[Alt Carbon]

Carbon dioxide removal prepurchase application

Summer 2024

General Application

(The General Application applies to everyone; all applicants should complete this)

Public section

The content in this section (answers to questions 1(a) - (d)) will be made public on the [Frontier GitHub repository](#) after the conclusion of the 2024 summer purchase cycle. Include as much detail as possible but omit sensitive and proprietary information.

Company or organization name

Alt Carbon

Company or organization location (we welcome applicants from anywhere in the world)

Darjeeling, India

Name(s) of primary point(s) of contact for this application

Shrey Agarwal, Sparsh Agarwal, Dr. Ramananda Chakrabarti, Dr. Sambuddha Misra, Dr. Sourav Ganguly, Roma Agarwal

Brief company or organization description <20 words

Accelerated chemical weathering of basalt, collaborating with the ailing Darjeeling tea industry, using robust sampling, monitoring and innovative quantification techniques.

1. Public summary of proposed project[1] to Frontier

a. **Description of the CDR approach:** Describe how the proposed technology removes CO_2 from the atmosphere, including how the carbon is stored for > 1,000 years. Tell us why your system is best-in-class, and how you're differentiated from any other organization working on a similar approach. If your project addresses any of the priority innovation areas identified in the RFP, tell us how. Please include figures and system schematics and be specific, but concise. 1000-1500 words

Alt Carbon focuses on accelerating chemical weathering of powdered silicate rock (basalt) on the foothills of the Himalayas. This region is characterized by **high summer temperatures (~25-35 °C), high humidity (75-90%)** and **intense monsoonal rainfall (2500-3000 mm/year),** thereby recording

[1] We use "project" throughout this template, but the term is not intended to denote a single facility. The "project" being proposed to Frontier could include multiple facilities/locations or potentially all the CDR activities of your company.

some of the highest natural silicate weathering rates (Sources 1, 2, 3). We utilize regionally sourced fine basalt dust as the weatherable substrate and our deployment is in collaboration with the Darjeeling tea industry of India (India's first GI tagged product). Leveraging our location in the Global South, we maintain a cost-effective supply chain deployment strategy, while augmenting the well-being of the farming community by improving soil health, increasing crop productivity and reducing the overall cost of farming.

Our innovative and high-precision in-situ and laboratory-based determination techniques for multi-parameter characterization of soil and soil pore-water chemistry enable us to accurately monitor and determine chemical weathering rates and associated carbon removal. We utilize a high-resolution sampling strategy, on both spatial and temporal fronts, to accurately quantify the net CO_2 removal and the final fate of the captured CO_2.

Chemical dissolution of basalt, a widely abundant calcium & magnesium-rich silicate rock in India, by CO_2-fluxed water, involves conversion of atmospheric CO_2 into inorganic carbon dissolved in the hydrosphere. This dissolved inorganic carbon ultimately reaches the ocean and remains locked for more than ten thousand years (Source).

Our project addresses the following priority innovation areas:

Industrial Integration & Working with new crops

Operating in the tea industry across Northeastern India (Darjeeling, Dooars-Terai, Assam, Tripura), we utilize large tea landholdings, spanning over **500,000 hectares,** where dolomite ag-lime is currently used to adjust soil pH levels for optimal nutrient absorption by plants. The existing expertise among community members and managerial staff on large tea estates, along with neighboring small growers (spanning another **250,000 hectares)**, facilitates the technical deployment of these soil nutrients.

Fig. 1. Our farm-partners spreading dolomite ag-lime at Kamala Tea Estate (taken while onboarding)

Our Ca-Mg rich basalt feedstock is a crucial addition to these existing practices. By replacing dolomite with basalt dust, we can enhance agricultural processes, increase crop yields by up to 30%, improve soil pH health, and enhance soil moisture retention (Source). This also helps mitigate soil damage from natural or biological agents and regulates nutrient uptake. The symbiotic relationship between large industrial tea estates and neighboring small growers, sharing resources and practices, enables our project to leverage industrial tea estates' social and local capital. This facilitates the integration of smaller landowners into larger industrial practices, promoting the widespread adoption of Enhanced Weathering in the tea industry and its neighboring cash crop growers (paddy/rice, bamboo, pineapple, etc.).

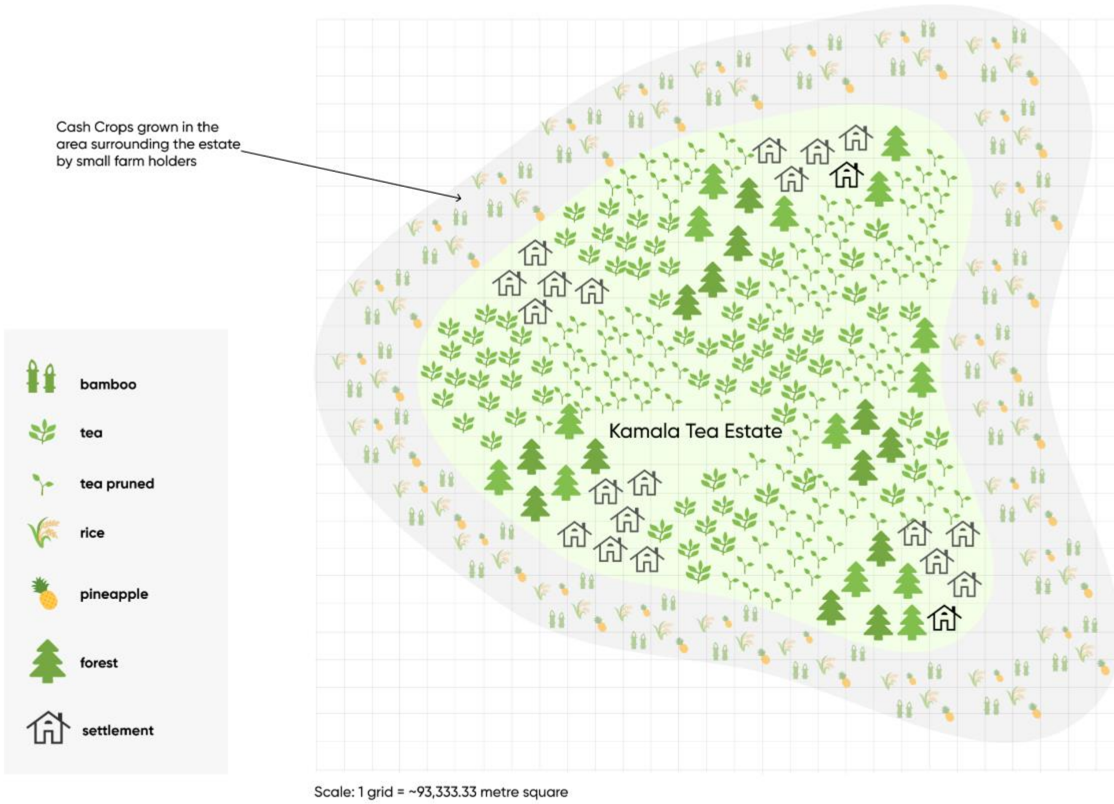

Fig. 2. A showcase of how tea estates are surrounded by cash crops like rice, bamboo, pineapple

Existing pre-harvest practices in the region, such as forking for tea cultivation, align well with our deployment methods.

Underrepresented Geographies

Our operations in Northeast India, a historically disadvantaged region, facing sparse connectivity with the rest of the country, share borders with Nepal, Bhutan, Bangladesh, and Myanmar. The Darjeeling tea industry employs ethnically Nepali populations and marginalized lower caste/tribal communities. These communities, engaged in the tea plantation industry since the 1800s, now face significant challenges due to several tea estates facing risk of closure (Source). **About 90% of the 300,000 community members in the Darjeeling tea industry and over 50% of the 1.2 million people in the Indian tea industry are women, earning less than $4/day (**Watch Clip**).** These women face both geographical and socio-ethnic disadvantages.

By undertaking CDR using EW of basalt in tea estates, we create supplementary sources of income for the tea estate system as well as small landowners, thereby preventing closures. Through novel community engagement plans, which include inclusive deliberative processes like the **Vigyaan Krishi Sabhas** (grassroot-level science and agriculture townhalls), substantive operational structures like the **Association for Responsible Deployers**, large scale health surveys organized in partnership with the Kamala Education Foundation, and workforce training in association with Safeducate, we aim to bring local knowledge systems to bear on the operations of the project, while also undertaking interventions for environmental justice and socially-inclusive practices. This will be crucial to smooth long-term scalability as well.

Additionally, we will be increasing employment of scientists within the region by setting up our state-of-the-art geochemistry lab– **the Darjeeling Climate Action Lab (D-CAL)**. We have already begun engaging with the University of North Bengal, which has a nationally renowned Chemistry, and Tea Research Departments. In collaboration with the Centre for Earth Sciences (CEaS) at the Indian Institute of Science (IISc), Bangalore, we plan to undertake training workshops to spur science-based employment in the region. This initiative will have a catalytic impact on local scientific research, fostering growth and development in the field.

EW Innovation

- Rock weathering rates are significantly accelerated in **Darjeeling's monsoon-heavy regions, characterized by nutrient-rich soils with high water retention, sudden dry spells, warm summers, high humidity and concentrated rainfall,** creating optimal conditions for rapid chemical weathering.
- Furthermore, our **cost-effective and abundant supply of targeted basalt feedstock** (source-characterized and selected based on careful geochemical and isotopic analyses to increase CDR and reduce potential soil contamination), **ultra-fineness of our feedstock's particle size**, and incredibly **low CO_2 outgassing** possibilities downstream due to elevated Himalayan river water pH (Source) makes our system one of the best candidates for high CO_2 removal through the EW pathway.
- There is a significant increase in weathering rates & crop yield due to our practice of **adding organic manure** along with our alkaline feedstock (Source). In the future we plan to use biochar, created using our in-house unique technique of using Tea Pruning Litter Waste (TPLW) and enzyme/microbe cocktails to further accelerate chemical weathering, aiming for even greater improvements in soil health and agricultural productivity.
- We employ rapid and extensive high-resolution sampling using cost-effective samplers. Our advanced geochemical sample curation and management framework, along with in-situ probes, facilitates high-resolution data collection of meteorological, climate, and hydrological parameters. We employ robust quantitative and numerical tools to analyze our data.
- We have developed an **exclusive in-house framework for CDR determinations, eliminating the need to send our samples outside the Global South for analysis, thereby reducing our physical footprint.** Our approach integrates high-precision geochemical and **metal isotopic measurements using mass spectrometers**, along with mineralogical characterization of the soil at IISc, Bangalore. Our robust quantification method ensures accurate and reliable determination for CDR.
- Additionally, scaled-down laboratory experiments at IISc using the same soil and basalt powder as in our deployment area provide us with a better understanding of the basalt weathering processes occurring in the field. (Source)

Additional Revenue Sources for Stakeholders

- Reducing or eliminating dolomite liming and fertilizer costs for tea plantations.
- Enhancing crop yield, increasing overall income for farmers and landowners.
- Creating full-time and contractual green jobs for local community members (mostly Scheduled Tribes/Scheduled Castes), especially women, in our supply chain activities.
- Incentivizing local farmers to prioritize high weathering cash crops like bamboo, creating circular economy opportunities.
- Purchasing basalt dust from crushers and establishing a truck/rail freight route between Rajmahal Traps and Darjeeling, generating new revenue streams.
- Supporting a local ethical tea brand (Dorje Teas) to establish a circular economy for tea produced at our partner estates, ensuring fair profit distribution.

Environmental / Economic Co-Benefits

- Protecting local forest systems by providing additional income sources to tea estates, preserving the organic carbon sink these forests represent (Source).
- Improving soil health by adding essential nutrients, increasing soil fertility, organic content, and crop yield.
- Enhancing alkalinity supply to the Bay of Bengal, aiding in the deacidification of multiple open-water systems.
- Increasing the organic carbon status of the soil in the region, which has historically been depleted due to monocultural cropping of tea.

Operational Excellence & Feedstock Strategy

- The tea estate industry's freight network has proven resilience and reliability, having operated successfully for decades (Source). This reliability translates to our operations. By integrating into the existing well-established freight network (rail + trucks) of the Darjeeling tea industry, we avoid the high costs, high emissions and logistical challenges of setting up an independent transport system.
- We make use of the existing warehouse infrastructure (Source) of tea estates for storing and handling basalt dust. This reduces the need for additional capital expenditure on new storage facilities, thereby improving our cost-efficiency and operational readiness.
- To avoid adding to the labor strain of the tea estates, we onboard an additional workforce from the villages within the tea estate. This approach ensures timely sampling and deployment, maintaining operational timelines without disrupting the existing agricultural activities.
- We are collaborating with leading Indian social organizations to educate our farm partners on best agricultural practices and the positive effects of our feedstock. This continuous training not only increases awareness but also improves the implementation of our project.
- We ensure the basalt dust meets specific particle size, hence we have an on-ground team that is present around the crusher when feedstock is being loaded. Aliquots of the basalt dust are also geochemically and isotopically characterized to ensure repeatability of the whole process.
- Building on our family's longstanding presence in the tea industry of India, we have successfully onboarded 5 neighboring tea estates within 3 months, encompassing more than 3,000 hectares, to participate in subsequent phases of the project.

b. **Project objectives:** What are you trying to build? Discuss location(s) and scale. What is the current cost breakdown, and what needs to happen for your CDR solution to approach Frontier's cost and scale criteria?[2] What is your approach to quantifying the carbon removed? Please include figures and system schematics and be specific, but concise. 1000-1500 words

As 4th generation tea planters, at the onset of the pandemic induced lockdown, we realized that Darjeeling's tea industry faces a two pronged existential crisis: (a) market linked structural factors leading to producers/local communities facing heavy losses; (b) climate change related risks such as shorter harvest periods, & higher risk of extreme incidents such as forest fires, hailstorms, longer drought periods, & frequent heat waves, leading to degraded soil quality for the region. The impact of this crisis has been the widespread closure of large tea estates in the region (Source), thereby not only impacting disadvantaged local communities dependent on the tea industry for their livelihoods, but also endangering local biodiversity and ecosystems dependent on forest covers maintained by tea estates in the region.

[2] We're looking for approaches that can reach climate-relevant scale (about 0.5 Gt CDR/year at $100/ton). We will consider approaches that don't quite meet this bar if they perform well against our other criteria, can enable the removal of hundreds of millions of tons, are otherwise compelling enough to be part of the global portfolio of climate solutions.

Fig. 3. Aftermath of extreme climate events like a forest fire in one of the Darjeeling tea estates

Alleviating these challenges requires a combination of short & medium term interventions relating to distribution of the product, but also longer-term, broader intervention to undertake climate action. We have designed the **Darjeeling Revival Project (DRP)** to transform these heritage tea estates from being at-risk of climate change to becoming the frontier of climate action, through the EW pathway of CDR. By working with the Darjeeling Tea industry, we not only have a path to scalability (by partnering with large landholdings) in a geographically ideal location for EW, but we also have a built-in incentive structure catalyzing scalability, given the ailing nature of this industry. Our project would create new green jobs for the local communities, provide supplementary sources of income for tea estates preventing their closure, & through an innovative community engagement plan transform the deliberative and substantive power structures for the industry.

The DRP is the first EW based CDR project being undertaken by us (post pilot). Due to the domestic & international recognition of Darjeeling, as a region and an industry, we aim to create a novel project that boosts the local economy, builds lasting climate mitigation/adaptation, & incorporates indigenous knowhow. We believe the DRP can provide CDR in general and EW in specific, the overall proof of concept needed to drive catalytic impact for South Asia.

Location

We began **DRP Phase 1** on our family's tea estates covering 2000 hectares. At present, we are enroute to scaling up to 500,000 hectares by 2030, by focusing on the tea industry of Northeast India.

As part of the DRP Phase 1, we have already deployed 1,500 tons of basalt dust in and around the **Kamala tea estate** located in Bagdogra, Darjeeling district, India, on three types of crops: tea, paddy(rice), and bamboo.

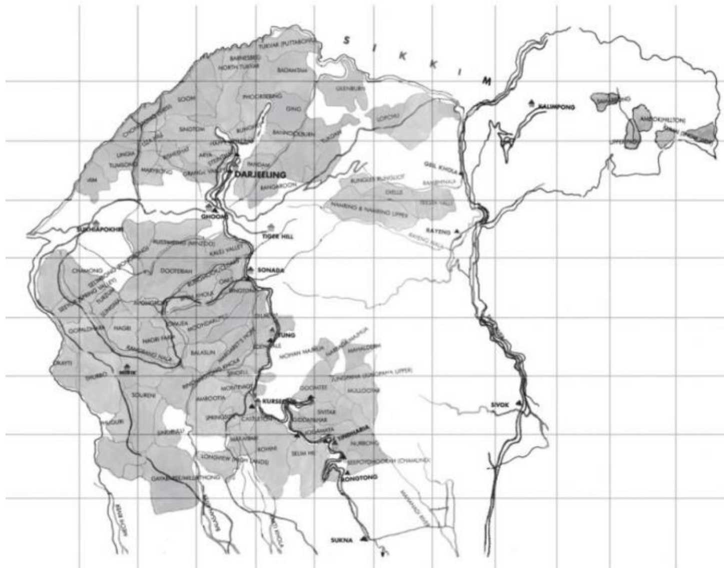

Fig. 4. Map of Darjeeling with the 87 tea plantations shaded (Source: Tea Board of India)

We expect to sequester ~435 tons of CO_2 before 2028. In September 2024 (immediately after the monsoons), we plan to scale up our deployment to 17,500 tons within the Kamala tea estate itself (which has ~512 hectares under tea cultivation, & is surrounded by ~900 hectares of rice paddy and bamboo combined). This expanded deployment will help us achieve an additional 5510 tons of CO_2 removal. We aim to credit a total of 2,500 tons of CO_2 removal from this corpus to Frontier.

Scaling Milestones:

- **Short Term Regional Focus**: We aim to scale within Darjeeling and adjoining tea estates by leveraging our social capital and historic presence in this industry, thereby reaching a 100,000 tons/year capacity. **The average landholding in India is fragmented at 1.08 ha, whereas the average size of a tea plantation stands at ~200 ha, with ~2,000 estates in total. This allows for swifter scalability of operations.** Each tea estate in the region is further surrounded by bamboo plantations, paddy (rice) fields, and other cash crops, managed by neighboring small growers (dominantly tea estate employees), providing additional opportunities for expansion (Source). We have identified that the primary incentives for our farm partners to collaborate with us are reduced farming costs and improved soil yields.
- **Indian Tea and Coffee Industry:** The concentrated structure of these plantations facilitates scaling our operations to 3 million tons/year by the end of 2030. By leveraging our successful model in the tea industry, we plan to extend our operations to Southern Indian tea estates & coffee estates, targeting an additional 2 million tons/year by 2030.
- **Extending Beyond Tea & India:** Utilizing our existing knowledge of tea, paddy (rice), and bamboo cultivation, we have two pathways for long term expansion-- to reach beyond Northeastern India to neighboring countries with similar crop types and weather conditions. Secondly, to expand into India's paddy (rice) networks (~46 million hectares) (Source) & bamboo bearing regions (~14 million hectare) (Source) to reach >0.5 Gt/year removal scale by 2040 at <$80/t$CO_2$

Cost - Today & Future

Our primary cost headers are the following:

- **Feedstock Sourcing:** The finer basalt dust produced during crushing, currently sent to landfills, is procured at <$2/ton of feedstock.
- **Transportation:** Our current transportation distances range between 100-400 km while utilizing the existing supply chain of the tea estates. We are in the process of optimizing for

one-way fares to minimize this cost.

- **Operational Integration:** Tea estates in Darjeeling have long applied dolomite to alleviate soil pH levels. Thus, the stakeholders are familiar with the standard operating procedures for soil nutrient application, reducing the need for extensive education and training costs.
- **Labor Efficiency:** The tea industry is incredibly labor-intensive which allows ready access to a large well-trained workforce. We capitalize on this by employing manual application methods and our proprietary forking/tilling practices, which are both energy and cost-efficient, eliminating the need for additional machinery.
- **Laboratory Analysis:** Our approach is customized for regional rainfall patterns, intense monsoonal rainfall leading to deep groundwater penetration, soil characteristics and composition. Our rigorous approach ensures that our reports are highly conservative and credible within both the scientific community and commercial sectors. As we scale and accumulate more baseline data, and eventually move towards a modeling supported approach, these costs are expected to decrease exponentially. Additionally, we are establishing our in-house Darjeeling-Climate Action Lab (D-CAL) equipped with advanced analytical and computational capabilities for cutting-edge geochemistry R&D, which will help in significantly reducing our MRV costs. Initial funding for the laboratory establishment has been acquired.
- **In-Situ Analysis:** We conduct in-situ physico-chemical measurements in the field using high-precision, standard-calibrated probes as part of our Localized Measurement Stations (LMS).

Fig. 5. Upper left: Feedstock sourcing site. Upper right: Deployment of basalt dust in the project site,

Lower left: Soil sampling at project site (tea) from different depths using a locally-built corer (called '*Phaang*'), Lower right: Pore water sample collection for analysis (tea)

Quantification Approach/Technology

1. The maximum potential of CO_2 removal due to stoichiometric dissolution of our feedstock was determined using a modified version of Steinour formulation published in EW literature (Sources 1, 2). We refined our determination considering oceanic physico-chemical characteristics of present-day Bay of Bengal (ultimate cation flux repository in our case). Combining basic cation-oxide data and Bay of Bengal ocean chemistry along with their uncertainties the maximum CDR potential of our feedstock basalt showed a range between **0.26-0.31 (tCO_2eq/t of rock powder)**, which is reasonably high when compared with published data (Source) and when compared with reported data from the same rock type undergoing weathering at other locations (Source).
2. Over multiple spatiotemporally distributed high-resolution sampling campaigns, we gather soil and porewater samples from pre- and post-deployment from treated plots (soil + basalt powder) and control plots. (Source). Immediately after collection, samples (solid = soil; liquid = pore water, surface and groundwater) are sent to our partner labs for further processing in metal-free clean lab environments. Following rigorous processing and qualitative analyses (eg., XRD for mineral phase identification) samples are comprehensively characterized by sophisticated high-precision instruments, such as mass spectrometers, ion chromatographs, to determine accurate concentration (errors 1-3%) of chemical species using protocols that are already published in flagship peer-reviewed journals (Sources 1, 2, 3). We repeat pre/post deployment sampling biannually as per harvest cycles of the respective crops. Additionally, our samples are characterized mineralogically to monitor formation of secondary clay minerals. Our geochemical analyses also allows us to closely monitor concentrations of transition metals in the soil which can potentially be added due to basalt weathering.
3. We have initiated determination of **radiogenic metal isotope ratios** in our samples using high precision thermal ionization mass spectrometry and metal stable isotopic measurements as a tool to better constrain weathering reactions. These approaches are well established in the field of natural weathering studies (Sources 1, 2, 3). For selected samples, radiogenic isotopes will allow accurate fingerprinting of the cations within the soil while **metal stable isotopes** (e.g., Ca isotopes) will allow us to monitor processes involved (leaching, secondary precipitation, biomass contribution, etc). **We understand that this process will increase our costs, however, the improved precision will allow us to better constrain the weathering rate/amount and better train our reactive-transport models.**
4. We are cognizant of determining the potential of CDR through **alkalinity (HCO_3^- based) transport by hydrosphere from the weathering site to rivers and by localized pedogenic carbonate formation.** This mode of quantification is being fine-tuned through high precision pore water alkalinity, pH and dissolved inorganic carbonate measurements. This approach is critical for net CO_2 capture transported to deeper levels of soil profile and in soil carbonates. Model calculations (using PHREEQC) for an expected range of alkalinity (**1.5-2.2 meq/L**) transport from average soil water to rivers considering alkalinity loss of **40-45% loss**, dominantly due to equilibration with the atmosphere or due to precipitation of secondary minerals, in surface water yield maximum annual **CDR of ~1-2 tCO_2eq/ha.** This is in overall agreement with our direct geochemical quantification using. Additionally, water samples from irrigation canals and local groundwater in the deployment area are also being monitored for their compositions.

c. **Risks:** What are the biggest risks and how will you mitigate those? Include technical, project execution, measurement, reporting and verification (MRV), ecosystem, financial, and any other risks. 500-1000 words

Technical:

1. **Availability of Pore Water for Sampling:** In tea plantations, the well-drained & young alluvial soil prevents water stagnation, making pore water collection difficult, especially during dry

spells. Our initial attempts included using Acrylic Corer (Image) with micro-rhizons to collect pore water - while successful to a depth of 15 cm, further penetration was limited due to the corer's inability to cut deeper without contamination from metal edges of the corer. Hence, we developed a unique Pore Water Corer (PWC) (Image) to utilize with our micro-rhizons. Alternatively, we have taken a novel centrifuge approach for extracting pore waters from soil. DRP Phase 1 involved high RPM centrifuging bulk wet soil samples from tea plantations and rice fields to extract pore water (Source). Additionally, we recognize the importance of post-leaching transport of dissolved species to the hydrosphere. **The local hydrology network is well characterized and to put a constraint on the geochemistry aspect to complement our understanding from the EW plots, we have started bi-monthly water sampling for geochemical analyses from groundwater sources and streams (outlets in our case) adjacent to our project site.** (Sources 1, 2).

2. **Bio-availability of weathering products:** Crop uptake of chemical species generated by weathering poses uncertainty in determinations of flux of cations and alkalinity to the hydrosphere which needs to be constrained to accurately report CDR values. We address this issue by developing a universal model to assign a crop factor for each project site. Moreover, our radiogenic and stable (non-traditional) isotope determination strategy is centered around utilizing elements which have zero to negligible involvement in the regional biological cycle.
3. **Complexity of weathering reactions:** Weathering reactions are complex and function of multiple thermodynamic and kinetics factors. Additionally, basalts with even slightly different modal mineralogy and bulk chemistry and in situ availability of interacting fluid may lead to variable weathering rates within the soil column. The possibility of heterogeneous weathering rates, in both lateral and vertical spread, can introduce uncertainty in CO_2 removal determinations. We are addressing these issues by setting up lab-based silicate weathering experiments using the same soils and basalt dusts from the deployment areas (Source).
4. **Outgassing and Alkalinity Delivery:** Dissolved species, such as bicarbonates are transported to the ocean (where carbon stays for thousands of years) majorly through surface and subsurface water networks. The chemistry of surface water and its equilibration with atmospheric gasses can alter the efficiency of alkalinity delivery to the ocean. Understanding the extent of this transport effect is crucial to ensure accurate and reliable carbon sequestration determination, where a first-order estimation of transport efficiency can be done by analyzing river geochemistry, the Ganges in our case. Significantly high pH of the Ganges (above 7.5) river network and optimal carbonate chemistry of the Bay of Bengal leads to limited reduction of our CDR potential due to outgassing and associated inorganic processes.

Project Execution:

1. **Change/Shift in Monsoon Rainfall Patterns:** The monsoon is a critical factor in our enhanced weathering process. In the Himalayan region the monsoon transforms the weathering regime from transport limited (removal of weathered material) to supply limited (availability of weatherable rock). Large-scale climate change could alter monsoon patterns, impacting rainfall intensity and distribution, which in turn would affect weathering rates and CO_2 removal efficiency. However, the predicted rainfall amount is expected to increase with global warming.
2. **Occurrence of Extreme Climatic Incidents:** The occurrence of hail storms, flash floods, and forest fires, whose preponderance has been increasing in recent years could create operational challenges along with interference with our enhanced weathering processes due to localized mass wasting.
3. **Uniformity of Particle Size of Feedstock:** Since the feedstock that we source is a waste product of the mining industry of Rajmahal traps, ensuring consistent particle size of basalt dust is a challenge. Variability in particle size can influence weathering rates in either direction (smaller size fractions augment reaction rates and vice versa). To overcome this, we have implemented internal quality assurance practices to maintain uniformity, however future stricter practices will have to be introduced and frequency of sampling must be maintained.

MRV:

1. **Laboratory Infrastructure:** Currently, India has very few labs with high-precision mass spectrometers for accurately determining cation abundances, isotopic ratios, and dissolved

inorganic carbon in EW samples. The academic labs we partner with can only process 1,000-5,000 samples per year due to bandwidth and innovation priorities. We are establishing state-of-the-art laboratories in Darjeeling (D-CAL) with advanced analytical and computational capabilities for cutting-edge geochemistry R&D, aligned with our science-driven EW approach. This will significantly enhance our sample analysis capacity by ~100x, promoting efficient CDR quantification mechanisms. This will also create a catalytic impact in supporting new agriculture-based rock weathering and CO_2 removal companies in South Asia.

2. **Smart Farm App & Ops/Clients Platform:** In rural and tier-3 regions of India, the use of digital technology is not yet widespread. Farmers and freight managers often rely on traditional methods for record-keeping and communication, which can lead to inconsistencies and gaps in data collection. Poor literacy levels and language barrier also adds to the resistance of using technology by local users. We are solving for this through our unique training programs with Safeducate and our in-house proprietary product– the Smart Farm App & Ops/Clients Platform.

Ecosystem Risk:

Although ultramafic rocks like dunites are highly effective for EW, they often contain high concentrations of hazardous heavy metals like chromium. Our approach mitigates these risks by using basalt from the Rajmahal traps, which is enriched in calcium and magnesium and is carefully selected based on internal geochemical characterization to reduce soil contamination. Additionally, our feedstock is lightly water-wetted during transport to reduce dust aerosol inhalation risks, and we provide protective gear to our field partners.

Financial Risk:

1. **High Capital Costs::** The size of the current offtake market, and the perceived implementation risks associated with Global South projects, lead to higher capital costs. Hence, we are constantly diversifying & innovating financial instruments.

d. **Proposed offer to Frontier:** Please list proposed CDR volume, delivery timeline and price below. If you are selected for a Frontier prepurchase, this table will form the basis of contract discussions.

Proposed CDR over the project lifetime (tons) *(should be net volume after taking into account the uncertainty discount proposed in 5c)*	2500 tCO_2eq (From 5365 net tCO_2eq of DRP Phase 1 deployments from Dec 2023 to Jan 2025)
Delivery window *(at what point should Frontier consider your contract complete? Should match 2f)*	Dec 2028
Levelized cost (\$/ton CO_2) *(This is the cost per ton for the project tonnage described above, and should match 6d)*	\$230/tCO_2eq
Levelized price (\$/ton CO_2)[3] *(This is the price per ton of your offer to us for the tonnage described above)*	\$245/tCO_2eq

[3] This does not need to exactly match the cost calculated for "This Project" in the TEA spreadsheet (e.g., it's expected to include a margin and reflect reductions from co-product revenue if applicable).