FROM THE GROUND UP

Recommendations for Building an Environmentally Just Carbon Removal Industry

XPRIZE CARBON REMOVAL | MUSK FOUNDATION + Carbon180

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The XPRIZE Foundation is a 501(c)(3) nonprofit, focused on incentivizing the breakthroughs that address humanity's most critical challenges. XPRIZE plays a powerful role in driving those breakthroughs, using large-incentive prize competitions to catalyze solutions that might not otherwise reach fruition. So instead of just celebrating great ideas, we recognize innovators who follow through on their vision to create tangible solutions, validated through extensive testing and judging. This approach empowers teams to create bold, transformative solutions that can scale and drive real impact.

Carbon180 is a new breed of climate NGO on a mission to reverse two centuries of carbon emissions. Working closely with US policymakers, entrepreneurs, and peer organizations, we design equitable, science-based policies that will bring carbon removal solutions to gigaton scale. Our environmental justice program is founded on the belief that carbon removal must serve communities, and can only succeed with their input and acceptance. We advocate for environmental justice integration across the field and work to ensure we are pursuing policy opportunities that are in line with justice objectives.

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OVERVIEW

In 2021, XPRIZE launched the XPRIZE Carbon Removal, a four-year, $100 million global incentive prize competition supported by the Musk Foundation. The goal of the prize is to grow the community of carbon removal (or CDR) solution developers and increase the number of viable, high-quality CDR projects. Teams competing to win the prize must produce a working demonstration that removes at least 1,000 net tons of carbon dioxide (CO_2) per year and present a plan for scaling up to gigatons of removal annually. Response to the prize has been strong: over 1,100 groups from around the world are currently registered to compete. In 2022, XPRIZE awarded 15 Milestone Round prizes of $1 million each. After the Milestone Round concluded, the competition reset, and any team is now eligible to win. (More details about these teams and the Milestone Round judging process can be found in Appendix A.) The grand prize winner ($50 million) and runners up ($30 million to be distributed among up to three teams) will be announced on Earth Day 2025.

A key motive underpinning the XPRIZE Carbon Removal is the need to support the scale-up of carbon removal in ways that are both sustainable and equitable. To this end, XPRIZE partnered with Carbon180 and a team of outside environmental justice experts — including social scientists, practitioners, and advocates — to explore how to best incorporate environmental justice (or EJ) into the competition. Our joint hope is to set nascent carbon removal companies on a path toward integrating environmental justice into all aspects of their organizations.

This report is the result of XPRIZE and Carbon180's partnered effort to bring environmental justice to the forefront of the competition and prioritize EJ within the broader carbon removal community. It includes learnings from an EJ questionnaire that XPRIZE Carbon Removal teams completed as part of their Milestone Round application as well as tailored recommendations for integrating EJ into carbon removal projects from the outset.

The analysis presented in this report is targeted to early-stage carbon removal companies, but it may also be useful for carbon removal purchasers, investors, civil society organizations, government actors, communities, and others who are working to scale the field in ways that are both equitable and just.[1] Our goal is to foster a dialogue within the carbon removal community about what an environmentally-just CDR industry might look like, and the processes and procedures that can enable it.

Carbon removal solutions represented in

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Any carbon negative project is eligible to win prize money, provided it removes CO_2 from the air or the surface layer of the oceans and sequesters it in a safe and durable way.

Teams may compete in any of the major carbon removal pathways listed below:

AIR: direct air capture (DAC)

OCEANS: algae, kelp, plankton, ocean alkalinity enhancement, or other methods of removing CO_2 from the epipelagic sunlight zone (the uppermost, or surface, ocean layer)

LAND: trees, agricultural solutions, soils, soil microbes and fungi, roots, grasslands, large-scale outdoor natural ecosystem solutions, biochar, etc.

ROCKS: mineralization, enhanced weathering, mine tailings, subsurface geologic sequestration combined with CO_2 removal from the air and/or the ocean, etc.

WHY ENVIRONMENTAL JUSTICE IS IMPORTANT FOR CARBON REMOVAL COMPANIES

WHAT IS ENVIRONMENTAL JUSTICE? WHAT IS CLIMATE JUSTICE?

Environmental justice (EJ) refers to a concept, a field of research, and a social movement. Communities of color, Indigenous and Tribal communities, and low-income communities have historically been burdened with disproportionate levels of environmental pollution. As a result, they have experienced, or are at risk of experiencing, high levels of adverse health impacts. These communities — collectively referred to as disadvantaged or EJ communities — have borne the brunt of the environmental harms of industrialization while reaping few of the benefits. The EJ movement is a response to these inequities. It calls attention to these historical and ongoing harms and advocates for policy measures that ensure access to clean, healthy environments for all.[2]

The climate justice (CJ) movement addresses the fact that the global-scale impacts of climate change will be distributed unequally, with disadvantaged communities (who contributed least to climate change) bearing the greatest burden. The CJ movement calls for climate mitigation and adaptation measures and loss and damage funds to address these inequalities. Climate justice highlights the global need for large-scale carbon removal to address the impending climate crisis while environmental justice provides the lens for considering local impacts of project deployment.[3]

Alongside emissions reductions, carbon removal is essential for meeting climate goals. To ensure the field can grow to and maintain gigaton scale, solutions developers must prioritize environmental justice. Without EJ front and center, the industry risks marginalizing, or further marginalizing, communities and reproducing harms of the past.

In the past, companies around the world and across different industries have sidelined communities, leaving them without a voice in key decisions about a project's siting and overall direction. In the case of disadvantaged communities, including Black, Indigenous, and other communities of color as well as low-income communities, this disenfranchisement has often occurred in tandem with industries' willful neglect of the environment, resulting in public health disasters and widespread environmental contamination that create "sacrifice zones." Given these past experiences and the subsequent erosion of trust, some communities and EJ advocates are understandably wary of the carbon removal industry. They fear that CDR will merely perpetuate cycles of disinvestment and disenfranchisement and deepen inequalities.

But carbon removal's nascency means there is still time to shape the direction of this emerging field and grow the industry in ways that address environmental justice issues head on. By placing EJ at the center of their business plans, carbon removal companies can demonstrate their commitment to learning from past injustices and set themselves on a path to scale sustainably and with societal support. From a business strategy perspective, this means seeing EJ not merely as a "nice to have" but as a fundamental component of a CDR company's social license — the perception that companies operate in ways that are credible, legitimate, and deserving of trust. By treating EJ as a dimension of carbon removal's social license to operate, CDR companies can address global legacy emissions while improving livelihoods at the local level where projects operate.

Disadvantaged community:
A community that suffers from a combination of health, economic, and environmental burdens. These burdens include high unemployment, air and water pollution, and poverty.

Source: Removing Forward, Carbon180

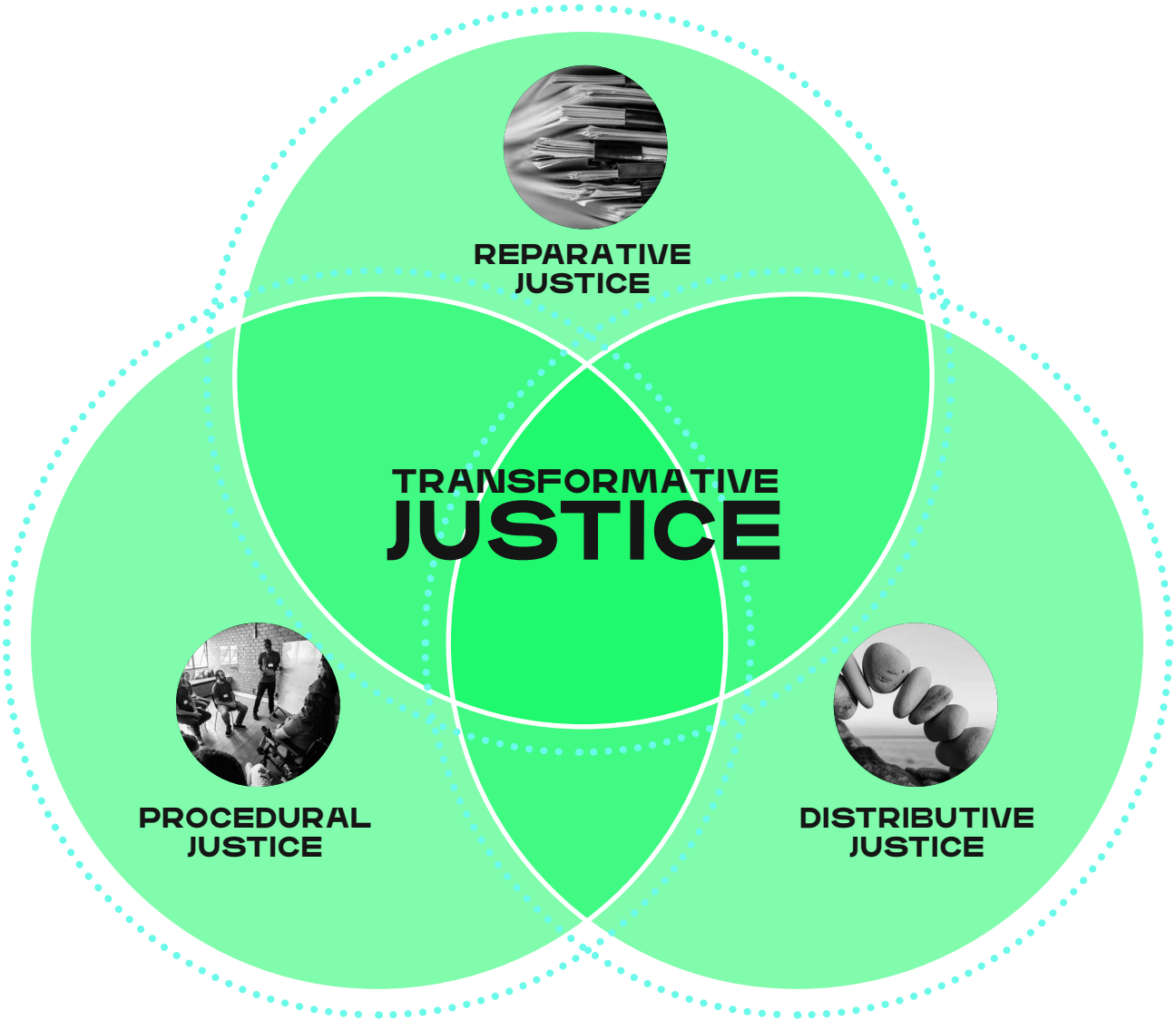
Sacrifice zone:
A community in proximity to pollution produced by intensive and concentrated industry. Due to redlining, low property values, and other social factors, these communities have historically consisted of low-income and/or BIPOC (Black, Indigenous, and people of color) populations.

Source: What are Sacrifice Zones?, CHEJ

Social license:
The perception that companies operate in ways that are credible, legitimate, and deserving of trust.

Source: Does ESG really matter — and why?, McKinsey Sustainability

THE LONG-TERM VISION: TRANSFORMATIVE CHANGE THROUGH CARBON REMOVAL



In the long term, carbon removal must become an industry in which environmental justice is woven into a company's business model at every stage. By embedding EJ in this way, carbon removal can be a vehicle for bringing about transformative social change by not only addressing but also redressing structural power imbalances and historic harms. In other words, **done right, carbon removal could become a means for counteracting — rather than entrenching — systemic environmental injustices**. This is the very basis of transformative justice: spurring changes in current structures and systems to create a more equitable and just society.[4]

For carbon removal to become a transformative force in society, developers will need to address at least three different dimensions of environmental justice.

01 Procedural justice: fairness in decision making[5]

Building inclusive dialogues with local communities is a crucial first step for carbon removal developers looking to ensure EJ considerations related to their projects are identified, assessed, and addressed in line with community priorities. To center procedural justice throughout a project's entire lifecycle, developers should establish mechanisms for repeatedly engaging communities and incorporating their feedback.

Examples of procedural justice:

- Transparent and inclusive dialogues between developers and stakeholders — especially disadvantaged groups — to address project priorities and concerns
- Tailored plans for how to include disadvantaged groups in decision-making processes
- Procedures and processes for incorporating community feedback into a project

02 Distributive justice: equitable allocation of project risks, benefits, and impacts[6]

Distributive justice ensures that the harms and adverse impacts from carbon removal solutions do not fall only on disadvantaged communities, and that the potential benefits of a project are distributed fairly.

Examples of distributive justice:

- Reduction/removal of exposure to environmental harms and hazards as well as improvements in local resources (e.g., air and water quality)
- Wealth redistribution and co-operative ownership models for infrastructure
- High-quality, local job creation (when and where it is desired by a community)

03 Reparative justice: acknowledging and addressing past harms[7]

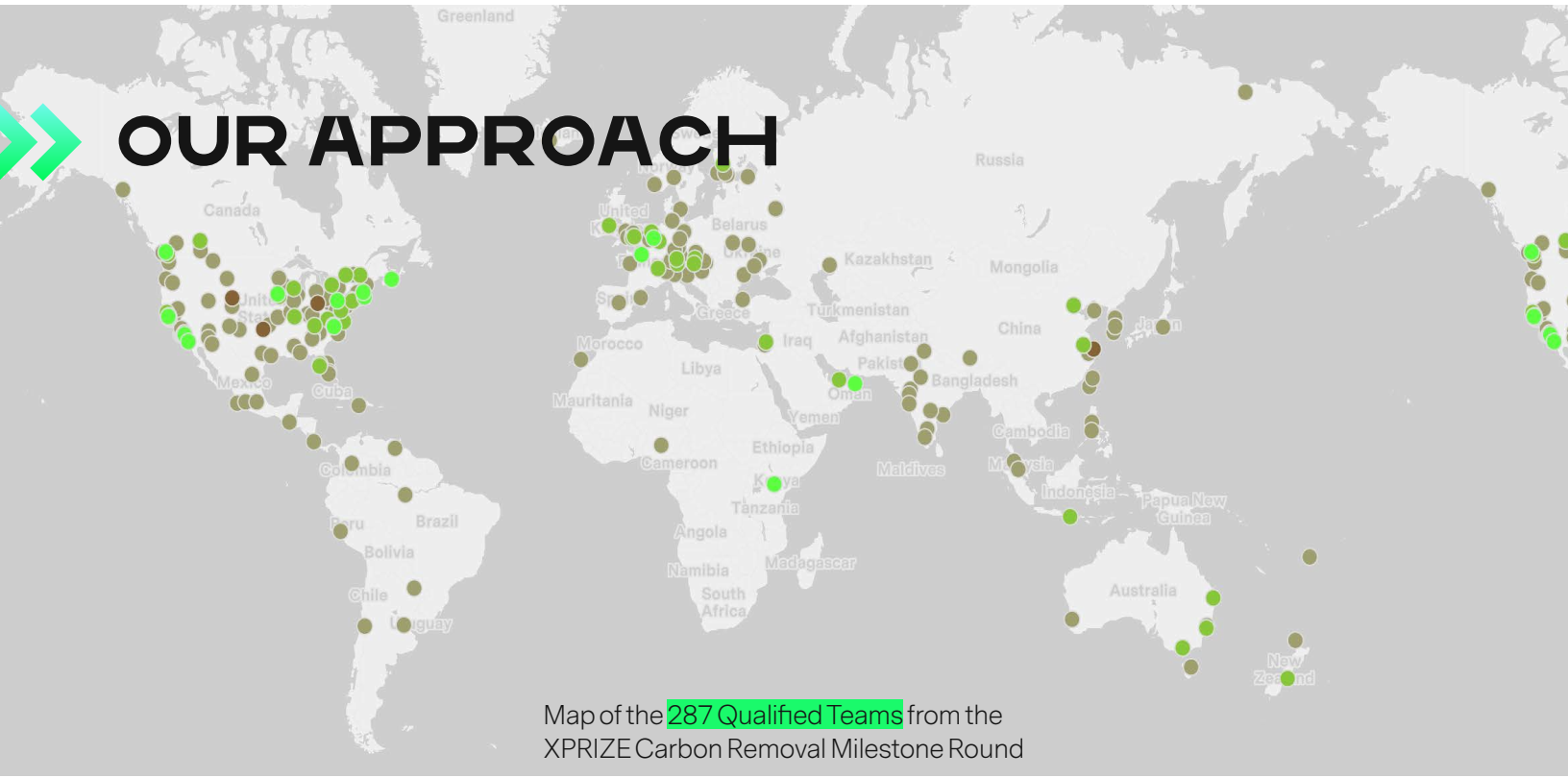
Many of the communities where carbon removal projects will be sited have endured significant environmental, social, and public health harms at the hands of extractive industries. While a baseline consideration is to ensure that projects do not introduce new harms to communities, developers can also use carbon removal as an opportunity to redress the harms of the past.

Examples of reparative justice:

- Remediation of legacy pollution and hazards
- Repurpose legacy infrastructure

We want to emphasize that these three facets of justice are not mutually exclusive, nor are they one-off events. To truly succeed in achieving the long-term goal of transformative justice, developers will need to address all three in an iterative, ongoing, and holistic way.

OUR APPROACH



Map of the 287 Qualified Teams from the XPRIZE Carbon Removal Milestone Round

As a first step in our efforts to incorporate environmental justice into the XPRIZE Carbon Removal, we wanted to establish a baseline of teams' current knowledge of environmental justice. We provided teams with a set of background readings to anchor their understanding of EJ and asked them to respond to an EJ questionnaire as part of their Milestone Round submission in February 2022. The questionnaire prompted teams about the various EJ dimensions of their projects — including existing environmental and public health burdens, potential positive or negative impacts on local ecosystems, and anticipated community benefits. (A copy of the questionnaire and the background readings can be found in Appendices B and C, respectively.)

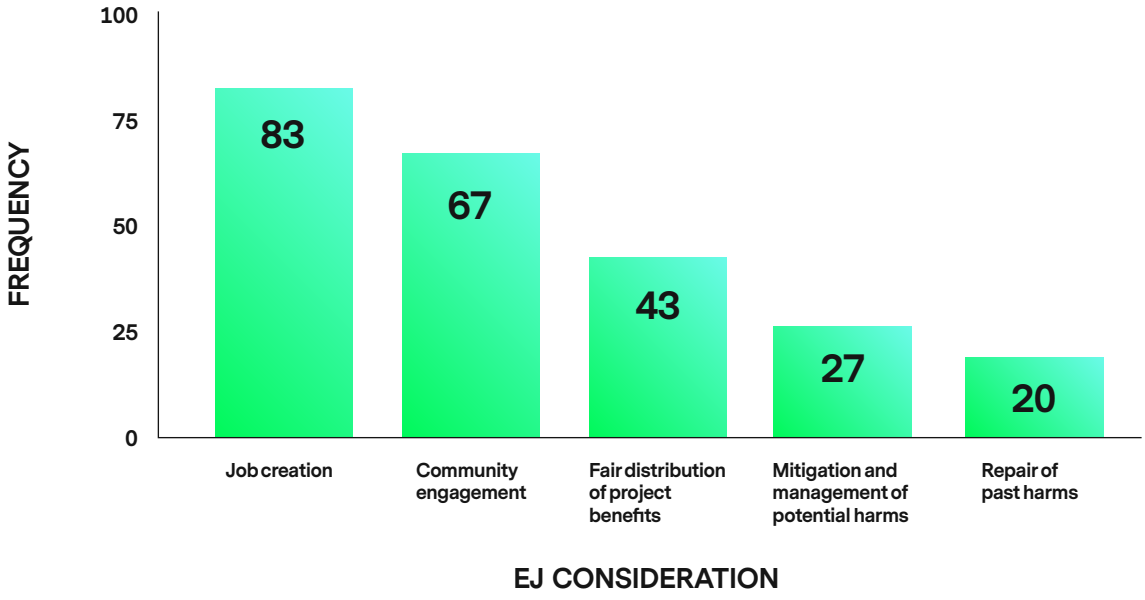
Once submissions were complete, XPRIZE recruited Dr. Leah Aronowsky, a social scientist working at the intersection of climate and environmental justice, to help analyze the responses of the 287 teams who qualified to compete in the Milestone Round. Meanwhile, Carbon180 recruited a panel of four EJ experts and practitioners to carefully review the responses of the top 60 XPRIZE Carbon Removal Milestone Round teams and provide each with feedback to improve their plans to integrate EJ into their projects. As we collectively reviewed the responses throughout this process, we looked for common themes including strengths and gaps in understanding, recurring challenges, and any overarching insights that could help other early-stage startups engage in equitable and just work. In what follows, we present insights from our questionnaire analysis and recommendations for moving forward.[8]

QUESTIONNAIRE INSIGHTS

From analyzing the Milestone EJ questionnaire responses, it's clear that many XPRIZE Carbon Removal teams were able to identify EJ considerations relevant to their projects. In several cases, teams provided thoughtful responses to the prompts we shared. That said, we want to emphasize that many teams were not familiar with EJ as a field of study nor a social movement, and a number of teams reported, for example, that this questionnaire was their first encounter with the concept of environmental justice. **After analyzing all of the responses, our overall takeaway is that while teams were often able to identify a variety of EJ-related concerns and issues, they did not always know the steps to take to address these issues.**

As we coded and analyzed the responses, five EJ considerations stood out as recurring themes: job creation, community engagement, fair distribution of project benefits, mitigating and managing potential harms, and repair of past harms. We've organized our discussion of the questionnaire insights around each of these five EJ considerations.

Top 5 EJ considerations reported by teams in the XPRIZE Carbon Removal Competition (n=287)[9]



Job creation

Over the course of our analysis, job creation quickly emerged as the most frequently occurring theme. Many teams, for example, told us about their plans to create jobs within low-income communities, including communities that previously relied on the fossil fuel industry for employment or that have seen a decline in key industries as a result of the effects of climate change. Additionally, several teams were familiar with the concept of a just transition — a concept that refers to the need to provide economic and social protections for workers and communities displaced by the decline of extractive industries. This was especially true for teams that are developing direct air capture technologies and teams developing enhanced-weathering solutions that will be sited on former mines. These teams were enthusiastic about the opportunity to use carbon removal to facilitate a just transition. We should note that teams did not always offer details about the nature of these jobs (high- vs. low-paying, permanent vs. temporary, etc.), although several indicated that they plan to partner with local community colleges to develop job training programs.

> The regional workforce has suffered long-term loss of well-paying jobs, due to the decline of coal mining and other historically important sources of employment. The emergence of a leading carbon sequestration technology directly provides much needed jobs.
>
> — XPRIZE Carbon Removal Team

Just transition:
A set of principles, processes, and practices that build economic and political power to shift from an extractive economy to a regenerative economy

Source: Just Transition, Movement Generation

Community engagement

Community engagement was another frequent theme across responses. Teams offered a wide range of strategies for ensuring that community voices are represented in their project. A few teams laid out highly detailed, multi-step plans for reaching the community and soliciting their input on a project's direction. These teams were clearly thinking about community engagement as an ongoing dialogue rather than a one-off event. On the opposite end of the spectrum, a few teams reported especially passive approaches to community engagement. For example, one team reported that "email questions are encouraged via our website." The majority of teams fell somewhere in the middle of these two extremes. Many reported that they plan to gauge and gain community support through formal channels like Chamber of Commerce meetings, presentations to planning commissions, or during the permitting and licensing process. Other teams told us that they will conduct focus groups or market research surveys to gauge community acceptance of the project.

Outside of formal mechanisms, few teams had a sense of how to establish direct lines of communication with local communities — a dimension of community engagement that EJ advocates emphasize as a key step towards building durable, good-faith partnerships. We also noticed that teams mostly approached community engagement as something that happens only during the project development phase, rather than over the entire lifecycle of a project (although this may reflect the fact that many of these teams are still in the early stages of project development). We also noticed that, for the most part, teams did not specify if or how they plan to incorporate community feedback into their projects.

> Our concern is to ensure that local communities are regarded as partners rather than resources to be exploited.
>
> — XPRIZE Carbon Removal Team

Fair distribution of project benefits

Another recurring priority for teams was the need to ensure a fair distribution of their project's benefits and opportunities. Teams did not always elaborate on the specific benefits their projects would provide, but among those who did, the majority pointed to benefits related to job creation. Many teams, for example, described their plans to create a diverse workforce and ensure that the jobs their projects create go directly to members of the local community. Others talked about the additional neighborhood benefits like schools, libraries, and parks that new industries can bring. Several land-based solutions teams whose projects involve biochar production talked about their plans to sell biochar cheaply to small-scale farmers, and to provide them with training and support to learn how to use it properly. A few teams also noted that they plan to pursue Community Benefits Agreements, which can help ensure the equitable development of a carbon removal project by spelling out the different benefits a community can expect to see.

> We seek to ensure that potential benefits from our project are distributed fairly across the full range of stakeholder groups, particularly those from Black, Indigenous, and people of color (BIPOC) and low-income communities. We will provide job opportunities to disadvantaged groups, including all necessary training and other support.
>
> — XPRIZE Carbon Removal Team

Mitigation and management of potential harms

Another theme was the need to mitigate and manage potential harms. We encouraged teams to think expansively about potential harms, asking them to consider the project's energy sources and materials, its impacts on air and water quality, biodiversity, natural resources, and more. However, the majority of teams took what we would characterize as a relatively narrow approach to the concept of "harm" in their responses. For example, many teams whose projects involve biochar production told us about their plans for managing any harms related to biomass feedstock sourcing. Others in the biochar category raised the issue of land use competition — the risk of using land that might otherwise be used for food production. Direct air capture teams talked about the need to safely dispose of chemical solvents used to remove carbon from the air, and several oceans-based teams, whose solutions involve modifying ocean alkalinity, acknowledged the high potential for unintended consequences.

Beyond these specific harms related to the technical aspects of their projects, many teams reported that they plan to "minimize the potential harms of a project" but did not offer further details about the specific harms they plan to target. There was also minimal discussion of the types of harms that communities and EJ advocates often point to as priority concerns, such as increases in truck traffic and air and noise pollution that can result from infrastructure expansion; environmental health impacts like groundwater contamination; the potential for leaks or explosions; or the potential for increased seismic activity. We also noticed a lack of discussion of public health concerns, but we attribute this to the nature of the questionnaire, which focused largely on environmental impacts.

> We want the community to be excited about this world-changing technology and that we are all on this journey to achieving net negative. At the same time, we have to be open and make sure that we do not solve this problem and create a new one — that may even be worse.
>
> — XPRIZE Carbon Removal Team

Repair of past harms

Many teams told us about the opportunities their projects present for repairing past harms. In several cases, this opportunity is built into the very fabric of the company. Many enhanced weathering solutions, for example, remediate former mining sites by using existing mine waste products like coal ash or mine tailings as chemical inputs for mineralizing and storing carbon. Similarly, several land-based teams reported that their projects will help clean up the industrial waste of the meat industry by remediating contaminated soils or by converting animal waste products into chemical feedstocks for sequestering carbon. Many teams are also contending with past harms when it comes to an industry's social legacy. For example, teams whose projects store carbon deep underground in former oil and gas injection wells acknowledged the concerns communities have about projects that rely on technologies typically owned and operated by the fossil fuel industry and that have been associated with frequent methane leaks, groundwater contamination, and other environmental and public health problems.

Overall, we were heartened to learn that many teams are building projects that aim to explicitly address past harms from the outset. Several teams are hoping to work directly with BIPOC and low-income communities to do this, an important step in embedding reparative justice into their projects and redressing instead of repeating past harms.

> Tailings produced by mines present an enormous opportunity for CDR. However, working and partnering with the mining industry raises environmental justice concerns. The mining industry has been responsible for innumerable historical and ongoing injustices to local and Indigenous communities. Much progress has been made in recent years to rectify previous standards of mining practice, but plenty of work remains.
>
> — XPRIZE Carbon Removal Team

RECOMMENDATIONS FOR CARBON REMOVAL DEVELOPERS

After analyzing the questionnaire responses, we worked with the EJ review panel and compiled a set of recommendations for carbon removal developers. Although these recommendations were developed specifically for the teams competing in the XPRIZE Carbon Removal, who are largely start-ups and early-stage project developers, we want to emphasize that they are relevant to carbon removal projects across all stages of development. These recommendations are organized according to the three types of justice introduced on page 8.

EJ REVIEW PANEL

Jasmine Davenport is a climate scientist, strategist, and native of Monroe, Louisiana, whose EJ advocacy — which stretches back more than a decade — is guided by witnessing the impacts of climate change to the Gulf Coast. She currently serves on Carbon180's environmental justice advisory council and concentrates her attention on ways to incorporate EJ in the early stages of CDR.

Naadiya Hutchinson is the Government Affairs Manager at WEACT for Environmental Justice. In addition, she serves as the Communications Lead on the Circle of Wise Counsel for the Black Yield Institute, which focuses on achieving Black Land and Food Sovereignty through community empowerment and political education. Naadiya earned her Masters of Health Science from the Johns Hopkins School of Public Health in Environmental Health, where she focused on environmental justice and gentrification.

Seema Kakade is director of the University of Maryland's Environmental Law Clinic. Seema guides student attorneys in providing legal support, advice, and representation to a variety of non-profit organizations and community groups. Most of her work focuses on environmental justice issues permit violations at both the State and Federal level, and public health and natural resource protections.

Simon Nicholson is an academic who co-created and leads the Institute for Carbon Removal Law and Policy at American University, which assesses how we can characterize and create sustainable carbon removal. Alongside a range of partners, the Institute designs and develops opportunities for open dialogue and co-learning between EJ organizations and communities and representatives from the federal government, private sector, and mainstream environmental NGOs.

PROCEDURAL JUSTICE

Meaningful procedural justice involves thinking about local communities as partners throughout the entire life cycle of a project. It requires developers to create avenues for transparent, equitable, and inclusive dialogues that afford communities the power to shape carbon removal development and deployment.

As discussed in the previous section, Questionnaire Insights, we found that many teams were planning to prioritize community engagement. However, they tended to think about community engagement as a one-off event rather than an ongoing conversation. They were also unsure about how to establish direct lines of communication with communities or how to effectively incorporate community feedback.

Given these findings, we recommend that carbon removal developers:

01 **Approach community engagement as a process of co-learning.** Community engagement is about more than simply convincing a community of a project's benefits. Rather, it is a process of co-learning between the community and the company. Project developers should aim for relationships of mutual respect, where the project team is engaging with community partners in a way that prioritizes true learning, listening, and educating in order to incorporate community suggestions and address needs.

Procedural justice: Fairness in decision-making processes.

Source: Procedural Justice, Yale Law School

02 Develop strategies for reaching communities directly. To have meaningful engagement, developers need to understand who the community is and the best ways to ensure that a majority of its members are being engaged. Because communities have deep knowledge about their local history, culture, and environment, they can serve as valuable resources to ensure project developers truly understand and address community concerns. In practical terms, companies can make direct inroads with communities by hiring a member of the local community to serve as a mediator and community liaison, and by establishing partnerships with local EJ advocacy groups and nonprofits who are familiar with the concerns and past harms that the community has faced. As part of these partnerships, companies should be prepared to pay fair wages or offer other fair compensation for these groups' time and expertise. Understanding the makeup of the community, determining what the community needs from you before telling them what you require of them, and ensuring the interests of the whole community are represented are all considerations that should be included in strategies for engagement.

03 Develop a community engagement strategy that includes continuous consultation throughout the lifecycle of the project. Early-stage decisions about a project's siting, design, conceptualization, and development are exactly the right time to begin building relationships with those who will be impacted by the project at scale. A community engagement plan can ensure that frequent and productive dialogues continue to occur.

A community engagement plan should outline:

- how stakeholders will be identified;
- how they will be involved in decision-making processes throughout the project life cycle;
- how community feedback will be incorporated into project design, implementation, and maintenance;
- plans for community access to data on project impacts;
- a timeline for when community consultation will happen.

Diversity:
How diverse a company is, not only in terms of race and gender, but also sexual orientation, age, national origin, physical ability, religion, and more.

Equity:
How fair and impartial the workplace is, with the goal of ensuring that all employees have equal opportunities to grow and progress. It also means creating room for underrepresented voices, tackling unconscious biases, and providing inclusive, culturally competent care through your health plan.

Inclusion:
Creating a welcoming environment for all, not just ensuring that people are treated fairly. Both in policy and in practice, employers should focus on making sure that everybody is heard and has the opportunity to surface their opinions, not just those that are comfortable in the spotlight.

Belonging:
The affinity and positive relationships that emerge between employees of various backgrounds when businesses actively promote diversity, equity, and inclusion within the workplace.

Source: What does DEIB stand for?, Collective Health

04 Explore mechanisms for formalizing environmental justice within the company. Because carbon removal developers are not typically experts in EJ, it's important that they hire others who are versed in these issues. This could take the form of a dedicated EJ staff position, a steering committee, or an EJ advisory council. Ideally these experts would already have a relationship to the communities relevant to the project. Their role would be to help incorporate environmental justice into all aspects of project design and development and to hold developers accountable. They could also work internally to support efforts to improve diversity, equity, inclusion, and belonging (DEIB) policies in the workplace.

> "It is important that project developers understand that community engagement goes beyond education and taking in questions at the very beginning of a project; community engagement involves the project's entire life cycle. Community engagement must involve an iterative process of integrating community feedback that goes beyond just listening."
>
> 
>
> —Naadiya Hutchinson

COMMUNITY ENGAGEMENT GUIDELINES

In "Setting DAC on Track: Strategies for Hub Implementation," Carbon180 published a set of community engagement guidelines for integrating fair decision making into the Regional DAC Hubs program.[10] We have adapted them here to apply to all carbon removal project types.

Community engagement meetings should be:

- convened at every project stage (i.e., feasibility, basic engineering, inception, early deployment, construction, operation and maintenance, and closure)
- accessible based on local needs and contexts (e.g., transportation services, childcare needs, and language access)
- open to the public (information on meeting times, locations, and topics made widely available through local media and government websites)
- targeted to local communities using proactive outreach efforts
- conducted using a democratic process to capture community sentiments and approval of project implementation
- transparent and honest about potential risks, benefits, and gaps in data.

For carbon removal companies based in the United States, the Department of Energy's "Community and Stakeholder Engagement Plan" provides additional guidance on how project developers can engage communities in ways that advance equity, justice, and inclusion.[11]

For companies engaging with Indigenous communities, the UN Declaration on the Rights of Indigenous Peoples stipulates that companies must obtain Free, Prior, and Informed Consent (FPIC) from Indigenous communities before beginning any projects on Indigenous land. FPIC also stipulates that Indigenous communities have a right to negotiate with developers about the design, implementation, and evaluation of a project to ensure that they can participate fully in decisions that impact their communities.[12]

DISTRIBUTIVE JUSTICE

All carbon removal projects will come with their own set of tradeoffs. Transparency around these potential harms and benefits is therefore key to embedding environmental justice in a project.

As discussed in the Questionnaire Insights section, teams grasped the concept of distributive justice and understood the role it could play in their projects. However, teams tended to emphasize the benefits of their projects, and gave less consideration to the potential harms or risks. Teams also tended to equate "project benefits" exclusively with job creation.

Distributive justice:
Equitable allocation of resources, risks, impacts, and benefits across society.

Source: Distributive Justice, Lamont, J. & Favor, C.

With these distributive justice–related findings in mind, we recommend that carbon removal developers:

01 **Be transparent about the potential risks of a project.** Understand the past injustices and harms communities have experienced. Developers should be aware of past injustices that communities have faced at the hands of industry. These can include social harms — such as unfulfilled promises about the economic opportunities an industry will bring, treaties ignored, and other types of trust-breaking violations or crimes — and environmental harms, like contamination of natural resources and high levels of pollution that have caused multiple, ongoing public health crises. Sensitivity to these past wrongdoings is crucial for building trusting relationships with local communities. On a practical level, this means having a baseline understanding of a potential host community's environmental and public health burdens that should be taken into account when deciding whether a project should be sited in a particular location.

02 **Develop strategies for reaching communities directly.** Design projects that prioritize repairing past harms. The project design and planning stages are key moments for identifying opportunities to repair past harms. Some carbon removal projects currently in development, for example, propose to repurpose or rebuild legacy infrastructure. Other projects remove existing pollutants like coal ash, mine tailings, and agricultural waste as part of the carbon removal process. These kinds of projects present built-in opportunities to right the wrongs of the past by actively remediating legacy industrial pollution. Keeping in mind the history of broken promises and other past social harms, developers should also ensure that all formalized agreements, regulations, and treaties are upheld and met to the fullest extent.

Working directly with communities can help determine whether job creation would be received as a benefit and, if so, what high-quality job creation should look like. This process should also clearly outline the type and number of jobs that can be created throughout the lifecycle of a project — from construction to operation to eventual site closure. This will allow community members to understand the skills required for different job opportunities and the timeline for when these jobs will become available.

03 **Create a customized workforce development plan.** Once developers have established that job creation is something the community desires, they should conduct their own research and engage with the community to identify any existing workforce needs. They should also work

to identify potential barriers to accessing high-quality carbon removal jobs. These barriers could include reliable transportation to skills development centers, potential childcare needs, and so forth. Developers should also consider partnering with job training initiatives, apprenticeship programs, local community colleges, or other trade schools to support skills development and create local hiring opportunities.

04 Put formal agreements into place to codify agreed-upon benefits. A key component of gaining and maintaining community trust is putting formal agreements into place and following through on commitments. Project labor agreements and community benefit agreements are a few examples of formal, legally-binding agreements that can ensure project benefits are actualized and distributed as discussed. These agreements can also outline enforceable mechanisms for accountability and oversight, as well as requirements for project monitoring. Additionally, these provisions can include parameters around local hiring percentages, prevailing wage rates, and other worker rights and protections that can support high-quality local job creation.

> Many of the teams took a commitment to EJ to mean the need for employment opportunities for historically marginalized communities. While this may be true, embracing EJ is about more than a set of boxes to check. Rather, the point is to work to recognize the social and political relations in play in a given location, to make sure that the project doesn't just repeat old mistakes or entrench current inequities, and instead works to the benefit — to the degree possible — of those who have historically suffered the worst impacts of industrial development and other polluting practices.

—Simon Nicholson

Project labor agreement: A collective bargaining agreement between building trade unions and contractors. It governs terms and conditions of employment for all craft workers (union and nonunion) on a construction project. It protects taxpayers by eliminating costly delays due to labor conflicts or shortages of skilled workers.

Source: Project Labor Agreements, AFL-CIO

Community benefit agreement: A legal agreement between community benefit groups and developers, stipulating the benefits a developer agrees to fund or furnish in exchange for community support of a project. Benefits can include commitments to hire directly from a community, contributions to economic trust funds, local workforce training guarantees, and more.

Source: Community Benefit Agreement (CBA) Toolkit, Department of Energy

REPARATIVE JUSTICE

As companies work to mitigate and manage the potential environmental harms their projects might cause, they can also take steps to scale the carbon removal industry in ways that right the wrongs of the past.

Many of the teams understood the unique role that carbon removal can play in repairing past harms. CDR developers themselves may not have caused the harms felt by communities, but taking good-faith steps to address them will help build the trust that is necessary for successful project deployment.

The following recommendations aim to broaden carbon removal developers' understanding of reparative justice and its interconnectedness with the other justice types mentioned above.

Reparative justice:
Repairing previous harms committed through violations and crimes.

Source: Digging deep corporate liability, EJOLT

01 Understand the past injustices and harms communities have experienced. Developers should be aware of past injustices that communities have faced at the hands of industry. These can include social harms — such as unfulfilled promises about the economic opportunities an industry will bring, treaties ignored, and other types of trust-breaking violations or crimes — and environmental harms, like contamination of natural resources and high levels of pollution that have caused multiple, ongoing public health crises. Sensitivity to these past wrongdoings is crucial for building trusting relationships with local communities. On a practical level, this means having a baseline understanding of a potential host community's environmental and public health burdens that should be taken into account when deciding whether a project should be sited in a particular location.

02 Design projects that prioritize repairing past harms. The project design and planning stages are key moments for identifying opportunities to repair past harms. Some carbon removal projects currently in development, for example, propose to repurpose or rebuild legacy infrastructure. Other projects remove existing pollutants like coal ash, mine tailings, and agricultural waste as part of the carbon removal process. These kinds of projects present built-in opportunities to right the wrongs of the past by actively remediating legacy industrial pollution. Keeping in mind the history of broken promises and other past social harms, developers should also ensure that all formalized agreements, regulations, and treaties are upheld and met to the fullest extent.

> "I foresee tremendous opportunity in CDR and environmental justice. The vast majority of teams have very little environmental pollution as output. In addition, many are trying to actually remove existing pollutants, like asbestos, or agricultural waste. Moreover, many teams are focused on local hiring, community economic development, and affordability issues — all which have strong potential to be successful if done carefully and thoughtfully."
>
> 
>
> —Seema Kakade

CONCLUSION

EJ considerations should be addressed at all stages of the carbon removal project development process. Even companies just starting out can take steps today to center EJ in their business plans. Not only will prioritizing EJ help build resilience by scaling projects in a way that is sustainable, durable, and supported by communities, it will also ensure that companies are meeting the growing demand for equitable climate action. An environmentally just carbon removal industry can play a major role in efforts to bring about the transformational societal change necessary to meet the urgency of the climate crisis.

Our research taught us that carbon removal developers are often eager to identify a variety of EJ-related concerns and issues, but they do not always know the practical steps to take to meaningfully address them. Our hope is that this report is a first step in providing guidance and actionable next steps for the carbon removal community.

As a concluding call to action, we encourage others to develop additional resources and tools for project developers, and for developers to share learnings as they pursue just carbon removal development and deployment. Working together, the field can ensure carbon removal reaches its full potential as a climate solution that redresses past harms while realizing environmental and community benefits. The time is now to ensure that the carbon removal industry doesn't scale up in a vacuum, but rather recognizes how interconnected it will be with other industries, people, and the environment.

> When we talk about environmentally just CDR technologies, we have to make sure that we are thinking about everything and everyone that goes into the project. This includes, but is not limited to: the people, policies, processes, communication, transparency, impacts (environmental, health, economic, and more), and decision-making.

— Jasmine Davenport

APPENDIX A: TEAM DEMOGRAPHICS

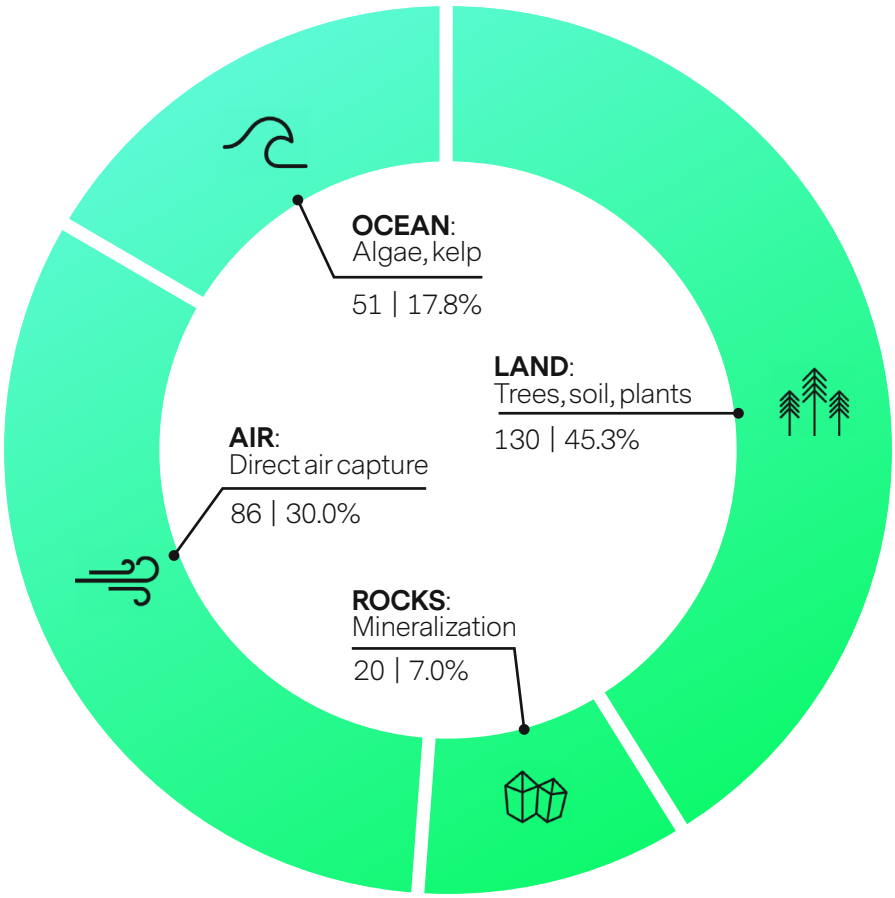
The $100 million XPRIZE Carbon Removal was launched in April 2021 with support from the Musk Foundation. Since then, over 1,100 teams have registered for the competition. In February 2022, XPRIZE received hundreds of submissions in consideration for the $15 million Milestone Awards.

The submission requirements for the Milestone Awards were extensive. In addition to the EJ questionnaire discussed throughout this report, teams were asked to describe their proposal for a 1,000 ton/year carbon removal project, demonstrate a key component of their carbon removal solution, estimate cost at megatonne/year scale, and make a case for scaling to gigatonne/year capacity.

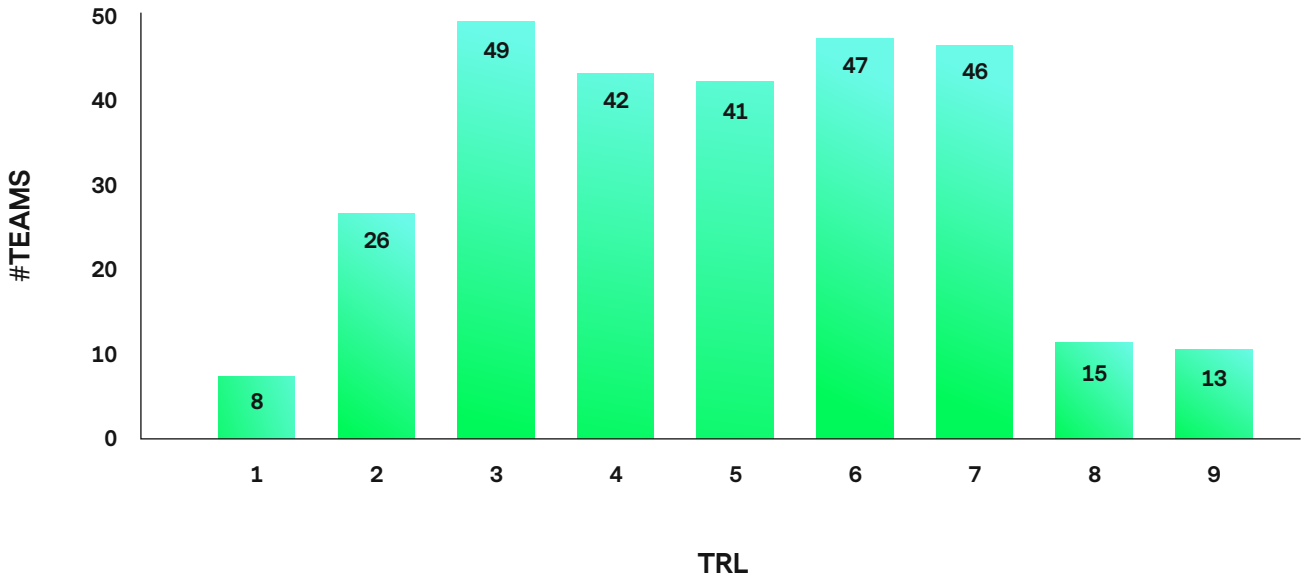
70 expert reviewers from around the world screened the proposals for eligibility and scientific validity and identified 287 qualified teams whose applications were complete and in scope. In addition to the 15 milestone winners who were awarded $1 million each, XPRIZE published the names of the top 60 ranked teams from this review process to provide special recognition for their achievements to date.

After the Milestone Round concluded, the competition completely reset. Any team is eligible to win whether they participated in the Milestone Round or not, and registration is still open for any team interested in joining the competition. The grand prize winner ($50 million) and runners up ($30 million to be distributed among up to three teams) will be announced on Earth Day 2025.

Milestone Award Round Teams Primary Solution Track (self- reported)



Milestone Award Round Teams Technology Readiness Level (TRL) (self- reported)



APPENDIX B: MILESTONE ROUND ENVIRONMENTAL JUSTICE QUESTIONNAIRE

Overview

Environmental Justice (EJ) is a critical component of climate innovations and solutions. Historically, issues of equity and justice have been considered very late in the lifecycle of a project, if at all. Experience in many industries and communities has shown that this leads to worse outcomes for solution developers and local communities. In an effort to establish a more productive conversation around EJ and CDR, we are introducing equity and justice considerations earlier in the development cycle of new solutions, so that issues can be identified and addressed well before projects are implemented. We understand that many solution developers are not experts in EJ — that is why we see this process as one of learning and exploration. Judges will have access to these questions and to your responses, but they will not be used for the Phase 1 Milestone Award submissions to either award or eliminate any team from the competition at this stage. XPRIZE will then work with Carbon180 to refine the requirements for EJ considerations in Phase 2.

Over the course of XPRIZE Carbon Removal, the collective data and experience of the teams competing in the prize will be analyzed by a panel of EJ advocates organized by Carbon180. The learnings from these experiences will be published for the benefit of the CDR community. All data collected on this form will be aggregated and anonymized in any analysis.

Project Description

01 Provide an overview of your demonstration project for the XPRIZE Carbon Removal. (200 words)

Project Location

02 Where will your XPRIZE Carbon Removal demonstration project occur? Why did you choose the project location that you did for your CDR Project? Have you already started work at this location, or have your plans for this location been finalized? (100 words)

Demographic Information

03 What are the demographics of the populations in the areas local to your demonstration project? What percentage are low income (X% below poverty line)? (100 words)

04 What existing environmental burdens have been identified in the local region of your proposed project? (100 words)

Legacy Pollution Analysis

05 How have you considered relevant public health data concerning the potential for exposure to human health and environmental hazards? Specific to the region you identified in question 1, are there any historical patterns of exposure to environmental hazards, to the extent such information is reasonably available? (200 words)

Environmental Sustainability

06 For your demonstration project, what are the local environmental impacts from your project (including from your sources of energy and materials) on air and water quality, as well as biodiversity or other natural resources? Thinking ahead to the full deployment of your solution up to gigatonne scale, how do the impacts change or grow as you move to gigatonne scale?

a. What are the negative environmental impacts? (200 words)

b. What are the positive environmental impacts (aside from CO_2 removal itself)? (200 words)

07 What steps will you take to ensure that voices from the communities in which you are building projects are represented in a way that ensures their concerns are being met? (200 words)

Quantitative Assessment

08 Based on the provided EJ reading materials (see link above), discuss what you think are the most important EJ considerations for your project. (200 words)

09 Please rate your level of concern (on a scale of 1 - 4) for each of the following issues as they relate to your project. Your selections will be used for research purposes only.

1 - not concerned at all
2 - mostly not concerned
3 - somewhat concerned
4 - very concerned

a. Moral hazard - the perception that the development of your CDR solution lessens or eliminates the urgency and need to reduce current GHG emissions.

b. Involvement of the oil and gas industry - any investments or ties to companies that participate in oil and gas

c. Expansion of infrastructure (such as transportation pipelines or truck traffic)

d. Land use competition (such as growing food, siting renewable energy, preserving biodiversity, and timber harvesting, among others)

e. Environmental health (such as groundwater contamination or seismic activity)

f. Workforce development - making sure good-paying, local jobs are readily available for community members

g. Other Issues of Concern (free entry)

APPENDIX C: XPRIZE CARBON REMOVAL MILESTONE ROUND ENVIRONMENTAL JUSTICE READING MATERIALS

The following resources provide information to help ground XPRIZE Carbon Removal project proposals in environmental justice.

Removing Forward – Executive Summary

This 2021 report from Carbon180 provides policy recommendations for stronger dialogue and action on carbon removal and EJ. The report advocates for implementing justice-oriented policies that support the wide, safe, and fair development and deployment of carbon removal solutions that improve the well-being of communities. Full report here.

Environmental justice, explained

This 2016 video from Grist provides an overview of the inequitable harms caused and persisted by pollution and climate change.

Environmental Justice: A Changing Landscape for Virginia Developers

This 2020 article by Woods Rogers, a Virginia law firm, discusses how Virginia is changing the legal and regulatory landscape as it pertains to environmental justice. It specifically proposes ways real estate developers can prioritize EJ in their projects.

Environmental Justice, Just Transition, and a Low-Carbon Future for California

This 2020 article in the Environmental Law Reporter analyzes the challenges and opportunities of rapid decarbonization as surveyed through a community-informed research project. Interviews, case studies, and original data analysis establish a framework for just transition policy development separated into four pillars: strong governmental support, dedicated funding streams, diverse and strong coalitions, and economic diversification.

Carbon removal can and must be part of the climate justice agenda

This 2021 op-ed in The Hill from Carbon180 policy advisor Vanessa Suarez discusses environmental justice concerns around carbon removal and how to integrate them into the scale-up of solutions.

Endnotes

1. For more on the policy dimensions of carbon removal and environmental justice, see Carbon180. (2021). Removing Forward: Centering Equity and Justice in a Carbon-Removing Future. https://carbon180.org/s/Carbon180-RemovingForward.pdf

2. The literature on environmental justice is vast. For an introduction to some of the key concepts and concerns, see Carder, E. F. (n.d.). The American Environmental Justice Movement. Internet Encyclopedia of Philosophy. https://iep.utm.edu/enviro-j/

3. United Nations Sustainable Development Goals. (2019). Climate Justice. https://www.un.org/sustainabledevelopment/blog/2019/05/climate-justice/

4. Batres, M. et al. (2021). Environmental and Climate Justice and Technological Carbon Removal. The Electricity Journal 34(7). https://doi.org/10.1016/j.tej.2021.107002; Morrow, D. R. et al. (2020). Principles for Thinking about Carbon Dioxide Removal in Just Climate Policy. One Earth 3(2), 150–53. https://doi.org/10.1016/j.oneear.2020.07.015; Buck, H. J. (2021). Ending Fossil Fuels: Why Net Zero Is Not Enough. Verso.

5. The Justice Collaboratory. (n.d.). Procedural Justice. Yale Law School. https://law.yale.edu/justice-collaboratory/procedural-justice

6. Lamont, J., & Favor, C. (2017). Distributive Justice. In E. N. Zalta (Ed.), The Stanford Encyclopedia of Philosophy (Winter 2017). Metaphysics Research Lab, Stanford University. https://plato.stanford.edu/archives/win2017/entries/justice-distributive/

7. Greyl, L. et al. (2013). Digging deep corporate liability. Environmental Justice strategies in the world of oil. EJOLT Report No. 9. http://www.ejolt.org/wordpress/wp-content/uploads/2013/10/131007_EJOLT09-final-Low-resolution.pdf

8. The recommendations are informed by our questionnaire analysis, and were developed using input from the EJ Review Panel.

9. The coding process did not take into account the breadth or depth of a team's response. For example, a team may have reported that they plan to minimize the project's potential environmental harms without offering details on the specific kinds of environmental harms they were concerned about. Another team may have provided a discussion of the specific environmental harms they are concerned about. For coding purposes, both responses were counted in the "minimize potential environmental or social harms" category.

10. Carbon180. (2022). Setting DAC On Track: Strategies for Hub Implementation. https://static1.squarespace.com/static/5b9362d89d5abb8c51d474f8/t/6261d1890b76863f1047a2dd/1650577901659/Carbon180-SettingDAConTrack.pdf

11. Department of Energy Office of Fossil Energy and Carbon Management. (2022). Creating a Community and Stakeholder Plan. https://www.energy.gov/sites/default/files/2022-08/Creating%20a%20Community%20and%20Stakeholder%20Engagement%20Plan_8.2.22.pdf

12. Food and Agriculture Association of the United Nations. (2106). Free Prior and Informed Consent — An Indigenous Peoples' right and a good practice for local communities. https://www.fao.org/3/i6190e/i6190e.pdf. Developers should also be aware of the concerns that Indigenous communities have raised around CDR and consent. See Whyte, K. P. (2018). Indigeneity in Geoengineering Discourses: Some Considerations. Ethics, Policy & Environment, 21(3), 289–307. https://doi.org/10.1080/21550085.2018.1562529

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