AUDIT REPORT
VALIDATION OF THE GHG-SEQUESTRATION PROJECT

"FOREST ADAPTATION PROJECT SCHLEGEL"

according to

ISO 14064-2:2019

Report No: 8003045594- 22/052

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Standard	ISO 14064-2:2019(E)
Category	Validation
Scope	Forestry – Improved Forest Management (14)

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Project Proponent	Forstbetrieb Luckaitztal
Other Entities involved	Boscor Gruppe GmbH Pina Technologies GmbH
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Summary:

The project "Forest Adaptation Project Schlegel" 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) reductions and removals of a forest conversion (Improved Forest Management) in the private forests of the Forstbetrieb Schlegel. The forest conversion pursues the goal of converting existing single layered pure stands (86% spruce) into bio-diverse and multi-layered mixed stands and achieving an increase in the total standing volume through the long-term establishment of an underlayer.

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 reductions and removals 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 Schlegel 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.

No Non-Conformities were identified in the course of the validation.

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

In a 30 year crediting period a GHG gross sink capacity of 33,358.65 tCO2 e can be achieved

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 confirms that the forest adaption of a spruce dominated even aged forest stand to a biodiverse and multi structured mixed forest stand **on 471.27 ha forested land of the Forstbetrieb Schlegel is expected to lead to the following GHG reduction and removal:**

Crediting Period: **2022 – 2052**

Emission reductions: **33,358.65 tCO_2 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.

Table of contents *Page*

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 validation scope is given as a thorough independent and objective evaluation of the project design and its implementation. Since the project the growth model Tree Growth Open Source Software (TreeGrOSS) which was developed by the NW-FVA and 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 included in the project description and supporting documents were assessed and evaluated against the requirements of ISO 14064-2 and the calculation methods used applied.

The validation is based on the information made available to TÜV NORD CERT GmbH and on contract conditions. 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

Indicate the level of assurance of the validation. The validation has been planned and organized to achieve a

☒ reasonable level of assurance

☐ limited level of assurance

1.4 Project Summary

Pina Technologies GmbH implemented a project in the forest of the Forstbetrieb Schlegel in Thüringen (Thuringia) to quantitatively assess the GHG reductions and removals to be achieved in the course of the of a forest conversion project.

Forest conversion pursues the goal of converting the existing single layered pures stands (86% spruce) into bio-diverse and multi-layered mixed stands. The forest conversion is initiated/implemented by two silvicultural 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 initiating the structural diversification of forest stands.
- Promotion and protection of natural regeneration 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 the forest stands.

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

Taking into account project-specific parameters, the project results in a potential additional GHG reduction and removal of 33,358.65 tCO2e over a project period of 30 years (2022 - 2052) on a forested area of 471.27 ha.

2 VALIDATION PROCESS

2.1 Methods and criteria

Validation is performed in the following steps:

- Contract review
- Appointment of team members and technical reviewers
- Desk review of the project description submitted by the client and additional suppoerint documents
- Validation planning
- On-site assessment
- Background investigation and follow-up interviews with personnel of the project developer and its contractors
- 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	n.a.
Final report issued	24.04.2023
Technical review	05. + 08.05.2023
Final Approval	08.05.2023

2.2 Appointment of the validation team

Table 2-2: Validation 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 Schlegel"

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 For- ests (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 inspection of the project area including the expert comparison of inventory data, a visit of inventory plots and expert comparison of measurement data (field sheets [”Kluppliste”])/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	0	0	0
3.2	Application of the methodology	0	0	0
3.3	Environmental impact	0	0	0
3.4	Stakeholder comments	0	0	0
-	**Total**	**0**	**0**	**0**

3.1 Project design

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

Description

The Forstbetrieb Schlegel is located within the boundaries of the administrative district Saale-Orla-Kreis and the corresponding subdistricts of Neundorf, Rodacherbrunn and Wurzach in the state of Thuringa in Germany. The project area is defined by maps, coordinates/01,02,03/ or other descriptions. The project area covers 471.27 ha of forested land.

The forest can be classified as even aged consisting mainly of spruce (86%) with very homogeneous structures. On 298.58 ha (approx. 63%) 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 even aged forest stands into bio- and structurally diverse forest stands. The forest conversion is initiated/implemented by two silvicultural 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 regeneration 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 manages forests according to the principles of nature-oriented forestry, 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 which may result 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 Schlegel			
Project owner	Pina Technologies GmbH			
Other	[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 31.10.2022 (submitted)	Final:	Ver. 0.2 24.01.2023 (08.03.2023) engl.
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	471.27
Start stock (upper layer only)	Vfm/ha	243
Increment	m3/ha	13.8

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

Parameter	Unit	Value
Project area (forested area)	ha	471.27
Start stock (upper layer only)	Vfm/ha	243

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

Result

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final Assessment

Project type and scope have been assessed during the onsite visit, consiting of an inspection of the forest stand, assessment of the forest management and discussion of the management activities planned.

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

3.1.2 Project owner

Description

Pina Technologies GmbH

Result

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final Assessment

The GHG sink project "Forest adaptation project Schlegel" covers 471.27 ha of forested 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/.

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

3.1.3 Project start

Description

Project start date is 01.01.2022

Result

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final Assessment
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 Management 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)

Result

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final Assessment
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 spruce trees of 70%, a standing volume of >280 m³/ha in the upper layer and a second tree layer on the total project area.

☒ The project start date information is consistent 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 sequestration of biologically and structurally diversified, and thus climate-resilient, forests of 33,358.65 t CO2 equivalents is calculated.

Result

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final Assessment
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 reproduced entirely. I.e. all calculation steps necessary for the estimation of the sink performance were reproduced step by step. The necessary due care in the selection of scientific sources (see chapter 5) and raw data/05/ could be confirmed exemplarily.

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

3.1.6 Project activities

Description
The project activity consists of the targeted conversion of existing even-aged forest stands (86% pine) into bio- and structurally diverse forest stands. The forest conversion will be initiated/implemented by two silvicultural 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 regeneration 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.

Result

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final Assessment
The project activity was assessed in the course of an on-site inspection consisting of a forest inspection of the project area including the expert comparison of inventory data, a visit of inventory plots and expert comparison of measurement data (field sheets [”Kluppliste”])/05/ and the assessment of the hunting conditions and corresponding browsing impact. Subsequently, the planned silvicultural measures were discussed with the project implementer/201,IM04/ and the tree species mixtures envisaged for the end of the project period were explained. By doing so a comprehensive overview of the initial situation and the project measures of the project could be obtained.

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

3.1.7 Project location

Description
The Forstbetrieb Schlegel is located within the boundaries of the administrative district Saale-Orla-Kreis in the state of Thuringia in Germany. The project area is defined by maps, coordinates/01,02,03/ or other unique descriptions. The project area covers 471.27 ha of forest land.

Project location details are provided in Table 3-1.7:

Table 3-1.7: Project location

No.	Project location
Country:	Thuringia / Germany
Region:	District of Saale-Orla-Kreis / subdistricts of Neundorf, Rodacherbrunn and Wurzach
Contact address:	Pina Technologies GmbH Vogelanger 7 82319 Starnberg Germany

Latitude:	50°25'9.77" northern latitude
Longitude:	11°34'5.55" eastern longitude

Result

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final Assessment

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 distinctive location of the project area.

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

3.1.8 Conformity with applicable laws, statutes and other regulatory frameworks

Description

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

Result

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final Assessment

The project aims at converting single layer age class forests (86% spruce) into climate resilient mixed stands. The project activites described in 3.1.6 are in line with the recommendations of the German Association of Forest Research Institutes (DVFFA)[/101/].

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

3.1.9 Forest property

3.1.9.1 Proof of ownership

Description

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

Result

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final Assessment

[redacted] ownership of the forest areas of the Forstbetrieb Schlegel

is adequately documented via the forest management plan[/01/] and via the forest management by the Boscor Gruppe GmbH[/IM04/].

☒ The ownership of the forest land is 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, accounts for the carbon stock changes in the national forests its national carbon footprint, regardless of ownership. Thus, the issuance of certificates from forest climate protection projects for the voluntary market is not possible[/DEHSt/].

Result

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final Assessment
This report with its issued CO2 reductions and removals is only an estimate of the CO2 reductions and removals of the forest conversion of the Forstbetrieb Schlegel in Thuringia. The report does not represent a tradable CO2 certificate, i.e. the use for the purpose of offsetting CO2 emissions is excluded.

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

3.1.9.3 Participation in other GHG programs

Description
Not applicable for the project activity.

Result

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

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

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

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.

Result

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final Assessment
None.

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

3.1.9.5 Rejection by other GHG programs

Description
Not applicable for the project activity.

Result

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final Assessment
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 start date information is consistent with the applicable ISO 14064-2 criteria.

3.1.10 Additional information relevant to the project

3.1.10.1 Eligibility criteria for group projects

Description
Not applicable for the project activity.

Result

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final Assessment
None.

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

3.1.10.2 Leakage management for AFOLU projects

Description
Leakage (displacement) can be neglected, since the volume harvested in the baseline scenario does not differ significantly from the volume harvested in the project scenario.

Result

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final Assessment
Due to the project activity leakage can be neglected. The project will not result in intensified thinning activities elsewhere.

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

3.1.10.3 Sensitive economic data

Description
Not applicable for the project activity.

Result

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final Assessment
None.

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

3.1.10.4 More information

Description
Not applicable for the project activity.

Result

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final Assessment
None.

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

3.2 Application of the method

3.2.1 Title and references

Description
The quantification of GHG reduction and removals 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 For- ests (LtPF), v1.2.

Result

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final Assessment
The audit team confirms the clear naming and application of the above listed 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 project start date information is consistent with the applicable ISO 14064-2 criteria.

3.2.2 Applicability

Description

For eligibility, the project owner defines criteria that must be met. A project must fulfil the following criteria:

1. The project takes place exclusively on forested areas in accordance with applicable laws, areas which are assigned to a protection category (NSG, FFH, etc.) are not affected;
2. Ownership is clearly defined as a private or community forest;
3. The project implementation is based on comprehensible forestry expertise;
4. Project activities are not allowed to be 100% publicly funded;
5. No participation in any 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 verifiably be increased, and a regeneration layer/second layer must be present by the end of the project period;
8. Conformity with relevant laws is ensured

Result:

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final Assessment:

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

On basis of the project contract, the forest owner confirms full compliance with the listed requirements in regard to the absence of public funding and non-participation in any GHG program 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, forestry expertise/200/.

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

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 471.27 ha of forested area.

Result:

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final Assessment:

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 location of the project area.

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

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.

Result:

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final Assessment:

The results of the Bundeswaldinventur (Federal Forest Inventory)[/206/] supports the assumption of the outlined baseline scenario in the state of Thuringia, whose forests are largely managed in age-class forests and whose share of multi-layered forests is with 0,20% is the lowest in the federal comparison.

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

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.

Result:

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final Assessment:

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 commercially used 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 multi-layered mixed forest stand is not prescribed by law and is therefore voluntary.

When comparing the developments of GHG reductions and removals in the baseline scenario to the project scenario shows that the project scenario is leading in total to a higher GHG sequestratin[/06/]. I.e. the implementation of the project proposal scores above the performance level in terms of GHG reductions and removals of the baseline scenario.

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

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 reductions and removals is the raw data of a sample based forest inventory (tree species, top height, diameter).

The simulation of the development of the forest volume over the course of the crediting period 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. The follwoing 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 regeneration".

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 which are 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 a root to shoot ratio.

The total amount of GHG reduction and removals is calculated by multiplying the living biomass by the carbon fraction and the specific molecular weight of CO2.

Result:

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final Assessment:

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 activities, 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 regeneration[/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 findings 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 GHG reductions and removals 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 literatue, 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 project start date information is consistent with the applicable ISO 14064-2 criteria.

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.

Result:

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final Assessment:

For the evaluation see explanations under 3.2.6.1

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

3.2.6.3 Leakage quantification

Description

Leakage can be neglected, since the volume harvested in the baseline scenario does not differ significantly from the volume harvested in the project scenario.

Result:

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final Assessment:

Leakage due to the project activity can be neglected. The project will not lead to intensified thinnings elsewhere.

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

3.2.6.4 Summary of GHG emission reductions and reductions

Description

The gross climate impact is estimated from the carbon stock changes in the project scenario minus the carbon stock changes of the baseline scenario.

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

For the project period of 30 years, this results in a net CO2 reduction and removal of 27,187 tCO2 e.

Result:

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final Assessment:

The exemplary Excel calculations/08/ submitted by the project developer were reproduced in their entirety. I.e. all calculation steps necessary for estimating the GHG reductions and removals were followed step by step and checked for plausibility. No discrepancies were found.

Furthermore, the baseline GHG reductions and removals at project start (300.67 tCO2e/ha) calculated by the project developer was compared to a baseline GHG reduction and removals at project start (303.29 tCO2e/ha) calculated using the actual forest stock (upper layer only) as provided by the forest inventory and publicly available conversion factors (BEF/52/wood density[spruce]/209/). There is a difference of -0.87%, 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 layer only, and iii) the use of conversion factors which were exclusively applied to the dominant tree species sruce (86%).

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

3.2.6.5 Statistical uncertainties in the calculation of emissions

Description

The basis for calculation are the results of the sample based forest inventory. The forest inventory has been carried out in accordance with the standard national procedures. The inventory has a sampling error of 4.87% in relation to the forest stock/01/.

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

Result:

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final Assessment:

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

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

3.2.7 Method deviation

Description

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

Result:

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final Assessment:

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/.

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

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 regeneration in the baseline/44/
- Proportion of surviving regeneration 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 have been identified

☐ The following deviations were identified:

Final Assessment:

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

3.2.8.2 Data and parameters to be monitored (variable parameters)

Description

The following parameters are monitored:

- 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].

Result:

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final Assessment:

The parameters and values were assessed for their applicability in the context of the project. The parameter and values correspond to good practice and are recorded during forest inspections, regular renewal of the forest management plan, 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 project start date information is consistent with the applicable ISO 14064-2 criteria.

3.2.8.3 Applicability and suitability of the monitoring procedure

Description

Commonly applied survey methods will be applied for monitoring purposes.

Result:

☒ No CARs, CLs or FARs have been identified

☐ The following deviations were identified:

Final Assessment:

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

The monitoring measures are sufficient to regularly monitor the status of the project.

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

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 have been identified

☐ The following deviations were identified:

Final Assessment:

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.

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

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 have been identified

☐ The following deviations were identified:

Final Assessment:

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

3.4 Comments from stakeholders

Description

The project is implemented 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 have been identified

☐ The following deviations were identified:

Final Assessment:

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

4 VALIDATION CONCLUSION

Pina Technologies GmbH has commissioned TÜV NORD CERT GmbH to carry out the validation of the "Forest adaptation project Schlegel" on the forest areas of the Forstbetrieb Schlegel in the district of Saale-Orla-Kreis in the federal state of Thruingia in Germany with regard to the requirements of ISO 14064-2.

The project activity includes active forest conversion from pure stands (86% spruce) 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 under and mid-layer.

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 33,358.65 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	33,358.65 tCO2 e	0	0	-6,171.35 tCO2 e	27,187.30 tCO2 e
Net CO2e sink services for the period: 01.01.2022-31.12.2052					27,187.30 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, 08.05.2023

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

Hanover, 08.05.2023

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_Schlegel_V0.1 Forest adaptiation project_Schlegel_V0.2
/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; 19.07.2022: 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 Thuringia (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.worldagrofor-estry.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)