



Catalyzing and Launching a Global Carbon Removal Partnership June 2020

Thunderbird School of Global Management and the Foundation for Climate Restoration have joined forces to catalyze a global effort, the Global Carbon Removal Partnership (the Partnership), to accelerate deployment of urgently needed solutions at scale. Carbon removal refers to human-driven natural and technological approaches to taking carbon dioxide out of the atmosphere and sequestering it for long periods of time, ideally 100 years or more. By leveraging the Fourth Industrial Revolution through a new, innovative global partnership, we intend to mobilize bold and transformative action to ensure the survival and flourishing of humanity.

Building on the inaugural Global Climate Restoration Forum held in the Trusteeship Council Chamber of the United Nations in September 2019, and the launch of a task force to build the Carbon Removal Partnership at the World Economic Forum in January 2020, and now as we live in an era of COVID-19 response and recovery to build back better, there is an unprecedented opportunity to mobilize a broad range of global stakeholders in support of the rapid scale-up of carbon removal actions: including businesses, financiers, governments, civic groups, faith-based groups, start-ups, social enterprises, certification systems, and policymakers around the world from the local to the international levels.

We believe a new Global Partnership on Carbon Removal that harnesses the collective capacities, resources, and creativity of stakeholders across the public, private, civic and academic sectors will be truly transformational. It will advance timely and critical local, national, and international policies, private sector investments and business opportunities, as well as citizen action that will rapidly accelerate carbon removal and storage action around the world.

Carbon Removal is the Critical Third Pillar to Achieve Climate Transformation

Of the carbon dioxide causing our global climate to warm, 95% is legacy carbon that has been accumulating in the atmosphere since the start of the Industrial Revolution. Policymakers and corporations have begun making commitments to reach “net-zero emissions” by 2050 in order to meet the Paris goal of limiting warming to 1.5°C. As the IPCC 1.5°C Report (2018) acknowledges, “All pathways that limit global warming to 1.5°C...project the use of carbon dioxide removal (CDR) on the order of 100-1000 Gt CO₂ over the 21st century.”

Net zero strategies are important for ensuring we do not add even more carbon to our atmosphere in the future; but restoring a safe climate can only be done by removing the excess carbon already in the atmosphere today. We will not solve the climate crisis without removing this legacy carbon and bringing CO₂ levels in the atmosphere back to where they were prior to the industrial revolution.

This translates to sequestering 1 trillion tons of carbon dioxide by 2050. While this sounds daunting, our research shows there are solutions, implementation and business models, and financing and investment levers within reach. Carbon removal is not a substitute for mitigation (preventing or reducing greenhouse-gas emissions) or adaptation (preventing or reducing damage from global warming)—but a timely and much-needed addition to them. Removing carbon that has accumulated in the atmosphere and storing it in solid forms will allow the world to achieve goals pursued by climate activists for decades while supporting new commitments being made by some of the world’s largest and most influential companies.

Carbon Removal Criteria and Solutions

Methods for getting carbon dioxide out of the atmosphere include afforestation, carbon sequestration in soils, bioenergy with carbon capture and storage, ocean fertilization and direct air capture. Carbon removal is also referred to as greenhouse gas removal and the technologies applied relate to carbon negative or negative emission technologies.

Criteria for Prioritizing Carbon Removal Solutions

The Partnership proposes three criteria for prioritizing development and deployment of carbon removal solutions:

1. **Permanent:** meaning that CO₂ stays securely out of circulation for at least a century. Mineralization, for example, is permanent.
2. **Scalable:** meaning that a carbon removal solution could be scaled up within a decade to remove and store at least 25 GT of CO₂ per year. Examples of methods that are not scalable include approaches that compete for significant land acreage needed for food or forest production.
3. **Financeable:** meaning that funding is already available or can be mobilized. Financeable solutions can be deployed by leveraging a large existing market, such as that for construction materials or seafood, or potentially through creating new markets.

Carbon Removal Solutions Examples

Carbon-negative Building Materials: Combining CO₂ with calcium to create synthetic limestone that is carbon-negative. Calcium can come from recycled materials and common rock such as basalt. The limestone can replace quarried rock traditionally used for aggregate, which has a trillion-dollar market. By 2030, substituting synthetic limestone for quarried aggregate could pull 50 GT of CO₂ per year from the atmosphere.

Ocean and fisheries restoration: Ocean restoration projects such as marine permaculture arrays to attach kelp are financeable and scalable. They can support nutrient systems in the ocean that increase plankton and kelp growth, facilitating revitalization of fish habitats and ocean food chains, from plankton all the way to tuna and sharks. This kind of restoration can bring abundance back to what today are deserts in the ocean.

Reforestation (restoring trees where they had been previously) and Afforestation (establishing forests in areas where there was no previous tree cover) deliver carbon capture and storage: Establishing forests in areas where there was no previous tree cover is a reliable method for carbon storage. However, the scale and impact varies depending on climate and tree species. Out of all natural options, reforestation has the potential to make the biggest

impact in carbon reduction available. Since trees release carbon dioxide back into the atmosphere when they die, rot and burn, thriving forests are critical and provide long term carbon storage. Soil continues to accumulate carbon after forest maturity and reforestation on degraded soils can double soil carbon content. Trees can take decades to mature, therefore restoring ecosystems must be done well, ensuring the right trees are in the right place. Restoring ecosystems can also be designed to provide additional benefits – for example trees on farms can produce incomes for farmers (agroforestry systems) while restoring degraded land and increasing carbon storage in both the soil and the trees.

Soil Carbon Sequestration: Agricultural practices and global food systems contribute 15-30% of total GHG emissions. Through regenerative farming practices, soils can sequester carbon emissions. However, the permanence of soil carbon sequestration depends on a number of factors, including continuation of regenerative practices over decades. Start-ups like Indigo Agriculture are tackling this issue by launching a global initiative to capture 1 trillion metric tons of carbon from farmland through a marketplace that incentivizes farmers to implement regenerative farming practices.

Direct Air Capture: DAC is the process of chemically scrubbing carbon dioxide directly from the air. This technology has generally been constrained by the cost of capture and ability to harvest at scale. However, new investments in R&D and projects such as Mechanical Trees at Arizona State University are now being deployed commercially, bringing the cost of carbon capture below \$100 per metric ton. DAC plants must be connected with permanent end-use applications of the captured carbon (e.g., for use in building materials) in order to meet the criterion of permanence.

Carbon Removal is Emerging as a Critical Global Priority

A Global Carbon Removal Partnership offers an opportunity to align efforts, catalyze faster action and create good governance around the world. Time is not on our side. We must come up with a plan today that will remove significant amounts of legacy carbon from the atmosphere by 2050. Current research and practice show that carbon removal solutions are rapidly emerging as opportunities through academic, government, and private sector partnerships. These early stage carbon removal efforts are fragmented and there is fierce competition for scarce resources.

More and more stakeholders around the world are pioneering new and effective approaches to carbon dioxide removal and climate restoration. With the severity of the climate emergency becoming more apparent, more innovators are ramping up ideas for carbon removal. However, there is difficulty in overcoming regulatory and financial barriers.

Despite these positive trends, there is an urgent need to accelerate carbon removal if we are to meet global and national goals. There is clear evidence that a global network of carbon removal actors is rapidly emerging and there is no global organization that is working to coordinate, align, and foster learning and cooperation between stakeholders.

The Case for a Global Carbon Removal Partnership

Significant and sustainable improvements in carbon removal demand a concerted and coordinated global approach. Multilateral institutions, notably the UN, World Bank, and Green Climate Fund, are implementing massive programs on climate mitigation and adaptation. Despite these efforts, there is no global institution focused on carbon removal that can lead

coordination across a range of stakeholders. There is growing recognition that efforts in the carbon removal field would benefit from a new approach to collaboration to ensure greater participation, connectivity, and potential for scale in a shared endeavor.

A multi-stakeholder platform will most effectively advance carbon removal. Substantial and sustainable carbon removal action requires broad engagement from across the public, private, international and private sectors. Multi-stakeholder partnerships have proved to be an effective yet nimble approach to foster effective and efficient cross-sector collaboration. There are now several examples of such initiatives, such as the Extractive Industry Transparency Initiative (EITI), the Global Compact, the Global Fund to Fight AIDS, TB, and Malaria, the Global Initiative for Fiscal Transparency (GIFT), the Global Partnership for Sustainable Development Data (GPSDD), and the Global Water Partnership.

Numerous global initiatives have succeeded in convening a broad range of stakeholders. Led by governments, international agencies, the private sector, and civil society, they promote and sustain improvements in practices over time. The core strength of the multi-stakeholder approach is that it engages all of the interested parties, increasing alignment and improving coordination of efforts. It provides access to information and open spaces for learning and improvement among all constituencies. Another major strength is that the various capacities and activities of a wide-range of stakeholders can be harnessed for innovation to scale impact.

This is the moment for a multi-stakeholder global partnership for carbon removal. A number of recent developments indicate that there is already considerable momentum for a coordinated global initiative on carbon removal:

- **Broad governmental leadership is now possible.** Local and national governments have taken on carbon removal as a key priority in their climate strategies. There are additional increasing opportunities through COVID-19 government stimulus packages, which total over \$10 trillion and could include spending in climate change solution industries creating jobs as they build back better. We want to build on government net-zero targets to get to carbon negative targets.
- **There is great potential for the private sector to lead global carbon removal efforts.** Businesses have strategic interests in restoring a safe and healthy climate to ensure more stable and efficient market function. Additionally, new carbon removal industries are starting to emerge and experts estimate that \$1-3 trillion per year of market opportunities may exist. Companies such as Microsoft, Stripe, Shopify, and Amazon have launched carbon negative plans with targets ranging from 2030 to 2040, committing billions in funding for climate innovation and carbon removal.
- **There is a growing network of civil society organizations operating in nearly all countries and mobilizing in support of carbon removal.** A nascent carbon removal movement spanning civil society, faith-based organizations, and the private sector seeks a hopeful pathway for ensuring a sustainable future. These diverse independent institutions can serve as critical partners for governments and the private sector in advancing impactful carbon removal opportunities across communities.
- **To accelerate the current momentum in carbon removal technologies, sustained investment will be needed across multilateral and bilateral donors, governments and private sector.** This is the right time to rally policymakers and private sector leaders to invest in carbon removal technologies to bring them to scale.

Global Carbon Removal Partnership Working Model

Vision: The Global Carbon Removal Partnership will convene and catalyze stakeholders worldwide to make political commitments, align strategic priorities, strengthen capacities, and foster innovation to remove and store carbon.

Proposed Objectives: The Global Carbon Removal Partnership will be co-designed to achieve the following objectives:

- Catalyze and mobilize committed constituencies (national/local governments, private sector, civic groups, youth-led movements, academia, and multilateral agencies) to join forces in a partnership to achieve the ambitious goal of restoring a safe and healthy climate for future generations.
- Establish specific time-bound, measurable goals and targets to ensure that we successfully return atmospheric CO₂ to proven safe pre-industrial levels by 2050.
- Develop and refine carbon removal strategies, typologies, and specific deployment criteria for solution types in/on the stratosphere, troposphere, land, oceans, and cryosphere.
- Catalyze partners to deploy carbon removal solutions with measures of impact and monitoring of safety, efficiency, and effectiveness, while driving advocacy to overcome political, policy, and regulatory bottlenecks.
- Harness data through modeling, sensors, and predictive analytics to guide deployment and monitoring of carbon removal solutions.
- Catalyze deployment of carbon removal research, demonstrations, and at scale implementation, leveraging the full capacities of the Fourth Industrial Revolution.
- Broker funding through traditional and innovative financing approaches for go-to market.
- Scale carbon removal solutions through market-driven approaches with catalytic support from governments and funding sources.
- Identify Quick Wins that demonstrate the value-add of a global partnership. Potential quick wins may include:
 - Accelerate Carbon-Negative Building Materials: Support the global launch of a quantitative standard and franchising mechanisms to deploy technologies for carbon sequestering building materials (concrete, for example)
 - Ocean Ecosystem Restoration: research and demonstrations deployed in 5 coastal regions
 - Innovative solutions identified to address critical carbon removal challenges
 - Climate Restoration/Carbon Removal Emergency Resolutions in 20+ local government jurisdictions that will bring government funding and support to implement carbon removal market solutions in those regions
 - Carbon removal seed and series A investment fund

Key Functions of the Global Carbon Removal Partnership

- Political agenda setting and commitment-making
- Convening minds to foster communication and collaborations
- Aligning the strategic priorities of the carbon removal movement
- Developing and strengthening principles and norms
- Accelerating the spurring and scaling of carbon removal solutions
- Facilitating peer-learning and technical support
- Mobilizing new funds and helping to align resources to ensure carbon removal solutions are being funded

2020 Action Plan: Catalyzing & Launching the Global Carbon Removal Partnership

In designing and launching a global multi-stakeholder partnership, we believe in the importance of a strategic and participatory consultative process.

Expected Outcomes of Action Plan

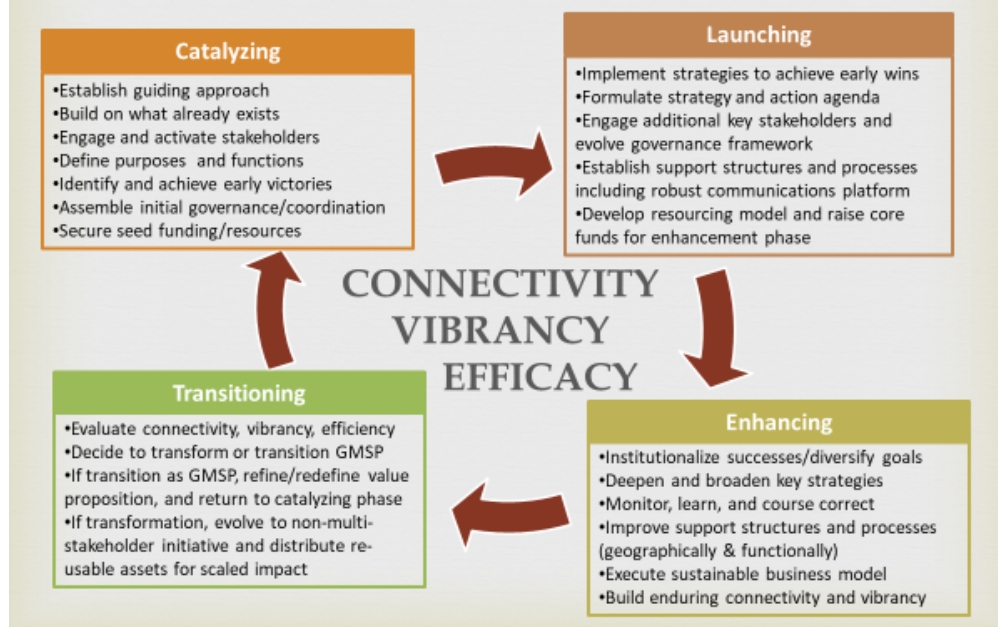
1. Catalyze support from key constituencies to advance a plan specifically for the workstreams of the Global Carbon Removal Partnership
2. Form a Champions Steering Committee and Action Plan
3. Commitment to Actions
4. Momentum of all participants to accelerate the work of the partnership and raise awareness of the partnership among key stakeholders and networks

Establishing a new multi-stakeholder partnership is most successful when stakeholders pass through four phases of development as represented in the figure below: catalyzing, launching, expanding/enhancing, and transitioning or transforming. Each of these phases involves key milestones.

Key Principles for the Catalyzing and Launching Phases

- Focus on and be inspired by the vision/goals/outcomes
- Ensure transparency, inclusiveness, and mutual accountability
- Include major stakeholders and engage unusual suspects
- Agree on strategic priorities based on sufficient consensus
- Empower action based on strategic priorities
- Identify and make progress towards achieving 3-5 early wins
- Be open to and seize unexpected opportunities
- Ensure the dense exchange of information, services, and resources
- Commit to light, nimble, evolving governance and coordination
- Document the process: monitor, learn, and course correct

Life-Cycle Stages of Global Multi-Stakeholder Partnership (GMSP)



Roles and Responsibilities of Global Partnership Champions Group

A Champions Group will prepare for the more official political launch of the partnership during 2020-2021 by mobilizing engagement from major actors and initiating concrete activities to achieve some quick wins. This will involve organizing several working groups, comprising broad representation of the key stakeholder groups. One or more working groups will focus on the key design elements of the Carbon Removal Partnership associated with the launching phase including: 1) a more developed set of support structures and processes (i.e. governance, decision-making, communications); 2) a more detailed action plan to leverage big wins in the field; 3) an associated monitoring and evaluation system; and 4) a robust business model. Specifically, the Champions group will:

- Develop and operationalize high level political commitments on carbon removal at key convening moments in 2020 and 2021
- Champion the Global Carbon Removal Partnership internationally and help to initiate action on 2 to 5 quick wins that demonstrate the value of the Global Carbon Removal Partnership
- Delegate a policy/technical point of contact to actively participate in the Partnership
- Guide a process of broad/deep stakeholder consultation on the Global Partnership across regions and sectors

2020 Timeline:

A participatory consultative process will be implemented at the global and regional levels during June 2020 until COP in Glasgow, UK in 2021

1. Discuss the Vision, Inspiration, and Milestones for a Global Partnership
2. Discuss Guiding Approach, Building on What Exists, and Key Stakeholders
3. Discuss the Purpose, Functions, and Potential Early Wins
4. Discuss Governance, Coordination, and Funding
5. Agree on an Action Agenda, Roles, and Responsibilities

June 2020

Virtual meeting with Partnership members and potential members

June - September 2020

Ongoing consultations and beginning of workstreams

September 2020 – COP 2021

Workstreams activated to deliver at COP in Glasgow in 2021 (date TBD due to COVID-19)

ANNEX 1: Organization Partners

About Thunderbird School of Global Management at Arizona State University

The Thunderbird School of Global Management is the world's premier leadership and management school (www.thunderbird.asu.edu). Thunderbird's empowers and influences global leaders and managers to maximize the potential of the 4th Industrial Revolution to advance sustainable and equitable prosperity worldwide. As the central global unit of the Arizona State University Enterprise, we judge ourselves not by whom we exclude, but by whom we include.

Thunderbird's vanguard Master of Global Management Degree was ranked the #1 in the world by the Wall Street Journal and Times Higher Education. Arizona State University Enterprise has been ranked the #1 University for Innovation by US News & World Report for the past six years. ASU and Thunderbird were recently ranked #1 for global impact with respect to the UN Sustainable Development Goals by the Times Higher Education. Consistently among ranked at the very top internationally, Thunderbird Executive Education delivers world-class global enterprise and leadership success development programs all over the world in the full range of modalities from immersive custom corporate to online open enrollment.

Thunderbird is constructing a brand new state of the art global headquarters in the technologically innovative and increasingly cosmopolitan urban center of Phoenix, which is now the 5th largest and fastest growing city in the United States. It has embarked a bold and audacious global expansion with regional centers of excellence around the world from Geneva to Nairobi to Jakarta to Moscow which will grow to over twenty worldwide by 2025.

About the Foundation for Climate Restoration

The Foundation for Climate Restoration's goal is to restore our climate to pre-industrial levels by 2050 by accelerating the development of solutions and facilitating their entry into markets around the world. The Foundation for Climate Restoration is building a coalition of partners, the *Coalition for Climate Restoration*, from all sectors, public and private, to support the goal of removing carbon from the atmosphere.

Mitigation, adaptation and climate restoration are critical to the survival of humanity– we must continue to reduce emissions, support those most vulnerable to the consequences of climate change, and actively remediate the damage that CO₂ emissions have wrought. Initiatives are required to restore our climate and remove the excess atmospheric CO₂.

The Foundation for Climate Restoration (F4CR) is a US-based 501(c)3 charitable organization whose mission is to catalyze action to restore the climate by 2050. It uses global dialogue and initiatives to unite the public, policy-makers, and technical and business experts behind the common goal of reversing global warming and restoring a healthy climate for future generations. The F4CR encourages and spotlights achievable solutions to draw down excess carbon dioxide from our atmosphere and rebuild Arctic ice. For more information visit the [Foundation for Climate Restoration website](#).