



**Verified Carbon
Standard**

MONITORING REPORT 2020 - 2023

NATURAL HIGH FOREST REHABILITATION PROJECT ON DEGRADED
LAND OF KIBALE NATIONAL PARK



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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The project activity in Kibale National Park (KNP) is located in the western part of Uganda and is implemented by Uganda Wildlife Authority in cooperation with Face the Future. Due to the high precipitation, complex landform and undulating valleys, as well as continual human disturbance (fire, grazing, charcoal production and cultivation) and poor land management, the area has been subjected to severe degradation of the vegetation and soil erosion. The project contributes to climate change mitigation by sequestering GHGs in sinks through planting of indigenous tree species and assisted natural regeneration activities. The purpose of the project activity is to realize multiple socio-economic and environmental benefits (climate change mitigation, biodiversity conservation, local community development and soil erosion control) through restoring forest vegetation on degraded lands.

This Monitoring Report is based on the monitoring plan provided in the VCS Project Document (PD) for Kibale v1.2. It describes the results of project monitoring carried out from the 1st of March 2020 to the 28th of February 2023 for the purpose of verification of the GHG emission reductions resulting from project implementation. Since the start of the ARR project activities 4,474 hectares have been replanted and 2,593 hectares have naturally regenerated. However a part of the reforested area is not included for this carbon monitoring campaign since the reforestation activities in these areas were done through 3rd party investments. Therefore this monitoring campaign includes 2,755 ha of replanted area and 2,593 ha of regeneration area.

The results of the 2023 carbon monitoring campaign show that since the beginning of the project in 1994 a total of 1,536,461 tCO₂e have been sequestered in living tree biomass within the project area. 730,619 tCO₂e (265 tCO₂e/ha) have been captured in the replanted area and 805,842 tCO₂e (311 tCO₂e/ha) in the regeneration area. The tree growth during the monitoring period, between the 1st of March 2020 to the 28th of February 2023, resulted in a net emission removal of 123,300 tCO₂e and, after a buffer subtraction of 15%, 104,805 VCU are eligible for issuance.

1.2 Audit History

Table 1 - Audit history of the Natural High Forest Rehabilitation Project on degraded land of Kibale National Park

Audit Type	Period	Program	VVB Name	Number of years
Validation	2000	GHGPVC-COV	SGS	-
Verification	1995-1999	GHGPVC-COV	SGS	5

Verification	2000-2004	GHGPVC-COV	SGS	5
Verification	2005-2008	GHGPVC-COV	SGS	4
Validation	2008	FSC	SGS	-
Validation	2011	VCS	SCS	-
Verification	01-January-2009 to 01-January-2011	VCS	SCS	2
Verification	02-January-2011 to 01-March-2014	VCS	RINA	3
Validation	2015	CCB	RINA	-
Verification	02-March-2014 to 28-February-2017	VCS+CCB	AENOR	3
Verification	01-March-2017 to 29-February-2020	VCS+CCB	AENOR	3
Verification	01-March-2020 to 28-February-2023	VCS+CCB	TÜV NORD	3
Total				28 years

1.3 Sectoral Scope and Project Type

Sectoral scope	14
AFOLU project category¹	Afforestation, Reforestation and Revegetation (ARR)
Project activity type	Reforestation (R)

¹ See Appendix 1 of the VCS Standard

The project falls under scope 14 of the VCS, Agriculture Forestry and Other Land Use (AFOLU). The AFOLU category is Afforestation, Reforestation and Revegetation (ARR), and the ARR project activity type is Reforestation (R). The project utilizes a Clean Development Mechanism (CDM) methodology called “Approved consolidated afforestation and reforestation baseline and monitoring methodology AR-ACM0001: Afforestation and reforestation of degraded land”, Version 05.0.0.

The project is not a grouped project.

1.4 Project Proponent

There has been a change in project proponents. The primary project proponent was Greenchoice. As of December 2023, PRIMAKLIMA e.V., a German NGO dedicated to the preservation and expansion of forests, took over the role of main project *proponent* from Greenchoice (see Verra Project Registry).

PRIMAKLIMA e.V. has been investing in forest projects since 1991.

Already since 2016, PRIMAKLIMA e.V. is supporting the Kibale restoration project by:

- *Buying carbon credits*
- *Providing funding for tree planting*

The reason for the project proponent change is that Greenchoice considers PRIMAKLIMA e.V. is a better fit to the project. This is because PRIMAKLIMA e.V. focusses fully on forest conservation and restoration projects whereas Greenchoice’s core activities are not in forest conservation but in energy provision.

Face the Future still carries out the project management on behalf of PRIMAKLIMA e.V.. There are therefore no changes in the project management and activities. Nothing has changed for the local stakeholders. Furthermore, the project proponent change does not have an impact on the applicability of the methodology, additionality, or the appropriateness of the baseline scenario.

In 2020 there also was a project proponent change. At that time, the project proponent was Face the Future, this was changed to Greenchoice (see VCS Monitoring report 2017-2020 v1.1). However, Face the Future still continued to manage the project on behalf of Greenchoice.

Despite the two project prononent changes in the last years, the implementation of the project is still achieved through a partnership between UWA and Face the Future.

PRIMAKLIMA e.V. is a non-governmental organization (NGO) based in Germany. Established in 1991, its primary mission is the preservation and expansion of forests, with a focus on actively contributing to climate protection efforts. Through various initiatives and projects, PRIMAKLIMA

e.V. works to raise awareness about the importance of forests in combating climate change and advocates for sustainable forestry practices.

Table 2 - Contact information – PRIMAKLIMA e.V.

Organization name	PRIMAKLIMA e.V.
Contact person	Justus Kossmann
Title	Internationale Klimaschutzprojekte
Address	Leskan Lofts, Building 65 (West Entrance) Waltherstr. 49-51, 51069 Cologne
Telephone	+49 221 71 79 38-70
Email	justus.kossmann@primaklima.org

1.5 Other Entities Involved in the Project

Face the Future (FtF) is an organization that develops forest projects in order to sequester carbon dioxide to mitigate climate change whilst facilitating socio-economic and biodiversity benefits. Face the Future's projects are partly funded through the marketing of carbon credits generated by the projects themselves. In addition to the development of forest projects, Face also provides consultancy services with regards to carbon certification of forest projects, project implementation as well as funding of projects.

The Uganda Wildlife Authority (UWA) was established in August 1996 by the Uganda Wildlife Statute, which merged the Uganda National Parks and the Game Department. It is governed by a Board of Trustees appointed by minister responsible for wildlife. UWA is in charge of management of 10 National Parks, 12 Wildlife Reserves, 13 Wildlife Sanctuaries and provides guidance for 5 Community Wildlife Areas. UWA's vision is to be a leading self-sustaining wildlife conservation agency that transforms Uganda into one of the best eco-tourist destinations in Africa. Its mission is to conserve, economically develop and sustainably manage the wildlife and Protected Areas of Uganda in partnership with neighbouring communities and other stakeholders for the benefit of the people of Uganda and the global community.

Face the Future and Uganda Wildlife Authority have successfully cooperated on the restoration of former encroached areas in Kibale National Park. Since the start of cooperation in 1994, 4,474 hectares have been replanted and 2,593 hectares have naturally regenerated.

The role of Face the Future has been to provide carbon development expertise and funding while the role of UWA has been to carry out all project implementation activities.

Since 1994, Face has been providing significant amounts of funding from which the project implementation activities have been paid.

Table 3 - Contact information - Uganda Wildlife Authority

Organization name	Uganda Wildlife Authority (UWA)
Contact person	Richard Kigenyi
Title	Warden Forest Restoration
Address	P.O. Box 403 Fort Portal Uganda
Telephone	+256 772 559386 or +256 752 559386
Email	richkig.ardenyi@gmail.com

Table 4 - Contact information - Face the Future

Organization name	Face the Future B.V.
Contact person	Kars Riemer
Title	Project Manager
Address	Hollandseweg 7g 6706 KN Wageningen The Netherlands
Telephone	+31 30 310 10 44
Email	k.riemer@facethefuture.com

IFER – Institute of Forest Ecosystem Research, Jílové u Prahy, Czech Republic is an independent research institute conducting ecosystem research, developing and applying modern forest monitoring techniques. IFER was contracted by Face the Future in 2002, 2008, 2011, 2014, 2017 and 2020 to conduct and / or support the implementation of carbon monitoring campaigns.

Table 5 - Contact information - Institute of Forest Ecosystem Research

Organization name	Institute of Forest Ecosystem Research (IFER)
Role in the Project	Monitoring technology & design; Training and data analysis
Contact person	Martin Černý / Petr Blazek
Title	CEO / Support Manager
Address	Areál 1. Jílovské a. s., 254 01 Jílové u Prahy, Česká republika
Telephone	+420 2 4195 0607
Email	info@ifer.cz

1.6 Project Start Date

Project start date	15-05-1994
Justification	However, the crediting period start date under VCS is 1st January 2009.

1.7 Project Crediting Period

Crediting period	Other: The project activity uses a fixed crediting period of 60 years
Start and end date of first or fixed crediting period	01-01-2009 to 31-12-2068

1.8 Project Location

The project activity is located in western Uganda, near the base of the Rwenzori Mountains and about 200 km north of the equator (Figure 1). It falls into Kabarole district and is within half an hour's drive from Fort Portal town.

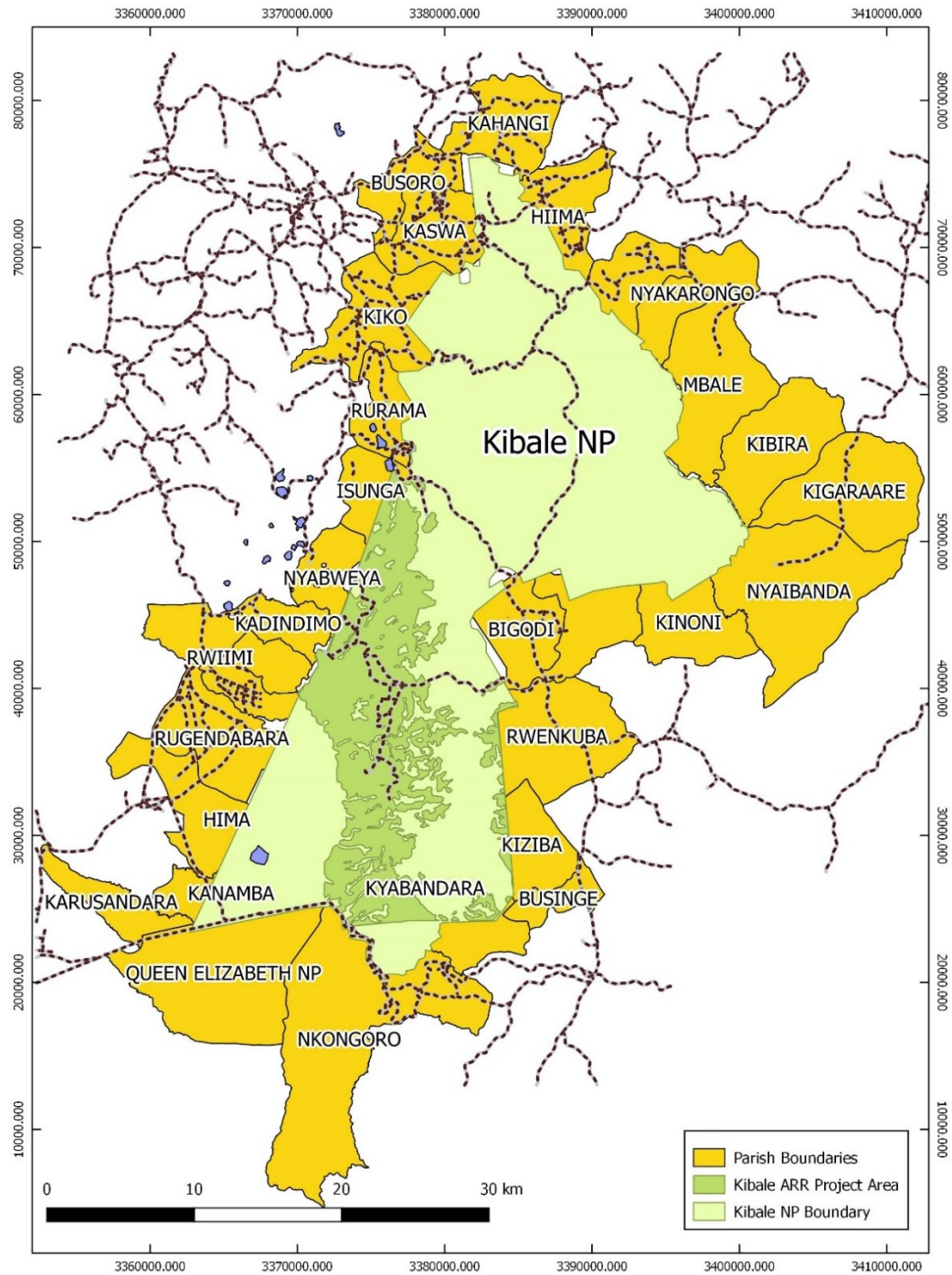


Figure 1 - Location of the proposed ARR VCS project activity and the communities surrounding Kibale National Park

1.9 Title and Reference of Methodology

Type (methodology, tool or module).	Reference ID, if applicable	Title	Version
Methodology	AR-ACM0001	Approved consolidated afforestation and reforestation baseline and monitoring methodology AR-ACM0001: Afforestation and reforestation of degraded land	Version 05.0.0

1.10 Double Counting and Participation under other GHG Programs

1.10.1 No Double Issuance

☒ No

The project is not receiving or seeking credit for reductions and removals from a project activity under another GHG program,

1.10.2 Registration in Other GHG Programs

☒ No

The project is not registered or seeking registration under any other GHG programs.

1.11 Double Claiming, Other Forms of Credit and Supply Chain, and Scope 3 Emissions

1.11.1 No Double Claiming with Emissions Trading Programs or Binding Emission Limits

☒ No

The project emissions reductions and removals or project activities are not included in emission trading programs or binding emission limits.

1.11.2 No Double Claiming with Other forms of Environmental Credit

☒ No

The project activity is not seeking, receiving, or planning to receive credit from another GHG-related environmental credit system.

1.11.3 Supply Chain (Scope 3) Emissions

☒ No

The project activities do not affect the emissions footprint of any product(s) (goods or services) that are part of a supply chain.

1.12 Sustainable Development Contributions

Table 6 - Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	2.4	Number of implemented activities to support protection from crop raiding	Implemented activities to increase	- Established 1 km of new elephant trenches and maintained 116 km of existing trenches along the park boundary where the project is situated. However, elephants still have areas where they can cross, where no trench can be established (e.g. swamp, river or rocky area). At these sites, crop raiding is a serious problem. 1 beekeeping group established along the park boundary in the vicinity of the project area. - Supported 1 community group (8000 seedlings) to plant and manage unpalatable crops (tea) along the park boundary See §4.1.1 of the CCB monitoring report	Overall increased protection from crop raiding by elephants and other wildlife, and mitigation of this risk. In total: 41.5 km elephant trenches established and maintained 207.66 km of trenches 20 beekeeping groups were established 4 groups were supported to plant unpalatable crops (tea)
2)	4.4/4.5/5/6.b	Number of girls/women supported to increase their independency	Implemented activities to increase	Provided training to 281 girls in the making of re-usable sanitary pads to reduce school dropout rates for girls. See §4.4 of the CCB monitoring report.	Overall, the project is supporting women to empower them increase their independency from men. Total nr. of women reached throughout the project is partially available upon request, see §4.4 of the CCB monitoring report.

3)	1.1/2.3/8.3	Number of income generating activities groups supported by the carbon revenue sharing fund	Implemented activities to increase	1 beekeeping group received 25 beehives. Protective suits have been distributed 8 goat rearing groups received 40 goats 1 pig rearing groups received 5 pigs 1 maize milling group received a maize milling machine 1 maize threshing group received a maize threshing machine 1 group received an ox plough 2 taxi groups received a motorcycle 2 catering groups received 1 catering tent 1 tea growing group received 8000 tea seedlings 1 farmer group received agricultural inputs worth 3,000,000UGX See §4.1.1 from the CCB monitoring report	The project promotes opportunities for communities for support in income generating activities, and entrepreneurship. In total 90 community groups were supported, with an overall value of 329,529,420UGX. At least 447 women participate in income generating groups supported by the project
4)	8.5	Number of employment opportunities provided by the project for communities	Implemented activities to increase	On average 409 people (equivalent to 359 full time jobs) from the surrounding communities were employed per month for various tasks. See §4.1.1 and 4.3.1 of the CCB monitoring report	On average 298 full time equivalent since March 2017 (records before March 2017 not available)
5)	4.4/8.2	Number of people trained in skill enhancement and capacity building	Implemented activities to increase	476 people participated in training of which 440 people from the local communities. Trainings were given on making eco-charcoal from Lantana camara, beekeeping, the use of energy saving stoves, agroforestry and making reusable sanitary pads. Additionally, UWA and UWA-FACE staff was trained in carbon monitoring, butterfly data collection, conducting wildlife-censuses and the use of GIS. See §4.1.1 and 4.3.1 of the CCB monitoring report	The project supports training and capacity building of 1,222 community members from the 12 parishes bordering the project area, and of the local team.

6)	13.0	Tonnes of greenhouse gas emissions avoided or removed (CO ₂ e)	Implemented activities to increase	By replanting 2,755 ha of tropical rainforest, and 2,593 ha of regenerated area, this project has removed 223,068 t CO ₂ e from the atmosphere during the monitoring period	By replanting 4,474 ha and 2,593 ha naturally regenerated (since 1994), the project has removed 1,636,230 t CO ₂ e from the atmosphere
7)	15.5/ 15.7/ 15.8	Establishment and restoration of native forest that supports and increases High Conservation values. Including but not limited to: - nr. of ha of forest planted, - nr. of exotic species eradicated - nr. of ha protected from fires - nr. of rangers employed - nr. of poachers arrested	Implemented activities to increase	- Planted 263 ha of forest with native species in connection with existing (recovering) forest. - Protected the planted existing restored and regenerated forest (4,474 ha planted and 2,593 naturally regeneration area) from fire. - Debarked 216 exotic trees and slashed and uprooted 182.4 ha of <i>Lantana camara</i> - Regeneration and tree species diversity were assessed based on the VCS carbon monitoring data. - See §5.3.1 of the CCB monitoring report. - Transect walks in the project area have confirmed the presence of the endangered Chimpanzee (<i>Pan troglodytes</i>), Ashy Red Colobus monkey (<i>Piliocolobus tephrosceles</i>) and African Elephant (<i>Loxodonta africana</i>) in the restored area. This gradual change is expected to become more apparent over time. See §5.3.1 of the CCB monitoring report. - Employed on average 3.5 rangers within the project 36 poachers were arrested, see §4.3.1 of the CCB monitoring plan	The project is restoring 7,076 hectares of high tropical forest which holds High Conservation Values and provides habitat to regional endemic and threatened or endangered species, See §5.3 of the CCB-report. - Removed/debarked 169,790 exotic trees, and uprooted/slashed 826.1 ha of <i>Lantana camara</i> 9 fire incidences in the project area that affected 193 ha of planted forest - Employed on average 2.75 rangers within the project 36 poachers arrested (recorded since 2020) - Built ranger outpost at Kanyante.

1.13 Commercially sensitive information

No commercially sensitive information has been excluded from the public version of the monitoring report.

2 SAFEGUARDS AND STAKEHOLDER ENGAGEMENT

2.1 Stakeholder Engagement and Consultation

2.1.1 Stakeholder Identification

The stakeholder make up has not changed since validation. The project's primary stakeholders are the local community members and their representatives within the parishes surrounding the project area. Stakeholder make up has not changed since validation. What has changed slightly over time is the extent and boundaries of the parishes surrounding the project area (some parishes have been split, while others merged). Upon validation of the VCS PD the parishes were delineated as follows:

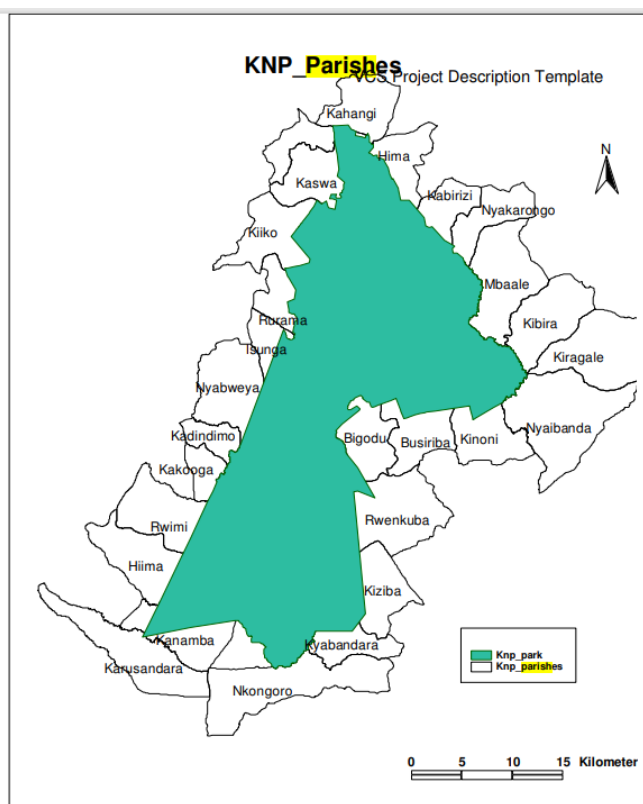


Figure 1.5.4 Detailed map of Kibale National Park and location of surrounding village communities.

This delineation was different upon validation of the CCB PD:

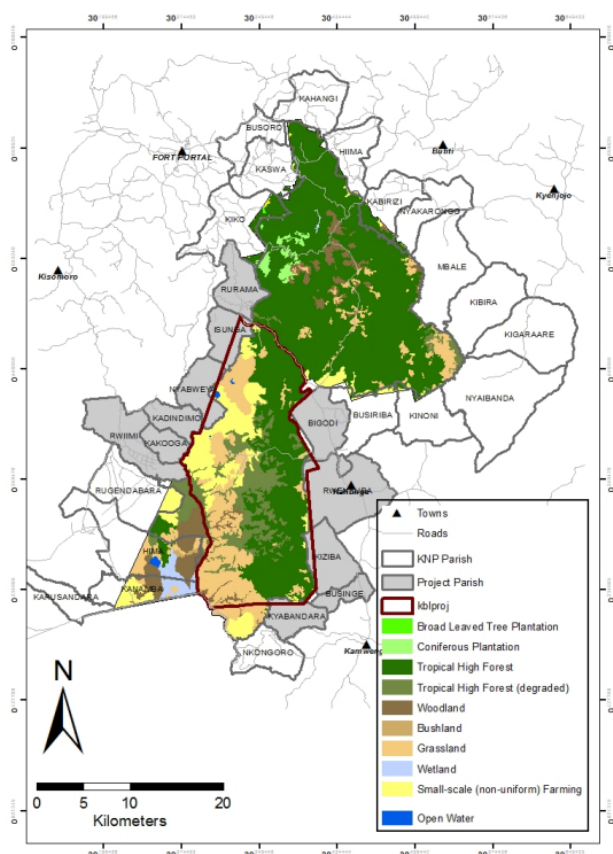


Figure 2. Map of Kibale National Park, the project area and location of surrounding parishes (relevant parish communities adjacent to the project area are highlighted in grey).

The parishes that are relevant to the project are the ones that are directly situated along the boundary of the project area as shown in the second figure above. Due to population growth the above described parishes have undergone further restructure which means that now there are 14 parishes bordering the project area:

1. Kihoima-Kyabandara (initially part of Kyanbandara)
2. Bigodi
3. Mahango Nyabubale (initially part of Bigodi)
4. Bujongobe (initially part of Bigodi)
5. Rugonjo (initially part of Rwenkuba)
6. Rubaba (initially part of Rwenkuba)
7. Kiziba
8. Busingye
9. Kyanbandara

10. Isunga
11. Nyabweya
12. Burambira (initially part of Nyabweya)
13. Kajumiro (initially part of Rwimi)
14. Kakooga

2.1.2 Stakeholder Consultation and Ongoing Communication

Ongoing consultation	Continued communication is achieved through having regular meetings organized by the Community Conservation Unit. During these meetings, the VCS and CCB Monitoring results have been presented using a PowerPoint Presentation ² . Each village is visited every quarter. The Warden Forest Restoration communicates through the Warden Community Conservation and the feedback of communities on the project is also provided to the Warden Forest Restoration.
Date(s) of stakeholder consultation	Consultation meetings have been held continuous throughout the monitoring period. Dates of the consultation meetings during the Monitoring Period are presented in the summary of meetings documents which are presented as separate Excel files to the audit team. These visit dates are the following: 10/03/2020; 17/03/2020; 18/03/2020; 19/03/2020; 06/04/2020; 07/05/2020; 08/09/2020; 09/09/2020; 10/09/2020; 20/01/2021; 24/02/2021; 26/02/2021; 07/03/2021; 09/03/2021; 10/03/2021; 13/03/2021; 15/03/2021; 27/03/2021; 06/04/2021; 13/04/2021; 14/04/2021; 28/04/2021; 29/04/2021; 19/05/2021; 25/05/2021; 26/05/2021; 27/05/2021; 20/07/2021; 26/07/2021; 05/08/2021; 14/08/2021; 30/08/2021; 01/09/2021; 19/10/2021; 24/10/2021; 08/11/2021; 15/11/2021; 30/11/2021; 01/12/2021; 10/12/2021; 13/12/2021; 15/12/2021; 16/12/2021; 27/12/2021; 12/01/2022; 13/01/2022; 14/01/2022; 17/01/2022; 23/01/2022; 24/01/2022; 28/01/2022; 29/01/2022;

² Kibale_stakeholder_presentation_2023_v3.1

	09/02/2022; 13/02/2022; 15/02/2022; 17/02/2022; 04/03/2022; 08/03/2022; 17/03/2022; 21/03/2022; 22/03/2022; 23/03/2022; 24/03/2022; 28/03/2022; 29/03/2022; 30/03/2022; 12/04/2022; 13/04/2022; 05/05/2022; 24/05/2022; 05/06/2022; 12/06/2022; 16/06/2022; 17/06/2022; 18/06/2022; 20/06/2022; 21/06/2022; 13/07/2022; 19/07/2022; 21/07/2022; 25/07/2022; 28/07/2022; 09/08/2022; 10/08/2022; 26/09/2022; 05/10/2022; 25/10/2022; 10/11/2022; 16/11/2022; 21/11/2022; 23/11/2022; 24/11/2022; 25/11/2022; 04/12/2022; 05/12/2022; 20/12/2022; 16/01/2023; 17/01/2023; 19/01/2023; 07/02/2023; 11/02/2023
Communication of monitored results	Stakeholder consultation / feedback meetings were organized to inform community representatives about monitoring results. The results were presented using a PowerPoint presentation. ³ These meetings took place between 01-10-2023 and 08-12-2023.
Consultation records	The meeting minutes have been documented by the project's community monitoring team and are available upon request.
Stakeholder input	The outcomes of the consultation meetings are being considered in the ongoing project decision making process. The Warden Forest Restoration communicates through the Warden Community Conservation and the feedback of communities on the project is also provided to the Warden Forest Restoration. No new project activities have been implemented based on the consultation meetings on the monitoring results of this verification round since they were conducted too recent.

2.1.3 Free, Prior, and Informed Consent

Consent	The project area is fully located within a National Park where local communities are not allowed to establish themselves. The land is owned by the Government of Uganda and managed by the Uganda Wildlife Authority which is one of the partners in this project. In 1994, the
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³ Kibale_stakeholder_presentation_2023_v3.1

	government of Uganda invited the FACE Foundation to carry out restoration work. In 1994 a MOU was signed between Face and the government of Uganda. Subsequently, for each planted compartment a contract was signed between the project proponent and the Uganda Wildlife Authority.
Outcome of FPIC	The project area is fully located within a National Park where local communities are not allowed to establish themselves. The land is owned by the Government of Uganda and managed by the Uganda Wildlife Authority which is one of the partners in this project. In 1994, the government of Uganda invited the FACE Foundation to carry out restoration work. In 1994 a MOU was signed between Face and the government of Uganda. Subsequently, for each planted compartment a contract was signed between the project proponent and the Uganda Wildlife Authority.

2.1.4 Grievance Redress Procedure

Grievances received	Resolution and outcome
Not applicable, no grievances received	Not applicable, no grievances received

During this monitoring period, the project did not receive any grievances or complaints related to the project activities.

The feedback and Grievances Redress Procedure is outlined in section G3.8 in the project's CCB PDD (V3.1). The separate Grievances Redress Procedure document will be shared with the audit team.

The documents are available on request at the UWA head office for local stakeholders. On top of that, the project is in the process of writing a new plan of activities (2025-2034) during the consultation process with local stakeholders, the project will again explain how local stakeholders can address grievances to the project.

2.1.5 Public Comments

Summary of comments received	Actions taken
No comments were received	No comments were received

2.2 Risks to Stakeholders and the Environment

	Risk identified	Mitigation or preventative measure taken
Risks to stakeholder participation	No risk identified	No risks to stakeholder participation where identified at validation. Furthermore, the project has a grievance redress procedure in place which did not result in the identification of new risks to stakeholder participation in the current monitoring period. The project is providing employment during the planting and tending activities, and provides other benefits to local stakeholders through the project's revenue sharing fund.
Working conditions	Risks of injury when not handling the equipment well (like the panga or the hoe), and animal attacks. (Section G3.2, CCB PDD V3.1)	Workers are sensitized about safety issues and are required to use PPE (Personal Protective Equipment) provided. UWA provides gumboots, overalls and raincoats. KNP has an arrangement with selected clinics to which serious medical cases can be taken in the event of occupational injuries. First aid kits are provided to work teams. Copies of various acts such as Workers Compensation Act, Traffic and road safety Act, The Employment Decree 1975, and the Pocket Guide to your Rights are available in the park's office. Risks are minimized and mitigated:

		- Headmen are trained in first aid (with Certificates) and carry first aid kits. - Summaries of injuries are provided monthly and summarized quarterly and annually. The health centres also keep records of injuries. - Safety is included in all general training sessions on e.g. how to safely and correctly sharpen tools. - Workers receive safety instructions at work from their supervisors before commencing work every morning and at the beginning of a new task.
Safety of women and girls	No risk identified	No risks to the safety of women and girls were identified at validation. Furthermore, the project has a grievance redress procedure in place which did not result in the identification of new risks to safety of women and girls in the current monitoring period. The project is supporting women and girls by providing training in the making of re-usable sanitary pads. Furthermore, the project creates employment for women. Finally, the project is supporting community groups surrounding the project area, a criteria for support is that these groups must be gender sensitive.
Safety of minority and marginalized groups, including children	No risk identified	No risks to safety of minority and marginalized groups, including children, were identified at validation. Furthermore, the project has a grievance redress procedure in place which did not result in the identification of new

		risks to safety of minority and marginalized groups, including children, in the current monitoring period. The project is supporting girls by providing training in the making of re-usable sanitary pads. Furthermore, the project is supporting rural women in several ways, see CCB Monitoring Report 2020-2023, section 4.5.4.
Pollutants (air, noise, discharges to water, generation of waste, release of hazardous materials)	Noise and waste production, (Section B2.1, CCB PDD V3.1)	The cooking site, used during operations in the forest, can have a negative impact on the biological environment by means of noise pollution and waste production. There are strict rules as to reduce the negative impacts of workers camps, mainly by observing waste management principles. These principles are described in the General Management plan KNP 2015 – 2025. ⁴

Risks to stakeholders were identified during the SBIA workshop by local stakeholders themselves. During that same workshop stakeholders drafted mitigation measures for these risks. The outcomes have been written down in the 20150529_SBIA Report for Kibale Rehabilitation Project Final document. Based on the input from the SBIA workshop the project designed a monitoring plan (CCB_Monitoring_Plan_v2.1.pdf).

2.3 Respect for Human Rights and Equity

2.3.1 Labor and Work

Discrimination and sexual harassment	No incidences of discrimination or sexual harassment have been recorded by the project. UWA's Human Resource Manual deals with anti-discrimination measures and points out the code of conduct for staff, amongst others applicable to discrimination and sexual
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⁴ Kibale National Park GMP.pdf (ugandawildlife.org)

	harassment. Within the organisation the superiors at each level have to responsibility to act in cases where the code of conduct is not observed.
Management experience	PRIMAKLIMA is the new project proponent. PRIMAKLIMA e.V. is a German non-profit organization that has been active in climate protection and forest conservation since 1991. With a team of 24 people, PRIMAKLIMA follows their mission: A diverse nature and a reliable climate are a given. In recent years PRIMAKLIMA has raised around €4 million, with around 80% of the donations going directly to the projects it supports. PRIMAKLIMA has the DZI seal of approval, which confirms that funds are used in a verifiable way and provide true, clear and factual information. PRIMAKLIMA's current forest projects are in Germany, Nicaragua, Papua New Guinea and Uganda. PRIMAKLIMA has been involved in the Kibale project since 2016 and has a long-term relationship with Face the Future, the project developer of the Kibale project.
Gender equity in labor and work	Casual workers are hired for implementing the project activities. These are positions for which physical strength and fitness are important attributes. Such appointments are therefore made based on the physical abilities of applicants. They are also appointed on a probation basis to prove that they have suitable skills for the position before appointments are confirmed. However, when higher level staff such as accountants are appointed qualifications and experience form the basis for selection. With regards to equal opportunities, as described under section G 3.9 of the CCB Project Document, both women and men are offered job opportunities as well as people with different levels of status and income. Workers are mostly employed for planting, tending and maintenance activities. Most of the park rangers (75 %) also come from local communities. All tourist staff such as guides, porters, trail maintenance and hospitality staff are local people. Simple on the job training is provided to workers. Individuals that excel are selected for more advanced positions and the training that goes with more senior positions. The project recruits workers from the communities adjacent to the project area, coming from within a distance of 7km from the actual working site to minimize travelling time. Any person coming from a distance of more than 7km is only considered when he or she is to rent accommodation from the nearby area.

	The age limit is from 18 years and above. When it is time for the project to recruit workers, a written notice, informing the public employment opportunities by the project, is hanged in busy public places like churches and trading centers, specifying the number and types of jobs available. Workers already engaged on work are also informed during a meeting to inform the public about the recruitment opportunities in the project Most casual workers in the project are men since the main activities for project implementation requires physical strength. Men are hired for ground preparation, tree planting, tending and fire protection. Female workers are mainly recruited for nursery operations, pitting and spot hoeing. Further details are provided in the document UWA-Face Terms and Conditions of Service.
Human trafficking, forced labor, and child labor	The project abides to certain laws and regulations when it comes to labour. The following laws and regulations are applicable: • The National Social Security Fund Act 1985 • The Employment Act 1977 • The Employment Decree 1975 • The Employment regulations 1977 • The Workers Compensation Act 2000 • UWA Human Resource and Administration Policy Manual Revised Version 2008 Uganda is a signatory to ILO. Uganda has adopted the ILO requirements into the Labour Laws of the country. Copies of the ILO documents 87, 98 and ILO Code of Practice on safety and Health in Forestry Work (ILO1998) are available. UWA KNP has recognised the Uganda Hotels and Allied Workers Union. There is a committee in place headed by a Chairperson, representing the UWA staff. Casual workers do not belong to a union, but a workers committee has been formed where they can raise any issues of concern to them. Workers Committees are available as a means of bargaining for other workers who are not members of formal unions. Workers Committees are used to communicate between management and workers. This committee meets at least once per quarter. Minutes of all meetings are available.

2.3.2 Human Rights

The project abides to certain laws and regulations when it comes to labour. See section 2.3.2 above. There are no people living in the project area since the project area is fully located within a National Park. The land is owned by the Government of Uganda and managed by the Uganda Wildlife Authority which is one of the partners in this project.

2.3.3 Indigenous Peoples and Cultural Heritage

Local communities surrounding Kibale National Park rely on the forest for their livelihoods (medicinal plants, religion, food, etc.)⁵. The project signs Memoranda of Understanding with community groups for legal extraction of resources (medicinal plants, firewood, etc.) from the park.

Furthermore, Kibale National Park is a HCV4 area that provides “Basic ecosystem services in critical situations, including protection of water catchments and control of erosion of vulnerable soils and slopes”. This means that the successful restoration activities in the project area will increase the degree to which Kibale National Park provides ecosystem services to the indigenous communities surrounding the park.

Specific actions taken in the project area during the current monitoring period to restore, conserve and protect Kibale National Park are:

- Planting of 263 hectares with native trees
- Fire protection (Fire tower, deployment of patrolmen, firelines) to prevent fires from entering the project area
- Removal of exotic/invasive species
- Working together with UWA to reduce illegal activities (constructing ranger outpost, awareness meetings)
- Promotion conservation awareness (construction of education centre, conservation awareness meetings)

2.3.4 Property Rights

Disputes over rights to territories and resources

N.A. There are no people living in the project area since it is fully located within a National Park. The land is owned by the Government of Uganda and managed by the Uganda Wildlife Authority which is one of the partners in this project.

⁵ Kakudidi, E. K. (2004). Cultural and social uses of plants from and around Kibale National Park, Western Uganda. *African Journal of Ecology*, 42, 114-118.

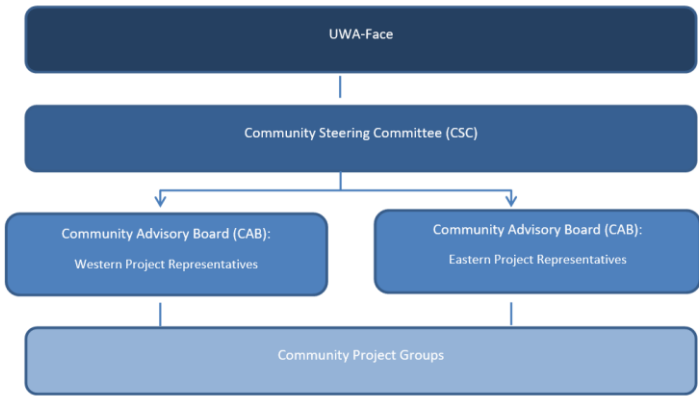
Respect for property rights

N.A. There are no people living in the project area since it is fully located within a National Park. The land is owned by the Government of Uganda and managed by the Uganda Wildlife Authority which is one of the partners in this project.

2.3.5 Benefit Sharing

Summary of the benefit sharing plan

The project's benefit sharing plan works as follows: The Community Steering Committee (CSC) is mandated to approve all community project proposals, recommend to UWA-Face management realistic activities for implementation, and supervise project implementation. Among others, members of the CSC are local professionals with technical knowledge on inputs provided, parish chiefs, politicians, and members of conservation agencies. The Community Advisory Board (CAB) comprises of community members and forms a bridge between the CSC and community groups. The CAB submits community group proposals to the CSC and has a mediating role between communities and the project/park in the resolution of issues such as human wildlife conflicts. The composition of the CAB must always be gender sensitive, this makes sure women will always have a seat within the management structure of the carbon revenue sharing program. One of the main benefits of this new bottom-up type of management structure is that all smallholders/community members applying for funds by submitting their own proposals will be directly involved in defining the direction (i.e. types of income generating activities) in which the carbon revenues are distributed. Thus, through the submission of their proposals, smallholder/community members actively participate in designing the implementation of the project.

	Management structure Carbon Revenue Sharing Program  <pre> graph TD UWA-Face[UWA-Face] --> CSC[Community Steering Committee (CSC)] CSC --> CAB-West[Community Advisory Board (CAB): Western Project Representatives] CSC --> CAB-East[Community Advisory Board (CAB): Eastern Project Representatives] CAB-West --> CPGroups[Community Project Groups] CAB-East --> CPGroups </pre> Transparency with regards to project funding and costs as well as benefit distribution is provided through stakeholder consultation meetings and presentations within communities. During these meetings and presentations, it is explained how to apply for funding from the carbon revenue sharing funds and what role carbon plays in general to release funds for community development. Also, it is explained what part of the funds available through the selling of carbon credits will be available for conservation, reforestation, and community development. Revenues from the selling of carbon credits are distributed within the project in the following manner: 50% of the revenues are flowing back to PRIMAKLIMA to partly cover the management costs, 35% of the revenues are for UWA in order to fund biodiversity conservation activities (i.e. exotic eradication, fire management, elephant trenches, wildlife censuses, etc.) within the borders of Kibale National Park, and 15% of the revenues will go to local communities surrounding the project area. The cooperation agreement between Face the Future and UWA where these shares are established is available upon request.
Benefit sharing during the monitoring period	The benefits shared with communities through the abovementioned benefits sharing plan during this monitoring period are the following:

	- 1 beekeeping group received 25 beehives. Protective suits have been distributed - 8 goat rearing groups received 40 goats - 1 pig rearing groups received 5 pigs - 1 maize milling group received a maize milling machine - 1 maize threshing group received a maize threshing machine - 1 group received an ox plough - 2 taxi groups received a motorcycle - 2 catering groups received 1 catering tent - 1 tea growing group received 8000 tea seedlings - 1 farmer group received agricultural inputs worth 3,000,000UGX Besides this community members are benefiting in various other ways because of the project. These benefits are described in section 4.3.1 and 5.3.1 of the CCB monitoring report.
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2.4 Ecosystem Health

	Risk identified	Mitigation or preventative measure taken during the monitoring period
Impacts on biodiversity and ecosystems	Road construction	To minimize the impact already existing tracks will be used as much as possible, and fire lines will also be used as roads.
	Noise pollution and waste production	Workers camps and field cooking sites, used during operations in the forest, can have a negative impact on the biological environment by means of noise pollution and waste production. There are strict rules as to reduce the negative impacts of workers camps, mainly by observing waste management

	Removal of wildlings	principles. These principles are described in the General Management plan KNP 2015 – 2025⁶. The removal of wildlings can on the long term negatively affect natural regeneration of the forest. About 50% of the seedlings used for reforestation are from wildlings while the other part is raised from seeds in the nursery. For the mitigation of this potential problem, removals are carefully planned as to result in minimal disturbance. In this planning, experience from earlier years is implemented. When collecting the wildlings, only the smaller wildlings are collected and not all of them are taken. The wildlings selected for the project are only shallow rooted.
Soil degradation and soil erosion	Removal of topsoil for raising seedlings	One of the nursery activities involves the removal of topsoil (up to 6 cm depth) from part of the forest for use in raising tree seedlings for reforestation. Planting bags are approximately 13 by 10 by 10 cm (= 0.0013 m³). Per hectare, considering a planting distance of 5 x 5 meters, this means that 0.52 m³ of topsoil is removed. To mitigate the negative effects of topsoil removal, soil is only extracted at a small scale with as less as possible disturbance of the surrounding vegetation so that

^{6 6} [Kibale National Park GMP.pdf\(ugandawildlife.org\)](http://Kibale_National_Park_GMP.pdf(ugandawildlife.org))

		vegetation can quickly cover the spot where soil has been extracted in order to prevent soil erosion. Furthermore, the vegetation that is cut before removing the soil is returned to cover and protect the soil from erosion.
Water consumption and stress	Water for tree seedlings	For the nurseries water is needed which is extracted from the rivers like the river Dura streaming through the park. However, the total amount of water taken from the river is relatively low, and it is unlikely that the extraction of water for the project will have negative effects on water levels in the rivers.
Usage of fertilizers	No risk identified	The project does not make use of fertilizers

2.4.1 Rare, Threatened, and Endangered species

Species or habitat	The project has not adversely impacted habitats for rare, threatened, or endangered species. In fact, the project is contributing to the protection of endangered species such as the Chimpanzee and Ashy Red Colobus monkey by restoring the forest within the borders of Kibale National Park. During this monitoring period the project has planted an additional 263 hectares (on top of the 7076 hectares within the park that were already restored before this monitoring period) that will mature to tropical high forest vegetation which is native to Kibale National Park. For more information on Rare, Threatened and Endangered species see section 5.4.1 CCB Monitoring Report 2020-2023
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2.4.2 Introduction of species

The project only uses native species for its reforestation activities.

Species introduced	Classification	Justification for use	Adverse effects and mitigation
<i>Bridelia micrantha</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects
<i>Cordia Africana</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects
<i>Cordia mellenii</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects
<i>Croton macrostarchys</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects
<i>Croton megalocarpus</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects
<i>Ficus natalensis</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects
<i>Mimusops bagshwawei</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects
<i>Prunus africana</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects
<i>Spathodea campanulata</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects
<i>Warbugia ugandensis</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects
<i>Sapium ellipticum</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects
<i>Albizia gummifera</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects
<i>Erythrina abyssinica</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects
<i>Markhamia platycalyx</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects
<i>Fagara angolensis</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects

<i>Monodora myristica</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects
<i>Phoenix reclinata</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects
<i>Olea lochsterteri</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects
<i>Chrysophyllum albidum</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects
<i>Diospyros mespiliformis</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects
<i>Uvariopsis congensis</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects
<i>Lovoa brownii</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects
<i>Strombosia scheffleri</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects
<i>Newtonia buchananii</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects
<i>Blighia unijugata</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects
<i>Aphania senegalensis</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects
<i>Trichilia drageana</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects
<i>Antiaris toxicaria</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects
<i>Morus lactea</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects
<i>Balanites wilsoniana</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects
<i>Aningeria altissima</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects
<i>Teclea nobilis</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects

<i>Parinari excelsa</i>	Native	Native species in tropical high forest vegetation in Kibale National Park	No adverse effects
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Existing invasive species	Mitigation measures to prevent spread or continued existence of invasive species
<i>Lantana Camara</i>	Uprooting and slashing. During the monitoring period the project uprooted 55.1 hectares and slashed 127.5 hectares in planted compartments infested with lantana camara.
<i>Senna spectabilis</i>	Debarking. During the monitoring period the project debarked 2016 trees.
<i>Eucalypt</i>	Debarking

2.4.3 Ecosystem conversion

The forest was cleared more than 10 years before the project start date (15 May, 1994)

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

Since the start of the ARR project activities 4,474 hectares have been replanted and 2,593 hectares have naturally regenerated. However since the trees in the compartments which have been replanted through 3rd party investments are not taken into account to avoid double-claim under VCS, this carbon monitoring campaign only includes compartments which were replanted through the funding provided by Face the Future (the former FACE foundation). Therefore this monitoring campaign includes 2,755 ha of replanted area and 2,593 ha of regeneration area.

As stated in the VCS P.D. table 7.2. it was initially planned to realize the reforestation of a total area of 6,000 hectares by the end of 2016. This intention however was not realized by the project due to lack of funding for the reforestation activities since 2012. As can be seen in the CCB MR 2020-2023 section 5.3, the total realized planted area by the end of 2022 is 4,474 hectares. This is still 1,526 ha short from the initial plan of 6,000 hectares in the registered VCS P.D.

An outline of the planted and natural regeneration areas within the project boundary is shown in Figure 2. The different planting years are presented in different colors ranging from orange (1995) to purple (2010).

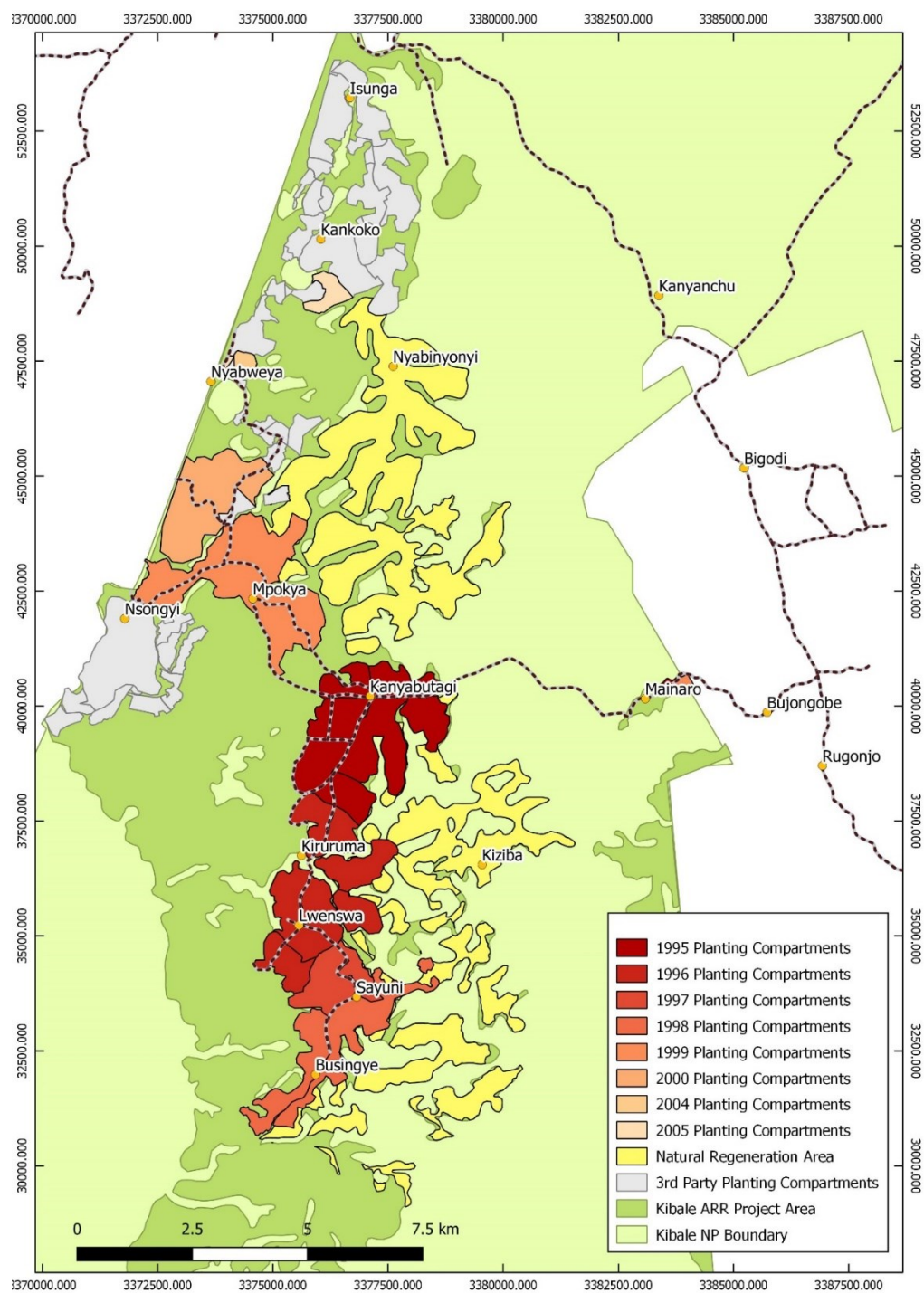


Figure 2 - Outline of planted and natural; regeneration areas within the project boundary

The ARR project activities in Kibale involved rehabilitation of degraded areas with native tree species comprising pioneers, intermediate, and climax species listed in Table 7.

Table 7 - List of species selected for planting in the Kibale project area

Pioneer	Intermediates	Climax
Bridelia micrantha	Cordia africana	Chrysophyllum albidum
Croton megalocarpus	Cordia millenii	Diospyros mespiliformis
Croton macrostachyus	Mimusopsis bagshawei	Funtumia elastica
Sapium ellipticum	Prunus africana	Uvariopsis congensis
Spathodea campanulata	Warburgia ugandensis	Lovoa brownii
Albizia gummifera	Markhamia platycalyx	Strombosia scheffleri
Erythrina abyssinica	Ficus natalensis	Newtonia buchananii
	Fagara angolensis	Blighia unijugata
	Monodora myristica	Aphania senegalensis
	Phoenix reclinata	Trichilia drageana
	Olea lochsterteri	Antiaris toxicaria
		Morus lactea
		Balanites wilsoniana
		Aningeria altissima
		Teclea nobilis
		Parinari excelsa

The project does not anticipate any significant emissions from the project implementation activities because:

1. All labour force used for the proposed ARR VCS project activity is from local villages; hence transportation for workers is not needed.
2. All seedlings are raised on or near the site and will be transported to the project sites by manpower and project vehicles, whose emissions are insignificant.
3. No harvesting or thinning of the forest expected to take place as the project area wholly contained within the National park.

Non-permanence risk assessment was carried out using the VCS' "AFOLU Non-Permanence Risk Tool" version 4.2. According to this tool, the project activity was rated at 15%. The project has a system in place to identify risks and established targets to reduce any non-permanent risks. Procedures have been developed and responsibilities are well assigned with internal auditing, reviews and training in place. The project also has a well-qualified, experienced local

management team in place to ensure that the project activities are implemented effectively. The land planned for the project activity is wholly contained within a national park. Based on the Sections 3, 4 and 5 of the Uganda Wildlife Statute, the national park is fully owned by the government of Uganda under the UWA Act and mandated by Uganda Wildlife Authority on behalf of Uganda government and all Ugandans. Therefore, UWA has full control over the entire project lands. Additionally, the project will hold a 15% VCS buffer in reserve for use in case of any loss of permanence.

No loss events of carbon took place during the monitoring period.

Reference is hereby made to the VCS Non-Permanence Risk Report Kibale 2020-2023 for more information.

3.2 Deviations

3.2.1 Methodology Deviations

There are no deviations to the methodology.

3.2.2 Project Description Deviations

Change in project Proponent

There has been a change in project proponents. The primary project proponent was Greenchoice. As of December 2023, PRIMAKLIMA, a German NGO dedicated to the preservation and expansion of forests, took over the role of main project *proponent* from Greenchoice (see Verra Project Registry).

PRIMAKLIMA has been investing in forest projects since 1991.

Already since 2016, PRIMAKLIMA is supporting the Kibale restoration project by:

- *Buying carbon credits*
- *Providing funding for tree planting*

The reason for the project proponent change is that Greenchoice considers PRIMAKLIMA is a better fit to the project. This is because PRIMAKLIMA focusses fully on forest conservation and restoration projects whereas Greenchoice's core activities are not in forest conservation but in energy provision.

Face the Future still carries out the project management, on behalf of PRIMAKLIMA. There are therefore no changes in the project management and activities. Nothing has changed for the local stakeholders. Furthermore, the project proponent change does not have an impact on the applicability of the methodology, additionality, or the appropriateness of the baseline scenario.

3.3 Grouped Projects

The project is not a grouped project activity.

3.4 Baseline Reassessment

☒ No

The project did not undergo baseline reassessment during the monitoring period.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	T
Data unit	years
Description	Monitoring period
Source of data	
Value applied:	3
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data	Calculation of project emissions
Comments	Monitoring period $T = t_7 - t_6$ where: t_6 Date of verification 2020 t_7 Date of verification 2023

Data / Parameter	T_6
Data unit	date
Description	Date of verification 2020
Source of data	Carbon monitoring campaign 2020
Value applied:	1 March 2020
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data	Calculation of project emissions
Comments	

Data / Parameter	T_7
Data unit	date
Description	Date of verification 2023
Source of data	Carbon monitoring campaign 2023
Value applied:	28 February 2023
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data	Calculation of project emissions
Comments	

Data / Parameter	i
Data unit	dimensionless
Description	Stratum
Source of data	
Value applied:	Planting year; Natural regeneration area
Justification of choice of data or description of	

measurement methods and procedures applied	
Purpose of the data	Determination of baseline scenario (AFOLU projects only) Calculation of baseline emissions Calculation of project emissions
Comments	Planting year was chosen in compartments area for stratification. While the entire naturally regenerated area was considered as a single stratum.

Data / Parameter	A_i
Data unit	ha
Description	Total area monitored for GHG sinks
Source of data	GPS coordinates
Value applied:	2,755 ha (compartment area) and 2,593 ha (natural regeneration area); see section 3.1 with area size per stratum
Justification of choice of data or description of measurement methods and procedures applied	Monitoring is carried out using GIS integrated with GPS and Remote Sensing data
Purpose of the data	Determination of baseline scenario (AFOLU projects only) Calculation of baseline emissions Calculation of project emissions
Comments	Project activity area

Data / Parameter	$a_{i,p}$
Data unit	m ²
Description	Area of permanent sampling plot p
Source of data	IFER
Value applied:	Plot size to measure trees with DBH 50mm - 150mm: 201.06 m ² Plot size to measure trees with DBH 150mm - 300mm: 500 m ² Plot size to measure trees with DBH > 300mm: 2,000 m ²

Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data	Calculation of baseline emissions Calculation of project emissions
Comments	See section 4.3.3 for the specifications of the IFER plot design

Data / Parameter	$A_{p,i}$
Data unit	ha
Description	Total area of all sample plots in stratum i
Source of data	Calculated based on the strata and the applied sampling scheme
Value applied:	Various depending on sampling scheme
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data	Calculation of baseline emissions Calculation of project emissions
Comments	A regular grid is applied as a sampling scheme for all strata in the project area, see section 4.3.3 for details on the sampling scheme. Once selected, the size of the sampling frame is fixed until the end of the last crediting period.

Data / Parameter	<i>Plot position</i>
Data unit	GPS coordinates
Description	Plot position, GPS coordinates
Source of data	Field measurement
Value applied:	GPS coordinates
Justification of choice of data or description of	

measurement methods and procedures applied	
Purpose of the data	Calculation of baseline emissions Calculation of project emissions
Comments	The GPS coordinates of the plot positions is used to navigate to the sample plots

Data / Parameter	<i>a,b,c,d</i>
Data unit	<i>Dimensionless</i>
Description	<i>Parameters used in in the allometric equation to calculate the fresh weight of above-ground tree biomass (W_{wet})</i>
Source of data	<i>National Biomass Study (NBS), Uganda</i>
Value applied:	See Table 11
Justification of choice of data or description of measurement methods and procedures applied	See section 4.3.4
Purpose of the data	Calculation of project emissions
Comments	<i>Varies according to tree diameter</i>

Data / Parameter	CF_a
Data unit	dimensionless
Description	Conversion Factor for the conversion of fresh weight to air dry weight of woody biomass
Source of data	National Biomass Study, Uganda
Value applied:	Species specific conversion factors to be found in Appendix 2 If a factor for particular species is unknown, a default value of 0.54 is applied.
Justification of choice of data or description of measurement methods and procedures applied	See section 4.3.4

Purpose of the data	Calculation of project emissions
Comments	

Data / Parameter	CF_b
Data unit	dimensionless
Description	Conversion Factor for the conversion of air-dry weight to oven-dry weight of woody biomass
Source of data	National Biomass Study, Uganda.
Value applied:	0.853
Justification of choice of data or description of measurement methods and procedures applied	See section 4.3.4
Purpose of the data	Calculation of project emissions
Comments	Corresponds to moisture content of 14.7% for Ugandan experiments.

Data / Parameter	CF_c
Data unit	dimensionless
Description	Conversion factor for conversion of oven-dry weight to carbon stock in above-ground tree biomass
Source of data	IPCC 1995
Value applied:	0.50
Justification of choice of data or description of measurement methods and procedures applied	See section 4.3.4
Purpose of the data	Calculation of project emissions
Comments	

Data / Parameter	CF_r
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Data unit	dimensionless
Description	Conversion Factor for calculating root biomass
Source of data	CO ₂ fix model (Mohren et al. 1999)
Value applied:	0.16
Justification of choice of data or description of measurement methods and procedures applied	See section 4.3.4
Purpose of the data	Calculation of project emissions
Comments	Root factor for calculating root biomass. Ranges from 0.32 for smallest trees, up to 0.08 for large trees.

Data / Parameter	$\frac{44}{12}$
Data unit	dimensionless
Description	Ratio of molecular weights of CO ₂ and carbon
Source of data	IPCC
Value applied:	44/12
Justification of choice of data or description of measurement methods and procedures applied	See section 4.3.4
Purpose of the data	Calculation of project emissions
Comments	

Data / Parameter	ΔC_{BSL}
Data unit	tCO ₂ e
Description	Baseline net GHG removals by sinks
Source of data	PD (section 2.5 and 4.2)
Value applied:	0

Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data	Calculation of project emissions
Comments	

Data / Parameter	C_{TREE_BSL}
Data unit	tCO ₂ e
Description	Baseline GHG removals by sinks
Source of data	PD (section 2.5 and 4.2)
Value applied:	19.1
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data	Calculation of project emissions
Comments	Value based on the data provided by the 1999 study of Meijer.

Data / Parameter	GHG_E
Data unit	tCO ₂ e
Description	Increase in non-CO ₂ GHG emissions within the project boundary as a result of the implementation of the ARR VCS project activity
Source of data	PD
Value applied:	0
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data	Calculation of project emissions
Comments	

Data / Parameter	LK
Data unit	tCO ₂ e
Description	Total GHG emissions due to leakage
Source of data	PD (section 4.4)
Value applied:	0
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data	Calculation of project emissions
Comments	

4.2 Data and Parameters Monitored

Data / Parameter	DBH
Data unit	mm
Description	Diameter at breast height of tree - measured at 1.3m height
Source of data	Field measurements in inventory sample plots.
Description of measurement methods and procedures to be applied	DBH was measured for all qualifying trees (equal or greater than 50 mm DBH) in the sample plots using a calliper. Diameter was measured at 1.3m height (breast height).
Frequency of monitoring/recording	DBH is measured in the inventory sample plots during the monitoring campaigns (every 3 years).
Value monitored:	Tree DBH vary per tree age and tree species, see Appendix 4 for measured DBH per tree
Monitoring equipment	The DBH was measured in the field using a calliper. Data was stored in Field-Map.
QA/QC procedures to be applied	See section 4.3
Purpose of the data	Calculation of project emissions

Calculation method	-
Comments	To qualify for sampling and carbon stock calculation, only trees with dimensions greater or equal to 5 cm in diameter at breast height were considered.

Data / Parameter	<i>H</i>
Data unit	m
Description	Tree Height
Source of data	Field measurements in inventory sample plots.
Description of measurement methods and procedures to be applied	Triangulation using Field-Map Technology
Frequency of monitoring/recording	Tree Height is measured in the sample plots during the monitoring campaigns (every 3 years)
Value monitored:	Tree heights vary per tree age and tree species, see Appendix 4 for measured heights per tree
Monitoring equipment	Field-Map Technology
QA/QC procedures to be applied	See section 4.3
Purpose of the data	Calculation of project emissions
Calculation method	When field measurement was missing, tree height was modeled according to the exponential model: $H = 1.3 + \exp \left(P_1 + \frac{P_2}{DBH} \right)$
Comments	Tree height was measured whenever it was possible. If it was not possible to measure tree heights in the field (e.g. bend or slanted trees) the tree heights were modelled using exponential model (see section 4.3.4.1).

Data / Parameter	CW
Data unit	m
Description	Tree crown width
Source of data	Field measurements in inventory sample plots.
Description of measurement methods and procedures to be applied	The crown width of the tree crown was measured using Field-Map technology.

Frequency of monitoring/recording	Tree Crown is measured in the sample plots during the monitoring campaigns (every 3 years)
Value monitored:	Tree crowns vary per tree age and tree species, see Appendix 4 for measured crown widths per tree
Monitoring equipment	Field-Map Technology
QA/QC procedures to be applied	See section 4.3
Purpose of the data	Calculation of project emissions
Calculation method	When field measurement was missing, tree crown width was modeled according to the regression model: $CW = a * DBH^b + H^c$
Comments	Crown width was measured directly in the field. Field-Map provides functionality for mapping the horizontal crown projection. If projection was circular then only one point was measured (x, y co-ordinates in relation to the tree stem center), if horizontal projection was irregular then two points were taken to map the shortest and longest distance of crown circumference. Tree crown was measured whenever it was possible. If it was not possible to measure tree crowns in the field (e.g. bend or slanted trees) the tree crowns were modelled (see section 4.3.4.1).

Data / Parameter	<i>Tree species</i>
Data unit	dimensionless
Description	The name of the tree species, identified at both genus and species level.
Source of data	Field measurements in inventory sample plots.
Description of measurement methods and procedures to be applied	The name of the tree species are identified by highly skilled botanists in the field.
Frequency of monitoring/recording	The tree names are recorded in the sample plots during the monitoring campaigns (every 3 years)
Value monitored:	Tree species, see Appendix 4 for recorded tree species
Monitoring equipment	Field-Map Technology
QA/QC procedures to be applied	See section 4.3
Purpose of the data	Calculation of project emissions
Calculation method	-

Comments	The identification of tree species is necessary for the calculation of the amount of carbon stored in the trees
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Data / Parameter	W_{wet}
Data unit	t
Description	Fresh weight of above ground tree biomass
Source of data	Field data monitoring; model by IFER
Description of measurement methods and procedures to be applied	Calculation of fresh weight of above ground tree biomass, based on the tree measurements in the field
Frequency of monitoring/recording	Each monitoring campaign (every 3 years)
Value monitored:	Depends on tree species and tree size, see Appendix 4 for W_{wet} calculations per tree
Monitoring equipment	Field-Map Technology
QA/QC procedures to be applied	See section 4.3
Purpose of the data	Calculation of project emissions
Calculation method	$\ln(W_{wet}) = \frac{a + b * \ln(DBH) + c * \ln(H) + d * \ln(CW)}{1000}$
Comments	See paragraph 3.3.4.1 for parameters used

Data / Parameter	W_{airdry}
Data unit	t
Description	Air-dry weight of above ground tree biomass
Source of data	Field data monitoring; National Biomass Study, Uganda
Description of measurement methods and procedures to be applied	Calculation of air-dry weight of above ground tree biomass, using conversion factor CF_a
Frequency of monitoring/recording	Each monitoring campaign (every 3 years)
Value monitored:	Depends on tree species and tree size, see Appendix 4 for W_{airdry} calculations per tree
Monitoring equipment	Field-Map Technology

QA/QC procedures to be applied	See section 4.3
Purpose of the data	Calculation of project emissions
Calculation method	$W_{airdry} = W_{wet} * CF_a$
Comments	

Data / Parameter	$W_{ovendry}$
Data unit	t
Description	Oven-dry weight of above ground tree biomass
Source of data	Field data monitoring; National Biomass Study, Uganda
Description of measurement methods and procedures to be applied	Calculation of oven-dry weight of above ground tree biomass, using conversion factor CF_b
Frequency of monitoring/recording	Each monitoring campaign (every 3 years)
Value monitored:	Depends on tree species and tree size, see Appendix 4 for $W_{ovendry}$ calculations per tree
Monitoring equipment	Field-Map Technology
QA/QC procedures to be applied	See section 4.3
Purpose of the data	Calculation of project emissions
Calculation method	$W_{ovendry} = W_{airdry} * CF_b$
Comments	

Data / Parameter	CS_{TAG}
Data unit	tC
Description	Carbon stock in above-ground tree biomass
Source of data	Tree data; IPCC
Description of measurement methods and procedures to be applied	Calculation of carbon stock in above ground tree biomass, using conversion factor CF_c
Frequency of monitoring/recording	Each monitoring campaign (every 3 years)
Value monitored:	Depends on tree species and tree size, see Appendix 4 for CS_{TAG} calculations per tree

Monitoring equipment	Field-Map Technology
QA/QC procedures to be applied	See section 4.3
Purpose of the data	Calculation of project emissions
Calculation method	$CS_{TAG} = W_{ovendry} * CF_c$
Comments	

Data / Parameter	CS_{TBG}
Data unit	tC
Description	Carbon stock in below-ground tree biomass
Source of data	Tree data; CO ₂ fix model (Mohren et al. 1999)
Description of measurement methods and procedures to be applied	Calculation of carbon stock in below-ground tree biomass (root system), using conversion factor CF_r
Frequency of monitoring/recording	Each monitoring campaign (every 3 years)
Value monitored:	Depends on tree species and tree size, see Appendix 4 for CS_{TBG} calculations per tree
Monitoring equipment	Field-Map Technology
QA/QC procedures to be applied	See section 4.3
Purpose of the data	Calculation of project emissions
Calculation method	$CS_{TBG} = CS_{TAG} * CF_r$
Comments	

Data / Parameter	C_{TREE}
Data unit	tCO ₂ e
Description	GHG sinks in above- and below-ground tree biomass
Source of data	Tree data; IPCC
Description of measurement methods and procedures to be applied	Calculation of GHG sinks in above- and below-ground tree biomass
Frequency of monitoring/recording	Each monitoring campaign (every 3 years)

Value monitored:	Depends on tree species and tree size, see Appendix 4 for C_{TREE} calculations per tree
Monitoring equipment	Field-Map Technology
QA/QC procedures to be applied	See section 4.3
Purpose of the data	Calculation of project emissions
Calculation method	$C_{TREE} = \frac{44}{12} * (CS_{TAG} + CS_{TBG})$
Comments	

Data / Parameter	ΔC_P
Data unit	tCO ₂ e
Description	Sum of the changes the carbon stock in the selected carbon pools within the project boundary since the start of the ARR project activity
Source of data	Carbon monitoring campaigns
Description of measurement methods and procedures to be applied	Sum of the changes the carbon stock in the selected carbon pools within the project boundary since the start of the ARR project activity
Frequency of monitoring/recording	Each monitoring campaign (every 3 years)
Value monitored:	See Appendix 4 for ΔC_P calculations
Monitoring equipment	Field-Map Technology
QA/QC procedures to be applied	See section 4.3
Purpose of the data	Calculation of project emissions
Calculation method	$\Delta C_P = \sum_{t=1}^{t^*} \Delta C_{TREE,t}$
Comments	See section 4.2

Data / Parameter	ΔC_{ACTUAL}
Data unit	tCO ₂ e
Description	Actual net GHG removals by sinks since the start of the ARR project activity
Source of data	Carbon monitoring campaigns

Description of measurement methods and procedures to be applied	Actual net GHG removals by sinks since the start of the ARR project activity
Frequency of monitoring/recording	Each monitoring campaign (every 3 years)
Value monitored:	See Appendix 4 for ΔC_{ACTUAL} calculations
Monitoring equipment	Field-Map Technology
QA/QC procedures to be applied	See section 4.3
Purpose of the data	Calculation of project emissions
Calculation method	$\Delta C_{ACTUAL} = \Delta C_P - GHG_E$
Comments	

Data / Parameter	C_{AR_VCS}
Data unit	tCO ₂ e
Description	Net anthropogenic GHG removals by sinks
Source of data	Carbon monitoring campaigns
Description of measurement methods and procedures to be applied	the actual net GHG removals by sinks minus the baseline net GHG removals by sinks minus leakage
Frequency of monitoring/recording	Each monitoring campaign (every 3 years)
Value monitored:	See Appendix 4 for C_{AR_VCS} calculations
Monitoring equipment	Field-Map Technology
QA/QC procedures to be applied	See section 4.3
Purpose of the data	Calculation of project emissions
Calculation method	$C_{AR_VCS} = \Delta C_{ACTUAL} - \Delta C_{BSL} - LK$
Comments	

Data / Parameter	$\Delta C_{AR_VCS,T}$
Data unit	tCO ₂ e
Description	Net change in anthropogenic GHG removals by sinks over the monitoring $T = t_7 - t_6$
Source of data	Carbon monitoring campaigns

Description of measurement methods and procedures to be applied	the net GHG removals by sinks in t_7 minus the net GHG removals by sinks in t_6
Frequency of monitoring/recording	Each monitoring campaign (every 3 years)
Value monitored:	See Appendix 4 for $\Delta C_{AR_VCS,T}$ calculations
Monitoring equipment	Field-Map Technology
QA/QC procedures to be applied	See section 4.3
Purpose of the data	Calculation of project emissions
Calculation method	$\Delta C_{AR_VCS,T} = C_{AR_VCS,t_7} - C_{AR_VCS,t_6}$
Comments	

4.3 Monitoring Plan

4.3.1 Information on how geographic coordinates of the project boundary are established, recorded and archived

The project boundary is used to delineate the project area. The location of each node of the project boundary will be measured during fieldwork and archived in the database. The project boundary is monitored during events such as site preparation, planting, permanent sampling operations, fire monitoring events, carbon monitoring campaign, etc., during which compartment IDs and compartment areas are required to be entered.

The project and planted compartment boundaries are mapped using a hand-held GPS. Coordinates at each turning point on the compartment boundary are recorded in order to show proper boundaries of planted areas and to determine the actual planted areas. Mapping is carried out every year after planting targets have been achieved. The end product of the mapping exercises are maps of the rehabilitated areas.

All spatial data are archived at the UWA-Face office in Mainaro, Kibale, and at the Face the Future office in the Netherlands.

4.3.2 Stratification

Stratification was based on the ARR VCS project planting and management strategy. All planting stands comprised of mixed species planted at the same time and same density of 5x5m resulting in 400 trees per hectare across the project area. The same tending and weeding regime was applied in all planting stands of the same age for the respective species. As such, for the ex-ante actual net GHG removals by sinks, the planted areas were stratified into planting age cohorts. In addition to these strata, there exists a natural regeneration area stratum resulting from the planting of a buffer zone strategy of 1995 on the western part of the project

area. As a result of full protection from fires due to project activities, the inner portion (eastern part) of the project area has started to regenerate naturally and forms a stratum of its own. Therefore, the management strategy, temporal and spatial information on the forest establishment will be adopted as stratification criteria. The geographical locations of the naturally regenerated area, planting sites, planting dates and the actual areas planted per year have been identified and are represented as polygons in the stratification map shown in Figure 3 below. A list with the planting sites and its corresponding GPS coordinates can be found in Table 8 below.

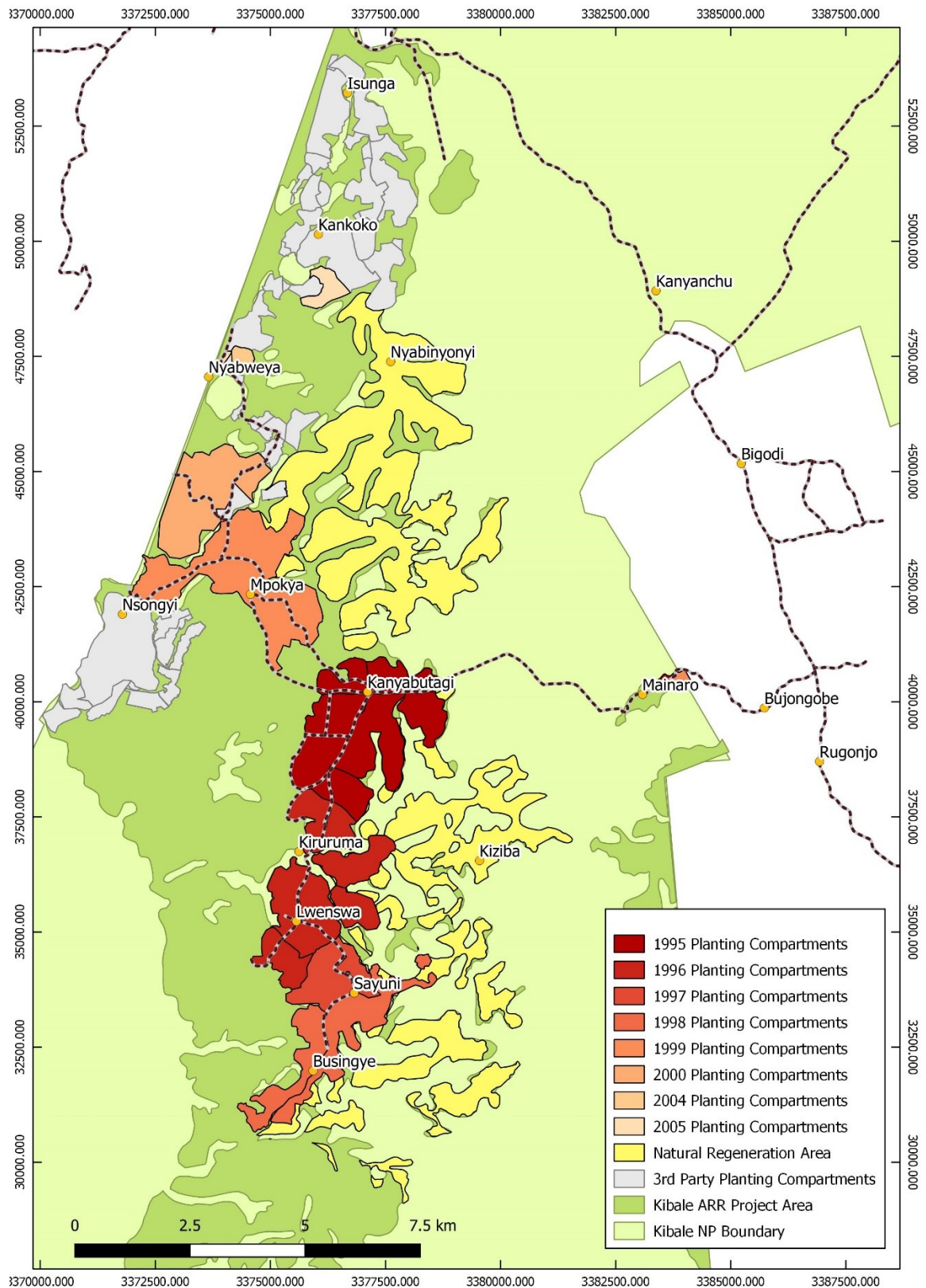


Figure 3 - Showing an outline of planted and natural regeneration areas within the greater National Park boundary (Map projection WGS84)

Table 8 - Unique identification of the planting compartments for the KNP project
(coordinates in UTM ARC 1960 Zone 36N)

Compartment ID	PHASE	Planting Year	Area (ha)	Grid Coordinates	
				Eastings	Northings
101	Phase one	1995	61.7	202919	39805
102	Phase one	1995	185.3	203380	39166
103	Phase one	1995	64.3	203196	40444
104	Phase one	1995	66.0	203103	38162
105	Phase one	1995	80.8	204763	19896
106	Phase one	1995	32.3	202458	19714
107	Phase one	1995	108.6	202365	18710
108	Phase one	1995	83.8	204026	40535
109	Phase one	1996	68.5	202365	37705
110	Phase one	1996	56.0	202826	37431
111	Phase one	1996	88.5	201719	35788
112	Phase one	1996	79.4	202364	35606
113	Phase one	1996	48.8	202088	35058
114	Phase one	1996	85.1	201719	34419
115	Phase one	1996	99.8	203194	36518
116	Phase one	1996	65.7	203102	35605
117	Phase one	1997	119.6	202548	33962
118	Phase one	1995	6.0	209927	40533
201	Phase two	1997	49.0	203286	34145
202	Phase two	1998	208.6	203101	33323
203	Phase two	1998	143.2	202271	32319
204	Phase two	1998	7.9	204669	34418
205	Phase two	1999	184.7	201628	41997
206	Phase two	1999	368.7	200707	43275
207	Phase two	1999	11.8	210204	40533
301	Phase three	2000	315.8	199877	44554
407	Phase four	2005	45.9	202737	49026
409	Phase four	2005	3.0	200431	47566
410	Phase four	2004	16.8	200800	47475

4.3.3 Data collection

The carbon monitoring campaign in Kibale NP used the same plot design and methodology as were applied in Kibale NP during previous campaigns. For details about the general methodology see Methodology for Carbon Stock Monitoring (IFER, 2002).

4.3.3.1 Sampling scheme

A regular sampling grid was applied to all the compartment areas using clusters of four permanent sampling plots at a spacing of 500 x 500 meters. In the naturally regenerated areas, the same grid was employed, however, clusters of three permanent sampling plots was used for the natural regeneration area. This design allowed adding new clusters when new strata (planting years) are being added to the project area (see Figure 4).

In total there were 215 plots in 54 clusters measured in the compartment area. All of these 54 clusters were re-measured, meaning that these clusters were already measured in the previous campaign in 2020. In the naturally regenerated areas 66 plots within 22 clusters were measured. All of these 22 clusters were re-measured, meaning that these clusters were already measured in the previous campaign in 2020.



4.3.3.2 Cluster Design

The inventory plots were aggregated in clusters. It was planned that one field group would manage one cluster per day on average. The cluster design is described in Figure 5 below.

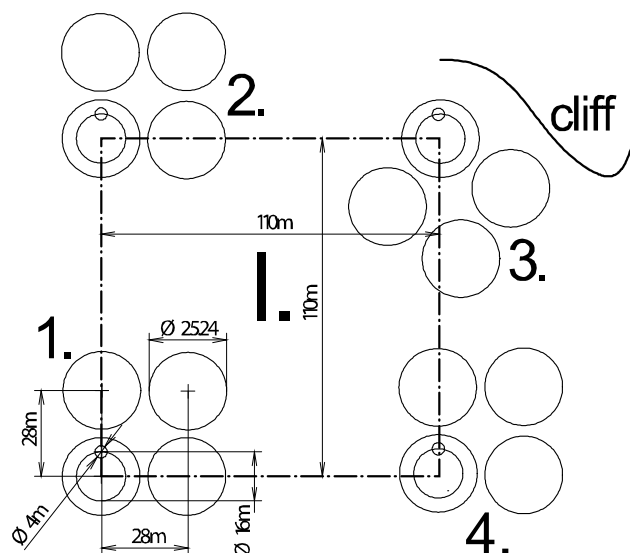


Figure 5 - The monitoring cluster (I.) consists of four plots (in compartments) or three plots (in naturally regenerated areas). Each sampling plot is composed of four circles 500 m² each. Plot 3 was rotated because of the obstacle. The obstacle can be road, cliff, river, etc.

4.3.3.3 Plot Design

Each inventory plot (Figure 6) was composed of four circles with an area of 500 m² each (i.e. 2,000 m² altogether). The key circle contained an additional circle, a concentric internal subplot to measure smaller trees. The applied limits for the inventory circles and tree size specified for the carbon monitoring project in Uganda are shown in Table 9.

Table 9 - Applied limits for trees given by diameter at breast height (DBH) for particular sub-plots within an inventory plot

Circle radius	Tree DBH limit
Up to 8 m of the key plot centre	50 mm and more
Up to 12.62 m of the key plot centre (its entire area)	150 mm and more
Remaining three large circles of the plot	300 mm and more

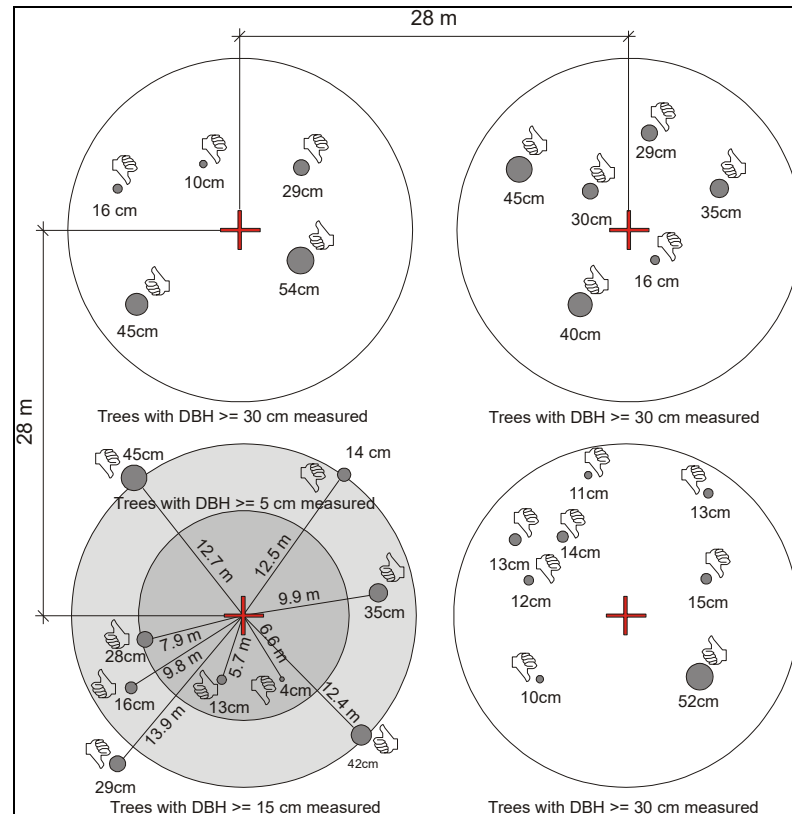


Figure 6 - Trees equal or greater than 300 mm of DBH are measured in the entire plot. Trees equal or greater than 150 mm of DBH are measured in the light gray circle. Trees equal or greater than 50 mm of DBH are measured in the inner dark gray circle

4.3.3.4 Plot Monumentation

In order to comply with the requirement of the methodology (AR-ACM0001 - Version 05.0.0) for permanent sampling plots, all inventory plots are measured in a local Cartesian co-ordinate system with the center in the middle of inventory plot. The project utilizes both the Laser and GPS technologies to locate plot centers. The GPS is used in Global Coordinate System (i.e. on the navigation plot) whereas the Laser is utilized on both the local and global coordinate systems. The Laser is reliable for navigation under canopy, provides a precise navigation to the plot center and is utilized for all measurements carried out within the inventory plot.

From the center of an inventory plot, a position of marked tree is measured. This marked tree is then painted and if necessary some more descriptive comments are entered into the database. Selection of the tree to be painted is based on the size and type of the tree. For example, a tree of 200 mm DBH, belonging to the climax species group and not edible to wildlife, is preferably selected because it is more likely to still be alive during the next carbon monitoring campaign, 5 years later. Therefore, during the repeated measurements the geo-reference is taken from the painted tree. This means that upon reaching the inventory plot, the Field Team immediately searches around for painted tree and uses the positioning routine to get a reference from it.

4.3.3.5 Precision requirements

The number of permanent sampling plots and the targeted precision level for the biomass estimation is $\pm 10\%$ of the mean at a 90% confidence level and was determined using the approved CDM tool for “Calculation of the number of sample plots for measurements within A/R CDM project activities” version 02.1.0 as required by the CDM methodology AR-ACM0001, version 05.0.0.

During the 2023 monitoring campaign a total of 215 plots in 54 clusters were measured in the compartment area and 66 plots within 22 clusters were measured in the natural regeneration area. Table 10 below outlines the precision levels for both the planting compartments and the natural regeneration area. The results shows that at a confidence level of 90%, the average precision level for the planting compartments is 5.6%, and the average precision level for the natural regeneration area is 6.6%. This calculation is also included in Appendix 3 of this VCS Monitoring Report.

Table 10 - Outlining the precision level for biomass estimation in planted areas at a confidence level of 90%

Tree Stage	Carbon/Whole tree biomass (tCO ₂ /ha)	Precision level ($\alpha=0,10$)		
		lower conf. limit	upper conf. limit	Precision, %
Planting Compartments	255.45	241.12	269.78	5.6%
Regeneration Area	310.79	290.23	331.34	6.6%

4.3.3.6 Measurement technology

Field-Map technology (www.field-mapping.com) was used for data collection and mapping in this monitoring campaign. Field-Map (© IFER-Monitoring and Mapping Solutions, Inc.) is an advanced computer aided field data collection technology based on modern electronic devices and user-friendly software. The complete Field-map solution includes specific features and utilities that are specifically important for the demanding field conditions of tropical regions. They include efficient field navigation, support for concentric sample plot circles, continuous georeferencing, remote diameter measurement allowing measuring trees with buttresses, several height measurement modes etc.

List of main parts of Field-Map equipment used in Kibale:

- Field computer
- Laser rangefinder (with integrated compass)
- Telescopic monopod
- Reference poles with reflectors
- Calliper
- GPS
- Accessories



Figure 7 - Field-Map set

4.3.4 Data processing

Statistical methods used in the Field-Map Inventory Analyst represent standard methods used for simple and stratified sampling design (Thomson, 1992). A complete description of methods used is available in Field-Map Inventory Analyst Manual (IFER, 2007).

The carbon stock assessment is based on the field inventory of ecosystem components containing carbon. Carbon in ecosystems is sequestered into biomass and residual organic material. Carbon is fixed in standing trees and other components such as deadwood, ground vegetation and soil as well. As described in the PD (section 2.3), only the above-ground and below-ground biomass of tree vegetation is included as carbon pool for the project activity. Dead wood, litter and soil organic carbon are conservatively excluded as carbon sink. Tree regeneration, ground vegetation, shrubs and stumps were also not included in the total carbon stock calculation. These components represent only an insignificant fraction of biomass in the project area. The carbon calculation in this report only concerns the tree biomass.

Using the collected data (measured or described) from the field, carbon calculation involves the following steps:

- Applying suitable allometric equations to calculate tree biomass (fresh weight), which is converted to dry weight and carbon units using species-specific density and average carbon stock held in biomass dry weight, respectively.
- Using statistical procedures to assess carbon stock in tree biomass in compartments and naturally regenerated areas (statistical extrapolation from plot to total area).

4.3.4.1 Calculating carbon stock held in trees

To qualify for sampling and carbon stock calculation, only trees with dimensions greater or equal to 5 cm in diameter at breast height were considered. The required input parameters for

suitable allometric equations were: tree breast height diameter (DBH ; mm), tree height (H ; m) and crown width (CW ; m).

Breast height diameter was measured for all qualified trees, height and crown width were measured whenever it was possible. Heights and crown projections were not measured for bent or slanted trees. Tree height samples measured in the field were used to parameterize DBH-Height exponential model to fill missing heights:

$$H = 1.3 + \exp \left(P_1 + \frac{P_2}{DBH} \right) \quad (1)$$

where:

H	Tree height; m
DBH	Diameter at breast height; mm
P_1, P_2	Exponential model parameters

If there were enough height samples measured (min. number of height samples per species was set to be 4) on single inventory plot per particular species, then the model was parameterized on the level of plot (i.e. local species model). In case there were not enough samples on the inventory plot the overall species model was adjusted to fit height samples available on particular inventory plot (i.e. adjusted species model). In very rare cases, when there were not any height samples available on the inventory plot for particular species, the general species model was applied (i.e. general species model). Modelled heights were used only for trees with no measured height (e.g. bend or slanted trees). The parameters for all DBH-H models used are given in Appendix 1.

Tree crown widths measured in the field were used to parameterize regression model:

$$CW = a * DBH^b * H^c \quad (2)$$

where:

CW	Tree crown width; m
H	Tree height; m
DBH	Diameter at breast height; mm
a, b, c	regression model parameters

All the trees regardless species with measured crown width were used for parameterization of the model. Measured crown widths were used in allometric equations. Modelled crown widths were used only for trees with no crown width (e.g. bend or slanted trees) or for outliers. To identify the outliers, the difference between measured and modelled crown width S_{yx} was

calculated. Any tree with S_{yx} out of 3 standard deviations was considered to be an outlier and its crown width was modelled.

The crown widths were modelled for both the compartment area and the regeneration area separately. Final parameters of the crown width regression model were:

Compartment Area

$$a = 0.19460$$

$$b = 0.63078$$

$$c = 0.10905$$

$$R = 0.836$$

Regeneration Area

$$a = 0.18214$$

$$b = 0.64635$$

$$c = 0.10113$$

$$R = 0.835$$

Both the regression models for crown widths in the compartment area and the regeneration area are also attached to this Monitoring Report as Appendix 2.

To calculate the fresh weight of above-ground tree biomass from the measured tree parameters, the allometric equations were formed as:

$$\ln(W_{wet}) = \frac{a + b * \ln(DBH) + c * \ln(H) + d * \ln(CW)}{1000} \quad (3)$$

where:

W_{wet}	Fresh weight of above-ground tree biomass; t
DBH	Diameter at breast height; mm
H	Tree height; m
CW	Tree crown width; m
a, b, c, d	parameters

The parameters a, b, c, d were established for three tree size classes based on a wealth of destructively obtained data in Uganda (Velle 1997, Begumana 2000, IFER 2002). The parameters a, b, c, d that were applied in the calculation of W_{wet} are shown in Table 11 (after Velle 1997 adjusted by Begumana 2000).

Table 11 - The set of parameters for Eq. 3 estimated by NBS, Kampala, Uganda

Diameter range	Parameters			
	a	b	c	d
DBH<200 mm	-0.85989	1.54456	0.50663	0.33335
DBH 200-600 mm	-1.75089	1.94391	0.47373	0.24578
DBH>600 mm	-2.16650	2.03293	0.31292	0.43634

Conversion of fresh weight to air-dry weight of above ground tree biomass was performed by applying a conversion factor that is derived from the National Biomass Study NBS, Kampala, Uganda:

$$W_{airdry} = W_{wet} * CF_a \quad (4)$$

where:

W_{airdry} Air-dry weight of above-ground tree biomass; t

W_{wet} Fresh weight of above-ground tree biomass; t

CF_a conversion factor

The conversion factors are obtained from the National Biomass Study (Forestry Department, Uganda, 1992, NBS Appendix K). They are species-specific and range between 0.33 and 0.74. If a factor for particular species is unknown or unrecognized, a default value of 0.57 is applied. This corresponds to a mean value of the available factors for common tree species in Uganda. The species specific conversion factors are given in Appendix 3.

Conversion of air-dry weight and oven-dry weight of tree biomass is calculated by applying a conversion factor:

$$W_{ovendry} = W_{airdry} * CF_b \quad (5)$$

where:

$W_{ovendry}$ oven-dry weight of above-ground tree biomass; t

W_{airdry} Air-dry weight of above-ground tree biomass; t

CF_b conversion factor (0.853)

The value of the additional conversion factor CF_b (0.853) corresponds to a moisture content of 14.7 % in air-dry matter. This is the average value found in the local experiments (Forestry Department, Uganda, 1992, NBS paragraph 9.4).

Oven-dry matter is converted to carbon stock in above-ground tree biomass (CS_{TAG}) using conversion factor (CF_c) of 0.50 , which is commonly used elsewhere (Matthews 1993, Schelhaas 2002, Kort 1999) and also recommended by the IPCC (1995 a, b):

$$CS_{TAG} = W_{ovendry} * CF_c \quad (6)$$

where:

CS_{TAG}	Carbon stock in above-ground tree biomass; tC
$W_{ovendry}$	oven-dry weight of above-ground tree biomass; t
CF_c	conversion factor (0.50)

Finally, the below-ground biomass component (root system) is accounted for by multiplying the above-ground carbon stock by a specific root factor:

$$CS_{TBG} = CS_{TAG} * CF_r \quad (7)$$

where:

CS_{TBG}	Carbon stock in below ground biomass in tree roots; tC
CS_{TAG}	Carbon stock in above-ground tree biomass; tC
CF_r	Root factor applicable on the level of individual trees (0.16)

CF_r is derived from the CO₂fix model (Mohren et al. 1999) estimation using a default parameter set for tropical evergreen forest ecosystems (Nabuurs and Mohren, 1993). The model gives a root ratio in relation to mean stem volume and stand age. The volumetric information is used to derive a size-dependent root factor that is attributed to each measured tree stored in the database. The root fraction ranges from 0.32 for the smallest trees up to 0.08 for the largest trees. The average value of 0.16 is applied as root ratio for this monitoring campaign, this is a rather conservative value to comply with a rigorously “safe” assessment strategy involved in the assessment.

The total GHG sink in above-ground and below-ground tree biomass is calculated as:

$$C_{TREE} = \frac{44}{12} * (CS_{TAG} + CS_{TBG}) \quad (8)$$

where:

C_{TREE}	GHG sinks in above- and below-ground biomass in trees; tCO ₂ e
CS_{TAG}	Carbon stock in above-ground tree biomass; tC
CS_{TBG}	Carbon stock in below ground biomass in tree roots; tC
$\frac{44}{12}$	Ratio of molecular weights of CO ₂ and carbon; dimensionless

4.3.4.2 Stratification and Extrapolation

The stratification is a statistically sound approach for improving the quality of the results based on grouping members of the population into relatively homogeneous subgroups. Therefore, when sub-populations vary considerably and each sub-population has smaller variability than the whole population, it is advantageous to employ stratification approach. Planting year was chosen in compartments area for stratification. While the entire naturally regenerated area was considered as a single stratum.

Standard statistics for stratified sampling (Thompson, 1992) has been used for calculations.

4.3.4.3 Technology for data processing

Advanced technology Field-Map was used also for data processing. The advantage of the Field-Map technology is the use of the field computers in data collection process. Therefore the data collected in the field are digitized instantly in the field and are stored in industry standard formats (maps in ESRI shape files, tables in Paradox or MS Access).

Field-Map Data Processing Tools are used for further processing (i.e. calculation of missing variables, data classifications/re-classifications, data aggregation), while Field-Map Inventory Analyst (© IFER-Monitoring and Mapping Solutions, Inc.) is used for statistical analyses.

4.3.5 Quality Assurance and Quality Control

4.3.5.1 Roles and responsibilities

Many people were involved in the monitoring campaign on different levels. Majority of them were workers doing the actual fieldwork. There were 4 field teams involved in the 2023 field campaign. For easy orientation these were called Red, Blue, Green and Yellow teams.

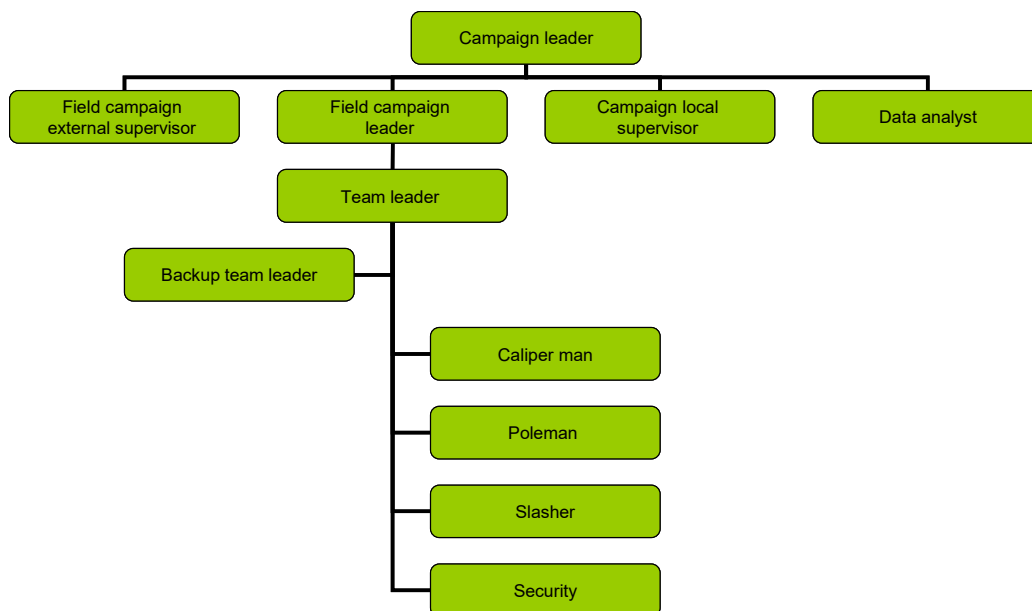


Figure 8 - Organizational Structure of the Carbon Monitoring Campaign teams

Campaign leader

The leader of the campaign is responsible for the methodology of the campaign. He designs the project structure and supervises the data evaluation.

Field campaign leader

Leader is responsible for the operations on the ground. The main tasks of the leader are to select and hire local staff capable of works related to computer aided field data collection, manage monitoring teams in the training phase and also later in the field, organize repairs of broken equipment and assigned other responsibilities to team leaders.

Field campaign external supervisor

External supervisor is responsible for teaching the correct methodological approach to the local workers. He is present in the beginning of the campaign to ensure that all problems related to equipment and project database structure are solved and all questions regarding the methodology of data collection are answered. He leads the training of local staff. He is also present at the end of the campaign to check data quality and to check the quality of field work by revisiting random selection of inventory plots and re-measuring them.

Campaign local supervisor

Local supervisor is present during the campaign to ensure that the data collection in the field is done according to the correct methodological approach. The local supervisor answers questions with regards to the methodology of data collection in the field.

Data analyst

Data analyst is responsible for data check and data evaluation. He carries out the statistical computations and produces the final results.

Team leader

Team leader is responsible for managing local workers in the field and is operating the technology in the field and therefore must be familiar with it. He is also responsible for daily backup of collected data.

Backup team leader

Backup team leader acts as team leader in case that team leader is not able to participate in the field work on particular day. Otherwise he is regular member of the field crew.

Caliper man

Works with caliper. He needs to follow the methodology for DBH measurement and measure diameters responsibly.

Poleman

Poleman is operating measuring pole. He is familiar with the correct procedures for measuring positions of the trees and also procedure for navigation to the plot.

Slasher

Slasher helps to clear the way to the other team members. He must make sure that no excessive cutting takes place during the survey.

Security

Security man is armed and ensures safety of the team in the field.

Table 12 - List of people involved in the 2023 campaign

Team member	Team	Role
Kars Riemer	-	Campaign leader
Richard Kigenyi	-	Field campaign leader
Petr Blazek	-	Field campaign external supervisor & Data analyst
Kars Riemer	-	Quality controller
Allan Bagonza	-	Quality controller
Patrick Kamara	-	Quality controller
Obed Kareebi / Nelson Enyagu	Red	Team leader / Main operator
Allan Bagonza	Green	Team leader / Main operator
Patrick Kamara	Blue	Team leader / Main operator
Philemon Tumwebaze	Yellow	Team leader / Main operator

4.3.5.2 Training and support

The monitoring campaign started with a training during the second week of February 2023. The 4 field teams were trained in the hardware maintenance and software operation using Field-Map technology. Team leaders were also trained in backing up of the data. IFER, represented by Petr Blazek, led the training of the data collection.

4.3.5.3 Equipment calibration

For the mapping and monitoring of the trees within the permanent sampling plots a laser rangefinder (with integrated compass) as being used as part of the measuring equipment (see Paragraph 4.3.3.6). For this monitoring campaign TruPulse 360R from Laser Technology Inc. where used as laser range finders. To ensure optimum performance of the laser rangefinders, the field teams were trained to complete an on-site Horizontal Angle Compass Calibration each day before starting with the first plot of the day. For this calibration the teams followed the the calibration procedures as set out by the manufacturer in their user's manual.⁷

4.3.5.4 Data check

The Field-Map software includes a number of automatic data checks. In addition, the build-in checking routines were amended by scripts written specifically for this monitoring campaign. Thus the data could be checked online in the field. The checking routines included:

⁷ Laser Technology Inc., 2018 LTI TruPulse 360°R User's Manual 3rd Edition (<https://lasertech.com/wp-content/uploads/LTI-TruPulse-360-R-UM.3.pdf>)

- empty values (where database fields are defined as required, the data checking routine warns the user about empty values).
- values out of bounds (e.g. since the trees are measured for the second time the DBH should be larger and therefore a warning message pops up every time the new DBH is smaller than old DBH).
- dependency checks (conditional lookup lists shorten the choice for subordinate variable, e.g. selecting certain species group shortens list of individual species).
- SQL queries (final checking of the database performed by IFER is through the SQL queries. These checks are designed specifically for the purpose of this project at the time of data checking and validation at the end of the campaign).

The final checks of the database revealed some discrepancies, but there were not many since most of the potential mistakes were captured by automatic checks.

These errors were mainly concerning proper categorization of tree regeneration into height classes. The errors were corrected by moving the individual trees into proper classes.

Field checks were performed during the campaign. A total 30 plots were re-measured (24 plots in compartment area and 6 plots in regeneration area), which is around 10% of the total number of plots sampled during the monitoring campaign 2023. The field checks were conducted jointly by UWA and Face the Future. The difference between data collected by the QA/QC teams and the field teams expressed in tons of CO₂e per hectare ranged from -31.3% up to +14.8% (checking data are considered to be 100%). Mean relative difference is -1.9%. A detailed overview of the QC results can be found in Appendix 5.

4.3.5.5 Corrective and preventive measures

The Field-Map software contains a measurement assistant. The assistant is a software expert, which guides the user through the field measurement process. The assistant can be switched on for beginners and switched off for advanced users. The user interface is built for the project and contains lookup list populated with project specific values (e.g. species list contains only species occurring in the project area). This prevents the mistyping the names and values which is crucial for database consistency and further data processing.

For every numeric field in the data collection forms it is possible to define minimum and maximum accepted values. If smaller or larger value is entered, the software warns the user and the user needs to enter valid value.

The main window of the data collection software contains a map of the inventory plot showing the plot boundary, boundary of concentric circles, location of measured trees and circles showing DBH for every tree. Any time the measured tree location falls outside the plot, the user is warned. As soon as DBH of the tree is entered, the location of the tree is checked and

compared to allowed DBH value in particular concentric circle. If there is a discrepancy, the user is warned and asked to either delete the tree or correct the DBH value.

In the 2023 monitoring campaign it was necessary to find existing trees in the field that had been measured in previous campaigns. The software has functions for searching the trees and comparing the new measured values with the old ones. More details on the functionality of Field-Map software are located at www.fieldmap.cz.

4.3.5.6 Management of monitoring data and archiving of documentation

The data is stored in the database called Field-Map project. Field-Map project is a folder containing database tables in Firebird or MS Access format, ESRI Shapefiles, XML configuration files and other necessary files. The structure of the Field-Map project is managed through Field-Map Project Manager application.

Field-Map is designed to work with distributed databases, which in practice means that many field teams can work on the same project at the same time and the results of the data collection can be easily combined together and stored in common database on daily basis.

The database was backed up on several locations and intervals during the field campaign:

- Field computers (Field teams stored their work on their computers.)
- USB drives of the field team leaders (Every day the teams backed up the work to computer in the office through USB stick. The data stayed on the USB stick as well.)
- Office computer (The data was combined together from all three groups and stored at UWA-Face office computer on daily basis).
- Computer at the Face the Future office in the Netherlands (data backup was done at regular basis during the 2023 campaign)
- Computer at the IFER office in Czech Republic (data at the beginning of the campaign and processed data at the end)

Since the entire data collection process is electronic, there is no need to store any paper forms.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

As stated in the Methodology AR-ACM0001/Version 05.0.0, the baseline net GHG removals by sinks is the sum of the changes in carbon stocks in the selected carbon pools within the project boundary that would have occurred in the absence of the ARR project activity.

Under the applicability conditions of AR-ACM0001 methodology, the baseline net GHG removals by sinks is determined as:

$$\Delta C_{BSL} = \sum_{t=1}^{t^*} (\Delta C_{TREE_BSL,t} + \Delta C_{SHRUB_BSL,t}) \quad (9)$$

where:

ΔC_{BSL}	Baseline net GHG removals by sinks; tCO ₂ e
$\Delta C_{TREE_BSL,t}$	Change in carbon stock in tree biomass in baseline within the project boundary in year t, as estimated in the tool “Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities”; tCO ₂ e
$\Delta C_{SHRUB_BSL,t}$	Change in carbon stock in shrub biomass in baseline within the project boundary in year t, as estimated in the tool “Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities”; tCO ₂ e (Under the applicability conditions of this methodology, changes in carbon stock of above-ground and below-ground biomass of shrub vegetation may be conservatively assumed to be zero for all strata in the baseline scenario)
t	1, 2, 3, ... t* years elapsed since the start of the ARR project activity; yr

As described in the PD (section 2.5 and 4.2), the baseline is in a steady state. There is no increase in GHG removal, therefore:

$$\Delta C_{BSL} = 0$$

The initial baseline carbon stock in tree biomass (C_{TREE_BSL}) is conservatively determined to be 5.2 tC/ha or 19.1 tCO₂/ha. As described in the same sections 2.5 and 4.2 of the PD, this value is based on data provided by the 1999 study of Meijer (Meijer, 1999). This baseline carbon

stock is being used as the initial carbon stock value in the project area before the implementation of the ARR VCS project activity in the compartments:

$$C_{TREE_BSL} = 19.1 \text{ tCO}_2/\text{ha}$$

5.2 Project Emissions

The actual net greenhouse gas removals by sinks were estimated using the equations described in section 5 of the CDM methodology AR-ACM0001/Version 05.0.0 as follows:

$$\Delta C_{ACTUAL} = \Delta C_P - GHG_E \quad (10)$$

where:

ΔC_{ACTUAL}	Actual net GHG removals by sinks since the start of the ARR project activity; tCO ₂ e
ΔC_P	Sum of the changes the carbon stock in the selected carbon pools within the project boundary since the start of the ARR project activity; tCO ₂ e
GHG_E	Increase in non-CO ₂ GHG emissions within the project boundary as a result of the implementation of the ARR VCS project activity; tCO ₂ e

Under the applicability conditions of this methodology, there is no quantification of project emissions because all the labour force used for the proposed ARR VCS project activity is from local villages; hence transportation for workers is not needed. All seedlings will be raised on or near the site and will be transported to the project sites by manpower and project vehicles, whose emissions are insignificant. No harvesting or thinning of the forest expected to take place as the project area wholly contained within the National park. Emissions from burning of woody biomass is also not accounted for since this burning does not takes place in the project area (PD section 2.4). Therefore, the increase in GHG emissions as a result of the implementation of the proposed ARR VCS project activity within the project boundary is set to zero:

$$GHG_E = 0$$

As described in the PD (section 2.3), only the above-ground and below-ground biomass of tree vegetation is selected as carbon pool for the project activity. Dead wood, litter and soil organic carbon are conservatively excluded as carbon sink. Furthermore, changes in carbon stock of above-ground and below-ground biomass of non-tree vegetation is conservatively set to be zero for all strata in the project scenario. Therefore the change in the selected carbon stock since the start of the ARR project activity is calculated as follows:

$$\Delta C_P = \sum_{t=1}^{t^*} \Delta C_{TREE,t} \quad (11)$$

where:

ΔC_P Sum of the changes the carbon stock in the selected carbon pools within the project boundary since the start of the ARR project activity; tCO₂e

$\Delta C_{TREE,t}$ Change in carbon stock in tree biomass within the project boundary, in year t ; tCO₂e

t 1, 2, 3, ... t^* years elapsed since the start of the ARR project activity; yr

The 2023 verification results for the actual net GHG emission removals by sinks since the start of the ARR project activity, are presented per stratum in Table 13. A detailed elaboration of the results can be found in the excel spreadsheet attached as separate file attached to this Monitoring Report as Appendix 4.

Table 13 - Actual net GHG emissions removals by sinks per stratum in 2023 (the date of the verification)

Stratum i	Area monitored in 2023 (ha)	Carbon stock in selected pools (tree biomass) ΔC_P (tCO ₂ e)	Project emissions GHG_E (tCO ₂ e)	Actual net GHG removals by sinks ΔC_{ACTUAL} (tCO ₂ e)
Planting year 1995	689	140,338	0	140,338
Planting year 1996	592	188,539	0	188,539
Planting year 1997	169	68,053	0	68,053
Planting year 1998	360	115,682	0	115,682
Planting year 1999	565	136,684	0	136,684
Planting year 2000	316	70,756	0	70,756
Planting year 2004	17	2,116	0	2,116
Planting year 2005	49	8,452	0	8,452

Natural Regeneration	2,593	805,842	0	805,842
Total	5,348			1,536,461

5.3 Leakage emissions

Under applicability conditions of the CDM methodology AR-ACM0001/Version 05.0.0 leakage emissions are estimated as follows:

$$LK = \sum_{t=1}^{t^*} LK_{AGRIC,t} \quad (12)$$

where:

LK Total GHG emissions due to leakage; tCO₂e

$LK_{AGRIC,t}$ Leakage due to the displacement of agricultural activities in year t, as calculated in the tool “Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity”; tCO₂e

As described in the PD (section 4.4), leakage is not applicable to the project. Therefore leakage is not monitored and set to zero:

$$LK = 0$$

5.4 GHG Emission Reductions and Carbon Dioxide Removals

The net anthropogenic GHG removals by sinks is the actual net GHG removals by sinks minus the baseline net GHG removals by sinks minus leakage, therefore, the following general formula is used to calculate the net anthropogenic GHG removals by sinks of the ARR VCS project activity:

$$C_{AR_VCS} = \Delta C_{ACTUAL} - \Delta C_{BSL} - LK \quad (13)$$

where:

C_{AR_VCS} Net anthropogenic GHG removals by sinks since the start of the ARR project activity; tCO₂e

ΔC_{ACTUAL} Actual net GHG removals by sinks since the start of the ARR project activity; tCO₂e

ΔC_{BSL} Baseline net GHG removals by sinks; tCO₂e

LK Total GHG emissions due to leakage; tCO₂e

The results in t_7 , date of verification 2023, for the net anthropogenic GHG removals by sinks since the start of the ARR project activity, is presented in Table 14. A detailed elaboration of the results can be found in the excel spreadsheet attached as separate file attached to this Monitoring Report as Appendix 4.

Table 14 - The net anthropogenic GHG removals since the start of the ARR project activity in t_7 (date of verification 2023)

Stratum i	Baseline emissions or removals ΔC_{BSL} (tCO ₂ e)	Project emissions or removals ΔC_{ACTUAL} (tCO ₂ e)	Leakage emissions LK (tCO ₂ e)	Net GHG removals by sinks C_{AR_{VCS},t_5} (tCO ₂ e)
Planting year 1995	0	140,338	0	140,338
Planting year 1996	0	188,539	0	188,539
Planting year 1997	0	68,053	0	68,053
Planting year 1998	0	115,682	0	115,682
Planting year 1999	0	136,684	0	136,684
Planting year 2000	0	70,756	0	70,756
Planting year 2004	0	2,116	0	2,116
Planting year 2005	0	8,452	0	8,452
Natural Regeneration	0	805,842	0	805,842
Total				1,536,461

To estimate the net change in GHG emission removals over the monitoring period $T = t_7 - t_6$, the CDM methodology AR-ACM0001/Version 05.0.0 uses the equation as the follows:

$$\Delta C_{AR_{VCS},T} = C_{AR_{VCS},t_7} - C_{AR_{VCS},t_6} \quad (14)$$

where:

$\Delta C_{AR_VCS,T}$ The net change in GHG emission removals over the monitoring period $T = t_7 - t_6$; tCO₂e

C_{AR_VCS,t_6} Net anthropogenic GHG removals by sinks, as estimated for $t^* = t_6$ = date of verification 2020; tCO₂e

C_{AR_VCS,t_7} Net anthropogenic GHG removals by sinks, as estimated for $t^* = t_7$ = date of verification 2023; tCO₂e

The results for the net change in GHG emission removals over for the monitoring period $T = t_7 - t_6$ (2020-2023) are presented per stratum i in Table 15 and for the total monitoring period T in

Table 17. A detailed elaboration of these results can be found in the excel spreadsheet attached as separate file (Appendix 4).

Table 15 - The net change in GHG emission removals per stratum for monitoring period T (2020-2023)

Stratum i	Area 2020 (ha)	Area 2023 (ha)	Net GHG removals 2020 C_{AR_VCS,t_6} (tCO ₂ e)	Net GHG removals 2023 C_{AR_VCS,t_7} (tCO ₂ e)	Net change in GHG removals $\Delta C_{AR_VCS,T}$ (tCO ₂ e)
Planting year 1995	689	689	118,743	140,338	21,595
Planting year 1996	592	592	170,573	188,539	17,966
Planting year 1997	169	169	64,409	68,053	3,644
Planting year 1998	360	360	114,667	115,682	1,015
Planting year 1999	565	565	127,376	136,684	9,308
Planting year 2000	316	316	67,875	70,756	2,881
Planting year 2004	17	17	1,581	2,116	535
Planting year 2005	49	49	8,269	8,452	183
Natural Regeneration	2,593	2,593	739,669	805,842	66,173

Total	5,348	5,348	1,413,161	1,536,461	123,300
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Table 16 – Non-Permanence Risk Assessment Result

State the non-permanence risk rating (%)	15%
Has the non-permanence risk report been attached as either an appendix or a separate document?	Yes
For ARR and IFM projects with harvesting, state, in tCO ₂ e, the Long-term Average (LTA).	N.a.
Has the LTA been updated based on monitored data, if applicable?	N.a.
State, in tCO ₂ e, the expected total GHG benefit to date.	1,536,461
If a loss occurred (including a loss event or reversal), state the amount of tCO ₂ e lost:	No loss events occurred during the project lifetime.

Table 17 - The net change in GHG emission removals for monitoring period T (2020-2023)

Vintage period	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)	Buffer pool allocation (15%)	VCUs eligible for issuance (VCUs)
01-Mar-2020 to 31-Dec-2020	0	34,250	0	34,250	5,137.5	29,112.5
01-Jan-2021 to 31-Dec-2021	0	41,100	0	41,100	6,165	34,935
01-Jan-2022 to 31-Dec-2022	0	41,100	0	41,100	6,165	34,935
01-Jan-2023 to 28-Feb-2023	0	6,850	0	6,850	1,027.5	5,822.5
Total	0	123,300	0	123,300	18,495	104,805

The Net GHG emission reductions or removals over the monitoring period $T = t_7 - t_6$ (2020 - 2023) is:

$$\Delta C_{AR_VCS,t_7-t_6} = 123,300 \text{ tCO}_2\text{e}$$

The percentage of VCU's to be deposited in the AFOLU Pooled buffer account is 15% = 18,495 tCO₂e (see the VCS Non-Permanence Risk Report Kibale 2020-2023).

Therefore NET VCUs after buffer subtraction = 104,805 VCUs

Table 18 - The estimated ex-ante GHG emission reductions and carbon dioxide removals and the achieved reductions and removals for the current monitoring period

Vintage period	Ex-ante estimated reductions / removals*	Achieved reductions / removals	Percent difference	Explanation for the difference
01-Mar-2020 to 31-Dec- 2020	79,127	34,250	43%	Measured growth lower than expected since planted project area is smaller
01-Jan-2021 to 31-Dec-2021	93,318	41,100	44%	Measured growth lower than expected since planted project area is smaller
01-Jan-2022 to 31-Dec-2022	91,968	41,100	45%	Measured growth lower than expected since planted project area is smaller
01-Jan-2023 to 28-Feb-2023	15,104	6,850	45%	Measured growth lower than expected since planted project area is smaller
Total	279,517	123,300	44%	Measured growth lower than expected since planted project area is smaller

* As presented in Table 4.4.1 in the VCS PD (page 67)

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APPENDIX 1: DBH-HEIGHT MODEL PARAMETERS

<Attached as excel spreadsheet in separate file>

APPENDIX 2: CROWN MODEL PARAMETERS

<Attached as excel spreadsheet in separate file>

APPENDIX 3: FRESH WEIGHT TO AIR-DRY WEIGHT CONVERSION COEFFICIENTS

<Attached as excel spreadsheet in separate file>

APPENDIX 4: MONITORING RESULTS 2023

<Attached as excel spreadsheet in separate file>

APPENDIX 5: QC RESULTS 2023

<Attached as excel spreadsheet in separate file>