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) evidences 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	Biocarb Solution ApS
Company address	Godthåbsvej 27, 1, Skanderborg ,8660, Denmark
Business ID	43671510
KYC status	Completed (2024-12-08)
CO_2 Removal Project	
Methodology	**Geological Carbon Storage, Edition 2024**
Production Facility name	GrønGas Vrå A/S
Facility registration date	2025-05-03
Production Facility ID	271123
Production Facility location	Grøngasvej 13, Vrå, 9760, Denmark
Host Country of removal	Denmark
Has this facility been registered in another registry?	☒No ☐Yes, additional information:
Preliminary Assessment Details	
Date of assessment	2025-04-14
Status of assessment	Completed
Conclusion of assessment	Passed

2. Non-Technical Project Summary*

BioCarb Solution ApS is a Bioenergy with Carbon Capture and Storage (BECCS) project in Denmark. The organization collaborates with Danish biogas plants to capture CO_2 from biogas production, using waste biomass like manure and agricultural waste. The captured CO_2 will be liquefied on-site, transported to Esbjerg harbor, and then shipped to an old oilfield in the North Sea for permanent storage under the seabed. Without this project, biogenic CO_2 from organic waste would be released into the atmosphere.
The approach is to measure CO_2 comprehensively throughout the process, ensuring the highest level of integrity and transparency. The project is financed by selling Carbon Dioxide Removal (CDR) credits, making it financially viable and attractive to investors and lenders.
Goals:

1. **Storage and Sales**: Start CO_2 storage and focus on selling removals.
2. **Scaling Operations**: Increase capacity from 75,000 tons to 150,000 tons, with plans to scale to 500,000 tons by 2030.

BioCarb Solution is committed to reducing atmospheric CO_2 levels and combating climate change through innovative carbon capture technology.

*The definition of CO_2 Removal Supplier and Production Facility can be found in the Puro Standard.

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.

- **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.**

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

ID	Criteria / Sub-Criteria	Outcome	Comment	Evidence Received	Required to be Listed	Purpose of Criteria
C1	**Planned CO_2 capture technology is technically sound**	**Passed**				
C1.1	*Captured CO_2 stream contains eligible CO_2 (atmospheric or from eligible biomass sources). If the captured CO_2 stream also contains non-eligible CO_2, the fraction of the non-eligible CO_2 can be determined or is already known*	Passed	CO_2 source is primarily biogenic CO_2 from biological treatment of livestock manure, food and farm industry byproducts, and household waste (anaerobic digestion for biogas + CCS). Some of the	Project Description Grøn Gas Vraa.pdf; Puro Capture site description Grøn Gas Vraa.xlsx ; CO_2 Stream Characterization.pdf;	Required to be passed	Technical eligibility

			processed wastes may contain a small share of fossil CO_2. This fraction must be determined.	Biomass overview, Grøn Gas Vraa.pdf		
c1.2	*Captured CO_2 stream consists overwhelmingly of carbon dioxide (i.e. > 95%)*	Passed	• Captured CO_2 stream will consist mostly of CO_2, as the biogas upgrading process effectively separates CH_4 from CO_2 and other raw biogas constituents via amine scrubbing, while liquefaction further enhances CO_2 purity through purification and filtering. • Liquefied CO_2 stream has been analyzed and is expected to exceed 99% purity, meeting food-grade standards (EIGA 70) with minimal moisture and oxygen content, and be compliant with the requirements of the CO_2 storage operator.	Project Description Grøn Gas Vraa.pdf; Puro Capture site description Grøn Gas Vraa.xlsx ; CO_2 Stream Characterization.pdf	Required to be passed	Technical eligibility
c1.3	*One or more options of capture technology have been identified*	Passed	The capture technology selected will use amine absorption to separate CH_4 from CO_2 and other constituents in raw biogas produced from the anaerobic digestion of multiple organic waste. This will be followed by a liquefaction process that includes purification, compression, and cooling of the captured CO_2.	Project Description Grøn Gas Vraa.pdf; Puro Capture site description Grøn Gas Vraa.xlsx	Required to be passed	Technical eligibility
c1.4	*Annual CO_2 capture capacity has been evaluated*	Assessed	Annual CO_2 capture capacity is expected to be 15,000 tonnes of CO_2/yr.	Puro Capture site description Grøn Gas Vraa.xlsx	Required to be assessed	Maturity & Quality
c1.5	*Capture technology design has been decided, contracted, or purchased*	Assessed	The capture equipment manufacturer and model have yet to be determined; however, the final investment decision on the capture and liquefaction/purification infrastructure is expected in the first half of 2025, with construction beginning once a contract with the storage partner is signed.	Project Description Grøn Gas Vraa.pdf; Puro Capture site description Grøn Gas Vraa.xlsx	Required to be assessed	Maturity & Quality
c1.6	*Capture technology is vetted, regarding technical performance*	Assessed	Amine-based carbon capture and liquefaction/purification systems are well-established industrial technologies. At this stage, these individual components are expected to meet the technical requirements.	Puro Capture site description Grøn Gas Vraa.xlsx	Required to be assessed	Maturity & Quality
c1.7	*Legal documentation of the capture site(s) has been planned or obtained*	Assessed	• The GrønGas Vrå facility is already operational, and compliant with Danish safety of workplace environment regulations. • The existing facility has obtained an Environmental Assessment Permit, and a request	Puro Environmental and Social Safeguards Grøn Gas Vraa.pdf; Environmental assessment permit for expancio of Grøn Gas.pdf;	Required to be assessed	Maturity & Quality

			for an amendment to this permit has been submitted in October 2024 to allow the establishment of a CO_2 capture and compression unit linked to the existing upgrading facility.	Reassessment of envirnm.approval Grøn Gas Vraa.pdf; Draft decision on non-environmental assessment Grøn Gas.pdf; Draft Supplement to environmental approval Grøn Gas Vraa.pdf; Screening of Establichment of CO_2 liquif. Grøn Gas Vraa.pdf		
C2	**For biogenic CO_2: Planned biomass source(s) is(are) eligible**	**Passed**				
C2.1	*Biomass feedstock has been categorised (i.e. origin and type) in accordance with the latest version of the Puro Biomass Sourcing Criteria*	Passed	Biomass feedstocks can and have been classified according to Puro's Biomass Sourcing Criteria. The identified categories include: Category B. Sorted food waste and assimilated, Category E. Animal waste, Category J: Food agricultural crop, and Categories K and L. In-field & Non-field agricultural residues.	Biomass Types and Origin List, Grøn Gas, version 1.0.xlsx; Biomass overview, Grøn Gas Vraa.pdf	Required to be passed	Technical eligibility
C2.2	*Biomass feedstock sustainability and traceability can be demonstrated to the level required by the Puro Biomass Sourcing Criteria*	Assessed	Biomass data records capture supplier and origin data and all biomass feedstock received by the facility are certified under EU REDIII. The data record provided demonstrates that sufficient data can be collected for Categories B and E. For Categories J, K, and L, additional evidence will be required to demonstrate biomass sustainability and traceability, as per Puro's Biomass Sourcing Criteria.	Biomass Types and Origin List, Grøn Gas, version 1.0.xlsx; Biomass overview, Grøn Gas Vraa.pdf	Required to be assessed	Technical eligibility
C2.3	*Ecological leakage relating to the use of biomass feedstock is minimal*	Assessed	• For biomass feedstock sourced from agricultural activities (Categories J, K, L), ecological leakage is expected to be minimal due to the sustainability requirements listed in the Biomass Sourcing Criteria that must be met. Meeting these requirements demonstrates that the impacts of biomass sourcing has minimal impacts on nearby ecosystems. • Ecological leakage is not relevant for the biomass feedstock classified as waste (Category B and E).	Biomass Types and Origin List, Grøn Gas, version 1.0.xlsx; Biomass overview, Grøn Gas Vraa.pdf	Required to be assessed	Technical eligibility
C2.4	*Market and activity shifting leakage relating to the use of biomass feedstock is minimal or addressed*	Assessed	The biomass feedstock described for each category are wastes and residues that were already being digested at the facility prior to the installation of	Biomass Types and Origin List, Grøn Gas, version	Required to be assessed	Maturity & Quality

			the carbon capture and storage process. Therefore, market and activity shifting leakage is expected to be minimal.	1.0.xlsx; Biomass overview, Grøn Gas Vraa.pdf		
c2.5	*Sourcing of biomass is secured (e.g. letters of intent, contracts)*	Assessed	Although no contracts or letters of intent were provided, records of biomass supplied were provided. These suppliers are expected to continue supplying biomass to the facility.	Biomass Types and Origin List, Grøn Gas, version 1.0.xlsx	Not required	Maturity & Quality
c3	**Planned CO_2 logistics (processing, transport, intermediary storage) are technically sound**	**Passed**				
c3.1	*Full logistics chain (processing, transport, and intermediary storage) has been identified*	Passed	The captured and liquefied CO_2 will be temporarily stored at the GrønGas Vrå facility before being transported via specialized trucks to Esbjerg Harbor. There, the transported CO_2 will be pumped into intermediate storage and mixed with CO_2 from other biogenic sources. Finally, the CO_2 will be shipped across the North Sea to the retired Nini oilfield for permanent underground storage.	Project Description Grøn Gas Vraa.pdf; Description of the logistic chain Grøn Gas Vraa.pdf	Required to be passed	Technical eligibility
c3.2	*Properties of the CO_2 stream to be transported are compatible with the logistics chain*	Assessed	• The CO_2 stream captured and liquefied at the GrønGas Vrå facility is expected to comply with the storage operator's requirements. • Throughout transport, CO_2 will be maintained in its liquid form to ensure compatibility with the entire logistics chain. This includes specialized trucks with pressurized tanks or cryogenic containers for delivery to the intermediate storage at Esbjerg Harbor, followed by shipment in specialized vessels equipped with insulated tanks.	Project Description Grøn Gas Vraa.pdf	Required to be assessed	Maturity & Quality
c3.3	*Legal documentation of the logistics chain has been planned or obtained*	Assessed	• CO_2 transport is classified similarly to hazardous waste, requiring compliance with Danish safety standards for cryogenic materials. The CO_2 supplier is expected to partner with a specialized transport operator and obtain the necessary legal permits, e.g. transportation license. • The logistics chain is also expected to secure an Integrated Environmental Approval (IEA) for intermediate storage.	Project Description Grøn Gas Vraa.pdf; Description of the logistic chain Grøn Gas Vraa.pdf; Puro Environmental and Social Safeguards Grøn Gas Vraa.pdf	Required to be assessed	Maturity & Quality
c3.4	*CO_2 transport logistics is secured (e.g. letters of intent, contracts)*	Assessed	Different transport solutions are being evaluated with support from selected transport providers, balancing cost and low-emission options. The final decision is expected in the first half of 2025.	Project Description Grøn Gas Vraa.pdf; Description of the logistic chain Grøn Gas Vraa.pdf	Not required	Maturity & Quality

c4	**Planned CO_2 storage site(s) is(are) eligible**	**Passed**				
c4.1	*One or more options for eligible CO_2 storage sites have been identified and are meant solely for permanent storage (no enhanced hydrocarbon recovery)*	Passed	• The designated CO_2 storage site is part of Project Greensand, located in a retired oil field within the Danish part of the North Sea. The permanent storage tank is located approximately 1,700 meters below the seabed. • The supplier confirmed that the storage site will not be utilized for any enhanced hydrocarbon recovery, as it is prohibited by law.	Project Description Grøn Gas Vraa.pdf; Description of the Storage Site Operator.pdf	Required to be passed	Technical eligibility
c4.2	*Robust legal framework of the storage site jurisdiction(s) has(have) been demonstrated*	Assessed	The storage site is located in the North Sea under Danish jurisdiction. Denmark, a member state of the European Economic Area (EEA) Agreement, is a priori recognized for its robust legal framework supporting the environmentally safe geological storage of carbon dioxide.	Project Description Grøn Gas Vraa.pdf	Required to be assessed	Technical eligibility
c4.3	*Relevant permits for the injection and storage of geological CO_2 have been planned or obtained*	Assessed	• The storage site operator has expertise in subsurface CO_2 storage and already operates under licenses from the Ministry of Climate, Energy, and Utilities. • Permit for this specific CO_2 Removal project requires approval of the Plan for Development & Operation (PDO) under the Subsoil Act (LBK nr 1461 af 29/11/2023). The PDO, covering emergency plans, vessel unloading, and CO_2 injection, is in its final approval stage and will soon be adopted. Danish Energy Agency (DEA) approval is expected in June 2025.	Project Description Grøn Gas Vraa.pdf; Description of the Storage Site Operator.pdf; Puro Environmental and Social Safeguards Grøn Gas Vraa.pdf	Required to be assessed	Maturity & Quality
c4.4	*Experimental/Computational procedures to characterize the storage site(s) have been identified, in progress, or completed*	Assessed	No specific information has been provided yet; however, the storage site is a retired oilfield and is expected to have been characterized. For the audit, confirmation that the storage site is suitable for permanent geological storage of CO_2 shall be provided.	Project Description Grøn Gas Vraa.pdf; Description of the Storage Site Operator.pdf	Required to be assessed	Maturity & Quality
c4.5	*Storage site for CO_2 is secured (e.g. letters of intent, contracts)*	Assessed	No specific information has been provided yet; however, given the project's advanced stage, the storage site is expected to be secured once the PDO is approved.	Project Description Grøn Gas Vraa.pdf; Description of the Storage Site Operator.pdf	Not required	Maturity & Quality
c5	**Additionality is demonstrated**	**Passed**				

c5.1	*Carbon additionality to the baseline*	Passed	Without the project, there would be no CO_2 removals, as the biomethane plant currently release biogenic CO_2 generated from the anaerobic digestion of organic waste directly into the atmosphere.	Project Description Grøn Gas Vraa.pdf; Puro Additionality v1.9.pdf; Production Facility Definition and Baseline Scenario Grøn Gas Vraa.pdf	Required to be passed	Technical eligibility
c5.2	*Financial additionality*	Passed	Carbon removal credits are necessary to offset the substantial capital and operational expenses associated with CO_2 capture, transport, and storage. Without this revenue stream, the Supplier indicated that internal rate of return would fall short of attracting the necessary investment.	Project Description Grøn Gas Vraa.pdf; Puro Additionality v1.9.pdf; Production Facility Definition and Baseline Scenario Grøn Gas Vraa.pdf	Required to be passed	Technical eligibility
c5.3	*Regulatory additionality*	Passed	There are no legal mandates in Denmark requiring CCS implementation, and existing subsidies are inadequate to fund the project.	Project Description Grøn Gas Vraa.pdf; Puro Additionality v1.9.pdf; Production Facility Definition and Baseline Scenario Grøn Gas Vraa.pdf	Required to be passed	Technical eligibility
c6	**Environmental and social safeguards**	**Passed**				
c6.1	*Stakeholder consultations have been planned or conducted*	Assessed	• Stakeholder consultations have already been conducted, including biogas producers, storage and transportation partners, regulatory bodies, and local communities. • Ongoing feedback and grievance mechanisms that will be implemented must still be clearly described for the Audit, ensuring that stakeholders can continue to submit feedback about CO_2 removal activities even after the end of the stakeholder consultation.	Project Description Grøn Gas Vraa.pdf; Puro Stakeholder Engagement Report Grøn Gas Vraa.pdf	Required to be assessed	Maturity & Quality
c6.2	*Applicable regulations for the geological storage activity have been identified*	Assessed	BioCarb Solution ApS has identified relevant EU and Danish regulations governing the environmental and social impacts of the geological storage activity—including CO_2 capture, transport, and storage.	Puro Environmental and Social Safeguards Grøn Gas Vraa.pdf	Required to be assessed	Maturity & Quality
c6.3	*Environmental and social permits, assessments, and other **statutory** documentation have been identified, planned, or obtained*	Assessed	BioCarb Solution ApS has confirmed that permits, including environmental approvals, transportation licenses, and storage site certifications, have been obtained. These environmental and social permits will need to be provided for the Audit.	Project Description Grøn Gas Vraa.pdf; Puro Environmental and Social Safeguards Grøn Gas Vraa.pdf	Required to be assessed	Maturity & Quality

c6.4	*Environmental and social safeguards assessment has been planned, drafted, or conducted*	Assessed	Environmental and social safeguard assessment was conducted for the CO_2 removal project, detailing established non-discriminatory recruitment practices and inclusive workplace policies, protocols to ensure a safe working environment and mitigate occupational health and safety hazards, as well as identification and management strategies for all environmental impacts associated with the project operations.	Puro Environmental and Social Safeguards Grøn Gas Vraa.pdf	Required to be assessed	Maturity & Quality
c6.5	*Risk assessment has been planned, drafted, or conducted*	Assessed	Risk assessments have not been submitted yet for all stages of the CO_2 removal project. These are expected to be conducted for the Audit.	Project Description Grøn Gas Vraa.pdf; Puro Environmental and Social Safeguards Grøn Gas Vraa.pdf	Required to be assessed	Maturity & Quality
c7	**Facility has monitoring, reporting, and LCA capabilities or tangible plans for it**	**Passed**				
c7.1	*A monitoring plan has been drafted*	Passed	A monitoring plan of the end-to-end removal activity has been drafted, identifying the system boundaries/scope of the project (i.e., CO_2 capture, transport, and storage) and listing the main parameters needed to be monitored and calculated during operations was provided. No mention of monitoring data for ensuring social and environmental safeguards, verifying that the surrounding region of the geological storage activity won't be endangered or otherwise negatively affected by the capture, transport, injection and storage activities.	MMRV plan.pdf	Required to be passed	Maturity & Quality
c7.2	*A monitoring plan specific to the storage site(s) has been drafted*	Assessed	No monitoring plan specific to the storage site was provided. However, the PDO is expected to cover some elements that would be appropriate for such plan.	MMRV plan.pdf	Required to be assessed	Maturity & Quality
c7.3	*An LCA model specific to the facility's operation is prepared in line with the monitoring plan*	Assessed	No preliminary LCA model was submitted.	LCA description Grøn Gas Vraa.pdf	Not required	Maturity & Quality
c8	**Leakage sources (excluding those from the use of biomass feedstock) are determined**	**Passed**				
c8.1	*Leakage sources are identifiable, have been identified, and/or characterised*	Passed	The potential leakage sources have been identified, and mitigation plans for each source have been provided.	Leakage Determination Grøn Gas Vraa.xlsx;	Required to be passed	Technical eligibility/ Maturity & Quality

				Leakage determination Capture site.pdf		
c8.2	*Procedures to assess mitigated leakage sources have been identified, planned or applied*	Assessed	A preliminary leakage assessment has been conducted, which will be updated when new information becomes available. Mitigation of identified leakage sources will be evidenced by Environmental Impact Assessments, and by securing renewable energy from the national grid that meets Puro requirements.	Leakage Determination Grøn Gas Vraa.xlsx	Required to be assessed	Technical eligibility/ Maturity & Quality
c8.3	*Procedures to quantify non-mitigated leakage sources have been identified, planned or applied*	Assessed	The preliminary leakage assessment indicates that identified leakage sources will be mitigated.	Leakage Determination Grøn Gas Vraa.xlsx	Required to be assessed	Technical eligibility/ Maturity & Quality
c9	**Facility has likely co-benefits and positive SDG impacts**	**Passed**				
c9.1	*Facility-specific co-benefits have been identified*	Assessed	The project will bring about local employment opportunities and economic benefits through the operation and maintenance of biogas plants, CO_2 capture facilities, transportation systems, and offshore storage infrastructure. These jobs contribute to the local economy, providing stable, long-term employment in rural and coastal regions in Denmark.	Project Description Grøn Gas Vraa.pdf	Required to be assessed	Maturity & Quality
c9.2	*Facility-specific SDG targets or indicators have been identified*	Assessed	No specific indicators were selected.	Puro SDG Report GrønGas.pdf	Required to be assessed	Maturity & Quality
c9.3	*NDCs commitments, or other net-zero plans relevant to Article 6 of the Paris Agreement of the host country have been identified*	Assessed	The Supplier has assessed Denmark's climate objectives. The Climate Act commits Denmark to a 70% reduction in emissions by 2030. It is understood that the geological storage of carbon is aligned with relevant frameworks and should contribute to the country's overall emission reduction goals.	Evaluation of Host country climate objectives.pdf	Not required	Maturity & Quality
c10	**Facility team has access to relevant knowledge and skills**	**Passed**				
c10.1	*Relating to CO_2 capture*	Assessed	Specialized operators will be responsible for each stage of the BECCS/Bio-CCS Facility, bringing specialised skills and experience for each stage of the supply chain.	Trade registry extract BioCarb Solution.pdf; Trade registry extract GrønGas Vrå.pdf; Trade registry extract Intermediate	Not required	Maturity & Quality
c10.2	*Relating to CO_2 logistics (transport)*				Not required	Maturity & Quality

c10.3	*Relating to geological storage of CO_2*			Storage.pdf; Trade registry extract Storage operator Ineos.pdf	Not required	Maturity & Quality
c10.4	*Relating to monitoring and emission accounting*				Not required	Maturity & Quality