Preliminary Assessment Public Summary

This *Preliminary Assessment Public Summary*, prepared by Puro.earth, contains general information about the CO_2 Removal Supplier and its project, as evaluated at the time of the Preliminary Assessment (PA). It also includes a *Non-Technical Project Summary* and a *Criteria Assessment Report* detailing: i) key criteria assessed and their associated outcomes, ii) Puro's comments, and iii) evidence provided by the CO_2 Removal Supplier.

The *PA Public Summary* serves as a transparent communication tool, enabling potential investors, buyers, and stakeholders to quickly understand the supplier's carbon removal capabilities and assessment status.

The supplier has also received an extended *Preliminary Assessment Report*. This confidential document offers in-depth insights, including specific remarks and actionable recommendations to guide the supplier's progression through the certification journey.

1. Supplier and Project Information

CO_2 Removal Supplier	
Company name	SCG Cement Co. Ltd.
Company address	1 Siam Cement Road Bang Sue, Bang Sue Bangkok 10800 Thailand
Business ID	0105541070740
KYC status	Completed (2024-10-23)
CO_2 Removal Project	
Methodology	**Biochar, Edition 2022, Version 3**
Production Facility name	SCG Cement
Facility registration date	2024-10-10
Production Facility ID	133972
Production Facility location	33/9 Moo 3 Tumbol Ban Pa Amphore Kaeng Khoi Saraburi 18110 Thailand
Host Country of removal	Thailand
Has this facility been registered in another registry?	☒No ☐Yes, additional information:
Assessment details	
Date of assessment	2025-01-28
Status of assessment	Completed
Conclusion of assessment	Passed

2. Non-Technical Project Summary*

In our pursuit of innovation, we have developed advanced biomass refinery technology aimed at creating a circular economy for Thai farmers. We have established Thailand's largest pyrolysis plant, transforming agricultural waste into biochar. This biochar is then dual-purposed—improving soil quality and being integrated into cement and concrete. Our collaboration with our internal startup, 'Arbon', enhances the biochar's properties, making it ideal for permanent carbon sequestration and effective in reducing construction industry emissions by substituting traditional clinker and cement. Moreover, this initiative not only boosts soil fertility and crop productivity—enhancing farmers' incomes and promoting sustainable practices—but also addresses the critical issue of PM 2.5 pollution by providing an alternative to the traditional burning of agricultural residues. Looking ahead, we aim to expand our use of biochar beyond our own mining rehabilitation projects. We are exploring the use of inorganic waste to advance enhanced weathering processes for further carbon sequestration. Optimistic about the potential sale of carbon credits, we are committed to significant environmental targets. Through these efforts, SCG Cement leads in environmental stewardship, supporting Thailand's agricultural community and forging a sustainable future.

3. Criteria Assessment Report

Reminder: Criteria/Sub-criteria assess either the *technical eligibility* of the facility or its *maturity and quality*, determining whether the facility qualifies for CO_2 Removal Certificates (CORCs) and evaluating its development stage and operational quality. There are three types of sub-criteria:

- **Required to be Passed**: These core criteria are crucial for determining the Supplier's facility eligibility as they may be otherwise impossible or costly to change at a later stage. For example, if the supplier is at a such an early stage of development that the *capture technology is not yet identified*, the PA won't be able to provide useful insights regarding the facility's eligibility.

1. **Required to be Assessed**: These criteria are important for evaluation, but they do not necessarily determine whether the facility will pass or fail at this stage. Suppliers may be at different stages of development, and some criteria (e.g., demonstrating the necessary permits) may not yet be fully met. In such cases, disclosing the status of permit acquisition is sufficient.

- **Not Required**: These criteria are optional and do not impact the facility's eligibility for listing at this stage. They may provide additional context or information about the facility's maturity but are not essential for passing the preliminary evaluation.

For a facility to be considered eligible for listing, all the sub-criteria that condition eligibility must be met (i.e. passed or assessed), as specified in Table 1. **If any of these critical sub-criteria are not met, the facility will not be eligible for listing in its current development stage.**

Disclaimer: The assessment has been made against the criteria in the current version of the methodology. Puro.earth relied on the CO_2 Removal Supplier for the correctness of the provided information during the time of the PA and will make no representation as to the accuracy or completeness of this report. The CO_2 Removal Supplier must undergo a third-party audit before issuing CO_2 Removal Credits (CORCs). **Passing the PA does not guarantee a success in the third-party audit.**

Overall evaluation: Preliminary Assessment is **passed**.

Table 1. Criteria and sub-criteria assessment by Puro based on the documents submitted.

ID	Criteria / Sub-Criteria	Outcome	Comment	Evidence Received	Required to be Listed	Purpose of Criteria
C1	**Planned biomass feedstock(s) is(are) eligible**	**Passed**			*Passed if required sub-criteria are met*	
C1.1	*Biomass feedstocks are identified and compatible with EBC positive list*	**Passed**	Biomass feedstocks identified are: waste eucalyptus chips (F-03), rubber tree stumps (F-03), corn straw and peels (Ag-05), and corn stubble (Ag-05). These biomass types are	Biomass types and origins list.xlsx	Required to be passed	Technical eligibility

			compatible with the EBC/WBC Positive List of Feedstocks.			
C1.2	*Biomass feedstock sustainability and chain-of-custody can be demonstrated, if applicable*	**Passed**	• The Supplier has identified all feedstock sources, though traceability needs to be verified during the Audit. • For wood residues, eucalyptus chips are sourced as waste products from a pulp mill. While these chips are certified as either FSC 100% or FSC Controlled Wood, the latter certification does not meet sustainability requirements. Rubber tree stumps are sourced from rubber plantations. Further evidence of these stumps' sustainability will be required for the Audit. • For agricultural residues, no evidence is required for corn straw, peels, and stubble, besides record keeping of origin and amounts consumed.	Biomass types and origins list.xlsx; Biochar raw materials_Pin chip and Rubber tree stump.pdf	Required to be passed	Technical eligibility
C1.3	*Bioenergy leakage related to feedstock use is minimal*	**Passed**	Alternative uses for waste eucalyptus chips, rubber tree stumps, and corn straw, peels, and stubble, could entail energy production (e.g.,biomass feedstock combustion). However, according to the Supplier, biomass feedstock are currently burnt in-field or left to decompose. Hence, bioenergy leakage is deemed minimal.	Biomass types and origins list.xlsx; Puro Additionality v1.9.docx; Biochar production equipment questionnaire.xlsx; Mass and energy balance of production process.xlsx	Required to be assessed	Technical eligibility
C1.4	*Land use change related to feedstock use is minimal*	**Passed**	Provided that sustainability evidence is provided for all selected feedstocks (wood and agricultural residues), their sourcing approach is deemed to have minimal to no effects on land use change, due to forest management certification for wood residues and the inherent nature of agricultural wastes. However, the sustainability of rubber tree stumps, and of some eucalyptus chips, still needs to be verified prior to Audit.	Biomass types and origins list.xlsx; Biochar raw materials_Pin chip and Rubber tree stump.pdf	Required to be assessed	Technical eligibility
C1.5	*Sourcing of biomass is secured (e.g. letters of intent, contracts)*	**Not required**	Specific feedstock sources have been identified, but no information was provided on whether the sourcing has been secured yet.	No information provided.	Not required	Maturity & Quality

C2	**Planned biochar production equipment is technically sound**	**Passed**			*Passed if required sub-criteria are met*	
C2.1	*Several options of reactor design have been identified*	**Passed**	The Supplier has selected a reactor from Beston, namely the BST-50 reactor in a configuration declared to operate with oil/tars condensation and wood vinegar production.	Biochar production equipment questionnaire.xlsx; Mass and energy balance of production process.xlsx	Required to be passed	Technical eligibility
C2.2	*Reactor design has been decided, contracted, or purchased*	**Assessed**	Reactor design has already been purchased. The equipment was manufactured two years ago and has been operational since July 2023.	Biochar production equipment questionnaire.xlsx	Required to be assessed	Maturity & Quality
C2.3	*Reactor design is vetted, regarding production of biochar with H/C ratio below 0.7*	**Passed**	• Pyrolysis temperatures are expected to be between 400-450°C, with residence time of 30 minutes and heating rate of 4°C/minute, which will vary depending on the feedstock properties. • The equipment and different feedstocks selected are deemed possible to produce biochar with an H/C below 0.7, which will need to be confirmed by laboratory analysis.	Biochar production equipment questionnaire.xlsx; Mass and energy balance of production process.xlsx	Required to be passed	Technical eligibility
C2.4	*Reactor design is vetted, regarding risk for CH_4 emissions*	**Passed**	• The reactor is designed to only combust non-condensable syngas. • The pyrolysis gases are expected to be combusted in two insulated chambers at temperatures between 800-1000°C, with measures to manually control air flow, as well as design features for primary and secondary air injection in the burners/nozzles, and for increased air flow turbulence. • CH_4 emissions tests have been conducted, demonstrating minimal risk of CH_4 emissions.	Biochar production equipment questionnaire.xlsx; Criteria 2-4 and 2-6.pdf ; E-File Report TREL24-00665 St.pdf	Required to be passed	Technical eligibility
C2.5	*Reactor design is vetted, regarding air pollutant emissions in line with local regulation*	**Passed**	• The reactor is designed to only combust non-condensable syngas. The condensation systems contribute to cleaning the syngas prior to combustion. Flue gas treatment system also includes cyclones and water scrubbers. • Relevant regulation on industrial emissions of pollutants to air, water, and soil has been identified by the Supplier. The equipment is expected to be compliant with such	Biochar production equipment questionnaire.xlsx; Environmental Evaluation Report.docx	Required to be passed	Technical eligibility

			regulations, with on-site environmental emissions testing being required twice a year.			
c2.6	*Facility design is vetted, regarding disposal of waste streams, including any liquid streams (wastewater, oil, tars)*	**Passed**	The reactor design is expected to produce certain amounts of liquid waste streams (wastewater, tars, and wood vinegar), beside other solid wastes (residues from flue gas treatment). Those streams have been clearly identified and quantified, and the supplier has described adequate management of their end-uses/disposals. Adequate management of these streams will be verified during Output Audits.	Biochar production equipment questionnaire.xlsx; Mass and energy balance of production process.xlsx; Environmental Evaluation Report.docx; REL24_00042-5 (1).pdf ; Criteria 2-4 and 2-6.pdf	Required to be passed	Technical eligibility
c2.7	*Facility is co-producing bioenergy (e.g. heat, power) for internal use*	**Assessed**	The facility will use part of the thermal energy generated from the combustion of pyrolysis gases to sustain the pyrolysis and dry the biomass.	Biochar production equipment questionnaire.xlsx; Mass and energy balance of production process.xlsx	Required to be assessed	Maturity & Quality
c2.8	*Facility is co-producing bioenergy (e.g. heat, power, fuel) for external use*	**Assessed**	The facility will not produce directly bioenergy for external use, but wood vinegar is planned to be sold as a sustainable alternative to chemical pesticides in agricultural applications.	Puro Project Description_F1.docx; Mass and energy balance of production process.xlsx;	Required to be assessed	Maturity & Quality
c3	**Biochar planned end-use(s) is(are) eligible**	**Passed**			*Passed if required sub-criteria are met*	
c3.1	*Biochar end-uses are eligible*	**Passed**	Biochar is intended to be used in both soil and non-soil applications. The planned end-uses are in agriculture (mixed with fertilizer and soil amendment/pure biochar) and construction materials (cement and concrete), which are all eligible end-uses.	Biochar end use.docx; TDS-Biochar (Arbon).pdf	Required to be passed	Technical eligibility
c3.2	*Plans of biochar end-uses are tangible*	**Assessed**	For non-soil applications, the supplier intends on selling biochar to cement and concrete production of the Siam Cement Group, of which SCG Cement is a subsidiary. Evidence demonstrating that the end-uses are tangible is provided as a brochure of SCG Cement Co. Ltd. with pictures of the products and their application in pavement materials. For soil applications, biochar is planned to be sold to farmers, some of them cultivating plantations for the Siam Cement Group. At this stage, no evidence was provided by the Supplier.	Biochar end use.docx; TDS-Biochar (Arbon).pdf	Required to be assessed	Maturity & Quality

c3.3	*Biochar environmental quality thresholds are known for the identified end-uses*	**Assessed**	List of parameters to analyze has been established, with identified laboratories: R&I laboratory for Corg, H, and heavy metals, and an EBC/WBC accredited laboratory for PAHs. At this stage, the thresholds for the intended end-uses have not been explicitly identified/reported.	Biochar sampling and analysis plan.xlsx; SCG Prelim - Criteria 8 - LCA report & calculations.pdf	Required to be assessed	Maturity & Quality
c4	**Additionality is demonstrated**	**Passed**			*Passed if required sub-criteria are met*	
c4.1	*Carbon storage additionality to baseline*	**Passed**	Without the project, biomass would be burnt in-field or left to decompose. Therefore, the carbon storage is deemed additional to the baseline.	Puro Additionality v1.9.docx	Required to be passed	Technical eligibility
c4.2	*Financial additionality of facility*	**Passed**	The Supplier has demonstrated with a cash flow model (and a sensitivity analysis) that the production of biochar without CORC revenue is unviable. The sale of CORCs is integral to the profitable running of the project and the payback of the initial investment.	Puro Additionality v1.9.docx; Biochar Feasibility with CORCs.xlsx; Biochar Feasibility with no CORCs.xlsx; Mass and energy balance of production process.xlsx	Required to be passed	Technical eligibility
c4.3	*Regulatory additionality*	**Passed**	The project is not mandated by existing laws, regulations, or other binding obligations in Thailand.	Puro Additionality v1.9.docx	Required to be passed	Technical eligibility
c4.4	*Production equipment is newly built (i.e. not an existing facility or a retrofit of existing facility)*	**Assessed**	The pyrolysis equipment was manufactured two years ago, for this project specifically.	Puro Additionality v1.9.docx; Biochar production equipment questionnaire.xlsx	Required to be assessed	Maturity & Quality
c5	**Facility has monitoring, reporting, and LCA capabilities or tangible plans**	**Passed**			*Passed if required sub-criteria are met*	
c5.1	*Protocol for biomass and biochar record keeping is prepared*	**Assessed**	SCG Cement is planning to develop a comprehensive record-keeping system, as part of its MRV plan, that will track and integrate data on the supply and utilization of biochar in both soil and non-soil applications. The system will monitor key metrics, including packaging, mass/moisture measurements, and data collection points from production to delivery. It needs to be converted into actual operating procedures.	Biochar end use.docx; Calibration in process.xlsx; Biochar sampling and analysis plan.xlsx	Required to be assessed	Maturity & Quality
c5.2	*Protocol for dry mass determination of biochar is prepared*	**Assessed**	The MRV plan includes a detailed list of parameters to measure (mass and moisture content), measurement equipment, and record-keeping system, for determining the dry mass of	Biochar end use.docx; Calibration in process.xlsx;	Required to be assessed	Maturity & Quality

			biochar. Must be further refined and turned into actual protocol that can be followed (i.e., step-by-step operating procedures). The multiplicity of feedstock processed by this facility shall be a point of attention in the monitoring procedures.			
c5.3	*Protocol for biochar sampling and laboratory analysis is prepared (permanence and environmental quality)*	**Assessed**	The MRV plan includes a detailed list of parameters to measure for biochar sampling and laboratory analysis, with sampling point, frequency, and amount, as well as testing frequency, amount, parameters, and laboratory. It must be further refined and turned into actual protocol that can be followed (i.e., step-by-step operating procedures).	Biochar end use.docx; Calibration in process.xlsx; Biochar sampling and analysis plan.xlsx	Required to be assessed	Maturity & Quality
c5.4	*Monitoring and reporting plan of facility emissions is prepared*	**Assessed**	The MRV plan includes monitoring of pyrolysis temperatures and pressures of different stream flows (e.g., air, syngas, exhaust gases). Air pollutants required to be measured are known, but not yet included in the MRV plan. Components required to calculate the project's biochar supply chain and facility emissions remain to be identified. Further work is required.	Calibration in process.xlsx; Biochar sampling and analysis plan.xlsx	Required to be assessed	Maturity & Quality
c5.5	*An LCA model specific to the facility's operation is prepared*	**Assessed**	An LCA was not included in the submission, but high-level activity boundaries were established, with first estimation of emissions and removal of the project. Further work is required.	SCG Prelim - Criteria 8 - LCA report & calculations	Not required	Maturity & Quality
c6	**Facility has likely co-benefits and positive SDG impacts**	**Passed**			*Passed if required sub-criteria are met*	
c6.1	*Facility-specific co-benefits have been identified*	**Assessed**	Multiple facility-specific potential co-benefits have been identified: enhanced soil quality and crop yields, job creation, reduced air pollution, promotion of innovation (by exploring biochar's use in concrete and construction applications).		Required to be assessed	Maturity & Quality
c6.2	*Facility-specific SDG targets or indicators have been identified*	**Assessed**	The potential co-benefits described by the Supplier have been linked to various SDGs (1, 2, 3, 8, 9, 11, 12, 13, 14, 15). However, the plans for monitoring and verification of these co-benefits are at a very early stage of development.	Puro Project Description_F1.docx	Required to be assessed	Maturity & Quality

c7	**Facility team has access to relevant knowledge and skills**	**Passed**			*Passed if required sub-criteria are met*	
c7.1	*Relating to biomass sourcing, handling, processing*	**Assessed**	The team includes specialists with backgrounds in biomass waste conversion, agriculture, and forestry, including a PhD in Forestry and experience in sustainable agriculture.	Professional Summary of the Team.pdf	Not required	Maturity & Quality
c7.2	*Relating to thermochemical processes*	**Assessed**	Multiple team members hold engineering degrees (Mechanical, Chemical) with direct experience in production processes, maintenance, and quality control, as well as biomass pyrolysis and hydrothermal processes. The facility has been operational since July 2023 under SCG Cement, part of Siam Cement Group.		Not required	Maturity & Quality
c7.3	*Relating to biochar use*	**Assessed**	The team has strong capabilities in biochar utilization, particularly in agricultural and construction applications, with specific expertise in biochar integration into low-carbon concrete.		Not required	Maturity & Quality
c7.4	*Relating to monitoring and carbon accounting*	**Assessed**	Several team members have backgrounds in sustainability, CO_2 capture, and climate mitigation, complemented by extensive quality control experience.		Not required	Maturity & Quality
c8	**Environmental and social safeguards**	**Passed**			*Passed if required sub-criteria are met*	
c8.1	*Stakeholder consultations have been planned or conducted*	**Assessed**	Stakeholder consultations have not been conducted yet.	Puro Stakeholder Engagement Report.docx	Required to be assessed	Maturity & Quality
c8.2	*Regulation applicable to facility has been identified*	**Assessed**	SCG Cement has identified Thailand's regulations and permits relevant to the biochar facility activities, products and biomass feedstock sources.	Biochar production equipment questionnaire.xlsx ; Environmental Evaluation Report.docx	Required to be assessed	Maturity & Quality
c8.3	*Procedures to acquire relevant permits have been identified, started, or completed*	**Assessed**	The Supplier has obtained a Business Operating License from the Saraburi Provincial Industrial Office in February 2023 for producing biochar from agricultural residues and wood processing waste biochar.	Puro Stakeholder Engagement Report.docx; Puro Project Description_F1.docx	Required to be assessed	Maturity & Quality