDG Laboratory, Keio Research Institute at Shonan-Fujisawa Campus; Co-Chair, SDSN Japan

Among the many tools that can encourage societies in their transition towards sustainability, I want to highlight the importance of setting goals and targets – what we now call "governance through goals." As work to achieve the Sustainable Development Goals (SDGs) gathers pace around the world, this novel approach to improving global governance on sustainability deserves more attention.

We have already seen that setting effective, long-term goals and targets to support SDG implementation can lead to benefits in three important areas.

1. Forging partnerships

Long-term targets are regarded as signals that an actor – be it a national government, local government, or company – is moving in a positive direction on sustainability. Such targets in turn attract other actors who are also moving in that direction, leading to potential partnerships and collaboration. These partnerships can take various forms, from sharing ideas to pooling financial or human resources.

2. Creating ethical appeal

Goals and targets set to move towards achieving the SDGs have built-in ethical legitimacy. The SDGs are supported by all UN Member States. Actors who are working to support the SDGs are therefore likely to enjoy broad support within their societies – or at least suffer minimal objections. Those companies setting goals and targets to achieve the SDGs are more likely to be considered as socially accountable and ethically "sound." This is an important consideration for private companies that are often viewed as primarily pursuing their own self-interests.

3. Incentivizing innovation

Pursuing even a single SDG using business-as-usual practices would be difficult enough – working towards achieving multiple SDGs simultaneously will necessarily stimulate creativity and can lead to innovation. To take just one example: for engineers, long-term goals and targets are helpful tools to remind them of the wider societal benefits they are contributing to – rather than being solely focused on day-to-day technological development.

Conclusion

A growing number of actors are setting long-term targets and goals that are aligned with the SDGs. Starting with profit and financial markers, we're now seeing many companies setting targets on a wide range of critical indicators, from greenhouse gas emissions, to gender-based employment, to plastics reduction. Some companies are even embedding these targets as part of their supply chain management.

Of course, targets are not enough on their own, and implementation as well as measurement and review are vital. But setting ambitious targets is an important first step towards transformation, and I want to see more of them in all domains of the 17 SDGs. ■

The case for regulation

We can't trust companies to prevent a climate catastrophe. We need tough global standards to stop unscrupulous operators putting profit over the environment

© Afolabi Sotunde/Reuters

By Mike Davis, CEO, Global Witness

Our core solution: global corporate accountability standards, so corporate power no longer goes unchecked and policymaking is made in the public good.

We have limited time left to protect our planet and save humanity. Yet all too often, global leaders prefer to dance around this reality, despite the mounting evidence of the many catastrophic ways the climate emergency is already affecting communities and ecosystems around the world.

We know we need to stop extracting fossil fuels, stop tearing down climate-critical forests, and cut emissions, so what's holding us back? Amid necessary attention on technology and consumption patterns, an overlooked part of the answer is the influence and impunity of powerful companies that are effectively betting on destruction and have most to lose from the action the rest of us desperately need.

Over a quarter of a century, Global Witness has been tracking, exposing, and challenging corporations that profit from practices that are destroying our planet, impoverishing whole nations, and fueling violence against communities. We may see improvements in the way individual businesses operate, or new restrictions in some countries. But until we have a new global standard of corporate accountability, in which the companies and individuals who are contributing so much to the current climate emergency can be held responsible and face justice, our progress towards a more sustainable future will be too slow.

Too many corporates know that if we are serious about curbing global warming, the way they make money will need to alter, in some cases irreparably. Whole industries (especially those reliant on extracting fossil fuels) see that their days could be numbered. Their efforts, despite what some of them may say, are, therefore, focused on distraction and delay.

Big Oil has been pumping out misinformation and funding pseudoscientists and think tanks to skew the debate on climate for decades. Companies around the world rely heavily on campaign financing and lobbying to water down regulations designed to protect people and planet.

Too many align themselves with oppressive regimes, including military juntas, to access precious natural resources. They use PR, advertising, and opacity to greenwash and hide their environmental impacts. Some are complicit in the killing and silencing of workers and environmental defenders. Their operations can lead to dire impacts like toxic waste, air pollution, and deforestation in communities from the Amazon in Brazil to the Niger Delta, and Richmond in California.

> ***We aim to force the hands of governments to ensure corporations who act beyond the law start acting in the public interest***

The most powerful economies – Western nations, China, and India – have allowed themselves to be co-opted. They have fallen victim to climate inaction. They have been unwilling and ineffective in holding powerful, carbon-intensive industries and financial institutions to account. They have failed to prioritize the public interest and the well-being of future generations globally.

Cutting off the access and influence enjoyed by the business community and holding them legally accountable for their actions, while championing a just and equitable transition, is our way of removing the poison infecting the planet, ruining lives and communities, and replacing it with an antidote. It is aimed at allowing nature to heal and giving space and power to those whose lives and livelihoods are linked to the protection of the land.

We are campaigning for new global standards to stop companies being able to operate in a way that drives environmental and human rights abuse. Together with our partners and social movements around the world, we aim to force the hands of governments to ensure corporations who act beyond the law start acting in the public interest. Nations must serve notice on those responsible for undermining progress towards a more sustainable, more equal, future.

At an EU level, this is already in train, with new corporate accountability legislation in the works that would ensure companies and investors prevent, identify, address, and account for environmental and human harms in their global operations. Yet already, it is evident that lobbying efforts from big business are attempting to dilute the proposals. By the end of the year, we will know who really has the ear of decision-makers in Brussels – the climate activists, scientists, and communities facing destruction, or the businesses whose bottom line will be hit by being made to face up to the terrible effects of their activity.

Either way, we can't stop there. If the legislation is strong and is properly enforced, the EU will be an important vanguard, demonstrating the principle that corporate power cannot continue to carry out damaging and destructive practices, unfettered and unaccountable. However, we need other jurisdictions and blocs of global power to follow, go further, and act faster.

Our climate is not safe in the hands of predatory companies. It's time to do something to loosen their grip. ■

◄ Gas flaring in Ughelli in the Nigeria Delta. The region has suffered decades of pollution and human rights abuses due to the operations of multinational energy companies

Spatial planning for land-based policy objectives

Action-oriented maps and data are critical to tackling the biodiversity and climate crises

By Guido Schmidt-Traub, Partner, SYSTEMIQ Ltd and Micheline Khan, Biodiversity Analyst and Program Manager, SDSN

To meet the ambitious objectives of the upcoming biodiversity and climate conventions, integrated strategies need to be implemented to better manage land use for agriculture, infrastructure, biodiversity conservation, climate change mitigation and adaptation, water provision, and other services.

Governments need spatial data to identify which land areas have the potential to generate the greatest synergies between conserving biodiversity and nature's contributions to people. The absence of action-oriented maps in land-based policies is concerning because neither the biodiversity nor climate crisis can be addressed without spatial data and spatial planning.

There are emerging policy actions on nature and climate happening around the world that require a spatial lens.

These include the High Ambition Coalition's 30×30 target to protect at least 30% of the world's land and ocean by 2030 and the Leaders Pledge for Nature signed by 88 heads of government committed to reversing biodiversity loss by 2030. A recent study by the Nature Map Consortium presented an approach for integrated spatial planning to achieve policy objectives, which can provide support to decision-makers in prioritizing locations for conservation efforts. It shows that managing a strategically placed 30% of land for conservation could protect 70% of all terrestrial plant and animal species, while simultaneously conserving more than 62% of the world's above and below ground vulnerable carbon, and 68% of all clean water.

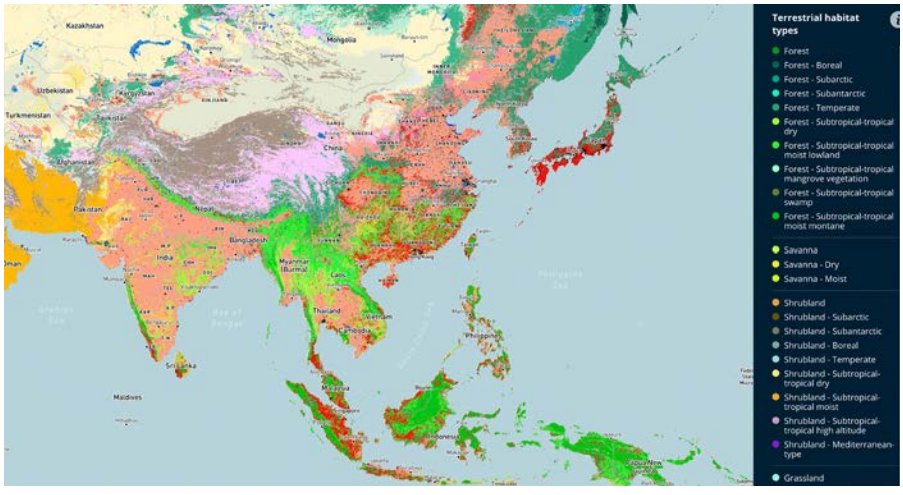
Developing national maps for integrated land-use planning can have many policy uses, including generating finance for natural climate solutions, improving carbon markets, and greening supply chains.

For instance, businesses need guidance on current and future land uses to understand from where they can and cannot source soft commodities, such as soy or beef. The same spatial data could also strengthen emerging standards for nature-related targets, as developed by the Science Based Targets Network and the Taskforce on Nature-related Financial Disclosures.

As governments start to include action-oriented maps in their national climate and biodiversity strategies, countries can address several critical policy needs. These include ecosystem services valuation, clarifying land ownership and tenure issues, protecting land rights of indigenous peoples, as well as incorporating key monitoring and evaluation tools for current and intended land use.

Spatial data and planning are not the sole answer to these global challenges; they are, however, a necessary step in advancing policies that meet national and local land-use objectives

Such land-based policies need to be designed in support of practical, local projects on the ground that both reduce biodiversity loss and anthropogenic emissions. This means that they need to be aligned with climate and biodiversity strategies to operationalize and meet the objectives of the United Nations Framework Convention on Climate Change and the UN Convention on Biological Diversity. ■



◄ Nature Map's global map of terrestrial biodiversity and ecosystem carbon stocks is a free resource, designed to support government policy design

Strengthening carbon sinks

Land-based carbon sinks should play a bigger role in national and international climate action planning

By Tarja Halonen, former President of Finland (2000 to 2012); Member, SDSN Leadership Council

The UN Climate Change Conference takes place at an opportune moment. The COVID-19 pandemic has opened our eyes to the necessity of sustainable development. Even more so, we understand the interconnectedness that defines various goals and undertakings. The fight against climate change is carried out through all 17 goals of Agenda 2030.

I hope to see this complexity of challenges and needed measures reflected at the negotiating table.

The reduction of emissions that add to global warming must be carried out more effectively. In the EU, forests absorb approximately 10% of the atmospheric carbon dioxide that is produced by other sectors. That said, the more traditional emissions trading system should be expanded to also include compensation for land-based carbon sequestration. Like the land-use and forestry (LULUCF) regulation in the European Union, this addition of carbon sinks to emissions trading would maintain and strengthen our long-term carbon sinks in accordance with the Paris Agreement.

However, a clear definition of carbon sinks based on measurements and models is a requirement. Otherwise, there is no way of knowing how different land-use and management measures affect the concentration of atmospheric carbon dioxide and other greenhouse gases (GHGs). In addition to GHGs, forests also have other climate impacts, such as low albedo (warming effect), atmospheric aerosols (cooling effect), and cloudiness (cooling effect). Forests also have a key role in biodiversity, and it is essential that challenges in climate change and biodiversity are tackled together.

Terrestrial sequestration of carbon dioxide can be strengthened by taking care of the growth potential and health of our forests, and by increasing forest carbon storage. The reduction of GHG emissions through carbon sequestration nationally endorses climate actions globally.

It is time to take action. The post-COVID reconstruction of the economy gives us an immense possibility to steer economic growth to a path of greater sustainable development. ■

With thanks to Professor Markku Kulmala, Docent Anna Lintunen, and Mii Vuorensalmi for their contribution to this article.

▲ Forest in Navarre, Spain. The capability of carbon sinks needs greater recognition and traditional emissions trading systems should be expanded to encompass them

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SDG ACTION

SDG Action is a new initiative launched by the UN Sustainable Development Solutions Network (SDSN) to support the UN's Decade of Action.

A resource for sustainability practitioners in all sectors, it brings timely analysis of the most pressing challenges. Its emphasis is on identifying opportunities and providing tangible ways to accelerate progress.

The website (www.sdg-action.org) features articles from world-leading experts on all aspects of the Sustainable Development Goals (SDGs) and climate action.

Two print editions are released annually, to coincide with major global diplomacy events. These editions provide a framework to understand the complex interdependencies between the SDGs, highlight priorities and dilemmas, and suggest ways to make the greatest impact, fast. The print editions are carbon-neutral and sustainably produced. The carbon emissions generated in manufacturing the paper, and printing and distributing the publications are offset. The paper used is PEFC certified from sustainable sources.

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UN Sustainable Development Solutions Network (SDSN) promotes integrated approaches to implement the Sustainable Development Goals (SDGs) and the Paris Agreement on Climate Change, through education, research, policy analysis, and global cooperation

The UN Sustainable Development Solutions Network (SDSN) was set up in 2012 under the auspices of the UN Secretary-General.

SDSN mobilizes global scientific and technological expertise to promote practical solutions for sustainable development, including the implementation of the Sustainable Development Goals (SDGs) and the Paris Climate Agreement. SDSN works closely with United Nations agencies, multilateral financing institutions, the private sector, and civil society.

SDSN is guided by a Leadership Council, which brings together global sustainable development leaders from all regions and all sectors, including civil society, public, and private sectors. The Leadership Council acts as the board of SDSN.

Much of SDSN's work is led by National or Regional SDSNs, which mobilize knowledge institutions around the SDGs. Our research and policy work mobilizes experts from around the world on the technical challenges of implementing the SDGs and the Paris Climate Agreement. The SDG Academy leads the education work of the SDSN.

Until 2016, the SDSN Secretariat was hosted by the Earth Institute at Columbia University. Since July 2016, the SDSN Secretariat and the SDG Academy have been hosted by the SDSN Association, a 501 (c) (3) non-profit organization. SDSN has offices in New York, Paris, and Kuala Lumpur. ■

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