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AUDIT REPORT
VALIDATION OF THE GHG-SINK PROJECT

"FOREST ADAPTATION PROJECT LUCKAITZTAL"

AFTER

ISO 14064-2:2019

Report No: 8003045593- 22/051

Date: 22.02.2023

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Standard	ISO 14064-2:2019(E)
Category	Validation
Scope	Forestry - reforestation (14)

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Other	Boscor Gruppe GmbH Pina Technologies GmbH
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Auditor	Martin Opitz (Team Lead, Subject Matter Expert) Alexandra Nuske (Technical Review)

Summary:

The project "Forest Adaptation Project Luckaitztal" was prepared according to the requirements of the ISO standard 14064-2 and is audited according to the same by TÜV NORD CERT GmbH.

Pina Technologies GmbH carried out a project to quantitatively evaluate the greenhouse gas (GHG) sink performance of a forest adaptation in the private forests of the Forstbetrieb Luckaitztal operation. The forest adaptation pursues the goal of converting existing pure stands (92% pine) into bio-diverse and structurally diverse mixed stands and achieving an increase in the total standing volume through the long-term establishment of a stand with a large number of stems.

To calculate the development of wood volume achieved by forest adaptation measures, the software library Tree Growth Open Source Software (TreeGrOSS), developed by the Northwest German Forest Research Institute (NW -FVA), was used.

The quantification of the GHG sink performance is based on internationally recognized standards and calculation methods such as the Intergovernmental Panel on Climate Change (IPCC) and the Verified Carbon Standard (VCS).

The forest adaptation of the Forstbetrieb Luckaitztal is implemented by Boscor Gruppe GmbH.

Risks and uncertainties were taken into account in the project as far as possible and appropriate measures were taken.

Eleven (11) non-conformities were found during the validation.

The validation showed that the project meets the requirements of ISO 14064-2.

In 30 years of operation, a GHG sink capacity of 29,061.05 tCO2 (gross) can be provided

As a result of the validation, TÜV NORD CERT GmbH confirms:

☒ all calculations comply with internationally recognized methods,

☒ there are comprehensible data bases for the conservative determination of the GHG sink performance,

☒ the GHG sink performance was calculated appropriately.

TÜV NORD CERT GmbH hereby confirms that the forest adaptation of a pine-dominated age-class forest to bio-diverse and structurally diverse mixed stands on 632.40 ha of forested land area of the Forstbetrieb Luckaitztal is expected to produce the following GHG sink performance:

Period under review: **2022 - 2052**

GHG sink performance: **29,061.05 tCO2 e* (Contribution Claim)**

*The report confirms the calculated GHG sink performance of the project. It is possible to trade the CO2 certificate with the purpose of a contribution claim and to communicate the financing and the positive GHG sink performance of the project as a buyer.

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1 INTRODUCTION

1.1 Objective

The objective of the validation is to verify the project documentation and implementation on site by an independent third party (TÜV NORD CERT GmbH). In particular, the following are validated:

- The requirements of ISO 14064-2:2019(E);
- Relevant customary laws and regulations

Validation is considered necessary to provide stakeholders with quality assurance on the quantified GHG sink performance.

1.2 Scope and criteria

The scope of the validation is understood as a thorough, independent and objective evaluation of the project design and its implementation. Since the project uses NW-FVA's growth simulator Tree Growth Open Source Software (TreeGrOSS), which has not been explicitly tested, the objective assessment includes, in particular, verification of compliance and due diligence with regards to the assumptions made and sources used in the application of the TreeGrOSS model, the justification of additionality, the environmental impact and monitoring plan included in the project report, and other evidence to ensure that the ISO 14064-2 project activity meets all relevant and applicable ISO 14064-2 criteria.

The information contained in the project description and supporting documents were reviewed and evaluated against the requirements of ISO 14064-2 and of the calculation methods used.

The validation is based on the information provided to TÜV NORD CERT GmbH and on the terms of the contract. TÜV NORD CERT GmbH cannot be held liable by any legal entity for issuing a validation opinion based on false or misleading information provided to it during the validation. Validation is not intended to provide advice to project participants. However, indicated requests for clarification and/or corrective action may provide input to improve the project design.

1.3 Level of assurance

The validation and verification were performed in order to

☒ obtain an appropriate level of assurance.

☐ obtain a limited level of assurance.

1.4 Project Summary

Pina Technologies GmbH undertook a project in the forest of Forstbetrieb Luckaitztal in Brandenburg to quantitatively assess the GHG sink performance of forest adaptation measures.

Forest adaptation pursues the goal of converting the existing age class forest (92% pine) into bio-diverse and structurally diverse stands. The forest adaptation is initiated/implemented by two silviculturally relevant activities:

- Initial stock reduction with the objective of increasing individual tree stability and creating space/light for the establishment of an additional tree layer and thus structural diversification of forest stands.
- Promotion and protection of natural rejuvenation and active supplementation through artificial introduction (sowing or planting) of climate-resilient tree species, such as oak, beech and Douglas fir for the ecological diversification of forest stands.

In addition to the measures outlined above, the goal is to be achieved by intensifying hunting.

Taking into account project-specific parameters, the project results in a potential additional GHG sink of 29,061.05 tCO2e over a project life of 30 years (2022 - 2052) on a forest area of 632.40 ha.

2 VALIDATION PROCESS

2.1 Methods and criteria

Validation is performed in the following steps:

- Contract review
- Designation of the VAL team
- Preliminary review of the project documents
- VAL Planning
- On-site inspection
- Background research, interviews, document review
- Preliminary reporting
- Resolution of all non-conformities
- Final reporting
- Technical review
- Release of the VAL

Table 2.1: Validation procedure

Topic	Time
Assignment to VAL	05.05.2022
On site office / meeting on documentation	21. & 27.06.2022
On-site inspection / inspection of the stocks	18. & 19.07.2022
Remote office / meeting on management plan	September 2022
Remote office / discussion of the model	16.11.2022
List of deviations	November 2023
Final report created	09.02.2023
Technical review	13.02.2023
Final Approval	22.02.2023

2.2 Appointment of the team

Table 2-2: VAL Team

	Name	Company	Function [1]	Qualification Status [2]	Scheme competence [3]	Technical competence [4]	Verification competence [5]	Host country Competence	On-site visit
☒ Mr. ☐ Ms.	Martin Opitz	ETE	TL	LA	☒	14.1	☒	☒	☒
☐ Mr. ☒ Ms.	Alexandra Nuske	TN CERT	FA/TR [B]	SA	☒	14.1	☒	☒	-

[1] TL: Team Lead; TM: Team Member, TR: Technical review; OT: Observer-Team, OR: Observer-TR; FA: Final approval

[2] GHG Auditor Status: A: Assessor; LA: Lead Assessor; SA: Senior Assessor; T: Trainee; TE: Technical Expert

[3] GHG auditor status (at least Assessor)

[4] As per S01-MU03 or S01-VA070-A2 (suchas 1.1, 1.2, ...)

[5] In case of verification projects

[A] Team Member: GHG auditor (at least Assessor status), Technical Expert (incl. Host Country Expert or Verification Expert), not ETE

[B] No team member

2.3 Document verification

The following documents were reviewed for audit:

The submitted project description: "Forest Adaptation Project Luckaitztal"

Additional methods and tools used:

- TreeGrOSS (**Tree Gr**owth **O**pen **S**ource **S**oftware)
- IPCC Intergovernmental Panel on Climate Change; Good Practice Guidance for Land Use, Land Use Change and Forestry, 2003.
- VCS AFOLU Non-Permanence Risk Tool, v4.0 19 September 2019
- VCS Methodology 'VM0012 Improved Forest Management in Temperate and Boreal Forests (LtPF), v1.2.
- Climate Action Reserve. (April 09, 2021). Forest Protocol Version 5.0.

All project-specific references used by the GHG project proponent to prepare the project document were also reviewed. A complete list can be found in the Appendix of this report.

2.4 Interviews

Interviews to clarify and verify facts and to hear further views on the project were conducted according to ISO 14064-2 requirements. A topic summary with the interview partners can be found in Table 2-4.

Table 2-4: Interview partners and topics

Interview partners and organizations	Topics
Project Developer: • Florian Fincke (CPO) • Jonas Kerber (CTO) • Dr. Jan Hansen (Dept. Forest Growth NW-FVA) • Tobias Elflein (Boscor Gruppe)	- Description and implementation of the project - Technical details, feasibility, design, duration - Monitoring system - Financial aspects - Deviations - Duration (crediting period) - Project start - Ownership - Baseline - Additionality - Monitoring/Supervision - Stakeholder consultation (if necessary) - Responsibilities and tasks of the project owner - Double counting - Calculations - Environmental aspects/social aspects - Editorials in the GHG Report

A list of all interview partners can be found in chapter 5 'References'.

2.5 On-site visit

The on-site inspection on July 18 and 19, 2022, consisted of a forest tour of the project area, including comparison with inventory data based on expert opinion, a visit to inventory points and comparison of measurement data (”Kluppliste”, measurement list)/05/, demonstration of the monitoring system based on remote sensing data, and exemplary discussion of the "Canopy Height Model" as well as an assessment of hunting requirements and browse impact.

2.6 Closure of non-conformities

Significant deviations identified during the validation are either treated as CARs, CLs or FARs.

A **Corrective Action Request (CAR)** is made when:

- Errors were made in assumptions, during application of the methodology, or project documentation, that have a direct impact on project results, or
- Requirements deemed relevant to the validation of the project have not been met.

A **Clarification Request (CL)** is made when information is insufficient, unclear, or not transparent enough to determine whether a requirement has been met.

A **Forward Action Request (FAR)** is made when certain issues related to project implementation should be reviewed during the initial verification.

A detailed list of CARs, CLs, and FARs posed during this validation is provided in the next section 3 of this report.

3 RESULT OF THE VALIDATION

This section summarizes the assessments and findings from the desk review of the GHG Report, the on-site inspection, the interviews, and the evaluation of the supporting documents. Table 3-1 includes a summary of all identified CARs, CLs, and FARs.

Table 3-1: Overview of all CARs, CLs and FARs

No.	Topic / Chapter	CAR	CL	FAR
3.1	Project design	1	0	0
3.2	Application of the methodology	7	2	0
3.3	Environmental impact	1	0	0
3.4	Stakeholder comments	0	0	0
-	**Total**	**9**	**2**	**0**

3.1 Project design

3.1.1 Project type and scope, technologies and measures used, and suitability of the project.

Description

The Forstbetrieb Luckaitztal is located within the boundaries of the municipality of Luckaitztal in the district of Oberspreewald-Lausitz in the state of Brandenburg in Germany. The project area is defined by maps, coordinates/01,02,03/ or other unique descriptions. The project area covers 632.40 ha of forest land.

The forestry company follows an age class management consisting mainly of pine (92%) with very homogeneous structures. On 186.0 ha (approx. 29%) of the area an understory exists with a stocking ratio of at least 0.1 and a dbh (diameter at breast height) < 7cm.

The project aims to convert the existing age class forest into bio- and structurally diverse stands. The forest adaptation is initiated/implemented by two silviculturally relevant activities/04 IM04/:

- Initial stock reduction with the objective of increasing individual tree stability and creating space/light for the establishment of another tree layer and thus structural diversification of forest stands.
- Promotion and protection of natural rejuvenation and active supplementation through artificial introduction (sowing or planting) of climate-resilient tree species, such as oak, beech and Douglas fir for the ecological diversification of forest stands.

In addition to the measures outlined above, the goal is to be achieved by intensifying hunting.

The Boscor Gruppe GmbH[/200/], a forestry service provider that forests according to the principles of natural forest management, has been commissioned to implement the project[/201,IM04/].

The forest owner contractually commits to implement the defined project activities and to adapt the project activities to new requirements resulting from changes in the project methodology[/04/].

Key data of the project are shown in the table below:

Table 3.1-1a.: Project characteristics

Item	Data			
Project name	Forest adaptation project Luckaitztal			
Project owner	Pina Technologies GmbH			
Other	Forest owner [redacted] Boscor Gruppe GmbH			
Specific project categories	☐ Mega project (> 10^6 t CO_{2eq} / a) ☐ Project (≤ 10^6 t CO_{2eq} / a) ☒ AFOLU project ☐ Grouped project ☐ No specific project category			
GHG Report (PD)	Draft:	Ver. 0.1 02.06.2022 (submitted)	Final:	Ver. 0.3 20.01.2023
Methodology	• TreeGrOSS (**Tree Gr**owth **O**pen **S**ource **S**oftware) • IPCC Intergovernmental Panel on Climate Change; Good Practice Guidance for Land Use Change and Forestry, 2003 • VCS AFOLU Non-Permanence Risk Tool, v4.0 19 September 2019			
Project start	01.01.2022			
Crediting period	☒ Project duration (30 y)			
Start of crediting period	01.01.2022 until 31.12.2052			

The key parameters of the project are in Table 1-2:

Table 3.1-1b: Technical data of the project

Parameter	Unit	Value
Project area	ha	632.40
Start stock (upper storey only)	Vfm/ha	256
Increment	m3/ha	9.3

Table 3.1-1c: Parameters confirmed in the course of validation

Parameter	Unit	Value
Project area (forest land)	ha	632.40
Start stock (upper storey only)	Vfm/ha	256

Parameter	Unit	Value
Growth model	n.a.	Reference 202
Growth formulas	n.a.	Reference 07
Root to shoot ratio	n.a.	Reference 51
Biomass to carbon ratio	n.a.	Reference 53
Carbon to CO2 by molar mass ratio	n.a.	Reference 208
Calculation of above-ground biomass of trees	n.a.	Reference 50
Climate-related mortality	n.a.	Reference 204 and 205

Results

☐ No CARs, CLs or FARs have been identified

☒ The following deviations were identified:

Final evaluation

The project type and scope was carried out as part of the on-site inspection consisting of a broad forest inspection and the presentation of the communal forests by the forest ranger.
The calamity areas were inspected and the tree species mix and protective measures of the previous reforestation measures were explained in order to obtain a comprehensive picture of the initial situation of the communal forests after the beetle calamities.

☒ The project design and its description are in accordance with the applicable ISO 14064-2 criteria.

3.1.2 Project owner

Description

Pina Technologies GmbH

Results

☐ No CARs, CLs, or FARs were identified

☒ Subsequent deviations were identified:

Finding: 3	**Requirement 6.2 h)**		
Classification	☒ CAR	☐ CL	☐ FAR

Description of finding *Describe the finding in unambiguous style; address the con- text (e.g. section)*	Chap. 3.8: • Please justify why the state of Brandenburg is listed as a project actor • Please complete the contact information in table 7
Corrective Action #1 *This section shall be filled by the PP. It shall address the cor- rective action taken in details.*	• The federal state of Brandenburg is no longer managed as a project actor. • The contact information was completed
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure, additional correc- tive action and DOE assess- ments (#2, #3, etc.) shall be added.*	• The state of Brandenburg was removed • Added detailed contact information
Conclusion *Tick the appropriate checkbox*	☐ To be checked during the first verification ☐ Additional action should be taken (finding remains open) ☒ The finding is closed

Final evaluation

The GHG sink project "Forest adaptation project Luckaitztal" covers 632.4 ha of forest land/01/. TÜV NORD CERT GmbH was commissioned by Pina Technologies GmbH in agreement with the forest owner to validate the project according to ISO 14064-2/04/.

3.1.3 Project start

Description

Project start date is 01.01.2022.

Results

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final evaluation

The start of the project is defined in the project description/GHG-R/ and in the project contract between the project owner and the forest owner/04/. January 2022 or 01.01.2022 is set as the project start date. The date coincides with the cut-off date of the Forest Plan/01/, which is the basic planning document for the project-specific management.

☒ The project start date information is consistent with the applicable ISO 14064-2 criteria.

3.1.4 Project duration

Description

According to the project description, the project duration is 30 years and ends on 31.12.2052 (2022 - 2052)

Results

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final evaluation

With the binding project contract the forest owner commits himself to implement the defined project activities/04;Annex1.9/. At the end of the project period (year 26 - 30), the entire project area shall have a maximum share of pine trees of 65%, a stock of >270 m³/ha in the upper storey and a second tree layer.

☒ The project duration as well as its description are in accordance with the applicable ISO 14064-2 criteria.

3.1.5 Project scope and estimated GHG emission reduction or -GHG removal

Description

For the period of 30 years, a net removal of anthropogenic GHG emissions through the biological sink effect of bio- and structurally diversified, and thus climate-resilient, forests of 29,061.05 t CO_2 equivalents is calculated.

Results

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final evaluation

The calculation of the GHG emission reduction is based on the treatment-dependent simulation of growth in the project area. The simulation used is a validated growth model from NW - FVA[/202/]. The "example" calculation provided by the project owner and the associated formulas[/06-07,08/] were understood in their entirety. This means that all calculation steps necessary for the estimation of the sink performance were retraced step by step. The necessary care in the selection of scientific sources (see chapter 5) and raw data[/05/] could be confirmed exemplarily.

☒ Project scope and estimated GHG emission reductions or GHG emission removals are in accordance with the applicable ISO 14064-2 Criteria.

3.1.6 Project activities

Description

The project activity consists of the targeted adaptation of an existing age class forest (92% pine) into bio-diverse and structurally diverse stands. The forest adaptation will be initiated/implemented by two silviculturally relevant activities:

- Initial stock reduction with the objective of increasing individual tree stability and creating space/light for the establishment of another tree layer and thus structural diversification of forest stands.
- Promotion and protection of natural rejuvenation and active supplementation through artificial introduction (sowing or planting) of climate-resilient tree species, such as oak, beech and Douglas fir for the ecological diversification of forest stands.

In addition to the measures outlined above, the goal is to be achieved by intensifying hunting.

Results

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final evaluation

The project activity was assessed within the framework of an on-site inspection consisting of a forest walk of the project area by an expert. The expert evaluated the inventory data, assessed inventory points, compared measurement data (”Kluppliste”, measurement list)[/05/], and assessed the hunting conditions and the browsing impact. Subsequently, the planned silvicultural measures were discussed with the project implementer [/201,IM04/] and the tree species mixtures aimed for the end of the project period were explained. In this way, a comprehensive picture of the initial situation and the project measures of the project could be obtained.

The planned mix of tree species and the establishment of a second layer over the entire area are expected to significantly increase the resilience of the forestand correspond to good forestry practice.

☒ The project activity is in accordance with ISO 14064-2 criteria.

3.1.7 Project location

Description

The Forstbetrieb Luckaitztal operation of the present project is located within the boundaries of the municipality of Luckaitztal in the district of Oberspreewald-Lausitz in the state of Brandenburg in Germany. The project area is defined by maps, coordinates/01,02,03/ or other unique descriptions. The project area covers 632.40 ha of forest land.

Project location details are provided in Table 3-1.7:

Table 3-1.7: Project location

No.	Project location
Country:	Brandenburg / Germany
Region:	District of Oberspreewald-Lausitz / districts of Bronkow, Gosda, Lipten, Schöllnitz
Contact address:	Pina Technologies GmbH Vogelanger 7 82319 Starnberg Germany
Latitude:	51°40'07.52" northern latitude
Longitude:	13°56'36.99" eastern longitude

Results

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final evaluation

In the course of the site visit, the location of the project was verified using a GPS device/100/, as well as the map material provided/02,03,05/. The existing map material from the forest management plan/01/ indicates the unmistakable location of the project area.

☒ The specified project location could be confirmed.

3.1.8 Conformity with applicable laws, statutes and other regulatory frameworks

Description

The forest is managed in accordance with legal requirements/30.31/.

Results

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final evaluation

The project aims at converting single layer age class forests (92% pine) into climate resilient mixed stands. The measures described in 3.1.6 are in line with the recommendations of the German Association of Forest Research Institutes (DVFFA)/101/.

☒ The project is in compliance with applicable laws, statutes and other regulatory frameworks.

3.1.9 Forest property

3.1.9.1 Proof of ownership

Description

Mr. [redacted] ownership of the forest areas of the Forstbetrieb Luckaitztal operation is adequately documented via the forest management plan/01/ and via the forest management by the Boscor Gruppe GmbH/IM04/

Results

☒ No CARs, CLs, or FARs were identified.

☐ The following deviations were identified:

Final evaluation

Mr. [redacted] ownership of the forest areas of the Forstbetrieb Luckaitztal are sufficiently documented via the forest management plan/01/ and via forest management by the Boscor Gruppe GmbH/IM04/

.

☒ The ownership of the forest land has to be sufficiently proven.

3.1.9.2 Emissions trading programs and other mandatory limits

Description

The Federal Republic of Germany, as a so-called Annex I country, counts the change in the carbon stock in the forest in its national carbon footprint, regardless of ownership. Thus, a generation of certificates from forest climate protection projects for the voluntary market is not possible, because there is a risk of double counting/DEHSt/.

Results

☒ No CARs, CLs, or FARs were identified.

☐ The following deviations were identified:

Final evaluation

The report confirms the calculated GHG sink performance of the project. It is possible to trade the CO2 certificate with the purpose of a contribution claim and to communicate the financing and the positive GHG sink performance of the project as a buyer.

☒ The project is in accordance with ISO 14064-2 requirements regarding this issue.

3.1.9.3 Participation in other GHG programs

Description

Not applicable to the project.

Results

☒ No CARs, CLs, or FARs were identified.

☐ The following deviations were identified:

Final evaluation

After reviewing relevant registries (Verra, GS, CDM) for GHG projects, no participation in other GHG programs could be confirmed.

☒ The project is in accordance with ISO 14064-2 requirements in relation to this question

3.1.9.4 Further applied for or received compensation payments for environmental services

Description

Not applicable to the project, the project refers only to the productive forest area.

Results

☒ No CARs, CLs, or FARs were identified.

☐ The following deviations were identified:

Final evaluation

None.

☒ The project is in accordance with ISO 14064-2 requirements in relation to this question

3.1.9.5 Rejection by other GHG programs

Description

Not applicable to the project.

Results

☒ No CARs, CLs, or FARs were identified.

☐ The following deviations were identified:

Final evaluation

The audit team has no indication of rejection by any other GHG program. No corresponding reference can be found on the common project databases.

☒ The project is in accordance with ISO 14064-2 requirements in relation to this question

3.1.10 Additional information relevant to the project

3.1.10.1 Eligibility criteria for group projects

Description

Not applicable to the project.

Results

☒ No CARs, CLs, or FARs were identified.

☐ The following deviations were identified:

Final evaluation

None.

☐ The project is in accordance with ISO 14064-2 requirements regarding this issue.

3.1.10.2 Leakage management for AFOLU projects

Description

Leakage (displacement) can be ruled out, since the withdrawal volume in the baseline scenario does not differ significantly from the withdrawal volume in the project scenario.

Results

☒ No CARs, CLs, or FARs were identified.

☐ The following deviations were identified:

Final evaluation

Leakage can be ruled out based on project activity. The project will not result in more thinning elsewhere.

☒ The project is in accordance with ISO 14064-2 requirements regarding this issue.

3.1.10.3 Sensitive economic data

Description

The forest owner only wants to be mentioned by name, no information about the postal address was given.

Results

☒ No CARs, CLs, or FARs were identified.

☐ The following deviations were identified:

Final evaluation

Details of the forest owner's address are available to the audit team; publication for the purpose of auditing is not necessary.

☒ The project is in accordance with ISO 14064-2 requirements regarding this issue.

3.1.10.4 More information

Description

Not applicable to the project.

Results

☒ No CARs, CLs, or FARs were identified.

☐ The following deviations were identified:

Final evaluation

None.

3.2 Application of the method

3.2.1 Title and references

Description

The quantification of sink performance is based on internationally recognized standards and calculation methods such as the Intergovernmental Panel on Climate Change (IPCC) and the Verified Carbon Standard (VCS) as well as the validated growth simulator of the Northwest German Forest Research Institute (NW -FVA). To be mentioned are:

- TreeGrOSS (**Tree Gr**owth **O**pen **S**ource **S**oftware)
- IPCC Intergovernmental Panel on Climate Change; Good Practice Guidance for Land Use, Land Use Change and Forestry, 2003.
- VCS AFOLU Non-Permanence Risk Tool, v4.0 19 September 2019
- VCS Methodology 'VM0012 Improved Forest Management in Temperate and Boreal Forests (LtPF), v1.2.

Results

☒ No CARs, CLs, or FARs were identified.

☐ The following deviations were identified:

Final evaluation

The audit team confirms the clear naming and application of the above methods, corresponding "tools" and the TreeGrOSS model. All formulas and models used correspond to good forestry practice in relation to forest climate protection projects.

☒ The title and references of the method were given correctly and in accordance with ISO 14064-2 requirements.

3.2.2 Applicability

Description

For eligibility, the project sponsor defines criteria that must be met. A project must fulfill the following criteria:

1) These are exclusively forest areas in the sense of valid laws and no areas which are assigned to a protection category (NSG, FFH, etc.);
2) Ownership is clearly defined as a private forest or a forest owned by a corporation;
3) The project implementation is based on comprehensible forestry expertise;

4) Project measures are not allowed to be 100% publicly funded;
5) No participation in GHG programs
6) There is a legal contract between the project owner and the forest owner;
7) Tree species and mixture ratios are in accordance with regional scientific recommendations, a minimum number of mixed tree species in fixed proportions is achieved, stand diversity must be shown to increase, and a rejuvenation layer/second layer must be present by the end of the project period;
8) Conformity with relevant laws is ensured

All eight requirements are met.

Results

☒ No CARs, CLs, or FARs were identified.

☐ The following deviations were identified:

Finding: 4	**Requirement 6.2 l)**		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	Chap. 3.12: • Please clarify if the listed requirements are "general" or "project specific". • The listed requirements related to "Ecological Diversity" are significantly lower than the target tree species compositions listed in Section 3.2, Table 1: "Choice of Tree Species Compositions of Target Condition Based on Site Cluster". *(5-7 tree species vs. "at least three (3) future secured, site-appropriate tree species on the site with at least 5% basal area").* • Please clarify which obligations have to be fulfilled by the project implementer.		
Corrective Action #1 *This section shall be filled by the PP. It shall address the corrective action taken in details.*	• It was clarified that the listed requirements are generally applicable • This also explains the difference between the requirements in chapter 3.2 (project-specific) and chapter 3.12 (general). • For the "Ecological Diversity" requirement, it was clarified that the "Project Sponsors" are responsible for compliance.		
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.*	• It is still unclear whether the requirements apply nationwide or to the state of Brandenburg ("according to Geoportal Brandenburg"). • The background of the diverging statements was clarified (general vs. project-specific) • The obligations of the project implementers were clearly emphasized		

Corrective Action #2 *This section shall be filled by the PP. It shall address the corrective action taken in details.*	It was clarified that the conditions of participation apply to all pro- jects. The Geoportal Brandenburg was consulted for this project to check the general requirement for the specific project area ("The project area is not located in any national park, natural monument, nature reserve, biosphere reserve, protected landscape area, nature park or Natura 2000 area")
DOE Assessment #2 *The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.*	Clarification was provided that the requirement applies generally.
Conclusion *Tick the appropriate checkbox*	☐ To be checked during the first verification ☐ Additional action should be taken (finding remains open) ☒ The finding is closed

Final evaluation

During the site visit, it was established that the project area is a forest/100/ and that the land does not fall under the above mentioned protection categories and it is private forest/203/.

By the project contract, the forest owner confirms the listed requirements regarding the absence of public funding and non-participation in GHG programs and commits to implement the project activities listed in the project contract/04,Annex 1.9/.

The forest management plan and the attached map material/01,02,03/ serve as evidence of the ownership of the forest areas.

The Boscor Gruppe GmbH,/IM04/, which is entrusted with the management, fulfills the required, demonstrable expertise/200/.

☒ The applicability criteria are met and in accordance with ISO 14064-2 requirements,

3.2.3 Project boundary

Description

The project area is defined by maps, coordinates/01,02,03/ or other unique descriptors. The project area includes 632.40 ha of forest area.

Results

☒ No CARs, CLs, or FARs were identified.

☐ The following deviations were identified:

Final evaluation

In the course of the site visit, the location of the project was verified using a GPS device[/100/], as well as the submitted map material[/02,03,05/]. The available map material from the forest management plan[/01/] indicates the unmistakable location of the project area.

☒ The project boundary is clearly defined and documented in accordance with the method and ISO 14064-2 requirements

3.2.4 Baseline scenario

Description

The baseline scenario is the continuation of the current management as a predominantly single stratum age class forest following a consistently economically and commercially oriented forestry.

Results

☐ No CARs, CLs, or FARs were identified.

☒ The following deviations were identified:

Finding: 5	**Requirement 6.4**		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	Ch 5.1: The climatic changes have led to fundamental changes in the forestry sector, especially since 2018. Please clarify whether the basic assumption that an age class forest will be the predominant management form in the state of Brandenburg can also be assumed after the end of the project period (30 years) or whether, in view of the expected changes, an "interim revision" of the assumed baseline scenario is advisable.		
Corrective Action #1 *This section shall be filled by the PP. It shall address the corrective action taken in details.*	It was clarified that this assumption will be reviewed each time the project is monitored and adjusted if significant changes occur.		

DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.*	The assumptions for the assumed baseline scenario were specified for the state of Brandenburg. This means that the statement that the forest is predominantly managed in the sense of an age class forest applies as specific for the federal state in question. During each verification, it must be checked whether significant changes have been observed in respect to management practices of the forest. If this is the case, the simulation of the baseline scenario must be adjusted accordingly. This is necessary to take into account the expected changes in management during a transition from an age-class forest to a permanent forest in the state of Brandenburg.
Conclusion *Tick the appropriate checkbox*	☐ To be checked during the first verification ☐ Additional action should be taken (finding remains open) ☒ The finding is closed

Final evaluation

The results of the Bundeswaldinventur (Federal Forest Inventory)/206/ support the assumption of the outlined baseline scenario in the state of Brandenburg, whose forests are largely managed in age-class forests and whose share of "near-natural" or "very near-natural" stocking in the main stand with a total of 15% is the lowest in the federal comparison.

☒ The baseline scenario was determined in accordance with the method and ISO 14064-2 requirements.

3.2.5 Additionality

Description

Three approaches are used to determine additionality for the project:

1) Statutory additionality: Statutory additionality is given if the project measures are voluntary, i.e. not required by law.
2) Performance-based additionality: Performance-based additionality is given if the project contributes to a higher GHG reduction due to its implementation compared to the continuation of the previous management form.
3) Financial Feasibility and Additionality: With the inclusion of the prescribed yield rate/01/, both scenarios are financially feasible. The baseline scenario results in lower costs due to lower complexity of the planned measures for the upcoming equalization period (10 years). Financial feasibility of the baseline scenario and the additionality of the project, are therefore ensured.

All assumptions are met by the project.

Results

☐ No CARs, CLs, or FARs were identified.

☒ The following deviations were identified:

Finding: 10	**Requirement 6.4**		
Classification	☐ CAR	☒ CL	☐ FAR
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	Ch 9 In terms of determining project additionality, the project owner refers to a methodology in the Climate Action Reserve; this calls for a justification of the financial feasibility for the scenarios. Please clarify the financial feasibility of the scenarios.		
Corrective Action #1 *This section shall be filled by the PP. It shall address the corrective action taken in details.*	It was clarified that in both scenarios, extraction is assumed to occur according to the prescribed yield rate over the life of the project (see Chapters 5.1 and 5.2), this is in line with the German standard and is therefore considered feasible. In addition, it was pointed out that public sources indicate that these assumptions are conservative. In addition, the financial additionality of the GHG project was examined in more detail.		
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.*	An additional chapter was added and the financial feasibility of both scenarios was proven. Thus, the requirements of the "tool" used are met. The information is in line with good forestry practice in the national context.		
Conclusion *Tick the appropriate checkbox*	☐ To be checked during the first verification ☐ Additional action should be taken (finding remains open) ☒ The finding is closed		

Final evaluation

The approaches used by the project owner to determine additionality have recently found their way into the determination of additionality /41,42/ and can thus be considered current common practice.

Since the project area has no protection status/203/ and is without exception a commercial forest, the legislator does not impose any restrictions on the management of the forest beyond those stipulated in the Landeswaldgesetz (State Forest Act)/30/. This means that the implementation of the project and thus the adaptation to a bio-diverse and structurally diverse mixed stand is not prescribed by law and is therefore voluntary.

When comparing the developments of the GHG reservoir in the baseline scenario to the project scenario, the higher stock volume in the project scenario shows that the project scenario achieves a higher GHG reservoir/06/. This means that the implementation of the project proposal scores above the performance level in terms of GHG reduction of the baseline scenario.

☒ The project is additionally in compliance with ISO 14064-2 requirements.

3.2.6 Quantification of GHG emission reductions and removals

3.2.6.1 Quantification of the sink performance of the baseline scenario (baseline reductions)

Description

The basis for quantifying the GHG sink performance is the raw data of a sample inventory (tree species, top height, diameter) obtained in the course of forest management.

The simulation of the development of the inventory volume over the course of the project duration is carried out with the help of the TreeGrOSS growth simulator of the NW-FVA. The starting point in year 0 of the project is based on a "digital twin" created from the above mentioned inventory data.

In the growth simulator, the treatment assumptions underlying each scenario (baseline scenario vs. project scenario) are defined in terms of i) tree species composition, ii) thinning [type of tree selection and setting of target density], iii) end-use [target diameter and prescribed yield], and iv) introduction of new trees [seeding, planting, natural rejuvenation].

This is followed by the actual simulation for the entire project duration. Here, four processes are simulated:

1) "Density-related mortality" as a function of available/required light conditions.

2) "Climate-induced mortality" as a function of tree species requirements in combination with regional climate models.

3) "Tree growth" based on site-specific growth formulas.

4) Application of the treatment defined in the introduction in form of "end-use, management, natural rejuvenation".

To compensate for random effects in the growth and mortality algorithms, a Monte Carlo simulation with 10 to 100-fold repetitions is performed.

The subsequent calculation of aboveground biomass is performed using the simulated tree volumes based on functions used in the German GHG reporting and accepted by the IPCC.

For the calculation of the total living tree biomass, the aboveground biomass is added to the belowground biomass, which is calculated using the root to shoot ratio.

The amount of GHG in the reservoir is calculated by multiplying the living biomass by the carbon fraction and the specific molecular weight of CO2.

Results

☐ No CARs, CLs, or FARs were identified.

☒ The following deviations were identified:

Finding: 1	**Requirement 6.2 f)**		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding *Describe the finding in unambiguous style; address the con- text (e.g. section)*	Ch 3.6: • Please list the correct expected GHG sink [CO_2] performance. • Please list all GHG sources, sinks and reservoirs (SSRs) considered in Table 6.		
Corrective Action #1 *This section shall be filled by the PP. It shall address the corrective action taken in details.*	• The value for the expected GHG sink was corrected. • A new table has been added for the baseline scenario as well as for the project scenario, showing the expected GHG sink depending on the forest products		
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.*	• The value for the expected GHG sink was corrected. • New tables have been included for the baseline and project scenarios, showing the expected GHG sink for each forest product. Furthermore, an explanatory text has been added.		
Conclusion *Tick the appropriate checkbox*	☐ To be checked during the first verification ☐ Additional action should be taken (finding remains open) ☒ The finding is closed		

Finding: 6	**Requirement 6.7**		
Classification	☒ CAR	☐ CL	☐ FAR

Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	Chap. 8.1: Please provide information on the achieved accuracy of the forest inventory on which the project is based (operating level). Section 8.2 "Management": ● Please specify "finding was confirmed by expert opinion". ● Please justify and provide evidence why a 75% probability of survival can be assumed in the project scenario and a 25% probability in the baseline scenario. Chap. 8.2 TreeGrOSS forest simulation. ● Please justify why the selected model is applicable to the project and whether it needs revision due to the project duration of 30 years and expected changes in growth behavior due to climatic changes. Chap. 8.3.2: ● Please justify why the sigmoid function of the Thünen Institute is applicable to the project and whether it requires revision within the project life of 30 years. ● Please adjust the term for $LB_{Ober,t}$ as the current term "Living aboveground tree biomass for year t [kg]" is misleading.
Corrective Action #1 *This section shall be filled by the PP. It shall address the corrective action taken in details.*	● Information was provided on the accuracy achieved in the forest inventory ● In section 8.2 "Management", the sources on the subject of rejuvenation have been specified and additional sources were added ● It was demonstrated why TreeGrOSS is applicable for the project and pointed out, that all parameters used are subject to continuous monitoring and are adjusted if necessary. ● Demonstrated why the sigmoid function is applicable to the project and indicated that all parameters used are subject to continuous monitoring and adjustment if necessary. ● The term $LB_{Ober,t}$ was adjusted

DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.*	Chap. 8.1. The achieved accuracy of the forest management plan on which the project is based was specified (3.99%). The accuracy is below the threshold (5%) of comparable projects of int. recognized CO2 standards Chap. 8.2. "Management". ● The "expert opinion" was specified: the responsible employee of the NW-FVA whose growth model is used. ● Scientific studies have been cited/provided to help justify the assumption of long-term secured natural rejuvenation in the project scenario (75%) and in the baseline scenario (25%). The percentages are expert assumptions. ⇨ Please clarify to what extent the assumption can be justified/supported by the figures presented in Table 6. ⇨ Please specify "occasional" hunting Chap. 8.2 TreeGrOSS Forest Simulation The Degenhardt 2007 study does not provide any information on the arguments listed, the pdf is partly difficult to read, and the Schröder 2004 study is not available. It is unclear to what extent Albrecht,Kohlne & Nagel are able to get below 5% in terms of the dbh and tree heights. Chap. 8.3.2: ● After consultation with the Tuv, it was decided that the GHG sink from forest products would not be accepted because it would be necessary to trace the sale or the end customer of the forest (wood) products. This means that a kind of “chain of custody” documentation would be necessary. ● The term was adjusted, "removed aboveground biomass vs. live removed aboveground biomass".

Corrective Action #2 *This section shall be filled by the PP. It shall address the corrective action taken in details.*	Assumptions on natural rejuvenation (section 8.2. "Management") • Table 6 has been removed as the contents are not relevant to the project description. Justification: The rejuvenation inventory presented here is qualitative and the data quality is not sufficient as input for the simulation. • In the absence of qualitative data, the penetration of rejuvenation is calculated in the simulation with a factor based on expert opinion depending on the hunting intensity (described in chapter 8.2, Management). It was clarified that the factor will be reviewed in the monitoring of the project. • The term "occasional hunting" was specified according to the cited source (without hunting plan) Chapter 8.2 TreeGrOSS Forest Simulation • It was shown that there were only insignificant deviations in the modeling of height and diameter increments relevant for biomass quantification when using the TreeGrOSS simulation software in different parts of Germany (<5%), by referring to studies (e.g. Albrecht, Kohnle, & Nagel, 2011) • It is also shown how the deviation and random defects are compensated for by the simulation, which is repeated often-times (Monte Carlo simulation) and carried out on entire stands (thousands of trees). Forest product sinks • Forest products were removed from the calculation and the graphs and tables in chapter 3.6 were adjusted accordingly. • Chapter 8.3.2 GHG reservoir of forest products has been removed. All references to forest products elsewhere in the document have been removed.
DOE Assessment #2 *The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.*	Chap. 8.2 "Management“ • Table 6 has been removed. • It has been clarified that "occasional hunting" equates to "without a hunting plan". Chap. 8.2 TreeGrOSS forest simulation The studies were submitted subsequently. It was clarified that the simulation in relation to the pure volume calculation falls under the maximum deviation value of 5% even without a re-parameterization. Furthermore, it was clarified that due to the large number of simulations (several thousand trees) and various repetitions (10 to 100 times / Monte Carlo simulation) outliers are leveled and a reliable result is achieved. Chap. 8.3.2: The forest product sink has been removed.
Conclusion *Tick the appropriate checkbox*	☐ To be checked during the first verification ☐ Additional action should be taken (finding remains open) ☒ The finding is closed

Final evaluation

Initially, it must be noted that the changes in stand volume are determined in the course of the project using the Tree Growth Open Source Software (TreeGrOSS) of the NW-FVA. The model was not explicitly tested in the course of the audit, nevertheless it can be assumed based on scientific publications that the model originally developed for the Northwest German region provides reliable results also for other areas of Germany without re-parameterization, i.e. within a threshold value of 5%[/43/]. This assumption is additionally supported by the use of a large number of single trees in the simulation (several thousand trees) as well as various repetitions (Monte Carlo simulation), since in this way outliers are leveled and random effects are excluded.

The treatment assumptions used for each scenario correspond to the expected management, as defined in the forest management plan[/01/] and the project contract[/04,IM04/] ,and are in line with the expected positive effect of intensified hunting on natural rejuvenation[/44/].

The simulation steps listed above are part of the TreeGrOSS software package except for step 3.

The simulation of "climate-induced mortality" is based on scientific knowledge related to tree species-specific survival models[/45/] and regional climate models[/204,205/].

The adaptation of the simulated tree volumes into aboveground biomass is done analogously to the German GHG reporting[/50,206/], the calculation of the total biomass and the subsequent quantification of the GHG reduction is done with the help of widely recognized conversion factors[/51/] (root to shoot ratio) or analogously to recognized calculation methods.

In summary:

- The quantification of the sink performance is carried out with due diligence.
- The model used and all simulation steps as well as the conversion factors/assumptions used were taken from scientific publications, and the applicability of the model in other areas of Germany was confirmed.
- Random effects are compensated for by applying a Monte-Carlo simulation
- The simulation step extended by Pina Technologies GmbH is comprehensible and adds expected climate effects to the existing model.
- All sources used are publicly available and comprehensible.

☒ The quantification of baseline emissions is consistent with the methodology and ISO 14064-2 requirements.

3.2.6.2 Quantification of the sink performance of the project scenario (project reductions)

Description

The quantification of the sink performance of the project scenario is analogue to that described under 3.2.6.1 Quantification of the sink performance of the project scenario, taking into account other treatment assumptions. See above for details.

Results

☒ No CARs, CLs, or FARs were identified.

☐ The following deviations were identified:

Final evaluation

For the evaluation see explanations under 3.2.6.1

3.2.6.3 Leakage quantification

Description

Leakage can be ruled out, since the volume removed in the baseline scenario does not differ significantly from the volume removed in the project scenario.

Results

☒ No CARs, CLs or FARs have been identified in this context

☐ The following finding(s) have been addressed:

Final evaluation

Leakage can be ruled out based on project activity. The project will not result in more thinning elsewhere.

☒ The quantification of leakage emissions is consistent with the methodology and ISO 14064-2 requirements.

3.2.6.4 Summary of GHG emission reductions and reductions

Description

The quantification of the gross climate impact results from the changes in GHG reductions in the project scenario minus the changes in GHG reductions in the baseline scenario.

The net climate impact is quantified after subtracting a risk buffer of 18.5%.

For the project duration of 30 years, this results in a net CO2 sink of 23,689.42 tCO2 e.

Results

☐ No CARs, CLs, or FARs were identified.

☒ The following deviations were identified:

Final evaluation

The exemplary Excel calculations/08/ submitted by the project developer were comprehended in their entirety. Thus, all calculation steps necessary for estimating the GHG sink performance were followed step by step and checked for plausibility. No discrepancies were found.

Furthermore, the baseline GHG sink performance at project start (335.41 tCO2e/ha) calculated by the project developer was compared to a baseline GHG sink performance at project start (322.87 tCO2e/ha) calculated using the "real stock (topsoil only)" data provided in the forest inventory and publicly available conversion factors (BEF/52/wood density[pine]/209/). There is a difference of 3.74%, which is explained by i) different volume functions in the forest management and the TreeGrOSS model, ii) the stock data from the forest management which refer to the upper storey only, and iii) the use of conversion factors which were exclusively applied to the dominant tree species pine (92%).

☒ The quantification of baseline emissions is consistent with the methodology and ISO 14064-2 requirements.

3.2.6.5 Statistical uncertainties in the calculation of emissions

Description

The basis for calculation are the results of the forest inventory, which are based on the results of a sampling method inventory. The sampling method inventory has been carried out in accordance with the standard national procedures. The inventory has a sampling error of 7.83% in relation to the stock/01/.

For the simulation of growth in TreeGrOSS, generally accepted growth formulas are applied/07/.

Results

☒ No CARs, CLs, or FARs were identified.

☐ The following deviations were identified:

Final Assessment

The sampling errors are within the internationally permissible range/53/ of 10%. With regards to forest growth, recognized growth formulas are used.

☒ The consideration of statistical uncertainties is consistent with the method and ISO 14064-2 requirements.

3.2.7 Method deviation

Description

The method has been developed specifically for the project, so there are no deviations.

Results

☒ No CARs, CLs, or FARs were identified.

☐ The following deviations were identified:

Final evaluation

The method has been developed specifically for the project, so there are no deviations. Parameters used correspond to the common practice of internationally recognized standards/IPCC//GS/CDM/

☒ No deviations were found.

3.2.8 Monitoring plan

3.2.8.1 Data and parameters available at the time of validation (fixed parameters)

Description

The project uses the following fixed parameters:

- Function for the potential growth in height/202/
- Function for diameter (dbh) increase/202/
- Volume function/202/
- Crown width function/202/
- Function for position of crown/202/
- Side Index function/202/
- Side Index Height function/202/
- Maximum tree density function/202/

- Climate-induced mortality/204,205/.
- Proportion of surviving rejuvenation plants in the baseline/44/
- Proportion of surviving rejuvenation plants in the project scenario/44/
- Biomass to carbon ratio/53/
- Carbon to CO2 by molecular mass ratio/208/
- Root to shoot ratio/51/
- Aboveground biomass from trees/50/

Result

☐ No CARs, CLs, or FARs were identified. The following deviations

☒ were identified:

Finding: 8	**Requirement 6.10**		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	Ch. 11 general: • Please list clearly all parameters intended for monitoring. Please provide information on: parameters, description of the method used, frequency, monitoring equipment, QA/QC, if necessary justification of the selected method/frequency/etc. (see also note below). • Please list all fixed parameters individually. • Please provide clear information on which monitoring is already clearly defined and which is "planned" (cf. chap. 11.3) *Note: You may want to orient yourself to the presentation/listing of the "fixed" and the "to be monitored" parameters to the parameter-boxes required under VERRA, or required in the corresponding Project Design Document templates.*		
Corrective Action #1 *This section shall be filled by the PP. It shall address the corrective action taken in details.*	• A table has been added listing the variable and fixed parameters with details of source, frequency, monitoring, etc.		
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.*	The variable and fixed parameters were listed as well as parameters that could still play a role in the further course of the project, should the technical prerequisites for this fall into place.		
Conclusion *Tick the appropriate checkbox*	☐ To be checked during the first verification ☐ Additional action should be taken (finding remains open) ☒ The finding is closed		

Final evaluation

The values were assessed for their applicability in the context of the project. They originate from the forestry context and correspond to good professional practice.

☒ The parameters used are consistent with good forestry practice and are appropriate for use by the project.

3.2.8.2 Data and parameters to be monitored (variable parameters)

Description

The following parameters must be monitored by the project:

- Number of trees per stand/01/
- dbh of the trees/01/
- Tree type/01/
- Age of trees/01/
- Tree height/01/
- Crown width [via remote sensing data, at the time of validation still in the "proof of concept"/testing stage, i.e. not yet relevant for quantifying the sink performance of the current project].
- Uniform height curve/01/
- Diameter generation/regression [via remote sensing data, at the time of validation still in the "proof of concept"/testing stage, i.e. not yet relevant for quantifying the sink performance of the current project].

Results

☐ No CARs, CLs, or FARs were identified.

☒ The following deviations were identified:

See Finding 8 in Section 3.2.8.1

Final Assessment.

The parameters and values were assessed for their applicability in the context of the project. The parameter and values correspond to good professional practice and are recorded during forest walks, regular forest management practices, and the evaluation of remote sensing data by the district forester, forest manager, and project owner. The monitoring measures are sufficient to regularly monitor the status of the project.

☒ The monitoring plan is in accordance with ISO 14064-2 requirements.

3.2.8.3 Applicability and suitability of the monitoring procedure

Description

Survey methods commonly used in forestry practice will be used for monitoring.

Results

☐ No CARs, CLs, or FARs were identified.

☒ The following deviations were identified:

Finding: 7	**Requirement 6.9**		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	Ch. 10: Please clarify whether and to what extent the forecast developments of the forest after 10, 20 and 30 years could be confirmed by the project implementer based on experience / numbers of.		
Corrective Action #1 *This section shall be filled by the PP. It shall address the corrective action taken in details.*	• The related paragraph has been removed from this chapter as it does not relate to data management • Expert opinions on the assumptions of the management or the parameters in the simulation were obtained (see chap. 8.2.)		
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.*	The relevant passage has been removed, so the deviation is no longer valid.		
Conclusion *Tick the appropriate checkbox*	☐ To be checked during the first verification ☐ Additional action should be taken (finding remains open) ☒ The finding is closed		

Finding: 9	**Requirement 6.12**		
Classification	☐ CAR	☒ CL	☐ FAR
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	Ch 13: Please clarify if, when and how often the project will be subject to verification by an independent third party.		
Corrective Action #1 *This section shall be filled by the PP. It shall address the corrective action taken in details.*	• It was clarified that verification is planned halfway through as well as at the end of the project period.		

DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.*	It was clarified that the project would be verified by an independent third party at mid-term and at the end of the term. It is unclear how any deviations from the ex-ante projection will be handled by ex-post verification.
Corrective Action #2 *This section shall be filled by the PP. It shall address the corrective action taken in details.*	• The procedure for dealing with deviations as a result of verification was described in chapter 13. • In the case of an initial overestimation of GHG emission reductions, certificates from the risk buffer are used • In case of initial underestimation of GHG emission reductions, additional credits are issued
DOE Assessment #2 *The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.*	Deviations in the course of verifications lead to corresponding deduction of credits from the risk buffer (ex-ante overestimation) or additional credit issuance (ex-ante underestimation).
Conclusion *Tick the appropriate checkbox*	☐ To be checked during the first verification ☐ Additional action should be taken (finding remains open) ☒ The finding is closed

Final evaluation

Survey methods commonly used in forestry practice will be used for monitoring. The monitoring measures are sufficient to regularly monitor the status of the project.

☒ The project activity is in accordance with the application criteria of the Monitoring method

3.2.8.4 Responsibilities for monitoring

Description

Pina Technologies GmbH[/IM01,IM02/] is responsible for the data collection of the GHG sink project.

Result

☐ No CARs, CLs, or FARs were identified. The following deviations

☒ were identified:

Finding: 11	**Requirement 6.11**		
Classification	☐ CAR	☒ CL	☐ FAR

Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	Ch 12 Please clarify why documentation is not required at this time to demonstrate compliance, especially since Ch. 11.6 provides information on the management of all project related data.
Corrective Action #1 *This section shall be filled by the PP. It shall address the corrective action taken in details.*	It was clarified that the documentation obligation as described in chapter 11.6 will be followed.
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.*	Clarification about the documentation requirement was added.
Conclusion *Tick the appropriate checkbox*	☐ To be checked during the first verification ☐ Additional action should be taken (finding remains open) ☒ The finding is closed

Final evaluation

Pina Technologies is a start-up company consisting of environmental scientists, software developers, and data scientists who are highly qualified to perform the monitoring activities and documentation duties entrusted to them.

☒ Monitoring responsibilities are defined in accordance with ISO 14064-2 requirements.

3.3 Environmental and social criteria

Description

In principle, it can be assumed that the project areas managed by Boscor Gruppe GmbH/200,IM04/ meet the legal requirements with regard to environmental issues.

The management of the project areas according to the principles of the Arbeitsgemeinschaft Naturgemäße Waldwirtschaft (Working Group for Natural Forest Management)/201/ and the contractually stipulated forest adaptation to a bio-diverse and structurally diverse mixed stand/04/ corresponds to the generally accepted recommendations for the adaptation of forests to climate change/101/.

Following the VCS AFOLU Non-Permanence Risk Tool, v4.0 19 September 2019, any risks to the project were analyzed and no serious risks were identified. The risk buffer of 18.5% is derived with 15% from the project longevity risk calculation formula prescribed in the aforementioned tool. The remaining 3.5% results from an analysis of the natural risks (storms/fires/insects)/10/.

Result

☒ No CARs, CLs, or FARs were identified.

☐ The following deviations were identified:

Finding: 2	**Requirement 6.2 g)**		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding *Describe the finding in unambiguous style; address the con- text (e.g. section)*	Chap. 3.7: Please clarify whether there are more up-to-date figures with regard to the assessment of "natural risks". Background: the climatic changes have led to fundamental changes in the forestry sector, especially since 2018, and this applies in particular to the fire risk in the State of Brandenburg in the years 2021/22		
Corrective Action #1 *This section shall be filled by the PP. It shall address the corrective action taken in details.*	• The sentence structure has been changed to make clear that the estimate of natural risk refers to current scientific sources • The figures for fire risk have been updated to the status of 2021		
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assess- ments (#2, #3, etc.) shall be added.*	• Additional explanation has been added to clarify that the risk assessment is based on current scientifically/statistically verified data. • For the fire risk, the most recent figures were also taken into account.		
Conclusion *Tick the appropriate checkbox*	☐ To be checked during the first verification ☐ Additional action should be taken (finding remains open) ☒ The finding is closed		

Final evaluation

The project areas are managed by the Boscor Gruppe GmbH. The risk assessment procedure developed by the VCS was carried out correctly and comprehensibly.

☒ The project activity is in compliance with ISO 14064-2 requirements related to environmental and social sustainability.

3.4 Comments from stakeholders

Description

The project takes place in a private forest where no external parties are involved. For the reasons mentioned above, no consultations with stakeholders were carried out.

Result

☐ No CARs, CLs, or FARs were identified.

☒ The following deviations were identified:

Final evaluation

Since the project is implemented in a private forest, its forest areas don't fall under protected areas[/203/], and the project measures correspond to generally accepted recommendations for the adaptation of forests to climate change[/101/], the argumentation of the project owner can be followed

☒ The public consultation process complies with the requirements of ISO 14064-2.

4 VALIDATION CONCLUSION

Pina Technologies GmbH has commissioned TÜV NORD CERT GmbH to carry out the validation of the "Forest adaptation project Luckaitztal" on the forest areas of the Forstbetrieb Luckaitztal in the district of Ostspreewald-Lausitz in the federal state of Brandenburg in Germany with regard to the requirements of ISO 14064-2.

The project activity includes active forest adaptation from pure stands (92% pine) to bio-diverse and structurally diverse mixed stands and to achieve an increase in total standing volume through the long-term establishment of a dense understory.

The review of the project design documentation and additional documents related to the baseline scenario and the monitoring methodology, as well as the subsequent background investigation, have provided TÜV NORD CERT GmbH with sufficient evidence to verify that the specified criteria have been met.

In detail, the conclusions can be summarized as follows:

- An appropriate level of assurance was applied.
- All data and information used for ex-ante calculation of emission reductions are projected and / or hypothetical in nature.
- The project is in compliance with all relevant host country legislation. If applicable, its GHG claims.
- The additionality of the project is justified in the GHG report/GHG-R/.
- The monitoring plan is transparent and appropriate.
- The calculation of the projects emission reductions is done in a transparent manner so that the calculated emission reductions of 29,061.05 t CO2e can be achieved.

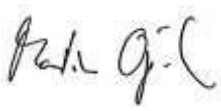
The conclusions of this report indicate that the project, as described in the GHG report/GHG- R/, meets all criteria applicable to validation under ISO 14064-2 without qualifications or limitations.

As a result of the validation, the auditor confirms that the GHG emission reductions are appropriately calculated without material misrepresentations. TÜV NORD CERT GmbH hereby confirms that the project can achieve the following emission reductions in the above-mentioned reporting period:

Period	Project-related sink performance	Project-related emissions	Leakage	Buffer 18,5%	Net CO2e sink capacities
01.01.2022-31.12.2052	29,061.05 tCO2 e	0	0	5,376 tCO_2e	29,061.05 tCO2 e
Net CO2e sink services for the period: 01.01.2022-31.12.2052					29,061.05 tCO2 e*

*The report confirms the calculated GHG sink performance of the project. It is possible to trade the CO2 certificate with the purpose of a contribution claim and to communicate the financing and the positive GHG sink performance of the project as a buyer.

Munich, 22.02.2023



TÜV NORD JI/CDM Certification Program
Val/Ver Team Leader
Martin Opitz

Hanover, 22.02.2023

TÜV NORD JI/CDM Certification Program
Final Approval
Alexandra Nuske

5 REFERENCES

Table 5-1: Documents provided by the project participant

Reference	Document
/GHG-R/	Waldumbauprojekt_Luckaitztal_V0.1 Waldumbauprojekt_Luckaitztal_V0.2 Waldumbauprojekt_Luckaitztal_V0.3 Waldumbauprojekt_Luckaitztal_V0.4
/01/	Forest management plan; planning period 01.01.2022 to 31.12.2031
/02/	Forest land map with parcels
/03/	Forest base map with sampling plot grid
/04/	Project contract between Pina Technologies GmbH and forest owner [redacted]
/05/	Collection of materials for site visit; 18.07.2022: o Coordinates of inventory plots o Site mapping o Aerial photos/ inventory map o Overview age groups o Kluppliste (measurement list)
/06/	Results GHG sink
/07/	Formulas TreeGrOSS
/08/	Example TreeGrOSS
/09/	App monitoring concept
/10/	Natural risks; risk assessment analogue to VCS AFOLU Non-Per- manence Risk Tool, v4.0 19 September 2019
/30/	Federal Forest Act (BWaldG)
/31/	Forest Act of the State of Brandenburg (LWaldG)
/40/	Duda. (October 27, 2006). Vergleich forstlicher Managementstrategien. Georg-August-Universität Göttingen.
/41/	VCS Methodology for Afforestation, Reforestation and Revegetation Projects, Version 0.1, 17 December 2021

Reference	Document
/42/	Climate Action Reserve. (April 09, 2021). Forest Protocol Version 5.0.
/43/	Albrecht, A., Kohnle, U., & Nagel, J. (2011). Übertragbarkeit empirischer statistischer Waldwachstumsmodelle: Prüf- und Anpassungsverfahren anhand des Beispiels BWinProfür Baden-Württemberg. Allgemeine Forstund Jagdzeitung
/44/	Fuchs, Z., Vacek, Z., Vacek, S., & Gallo, J. (2021). Effect of game browsing on natural rejuvenation of European beech (Fagus sylvatica L.) forests in the Krušné hory Mts. (Czech Republic and Germany). Central European Forestry Journal, 166-180.
/45/	Brandl, Paul, Knoke, & Falk. (2020). The influence of climate and management on survival probability for. Forest Ecology and Management 458.
/50/	Riedel, & Gerald. (23. November 2016). Nationale Treibhausgasberichterstattung: Neue Funktionen zur Schätzung der oberirdischen Biomasse am Einzelbaum.
/51/	Wördehoff, Spellmann, Evers, Aydin, & Nagel. (2012). Kohlenstoffstudie Forst und Holz. Nordwestdeutsche Forstliche Versuchsanstalt.
/52/	IPCC Good Practice Guidance for LULUCF; TABLE 3A.1.10 DEFAULT VALUES OF BIOMASS EXPANSION FACTORS (BEFS).
/53/	CDM AR-TOOL14; Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities, version 04.2.
/53/	Diestel, & Weimar. (December 2014). Der Kohlenstoffgehalt in Holz- und Papierprodukten - Herleitung und Umrechnungsfaktoren. Thünen Institut.

Table 5-2: Background investigation and evaluation documents

Reference	Document
/100/	GPS records / 2022-07-18_07-18_14_42_09
/101/	Anpassung der Wälder an den Klimawandel Positionspapier des Deutschen Verbandes Forstlicher Forschungsanstalten (DVFFA)

Table 5-3: Websites used

Reference	Link	Organization
/200/	https://www.boscor.de/ges-branches/forestry-economy	*Boscor forestry*
/201/	https://www.anw-deutsch-land.com/	*Working group for natural forestry*
/202/	https://www.nw-fva.com/publish/soft-ware/treegross	*TreeGrOSS (Tree Growth Open Source Soft-ware)*
/203/	https://geoportal.branden-burg.de/en/cms/por-tal/start/map/32#	*Geoportal Brandenburg*
/204/	https://www.klimafol-genonline.com/	*Potsdam Institute for Climate Impact Research (PIK) e. V.*
/205/	https://geopor-tal.bgr.de/mapapps/re-sources/apps/geoportal/in-dex.html?lang=en#/geo-viewer?metada-taId=09ca3d99-e2ab-467c-8815-19b7e1c6eb09	*Geoportal of the Federal Institute for Geosciences and Natural Resources*
/206/	https://bwi.info/start.aspx	*Third Federal Forest Inventory (2012); Johann Hein- rich von Thünen-Institut, Federal Research Institute for Rural Areas, Forest and Fish- rei*
/206/	https://www-genesis.desta-tis.com/genesis//online?oper- ation=table&code=41261-0012&bypass=true&levelin-dex=0&lev-elid=1675871025536#abreadcrumb	*41261-0012: Damaged wood felling: federal countries, years, cause of felling, wood species groups, forest ownership types.*
/207/	https://gitlab.com/vochr/rbda-t	*Vonderach. (2022). rBDAT.*
/208/	https://www.ipcc.ch/publica-tion/good-practice-guidance-	*IPCC, Good Practice Guidance for Land Use, Land-Use Change and Forestry*

Reference	Link	Organization
	for-land-use-change-and-forestry/	
/209/	http://db.worldagroforestry.org/wd	*IGRA Database - Wood Density*
/210/	https://pina.earth/	*Pina Technologies Ltd.*
/DEHSt/	https://www.dehst.de/DE/startpage/startpage-node.html	*German Emissions Trading Authority*

Table 5-4: List of interviewees

Reference	MoI[1]		Name	Organization / Function
/IM01/	V	☒ Mr. ☐ Ms	Florian Fincke	Pina Technologies GmbH, CPO / Project Developer
/IM02/	V	☒ Mr. ☐ Ms	Jonas Kerber	Pina Technologies GmbH, CTO / Project Developer
/IM03/	T	☒ Mr. ☐ Ms	Dr. Jan Hansen	Dept. Forest Growth NW-FVA / Developer "Tree Growth Open Source Software Library (TreeGrOSS)".
/IM04/	T	☒ Mr. ☐ Ms	Tobias Elflein	Oberförster Boscor Gruppe GmbH, project implementer

[1)] Interview means: (telephone, e-mail, visit)