# REFORESTATION OF DEGRADED FOREST RESERVE AREAS IN GHANA, WEST AFRICA

Document Prepared by

South Pole Carbon Asset Management S.A.S

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# 1 PROJECT DETAILS

## 1.1 Summary Description of the Implementation Status of the Project

Miro Forestry Development Limited ("Miro Forestry", or the "Company") is a reforestation company with plantations on the Boumfoum Forest Reserve near Agogo, Chirimfa Forest Reserve near Kumawu Drobonso, and Awura Forest Reserve near Mampong, all in the Ashanti Region of Ghana. Miro Forestry is committed to managing its plantations in a socially acceptable, environmentally sound, and economically viable way. Miro Forestry is committed to operating in line with all National/International Standards and strives to operate in compliance with the Principles and Criteria of the Forest Stewardship Council (FSC)[1].

Miro Forestry has five species: *Eucalyptus, Teak, Acacia, Gmelina* and *Corymbia* in the Boumfoum, Chirimfa and Awura Forest Reserves. From Miro Forestry's established plantations just 3,871 ha[2] of eligible project area will be considered for this verification period, however as of 2022, 5,643.00 ha of the planted areas has been considered eligible for the carbon project (Table 7) from Miro Forestry's acquired lands. In 2021, Miro Forestry acquired an additional 495 ha of land holdings in Ghana taking up their total land holdings to 10,495 hectares[3]. The project forecast an average expansion of 1,500 hectares per year of eligible areas until reaching approximately 14,000 hectares of eligible project land holdings in 2025 through the addition of new project areas. A provision of 10% of the total area will be made to cover the land-take for roads, rides, Special Management Zones (protection areas) and unproductive areas that will not be planted. This projection will be adjusted accordingly as additional areas in the North and South Formangsu and Aboma reserves become available and are allocated to the Company. From the 10,495 hectares of land holdings in Ghana, not all land has been planted to date, as planting occurs in a phased approach.

The implemented project involves reforestation activities in highly degraded forest reserves. The Chirimfa and Awura Forest Reserves were once productive reserves covered with high, elevation semi-deciduous forest. However, the reserves have been severely degraded by overexploitation, bush fires and conversion to agricultural land, particularly between 1980 and 2000, and has since been declared degraded by the Government of Ghana. Without the reforestation project, the area would degrade and degrade even further due to agricultural and farming activities, bushfires, and logging of the last remaining trees.

Miro Forestry, has land lease agreements and a benefit share agreement[4] with traditional landowners and the Forestry Commission of Ghana to restore the degraded forest reserves into productive planted forests. The eligibility of the leased lands are determined after planting has occurred for a given year and before each verification event. This lease construction is part of the presidential policy to restore degraded forest reserves in Ghana, which is a strong

[1] Supporting documents/PO Information/Preliminary Environment Report Abrimasu Forest Reserve

[2] Supporting documents/Estimations/Ghana Ex-ante UPDATED

[3] Supporting documents/MFGH FMP Reforestation Plan

[4] Supporting documents/PO Information/Land Leasing

policy instrument demonstrating the commitment of the Ghanaian government to conserve, restore and promote the sustainable use of forest resources in the country.

Miro Forestry conforms to high environmental, ethical, financial, and social standards, and achieves international forestry certification on all plantations. It aims to be the preferred partner for local communities, the national government and international development and finance. Miro Forestry was established in 2007 under Ghanaian law. It has been certified according to the principles and criteria of the Forest Stewardship Council (FSC) since January 2010. The FSC certificate demonstrates the commitment and adherence of Miro Forestry to the highest sustainability standards encompassing both social and ecological aspects. The VCS carbon was implemented according to the same high operational standards. Project activities are carried out and monitored according to approved project methodology AR-ACM0003 for a project period of 30 years, the project estimates to remove 59,889 tCO2e annually and 1,796,683 tCO2e during its entire life. During the each verification event the emission reduction will be updated based on the project activities and measured growth rates, therefore given this the total estimated reductions has been duly recalculated and updated to 51,187 tCO2e annually and 1,535,603 tCO2e during its entire life.

The objective of this document is to describe the project activities that have been carried out during the second monitoring period, (02-11-2020 to 19-09-2022). Meanwhile, the total area under the second monitoring verification is 3,871 ha. The second monitoring period aims to verify the estimated 326,399 tCO2e net GHG emission reductions achieved from Miro Forestry in West Africa.

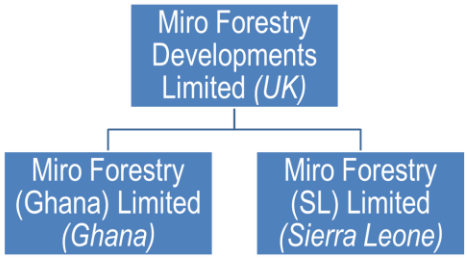
| Audit Type | Period | Program | VVB Name | Number of years |
|---|---|---|---|---|
| Validation and Verification | 24-03-2016 to 01-11-2020 | VCS | Spanish Association for Standardisation and Certification (AENOR) | Four years |
| Second Verification | 02-11-2020 to 19-09-2022 | VCS | KBS Certification Services | One year, eleven months. |
| Total | Two | | | |

## 1.2 Sectoral Scope and Project Type

The sectoral scope of this project is 14, Agriculture, Forestry, and Other Land Uses (AFOLU). Within this category, the project is of the Afforestation, Reforestation, Revegetation (ARR) type. This is not a grouped project.

## 1.3 Project Proponent

Miro Forestry Developments Limited (Miro Forestry) is a UK incorporated forestry and timber products investment company and is the holding company of the wholly (100%) owned subsidiaries, Miro Forestry (Ghana) Limited and Miro Forestry (Sierra Leone) Limited. MFD is the parent company and therefore wholly owns MFG and MFSL.




| | |
|---|---|
| **Organization name** | Miro Forestry Developments Limited |
| **Contact person** | Mr. Andrew Collins |
| **Title** | Co-Founder, CEO |
| **Address** | 5 Merchant Sq, London, W2 1AY, the United Kingdom |
| **Telephone** | Tel: +44(0)7899074158 |
| **Email** | ac@miroforestry.com |

## 1.4 Other Entities Involved in the Project

| | |
|---|---|
| **Organization name** | Miro Forestry (Ghana) Limited |
| **Role in the Project** | Wholly owned subsidiary of Miro Forestry Developments Limited /<br>Ghana operating subsidiary. |
| **Contact person** | Mr. Andrew Collins |
| **Title** | Co-Founder, CEO |
| **Address** | The Miro Street, Drobonso- Sekyere Afram Plains, Ashanti Region, Ghana- West Africa |
| **Telephone** | Tel: +44(0)7899074158 |

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|---|---|
| **Email** | ac@miroforestry.com |

| | |
|---|---|
| **Organization name** | South Pole Carbon Asset Management S.A.S. |
| **Role in the Project** | South Pole creates and oversees the development of appropriate project design and monitoring techniques in line with the guidelines of the VCS. |
| **Contact person** | Maria Fernanda Buitrago Acevedo |
| **Title** | ARR/ IFM Project Lead |
| **Address** | Technopark Str. 1, 8005 Zurich, Switzerland |
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| **Email** | m.buitrago@southpole.com |

## 1.5 Project Start Date

The project start date is: 24-03-2016. This date corresponds to the establishment of the compartment A6 of *E.pellita* for that year. As supporting documents, a print-out[5] from the Microforest system indicates the hiring and the payment of the activities (watering, land preparing) performed before the actual planting in the referenced compartment.

## 1.6 Project Crediting Period.

The Ghana project is projected until 2045 - a 30-year lifespan. The project started in 24-03-2016 and will end in 30-06-2045.

## 1.7 Project Location

The project area is in Ghana's Ashanti region, in the Asante Akim North, Sekyere East, and Sekyere West districts, between 7°1'26.77"N and 1°12'43.81"W14. It is composed of 763 compartments with a total area of 5,768 ha. For this monitoring period there are 726 compartments that are being considered. These have been planted with different species of trees between 2016 and 2022. The project is implemented in the Awura and Chirimfa Forest Reserves, which is an extension of the existing plantation in the Boumfoum Forest Reserve. In 2021, new plantations were developed in the Abrimasu forest reserve, which falls within the Mampong Municipality with the total area of 442.14 hectares and it is surrounded by mainly maize farms. It is about 7.7 km from the Adidwan community and about 17.3 km from the

[5] Supporting documents/PO Information/A6_Tickets_Proof_of_Planting.xlsx

Aframso township. The project area is part of a forest reserve which is being managed by the Forestry Commission. The Boumfoum Forest Reserve is in the Ashanti Region (See figure 1 below) and is under the administration of the Kumawu District Office of the FSD, while the Awura and Chirimfa Forest Reserves are under Mampong District office of the FSD.

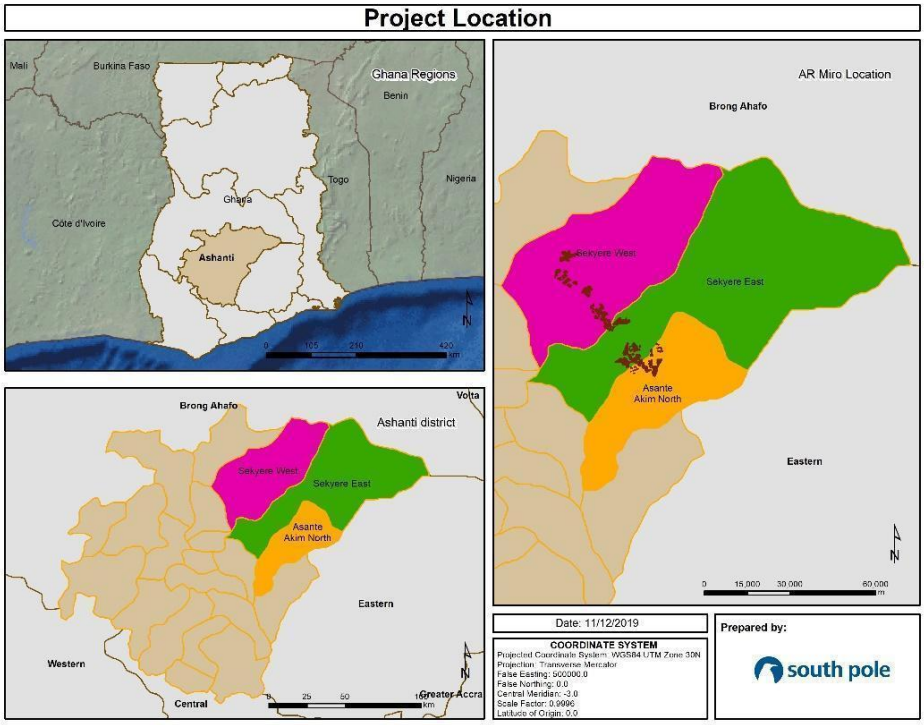



**Figure 1**. Project Location of Miro Ghana Project

## 1.8 Title and Reference of Methodology

The CDM consolidated methodology AR-ACM0003: Afforestation and reforestation of lands except for wetlands – Version 02.0 was applied. The following tools were applied to the project for this monitoring period:

- Estimation of carbon stocks and change in the carbon stocks of trees and shrubs in A/R CDM project activities (Version 04.2).
- Tool for estimation of the change in soil organic carbon stocks due to the implementation of A/R CDM project activities (Version 01.1.0).
- VCS AFOLU Non-Permanence Risk Tool (Version 4.0); and
- AR-TOOL 15 A/R Methodological tool: Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity Version 02.0.

For this monitoring period, the baseline, additionality, and interaction with local stakeholders will not be altered for the 3,871 ha that is being verified. Additionally, the initiative does not contribute to leakage in any way as described in section 5.3.

## 1.9 Participation under other GHG Programs

The project has not been registered and is not seeking registration under any other GHG programme[6].

## 1.10 Other Forms of Credit and Supply Chain (Scope 3) Emissions

- **Emissions Trading Programs and Other Binding Limits**: there are no other emissions trading programs or binding limits.

- **Other Forms of Environmental Credit:** the project involves reforestation and no other credits than the VCU are aspired for by the project proponent. The project's FSC certification will not generate environmental credits.

- **Supply Chain (Scope 3) Emissions**: There are no scope 3/ supply chain emissions related to this project activity.

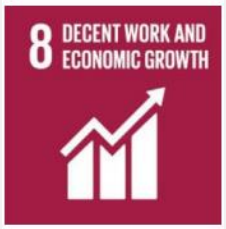
## 1.11 Sustainable Development Contributions

The Sustainable Development Report (SDR) 2022 (formerly the SDG Index & Dashboards) is a global assessment of a countries' progress towards achieving its Sustainable Development Goals (SDGs). Ghana currently has a rank of 110 globally out of the 163 countries that have been ranked[7]. The SDR 2022 provides Ghana with a SDG Site Index Score of 63.4% and a score of 100% is achieved when all 17 SDGs are met. This project has three SDGs that are of a particular focus: Gender Equality Decent Work and Economic Growth; Climate Action; and Life on Land. Given the project's outcomes, the project will continue to ensure that they contribute to the United Nations Sustainable Development Goals. The projects quantifiable contributions to the specific targets and indicators of the SDGs for this monitoring period are provided in Table 1.

[6] Supporting documents/ PO Information/ Undertaking Letter

[7] Available at: https://unstats.un.org/sdgs/metadata/

Table 1: Sustainable Development Contributions

| Row number | SDG Target | SDG Indicator | Net Impact on SDG Indicator | Current Project Contributions | Contributions Over Project Lifetime |
|---|---|---|---|---|---|
| *Sequential row number* | *SDG Target number* | *Number and text of SDG indicator or, if no official SDG indicator is applicable, user-defined indicator* | *Indicate the project's contribution to the SDG Indicator (implemented activities to increase or decrease)* | *Brief description of the quantifiable impact of the project's activities related to the SDG indicator, during the monitoring period.* | *Brief description of the cumulative quantifiable impact of the project's activities related to the SDG indicator, over the project lifetime.* |
| 1) | 8.5 | 8.5.1 Average hourly earnings of employees, by sex, age, occupation and persons with disabilities.   | Implemented project activities has increased employment opportunities and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value | Miro Forestry joined the Field Ready Alliance in Ghana in 2021 to recruit local men and women to work at the new ply mill[8]. All employees have access to transportation and personal protective equipment (PPE) decent salaries, and health care. Overall, Miro Forestry has made improvements in the amenities and social infrastructure of local and fringe communities. | More than 600 workers and personnel (permanent, fixed-term contracts, and contract labourers) are currently engaged and take active roles in achieving the company's planting objectives)[9]. |

[8] Supporting documents/EHSS and Report/Miro Annual Reports/Annual-Report-2021_v5_KR.pdf

[9] Supporting documents/PO Information/ Payroll Data_GH

| | | | | | |
|---|---|---|---|---|---|
| 2) | 13.2 | 13.2.2 Total greenhouse gas emissions per year   | The project is concerned with the sustainable development of its activities and its contribution to the mitigation of climate change by decreasing greenhouse gas emissions every year. | The project is estimated to remove 55,946 tCO2e annually and 1,678,387 tCO2e during its entire life[10]. | Prevents the release of 1,678,387 tCO2e of carbon into the atmosphere. |

[10] Supporting documents/EHSS and Report/Miro Annual Reports/Annual-Report-2021_v5.KR.pdf

| | | | | | |
|---|---|---|---|---|---|
| 3) | 15.2 | 15.2.1 Progress towards sustainable forest management.<br> | The project planted native species such as *Ceiba pentandra, Cola gigantea, Parkia biglobossia*, etc. These species are actively monitored for natural regeneration in conservation areas and for enrichment planting along streams and rivers. In further support of conservation aims, the MFGH has discovered small mosaics and clusters of old indigenous tree species, such as *Ceiba pentandra* and *Cola gigantea*, which will be transformed into conservation zones and preserved. | Approximately 20 million trees have been planted by Miro to date. Over 8,000 ha[11] is managed as conservation areas, including 150 ha of rehabilitation planting. Moreover, up to 18,500 ha of sustainable forest land developed and managed by Miro. It produces over 2.5 million cubic metres of sustainable timber[12]. | Up to 18,500 ha of sustainable forest land will be developed and managed by Miro which produces over 2.5 million cubic metres of sustainable timber. |

[11] Supporting documents/PO Information/Preliminary Environment Report Abrimasu Forest Reserve

[12] Supporting documents/PO Information/Preliminary Environment Report Abrimasu Forest Reserve

# 2 SAFEGUARDS

## 2.1. No Net Harm

Miro Forestry pursues having long-lasting beneficial effects, both socially and environmentally through the achievement of its project's goals. To assure a responsible and sustainable forest management standard, the Company obtained an FSC certification in 2017[13].

In the same vein, Miro Forestry has identified its environmental and socio-economic impacts through the development of an Environmental and Social Impact Assessment (ESIA), accredited by a local consultant for the project in Abrimasu Forest Reserve on August 20, 2021, they were able to identify the Environmental and social threats to the project which need to be considered.

According to the report the following environmental and social threats were identified[14]:

a) bushfires/wildfires;

b) illegal logging activity/charcoal production; and

c) open animal grazing.

After identifying these environmental and social threats, Miro Forestry identified the following mitigation measures which has subsequently been taken:

- **Bushfires/wildfires**: Miro designed mitigation measures based on 2 approaches of dealing with this threat:
  - The prevention measures.
    1. According to the Preliminary Environmental Report 2021[15] some of the prevention measures include the following (Figure 2):
       - Creation of buffer zones/fire belts between and around planting units within the plantation to prevent possible threats resulting from bushfire from the surrounding communities/activities.
       - A well-demarcated boundary of about 10-m width will be provided and will serve as access routes within the plantation.
       - Moreover, compartment roads, external boundary roads, and valley bottom cut-off roads will also serve as fire breaks.
       - Slash or vegetation are managed to reduce the risk of fire spread.

[13] Supporting documents/PO Information/PO Information/FSC Retrieved from: https://www.miroforestry.com/sustainability

[14] Supporting documents/PO Information/Preliminary Environment Report Abrimasu Forest Reserve

[15] 01_Supporting documents/PO Information/Preliminary Environmental Report _Abrimasu Forest Reserve.pdf

- That also includes fire watch towers, firefighting resources, fire reaction points and locally appointed fire marshals.

**Photo 1-21:**
**A fire watchtower with good sight lines of much of the plantation represents a significant investment in fire prevention. The site also houses a radio repeater providing coverage of the northern parts of the plantation.**



**Photo 1-15:**
**A controlled burn carried out by Miro staff for fuel reduction as part of their fire prevention activities.**



**Photo 1-19:**
**Roads are formed around planted blocks and extended with firebreaks for forest protection. Miro do not manage most open areas in and around its plantation as these belong to local communities who burn them seasonally increasing fire risk.**



**Photo 1-21:**
**During the fire season water tankers are placed at various standby points such as this village close to D Block. Miros biggest single loss event to date was in 2019 of 14 ha's.**



**Photo 1-20:**
**Fire is the biggest forest risk. Miro appears well prepared with 3 manned observation tours, regional community fire marshals 6 tractor drawn water tankers, a fire tender and 8 mobile units for staff vehicles (as pictured).**




**Figure 2**. Pictures of different firefighting equipment and prevention measures

2. Furthermore, community meetings for education and sensibilization on the preventive methods/mechanisms could be found in the supporting information (18 examples of educational meetings with pictures[16])

- Operational procedures in case bushfires/wildfires happen:

3. The project will liaise with the traditional authorities and the district security personnel and Forestry Commission's rapid response in case of detection of forest fires[17].
4. All the state of all the machinery, equipment, and vehicles is updated every day. This includes the truck's maintenance (See supporting information[18]).
5. The risk in case a wildfire happens in the area is mitigated by the preparation of a formal fire management plan[19]. The plan includes the objectives, responsible people, precise instructions, and operational procedures in case a fire starts (Figure 3).
    - This will include the training of workers in the use of fire suppression equipment and evacuation. Procedures may include coordination activities

[16] 01_Supporting documents/04_NPRT\3_Natural risks\C'tty meeting minutes Fire Mitigation November 2021

[17] 01_Supporting documents/PO Information/Preliminary Environmental Report _Abrimasu Forest Reserve.pdf

[18] 01_Supporting Information\ PO Information\CARs\CAR 3\Machine Breakdown Update.xlsx

[19] 01_Supporting documents/04_NPRT\3_Natural risks\Fire Management Plan 2022.pdf

with the Forestry Commission and local authorities (Attached find evidence of the training records and attendance of the participants[20]).

All of this was corroborated by Margules Groome and the report[21] elaborated that Margules Groome observed:

- "*Significant fire suppression activities undertaken by Miro staff including controlled burns, maintenance of fire breaks, fire watch towers, and firefighting resources*". There are a total of 10 towers (See the red triangles in the map[22] below as supporting information), and periodical inspections are done every month to detect anomalies using a checklist[23] (See Image below).
- *"During the field visits substantial investments in fire suppression were observed."*

[20] 01_Supporting Information\ PO Information\CARs\CAR 3\Fire management training participants records.pdf

[21] 01_Supporting Information\ PO Information\CARs\CAR 3\Margules Groome Miro Plantation Management Review 14.04.20 FINAL.pdf

[22] 01_Supporting Information\ PO Information\CARs\CAR 3\Miro Ghana Plantation Map.pdf

[23] 01_Supporting Information\ PO Information\CARs\CAR 3\Fire Tower inspection list.pdf

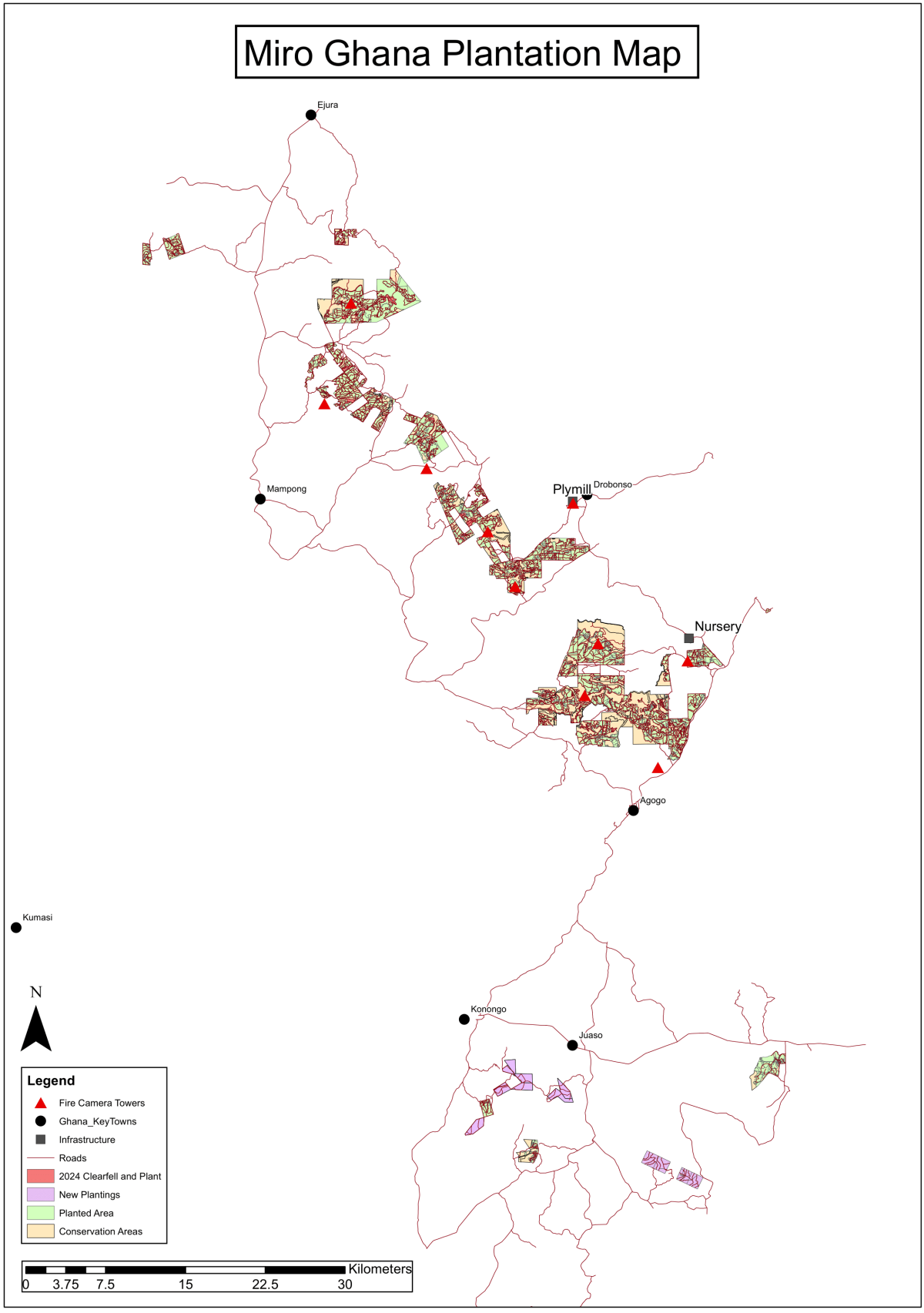

Miro Ghana Plantation Map
Ejura
Mampong
Plymill
Drobonso
Nursery
Agogo
Kumasi
Konongo
Juaso
N
Legend
Fire Camera Towers
Ghana_KeyTowns
Infrastructure
Roads
2024 Clearfell and Plant
New Plantings
Planted Area
Conservation Areas
0 3.75 7.5 15 22.5 30
Kilometers




**Figure 3**. Example of Dida community engagement on bushfire (12 November 2021)

- **Illegal logging activity/charcoal production:**

In the case of illegal logging or charcoal production the project liaised with the traditional authorities and the district security personnel and Forestry Commission's rapid response taskforce to tackle any illegal logging activities. Even though commercial logging activities do not seem to exist currently in the reserves, illegal logging activity in the reserves is a source of concern to the project. Miro Forestry is tracking the illegal activities using a record database[24] (Example of 2023), including illegal timber harvesting and charcoal production (Figure 4). This measure ensure the right monitoring of illegal activities to evaluate mitigation measures and propose new ones if needed.

[24] 01_Supporting Information\ PO Information\CARs\CAR 3\2023 MFGH Illegality records.docx

**ILLEGAL LOGGING RECORDED WITHIN MFGH COMPARTMENTS 2023**

| # | Date | GPS coordinate | Forest Reserve | FC Compt # | Tree species | Pictures |
|---|---|---|---|---|---|---|
| 1 | 20/02/2023 | 6°55'41.78" N 1°5'36.56" W | Boumfoum | 54 | Rosewood *Pterycarous erinaceus* Kane *Anogeissus leiocarpus* |  |
| 2 | 20/02/2023 | 6°55'38.32" N 1°6'28.69" W | Boumfoum | 73 | Ceiba *Ceiba pentandra* |  |
| 3 | 20/02/2023 | 6°55'38.35" N 1°6'28.71" W | Boumfoum | 64 | Ceiba *Ceiba pentandra* |  |
| 7 | 6/7/2023 | 6°55'1.28"N, 1°8'33.68"W | Awura | 62 | |  |
| 8 | 11/7/2023 | 7°13'26.12"N, 1°18'24.19"W | Boumfoum | 89 | |  |
| 9 | 1/7/2023 | 6°54'37.42"N, 1°6'40.92"W | Boumfoum | 135 | |  |

**Figure 4**. Illegal logging and charcoal production activities registry, 2023

Some implemented mitigation measures (both for illegal logging and charcoal production) are:

- According to the Livelihood Study Development Plan[25]at the beginning of the operational phase of the project, the number of illegal logging and charcoal production in the area were reduced considerably due to:
  - Access to plantation: control access at all entry points to the plantation where practically possible. In conjunction with the Forestry Commission will only allow permit

[25] 01_Supporting Information\ PO Information\CARs\CAR 2\ NMFC Livelihood Study_Development Plan (2014. 08.06).pdf

holders, beyond the control points

- Security: For the security and protection of the plantation's natural values, access must be controlled and can be integrated with recreation activities on the plantation by (i) limiting access to certain times of the year, (ii) providing forest guards (See Patrol timetables below, also as supporting information[26]), (iii) collaborating with local stakeholders in ensuring that locals are properly educated about how the reserve can be used to meet their traditional rights and way of life.

- Limiting illegal allocation of forest lands to migrant farmers who acquired portions of the degraded forest with the objective of establishing private commercial plantations rather engaged in the illegal practice of allocating portions of the reserve lands to migrant settlers and farmers for financial reward. This explains the presence of abandoned and poorly managed mosaics of old Teak and Gmelina plantations; as well as the presence of illegal maize farms within the reserve. Therefore, the allocation of some of these lands to MFGH for plantation development will limit the presence of illegal migrant farmers on the reserve and bring back the degraded area into forest production[27].
- Interested illegal loggers may be encouraged to participate in the reforestation project as a more sustainable income generation/ livelihood venture[28].
- Limiting access to the reserve to reduce access routes (forest roads) for future illegal logging activities[29].
- Forest guards are employed to assist with security and identify problems across the plantation. The security guards are also responsible for environmental issues, including; poaching, encroachment, and charcoal production. A team of forest guards currently patrol the Plantation weekly, on random days, to ensure that there is no traceable pattern. Their main priority is encroachment on both the reserve and conservation areas, poaching control, and illegal charcoal manufacturing control[30].
- The Forestry Commission sends a team of six people on a yearly basis from their Rapid Response Team to support the company in control of illegal activities within the forest reserves.

- **Open animal grazing:**

The nomadic cattle herdsmen (popularly known as the Fulani) also use the reserve as a grazing area for their cattle[31]. Cattle guards keep the cattle away from the young trees and Miro inform the Fulani where they can move where the trees are mature.
Despite Miro not interfering with the Fulani and having an open relationship attending some community meetings Miro needs to ensure that no conflict is arising between them and nearby communities as well as ensure that no fire is caused by them within the reserves. For that Miro has

[26] 01_Supporting Information\ PO Information\CARs\CAR 3\Security Patrol Duty rooster.pdf

[27] 01_Supporting documents/PO Information/Preliminary Environmental Report _Abrimasu Forest Reserve.pdf

[28] 01_Supporting documents/PO Information/Preliminary Environmental Report _Abrimasu Forest Reserve.pdf

[29] 01_Supporting Information\PO Information\EHSS and Reports\Adaptive_Management_Plan_2019.pdf

[30] 01_Supporting Information\PO Information\EHSS and Reports\Adaptive_Management_Plan_2019.pdf

[31] 01_Supporting Information\PO Information\EHSS and Reports\Adaptive_Management_Plan_2019.pdf

designed the following mitigation measures[32,33]:

- Collaboration with Rapid Response Task Force: to prevent animal grazing within the young compartments of the Forest Reserve. Forest guards are currently employed to assist with security by patrolling the reserve (Figure 5 below).



**Figure 5**. Security personnel on duty in a compartment (to the right) and security point at the entrance (to the left)

- Guidance through the more mature compartments (Figure 6): this measure avoids the cattle passing to the management units newly planted areas, eating the young seedlings.

[32] 01_Supporting Information\PO Information\ESIA\MFGH Stakeholder Mapping and Analysis 2020 small.pdf

[33] 01_Supporting documents/PO Information/Preliminary Environmental Report _Abrimasu Forest Reserve.pdf



**Figure 6.** Fulani crossing the reserve through the more mature compartments

- Attempt to engage with Fulani: Developed a roadmap to improve their understanding of and engagement with the Fulani and other vulnerable groups[34].
- Creation of a map where this seasonal routes take place and where the cattle intensity is concentrated (Figure 7 below[35]).

[34] 01_Supporting Information\PO Information\ESIA\MFC Land Development - Identifying People at Risk Ghana 2020.03.12 (2).pdf

[35] 01_Supporting Information\PO Information\ESIA\Fulani routes 2019

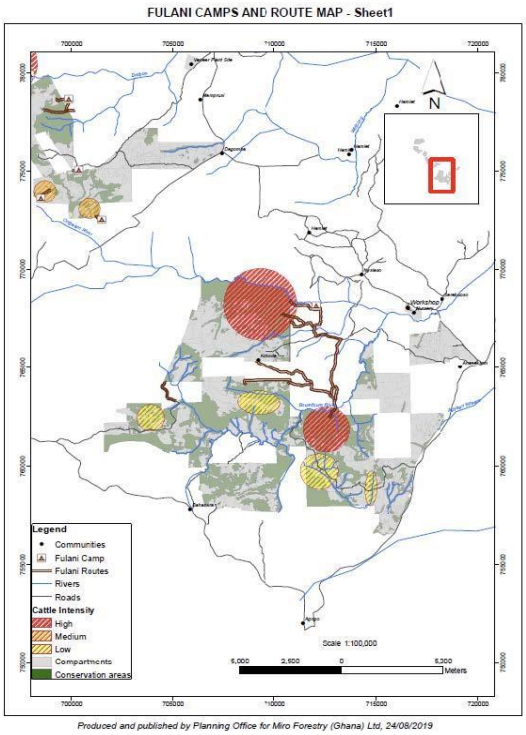



**Figure 7.** Map of the Fulani´s most common routes, camps and cattle intensity

- Finally, <u>when the direction of the patrols is not followed Miro Forestry will pro-actively work with the FC and their rapid response task force to prevent animal grazing within the non-desired areas (young stands) of the Forest Reserve</u>**.** Forest guards are currently employed to assist with security by patrolling of the reserve[36]. When this happens, it is included in a registry where illegal activities occur within the reserve.

## 2.2 Local Stakeholder Consultation

During the second verification period, there were no relevant changes to the project activities implemented that could alter the benefits for the stakeholders.

There were also no changes to the risks, costs, financial resources or benefits able to local stakeholders or which is needed to implement the project that could affect the stakeholder groups. All of the activities associated with this project is still underway. All of the direct positive impacts of the reforestation project[37] received by the local stakeholders as a result of this project are described later in this section.

There has also been no changes to the relevant laws and regulations covering workers right in Ghana from what was mentioned in section 1.14, Ghana Labour Act (651) in the PDD[38].

[36] 01_Supporting documents/PO Information/Preliminary Environmental Report _Abrimasu Forest Reserve.pdf

[37] Supporting documents/Preliminary Environmental Report Abrimasu Forest Reserve

[38] Referring to PDD Miro Ghana in section 1.14

With regards to the ongoing communication, engagement of the local stakeholders and the mechanism for on-going communication, Miro Forestry has a community department that is responsible for ensuring that the local stakeholder groups are attended too. The company's community department is currently made up of Community Relations Assistant reporting to Community Relations Manager who also reports to the Business Operations Manager (BOM) for Stakeholder Engagement Plan deliverables. The BOM in turn reports to the Group EHSS Director. Stakeholder Engagement is managed on a daily basis by the Community Relations Manager and is reviewed and supervised by the BOM. The progress and setbacks are reported to management at weekly management meetings. A summary of stakeholder engagement and any changes to the plan are reported at the quarterly Environmental, Social and Governance (ESG) Committee meeting. More information on the companies grievance redress policy can be seen in section 2.3 of this monitoring report.

Whilst no new stakeholders have been affected for this monitoring period, Miro Forestry has held and will continue to hold ongoing communication with the local stakeholder groups, more information is provided below. The comments from the consultations that took place during this monitoring period did not result in any changes to the project design. More information on the Local Stakeholder Consultation Process that took place during project validation and the information relevant to understanding carbon credits discussed with the stakeholders and the role of the project can be found in section 2.2 of the PDD. Relevant stakeholder engagements that occurred during the monitoring period are noted below:

During September 2020, Miro Forestry undertook extensive stakeholder engagement in the form of multiple stakeholder forums with the local communities of Droponso, Serebrosi, Nhyiaeso, Ankamadua, Jadaeko and Brunuso. Overall, there was a positive impression of the proposed activities from the six meetings held in these communities. Additional meetings were held with representatives of governments[39].

From December 14, 2021, to January 28, 2022, Miro Forestry held two community engagement meetings (Figure 9) with twenty different communities, which are Nnobem (52 people attended, 2 meetings), Jamestown 43 people, 2 meetings), Dida (39 people attended), Ankamadoa (5136 people attended), Serebuoso (48 people attended), Bunuso (46 people, 2 meetings), Fawoman (44 people, 2 meetings), Ananekrom (41 people, 2 meetings), Bonkwaem (66 people, 2 meetings), Esereso (51 people, 2 meetings), Jadeako (59 people, 2 meetings), Formangso (4 people attended), Nhyiaeso (37 people attended), Drobonso (22 people), Dagomba (17 people attended), Nkujoa (39 people), Bompa (39 people), Nkrama (31 people), Kokomba (29 people) and Gariba (31 people attended). All meeting minutes or recaps (documents) of each of these meetings held in 2021[40] and 2022[41] are available for review. The community meetings discussed the land allocation for reforestation, protection of water sources, conservation of riparian areas, and bush fires. Moreover, it is also discussed when Miro Forestry intended to begin work in the newly allocated/ acquired areas. In this discussion, Miro Forestry gathered information about the traditional authority, different land uses in the new area, illegal

[39] Referring to PDD Miro Ghana in the section 2.2

[40] Supporting documents/ EHSS and Report/Community meetings minutes December 2021

[41] Supporting documents/ EHSS and Report/Community meetings minutes January 2022

farmers and crops grown, water sources, cultural norms e.g., taboo days, and general socio-economic characteristics.



**Figure 9**. Meetings in 20 village communities

Miro Forestry also conducted meetings with the local communities[42] on February 22, 2022, to do the Environmental and Social Impact Assessments that aim to know what kind of flora and fauna species are present as well as the sociocultural norms of the people who live there. The meeting was deemed as important as Miro Forestry is seeking to develop compartments allocated to Formangso Forest Reserve by the Forestry Commission of Ghana.

On May 18, 2022, Miro Forestry held a community meeting at Formangso and Pra River with a total number of attendees of 114 people. The main discussion of the meeting was to inform them that the operation of silviculture compartments (1c, 11, 13, 14, and 17) would be carried out from June 2022. Miro Forestry informed the community that employment opportunities would become available and that special training for both genders would occur when the project commences.

On June 17, 2022, Miro Forestry held a community engagement with the farmers of Pra River (Figure 10), one of the forest fringe communities in South Formangso Forest Reserve, to inform them of commencement of land preparation for compartments. Some of the farmers pointed out and brought it to the attention of Miro Forestry that this process is too sudden and some compartments that were allocated to Miro Forestry were already admitted farms (11, 14, and 17). Therefore, Miro Forestry's social team recommended holding the land preparation to avoid any potential grievances.

[42] Supporting documents/EHSS and Report/MFGH Community engagement with South Formangso communities



**Figure 10.** Community engagement with farmers of Pra River Community, South Formangso Forest Reserve

Overall, the local stakeholders have been made aware of the direct positive impacts of the reforestation project which includes[43]:

. Employment and job opportunities during project implementation: Employment opportunities has increased for the local communities during implementation of this reforestation project which resulted in poverty reduction as family incomes have been enhanced. There has also been Improvement in the revenue base of key institutions and regulatory bodies such as the Forestry Commission (FC) from sales from forest products which leads to significant revenue generation from the project to benefit local communities, the district, and the nation through its exportation of timber. In addition, revenue accrues to the State in the form of corporate tax deductions and from the wages of workers. Government agencies such as the Forestry Commission generates revenue from local and export levies that accrues from harvesting, processing, and export of timber products.

. Improvement in amenities and social infrastructure of local and fringe communities: A major positive impact from the project is an improvement in facilities such as health care centres, schools, potable water supply, electricity, and transportation (roads) for the communities within the project area. Such amenities and infrastructure are provided by the project proponents as part of their corporate social responsibilities in close consultation with Ghana Government and for the effective management of the reforestation project. The impact from improvement in social amenities is of major environmental significance.

Further to the direct positive impacts of the reforestation project mentioned above, there are additional community projects that Miro Forestry is involved in which includes:

- Miro Forestry has committed funding towards the establishment and running of a vocational training centre primarily for skills and entrepreneurial development of the youth at Hwediem-Agogo.
- New kindergarten school at Ananekrom
- New Kindergarten school at Serebuoso

[43] Supporting documents/ EHSS and Report/Preliminary Environmental Report Abrimasu Forest Reserve

- Establishment of two boreholes in Agogo for the provision of clean drinking water for the local community.
- Health awareness outreach campaigns in the towns of Ananekrom and Serebuoso.
- New kindergarten school built at Nhyieaso in 2017
- Rehabilitation of Kumawu health center in 2017
- Training community women in soup making in 2017
- New Kindergarten School at Bunuso- 2018
- New Kindergarten School at Ankamadoa- 2019
- Water Closet toilet facility at Drobonso- 2019
- Beekeeping training for Community members- 2019
- Construction of borehole for Jamestown community-2019
- New Kindergarten School block at Nnobem – 2020
- Supply of COVID-19 materials to hospitals, schools, and communities- 2020
- New Kindergarten School block at Jediako – 2021
- Livelihood programme for Community Women- 2021
- Construction of borehole for Dagomba community-2021

At each stakeholder engagement that occurs within the project zone, Miro Forestry showcases the slides on the carbon project as seen in Figure 11.

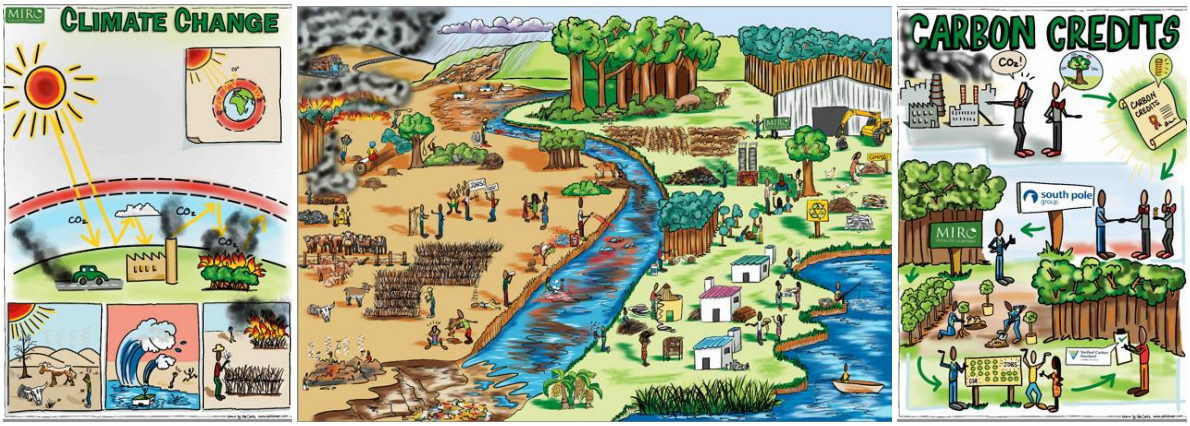



**Figure 11**. Slides that are showcased to the stakeholders describing the carbon project at each stakeholder engagement meeting held.

The second verification audit site visit has been communicated to the stakeholder (Miro Forestry). In addition, the Monitoring report has been made available one month before the audit site visit to the Miro Forestry team[44].

[44] Supporting Documents/ PO Information/Email MR Report

## 2.3 AFOLU-Specific Safeguards

Miro Forestry is committed to engaging with local communities who are considered as stakeholders that have impacts on their operational activities and to ensure that they are listened to, and that their views are considered as the company conducts their business. There is an ongoing communication process between Miro Forestry and the stakeholders of the project. In some cases, activities are developed and need to be implemented to mitigate risks posed by project implementation or from the risk posed from local stakeholders on the project activities and these are regularly communicated. Activities implemented to mitigate risks from local stakeholders due to project implementation as identified from section 2.1, include the following environmental and social threats: Bushfires/ wildfires; illegal logging activities, charcoal production, and open animal grazing. The plantation aims to prevent possible threats resulting from bushfire from the surrounding communities/activities. With regards to fires, fire breaks are managed, the project liaises with traditional authorities to tackle nomadic herdsmen menaces and encourages illegal loggers to participate in the reforestation activities. The mitigation measures for these identified risks can be referred to in greater detail in section 2.1 of this report.

In addition to the above-mentioned risks, other risks identified and or where relevant and related to the property and land use rights of the local stakeholders are also mitigated by Miro Forestry (Table 4 and 5). It can be noted that that there have been no updates to the property and relevant land use rights of the local stakeholders for this monitoring period however from 2016 Miro Forestry designed and rolled out a Land Development Policy[45] and Implementation Framework. Miro's Land Policy Principles state;

1. Miro Forestry respects all national and local laws and regulations. Long-term tenure and rights to the land and forest resources are clearly defined, documented, and legally established under national legislation.
2. Miro Forestry recognises and respects the rights of all land users and respects the cultural heritage of the communities where the Company operates. The Company's goal is to have a positive impact on the livelihoods of the people surrounding and affected by its operations. Miro Forestry works closely to consult with stakeholders to ensure the protection of their land rights, cultural heritage sites and values.
3. Miro Forestry aims to conserve biological diversity and its associated values including water resources, soils, ecosystems, and landscapes.
4. Miro Forestry is firmly committed to sustainable forest management practices, including those prescribed by the Principles and Criteria of the Forest Stewardship Council (FSC) and the International Finance Corporation (IFC) Performance Standards."

To enforce this, the company rolled out several procedures and steps to mitigate land development associated risk; this is known as the 'MFC Land Development – Policy, Implementation Framework and Guidelines for Conducting Environmental and Social Risk Assessments'[46], that addresses all the scenarios:

- Scenario 1 - Subsistence farmers living on the reserve,

[45] Supporting documents/PO Information/MFD-Policies 2019

[46] Supporting documents/PO Information/MFC Land Development – Identifying People at Risk Ghana 2020.03.12

- Scenario 2 - Commercial farmers growing cash crops on the reserve,
- Scenario 3 - People employed by the commercial farmers and seasonally residing on the reserve,
- Scenario 4 – People living in the local villages and subsistence farming on the reserve, and
- Scenario 5 – Nomadic Herdsmen (moving through the reserve)

Regarding Scenario 1, it is important to note that Miro only encountered this situation at the beginning of the project. At this early stage (2014-2015), according to the Livelihood Study and Development Plan[47] approximately 100 ha of farms were identified on the ground (in some cases with people living close by) by stakeholders meetings. However, aerial studies suggest that another 150-200 hectares may exist in other parts, summing a total of 300 ha (accounting a 7.15% of the project area). However, for the sake of conservativeness, Miro assumed that they were 10% of the total project area (corresponding to 387.1 ha). This value (10% has been used for accounting leakage in the project area as activities displaced to other nearby locations outside of the project area (For more information on leakage see the report[48] and calculations[49])

Once the project started, and during all its life time (2016- present) Miro has not encountered this scenario (people living inside the reserves) happening inside the project. This is because (i) the prohibition to do farming activities in the reserves, and (ii) the easier way to develop a farm outside of them because it is composed of grasses that farmers tend to burn and start new crops[50]; proved by:

- Clause 3.5 of the Benefit sharing agreement for a public private partnership in commercial forest plantation development[51] in which is explained how any structure erected on the reserve requires the permission of the lessor (hence implying that permanent structures are not allowed – and not allowed by people who are not leasing the land (illegal individuals).
- Where the Forest Services Division has ejected farmers and Miro Forestry subsequently planted its trees, the illegal farmers have not returned to the area, stated in 2014 in the NMFC Livelihood Study _ Development Plan (2014.08.06)[52]. Some of the measures taken to avoid illegal farming settlements were:
    - Access to plantation: control access at all entry points to the plantation where practically possible. In conjunction with the Forestry Commission will only allow permit holders, beyond the control points
    - Promotion of Awareness of Environment Issues: Awareness may be increased by using notice boards, maps or handouts.
    - Security: For the security and protection of the plantation's natural values, access must

[47] 01_Supporting information/PO Information/ESIA/NMFC Livelihood Study _ Development Plan (2014.08.06).pdf

[48] 01_Supporting Information\Estimations\Leakage\Leakage Miro Ghana 2nd verification.pdf

[49] 01_Supporting Information\Estimations\Leakage\Leakage_Miro_Ghana.xlsx

[50] Referring to PDD Miro Ghana, in section 1.17. (Referenced as PDD Supports/1.2 PO Information/ESIA/NMFC Livelihood Study_Development Plan (2014. 08.06))

[51] 01_Supporting Information\ PO Information\CARs\CAR 2\LVD-FC-ASR-1503-16_MFGH_BSA_Signed_825ha.pdf

[52] 01_Supporting Information\ PO Information\CARs\CAR 2\ NMFC Livelihood Study_Development Plan (2014. 08.06).pdf

be controlled and can be integrated with recreation activities on the plantation by (i) limiting access to certain times of the year, (ii) providing forest guards, (iii) collaborating with local stakeholders in ensuring that locals are properly educated about how the reserve can be used to meet their traditional rights and way of life.

If Miro permits people to remain in the reserve the Company is in breach of its agreement with the Forestry Commission and national law. This also means that it is illegal for Miro to pay compensation to any of the groups identified below and is not appropriate for Miro to be involved in the identification of alternative lands as this is a matter for the traditional authorities. As previously explained this situation is not happening any longer. However, Miro Forestry keeps tracking this by engaging with more than 20 percent of households within the 20 km boundary and all communities are regularly engaged[53].

An extract of this Guideline indicates the exposure risk identified by Miro Forestry, on the following situational changes:

The exposure to risk will be affected by one of the following situational changes:

- Change of access to nearby/free/convenient farming land
- Change of access to grazing land or water
- Change of access to land being used for residence and farming

This has the potential to expose these groups (Scenarios) to:

- Compromised food security or to lifestyle (nomadic – Fulani)
- Compromised income generation options and capacity
- Compromised ability to care for a family/gendered roles
- Compromised climate resilience (particularly during extreme weather events)

A system was created based on 2 stages for Scenarios 1-4 (for Scenario 5 an specific roadmap has been developed):

<u>Stage 1 - General information gathering using a questionnaire and closed question formats leading to a high level assessment according to set criteria</u>

The project gathered information to identify people at risk through a questionnaire and closed question formats, this led to a high-level assessment according to the defined criteria. After that, there was a second stage with a detailed assessment through open questions to build an integral vision of the life of the individual to allow for a tailored approach to address the vulnerability. The below table shows the initial questionnaire for stage one as follows.

Table 2. Initial information gathering and high-level assessment[54]

| Stage 1: Initial information gathering & high-level assessment | | | |
|---|---|---|---|
| Question | | Information | Assumption/next stage |
| 1 | Name | | |

[53] Referring to NPRR, in section 2. External risk (Community engagement)

[54] Supporting documents/PO Information/MFC Land Development – Identifying People at Risk Ghana 2020.03.12

| | | | |
|---|---|---|---|
| 2 | Gender | Male/Female | All females proceed to stage 2. |
| 3 | How old are you? | | Over 55 - proceed to stage 2. |
| 4 | Where do you originate from? | | |
| 5 | Where do you live now? | | No fixed abode - proceed to stage 2 |
| 6 | If migrated: Why did you leave your home and move here? | | If forced to leave - proceed to stage 2 |
| 7 | Do you have a spouse? | | No - Proceed to stage 2 if also has dependents listed (Q8) |
| 8 | How many dependents do you have? | | Over 5 - proceed to stage 2 |
| 9 | How many of them go to school? Primary/Secondary | | |
| 10 | Are you or any of your dependents ill? How serious? | | Yes - proceed to stage 2 |
| 11 | How many meals do you eat every day? | | 1 or less, proceed to stage 2 |
| 12 | How much land are you farming here? | | Less than 2 acres - proceed to stage 2<br>More than 5 acres - commercial - not vulnerable despite other answers |
| 13 | Are you allowed to farm in forestry compartments? | Yes/No | |
| 14 | Do you pay anyone to farm here? | Yes/No - whom? | |
| 15 | Are you farming for yourself or someone else? | Someone else - whom? | Farming for someone else and not farming elsewhere (Q17) proceed to stage 2 |
| 16 | Where else do you farm? | List | |
| 17 | If you want to farm elsewhere, where would you go? | | |
| 18 | What are you growing? | | |
| 19 | Would you be interested in working for Miro? | Yes/No | |
| 20 | What other businesses do you have? | | |

Table 3 demonstrates a complete evaluation using open-ended questions to construct a customized approach to address the vulnerability[55].

Table 3. Criteria to move to stage 2

| Criteria to move to stage 2 to assess the risk of: | | | | | |
|---|---|---|---|---|---|
| Compromised food security | | | | | |
| Compromised income generation options and capacity | | | | | |
| Compromised ability to care for a family | | | | | |
| **Persons considered as High Risk** | **Risk** | **Potential Adverse Impacts** | **Adaptive Capacity** | **Likelihood** | **Severity** |

[55] Supporting documents/PO Information/MFC Land Development – Identifying People at Risk Ghana 2020.03.12

| | | | | | |
|---|---|---|---|---|---|
| requiring further investigations | | | | | |
| All females | Loss of food security/economic security | Household food security and basic livelihoods | Lower adaptive capacity due to gender biases, lack of access to land and finance | 3 | 4 |
| All over 55 | Loss of food security/economic security | Household food security and basic livelihoods | Lower adaptive capacity due to age limitations on for employment | 4 | 3 |
| Single parent | Loss of food security/economic security | Household food security and basic livelihoods, increased pressure on household | Lower adaptive capacity due to limited ability to work and be a carer | 3 | 4 |
| More than 5 dependents | Loss of food security/economic security | Household food security and basic livelihoods, increased pressure on household - correlation with poverty | Lower adaptive capacity due to limited ability to work and be a carer and provide sufficient food for a large family | 4 | 4 |
| Has a member of the family suffering from serious illness | Loss of food security/economic security | Household food security and basic livelihoods, increased pressure on household | Lower adaptive capacity due to limited ability to work and be a carer | 3 | 3 |
| Eat once per day or less | Inability to provide sufficient food | Increased hunger & poor nutrition - correlation with poverty | Low adaptive capacity as increased hunger reduces the capacity of the individuals to adapt and grow | 4 | 4 |
| Has no fixed abode/permanent address | Loss of home and safe living environment | Increased migration and homelessness, increased poverty | Low adaptive capacity to manage any change or adverse situation | 3 | 4 |
| Forced to migrate to the area | Loss of home and safe living environment | Increased migration and homelessness, increased poverty | Low adaptive capacity to manage any change or adverse situation | 3 | 3 |
| Farming on less that 2 acres - low subsistence | Loss of economic security | Household food security and basic livelihoods | Low adaptive capacity to manage any change or adverse situation | 3 | 3 |

| | | | | | |
|---|---|---|---|---|---|
| Is farming for someone else with no other farmland | Loss of home and safe living environment | Household food security and basic livelihoods | Low adaptive capacity to manage any change or adverse situation | 2 | 3 |
| It is considered that: | | | | | |
| a person farming less than 2 acres is very much a subsistence farmer with low access to inputs | | | | | |
| a person farming on 2-5 acres must have some, albeit limited, access to funds to be able to procedure inputs and therefore is more resilient | | | | | |
| a person farming on >5 acres is farming on a commercial basis and has access to funds for inputs and is therefore resilient to change | | | | | |

After the vulnerability assessment was visualize as a severity-likelihood matrix (Figure 12).

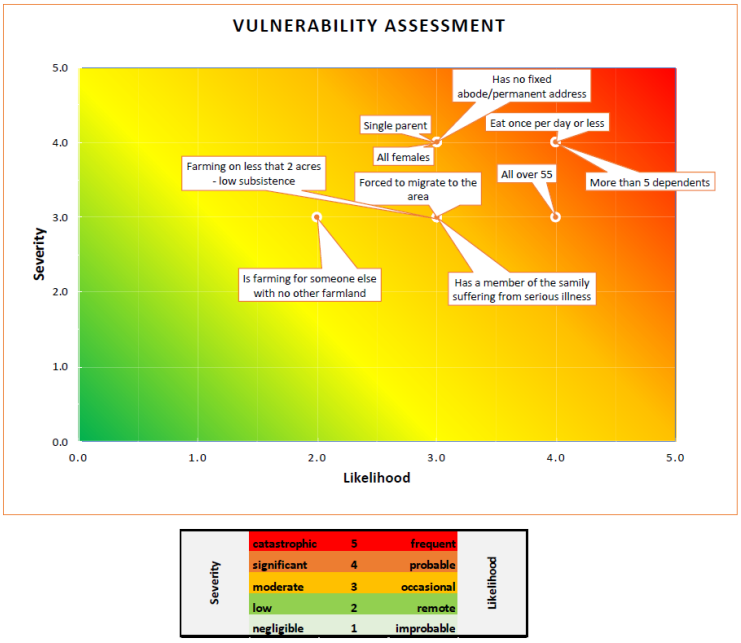



**Figure 12.** Vulnerability assessment (Likelihood-Severity)matrix

<u>Stage 2 - Detailed assessment through open questions to build a clear picture of the lives of the individuals to allow for a tailored approach to address vulnerability (Figure 13).</u>

**Sample open questions:**

- What do you treasure about your life
- What are your main worries and concerns about your life?
- Tell me the difference between a good and bad year/day?
- What are the biggest influences to a good or bad year/day?
- How have things changed in your life and your community over the last 5-10 years?
- What about your life would you like to be different in 5 years?
- What is stopping you from changing/reaching that?
- What are your biggest hopes and fears (aspirations) for your children
- How will you help your children to achieve this?
- How do you access land in your community?
- What could you do to help improve your life?

**Figure 13.** Sample open questions to address vulnerability

Stakeholder discussions in 2017[56] revealed general support for proposed development; key areas of concern and interest centre on the need for effective management and monitoring of the reserve, controlling the spread of illegal migrant settlers in the reserve, limiting forest fires, limiting poaching of game, preventing damming of water courses for irrigation, controlling the use of agro-chemicals, establishment of buffer and riparian strips near water bodies, controlling use of water resources, creation of employment, skills development and capacity building, allocating portions of the eastern part of the reserve for future expansion of Ananekrom and requests for permission to farm and herd cattle in the reserve.

The primary issues facing the community and the major stakeholders, as well as the steps being taken to solve them, are listed in table 4 below, which is based on the most recent stakeholder engagement report (2020):

Table 4. Community concerns and mitigation measure

| Community Concern | Mitigation Measures | How the impact can be addressed through Stakeholder Engagement Plan (SEP) |
|---|---|---|
| Loss of farming land leading to increased food insecurity | • Information Dissemination<br>• Agro-forestry initiatives<br>• Additional income opportunities through employment<br>• Grievance Mechanism | The overall issues here relate to land development. As the company continues to develop the land it has been leased by the Forestry Commission, illegal farmers and communities complain about the loss of farming land. Through the dissemination of clear messaging by the CR Manager and through regular informal and formal meetings, issues can be discussed, and information disseminated, such as the legal status of the land, intercropping access, recruitment policy and access to be grievance mechanism.<br>Access to smallholder projects |

[56] Supporting documents/PO Information/ MFC Land Development - Identifying People at Risk Ghana 2020.03.12

| | | |
|---|---|---|
| Land for village expansion | • Information Dissemination | This is the case for one community only (Ananekrom). Concern was voiced over space for expansion of the village, through the CLO. The legal status of the land (being part of the forest reserve) should be made clear as well as accessibility to the grievance mechanism procedure. |
| Reduced access to forest reserve for traditional rights | • Access still allowed to the reserve<br>• All significant sites demarcated | Through regular informal and formal meetings, the CR Manager can disseminate the company's commitment to the preserving traditional right |
| Personnel Health & Safety Risks | • Health and Safety Policy with regular meetings<br>• PPE<br>• Health awareness campaigns<br>• Grievance Mechanism | As part of the Stakeholder Engagement Plan (SEP), H&S personnel and management must disseminate OHS messages to employees on a regular basis, Best Operating Practices (BOP's) to be disseminated, weekly Toolbox Talks. |
| Provision of basic social services | • Community Development Plan based on consultation | The plan to be disclosed to stakeholders and community members as part of the SEP through workshops and meetings<br>Access to CSR projects; where Miro supports specific projects such as womens groups or economic activities, identified individuals could be introduced into the projects |
| Employment opportunities | • Prioritise Local employees<br>• Recruitment within communities | Job opportunities should be advertised within the local communities first as part of the SEP<br>Full or Part time employment with Miro when vacancies arise<br>Access to financial literacy training for those wishing to start small businesses |

The interest of stakeholder and way to quantify mitigation measures[57] shown in the Table 5.

Table 5. Stakeholder concerns and mitigation measures

| Community Concern | Mitigation Measures | How the impact can be addressed through Stakeholder Engagement Plan |
|---|---|---|
| Land disputes, incorrect forest reserve demarcation | • Information Dissemination<br>• Grievance mechanism<br>• Forestry Commission (FC) | The FC should lead the boundary demarcation process with involved parties to make sure there is a common understanding of where one boundary ends and where one begins |
| Reallocation of compartments by FC | • Information Dissemination<br>• Background of allocated compartments | There could be background checks on newly allocated compartments to know the history behind them. Old lease holders must be made aware of the reallocation on time. |

[57] Supporting documents/PO Information/MFC Land Development – Identifying People at Risk Ghana 2020.03.12

| | | |
|---|---|---|
| Company Perception, Company Future | • Information Dissemination | Annual reports, major management decisions/statements should be well disseminated to all stakeholders to avoid negative perceptions about the company. |
| Lack of donations | • Information Dissemination<br>• CSR projects/Community Development Plans | Stakeholders must be made aware of the existence of CSR plans and how the plan works. |
| Presence of Fulani | • Collaboration with Rapid Response Task Force<br>• Attempt to engage with Fulani | The Fulani issue keeps coming up at community meetings. Community members feel unsafe with the Fulani around. They are entreated to try as much as possible to avoid any confrontations with the herdsmen for the sake of their own safety. |

The following are examples of ongoing community projects since 2021:

- MFGH has committed funding towards the establishment and running of a vocational training centre primarily for skills and entrepreneurial development of the youth at Hwediem-Agogo.
- New kindergarten school at Ananekrom.
- Establishment of two boreholes in Agogo for the provision of clean drinking water for the local community.
- Health awareness outreach campaigns in the towns of Ananekrom and Serebuoso.
- Agreements signed with IDH (the Sustainable Trade Initiative) and FMO for match grant funding, applied to outgrowers farmers working for the company in 2021.
- The MISPA entrepreneurship training centre was selected among a few others. The centre primarily focuses on teaching trainees' practical skills such as soap making, shower gel, washing powder, bar soap, bead making, after wash, bread making, brown sugar, meat pie, power zone, make-up, wig making, ice cream, fresh yoghurt, 3D epoxy, biodigester, fascinators, and bridal fans
- Women's Group of Jamestown and Drobonso received guidance on starting small businesses.

And below some other examples from 2022[58]:

- Street lights have been erected on the road from the Drobonso Township to the Miro site.
- A borehole has been drilled for the Drobonso community, yet to be mechanized.
- A Water Closet toilet facility renovated at Drobonso
- A Kindergarten School block renovated at Ananekrom
- A Kindergarten School block renovated at Serebuoso
- Donated a cheque of ghc 2,500 to Agogo Traditional Council to support the sporting competition
- Donated a cheque of ghc 2,500 to Salt Media towards the quiz competition amongst Schools in Asante Akyem North
- Donated ghc 4210 to support the funeral rites celebration of the Chief nad Queen mother of Kwamang Traditional Council

[58] 01_Supporting Information\ PO Information\CARs\CAR 5\2022-04-31 MFGH Monthly Monitoring Sheet.xlsx

- Donated 60 pieces of Knapsack sprayers to support Farmers' Day celebration across the operational district

The processes used to communicate and consult with local stakeholders during the monitoring period, including any information about any conflicts that arise between the project proponent and local stakeholders and whether any such conflicts were resolved via the established grievance redress procedure: On an annual basis Miro Forestry conducts stakeholder mapping which feeds directly into a Stakeholder Engagement Plan to ensure proactive and open communication with all communities and stakeholders. Miro Forestry aims to build enduring relationships with its neighbours that are characterised by mutual respect, active partnership, and long-term commitment. Through this relationship any concerns can be brought to the forefront. Moreover, Miro Forestry also has a Grievance Mechanism[59] that provides an open and neutral mechanism for grievances to be raised and ensures appropriate mechanisms to aim to resolve any disputes[60].

The Company's grievance mechanism provides employees and stakeholders with a mechanism to express grievances without fear of reprisal and ensure concerns are appropriately addressed in a timely manner[61]. The grievance mechanism offers a set of approaches whereby the grievant and the Company can find effective solutions together[62]. The grievance mechanism offers a set of approaches whereby the project affected person/complainant and the Company can find effective solutions together.

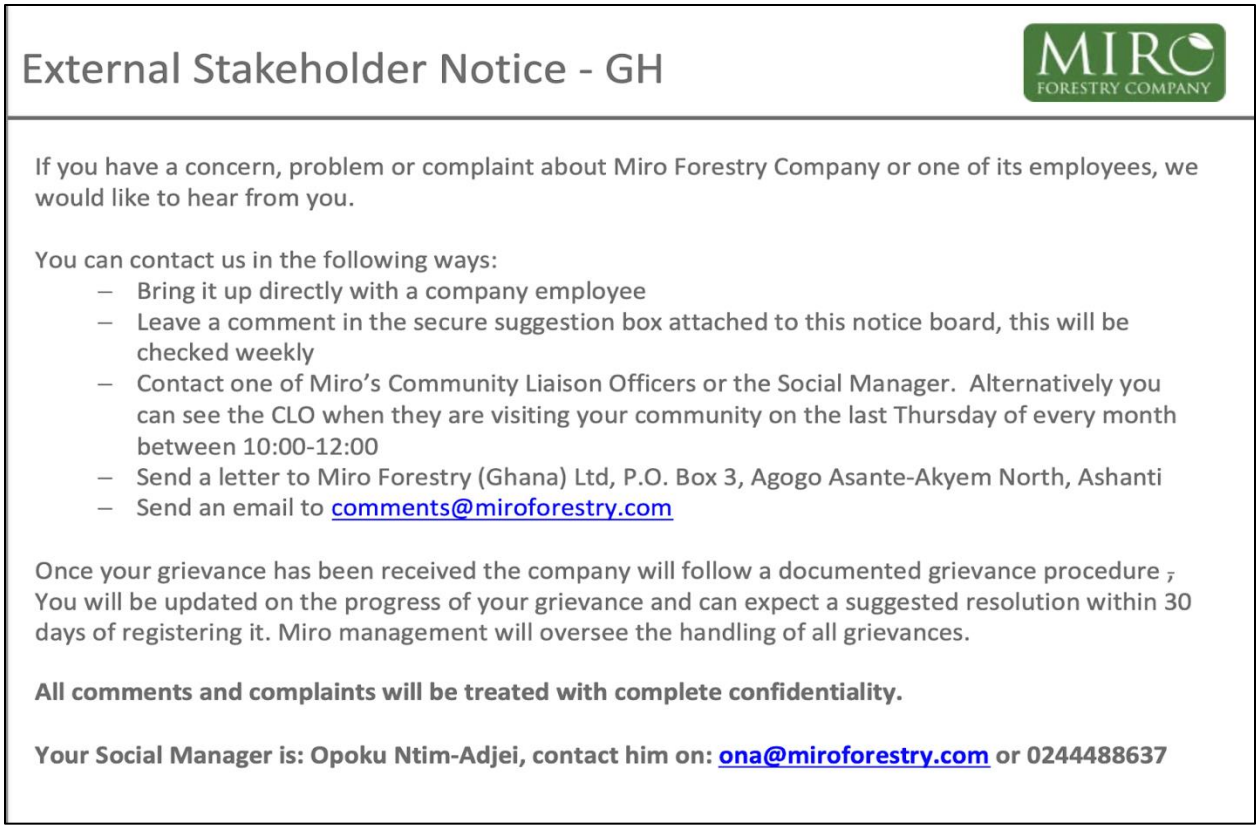
The grievance redress process includes[63]:

- Receive/ Accept Grievance
- Investigate
- Determine Resolution
- Complaint Satisfied? (closed/pending)
- Documentation management.

Notice boards have been erected in the communities surrounding the plantation operations, as well as the provision of a suggestion box that is checked monthly. An image of the External Stakeholder Notice and its contents can be seen in Figure 13.

The Community Liaison Officer is responsible for hosting workshops on the grievance mechanism. A notice is published in all communities stating how to contact the Company and how the grievance will be dealt with. A copy of the Grievance Registry Form can be seen in Figure 14.

[59] Supporting documents/PO Information/ ESIA/MFC Grievance Procedure 2020 external small.pdf
[60] Supporting documents/EHSS and Reports/MFGH ESIA Awura Chirimfa Reforestation Project 2018
[61] Supporting documents/PO Information/ ESIA/MFC Grievance Procedure 2020 external small.pdf
[62] Supporting documents/EHSS and Report/MFGH FMP Reforestation Plan
[63] Supporting documents/EHSS and report/MFGH ESIA Awura Chirimfa Reforestation Project 2018



External Stakeholder Notice - GH

MIRO FORESTRY COMPANY

If you have a concern, problem or complaint about Miro Forestry Company or one of its employees, we would like to hear from you.

You can contact us in the following ways:

- Bring it up directly with a company employee
- Leave a comment in the secure suggestion box attached to this notice board, this will be checked weekly
- Contact one of Miro's Community Liaison Officers or the Social Manager. Alternatively you can see the CLO when they are visiting your community on the last Thursday of every month between 10:00-12:00
- Send a letter to Miro Forestry (Ghana) Ltd, P.O. Box 3, Agogo Asante-Akyem North, Ashanti
- Send an email to comments@miroforestry.com

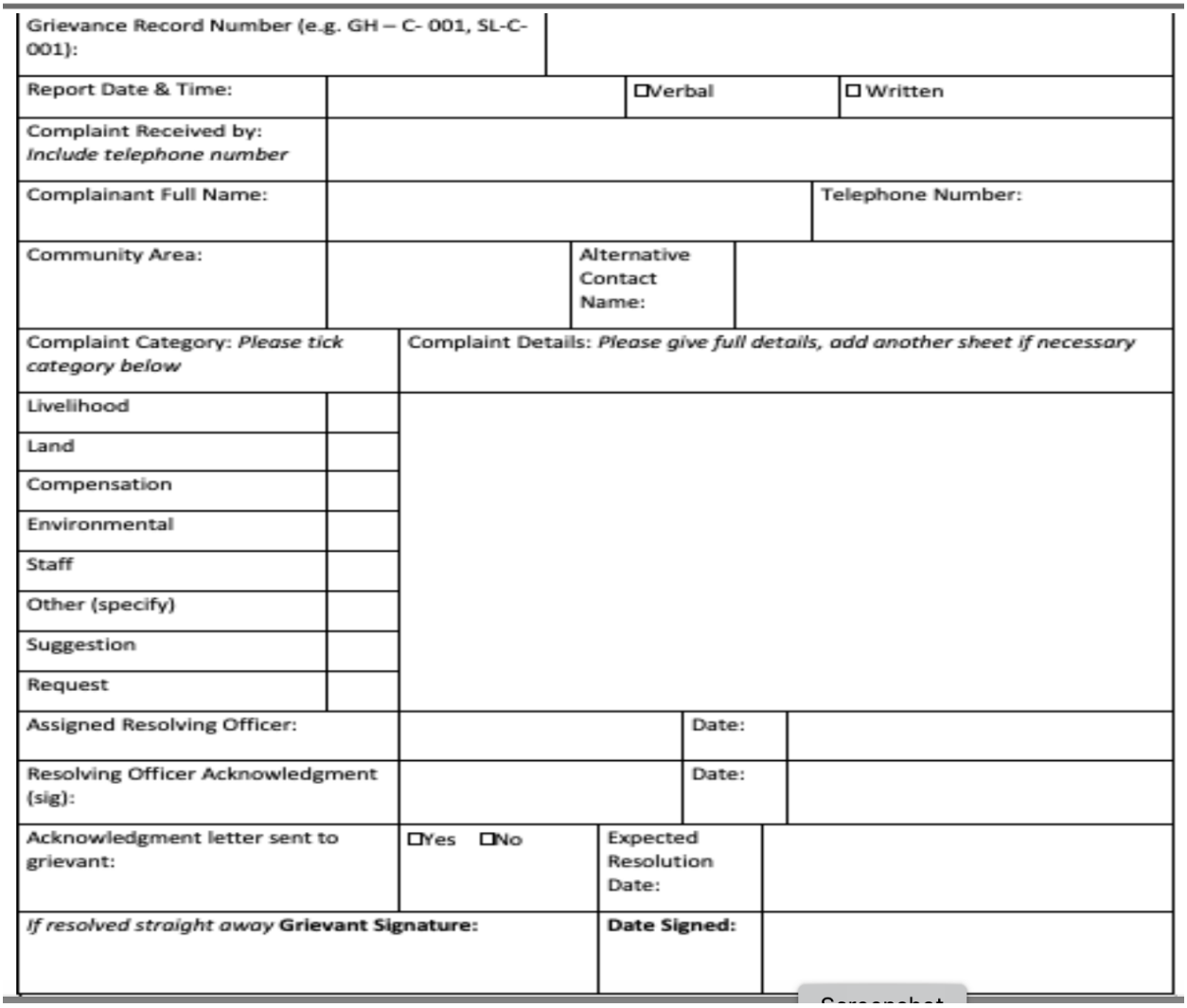
Once your grievance has been received the company will follow a documented grievance procedure , You will be updated on the progress of your grievance and can expect a suggested resolution within 30 days of registering it. Miro management will oversee the handling of all grievances.

**All comments and complaints will be treated with complete confidentiality.**

**Your Social Manager is: Opoku Ntim-Adjei, contact him on: ona@miroforestry.com or 0244488637**

**Figure 13**. External Stakeholder Notice for Grievance in Ghana prepared by Miro Forestry

Miro Forestry has taken stringent measures to develop the project's stakeholder strategy. The aim of this strategy is to develop fruitful working relationships with its key stakeholders; thereby leveraging their support to enable the company to achieve its planting, commercial, environmental, and social objectives.



| | | | |
|---|---|---|---|
| Grievance Record Number (e.g. GH – C- 001, SL-C-001): | | | |
| Report Date & Time: | | ☐Verbal | ☐ Written |
| Complaint Received by: *Include telephone number* | | | |
| Complainant Full Name: | | | Telephone Number: |
| Community Area: | | Alternative Contact Name: | |
| Complaint Category: *Please tick category below* | | Complaint Details: *Please give full details, add another sheet if necessary* | |
| Livelihood | | | |
| Land | | | |
| Compensation | | | |
| Environmental | | | |
| Staff | | | |
| Other (specify) | | | |
| Suggestion | | | |
| Request | | | |
| Assigned Resolving Officer: | | Date: | |
| Resolving Officer Acknowledgment (sig): | | Date: | |
| Acknowledgment letter sent to grievant: | ☐Yes ☐No | Expected Resolution Date: | |
| *If resolved straight away* **Grievant Signature:** | | **Date Signed:** | |

**Figure 14**. Grievance Registry Form available from Miro Forestry to stakeholders

# 3 IMPLEMENTATION STATUS

## 3.2 Implementation Status of the Project Activity

Miro Forestry aims to achieve net GHG removals by establishing fast-growing commercial plantations in degraded lands. The core activity of the project therefore corresponds to the establishment and maintenance of the forest reserves. Figure 15 shows the areas where these silvicultural activities take place. For achieving the net GHG removals, the plantation established must be managed in a rigorous way. The company has developed policies and procedures to establish a world-class forestry reserve and all operational activities are described in full detail in the PDD, section 1.11.2. and include such

information as land mapping and planning, management of natural areas, conservation areas, and management of commercial areas and species used.

Therefore, during this monitoring period, all project activities described in the PDD, and first verification are still currently underway.

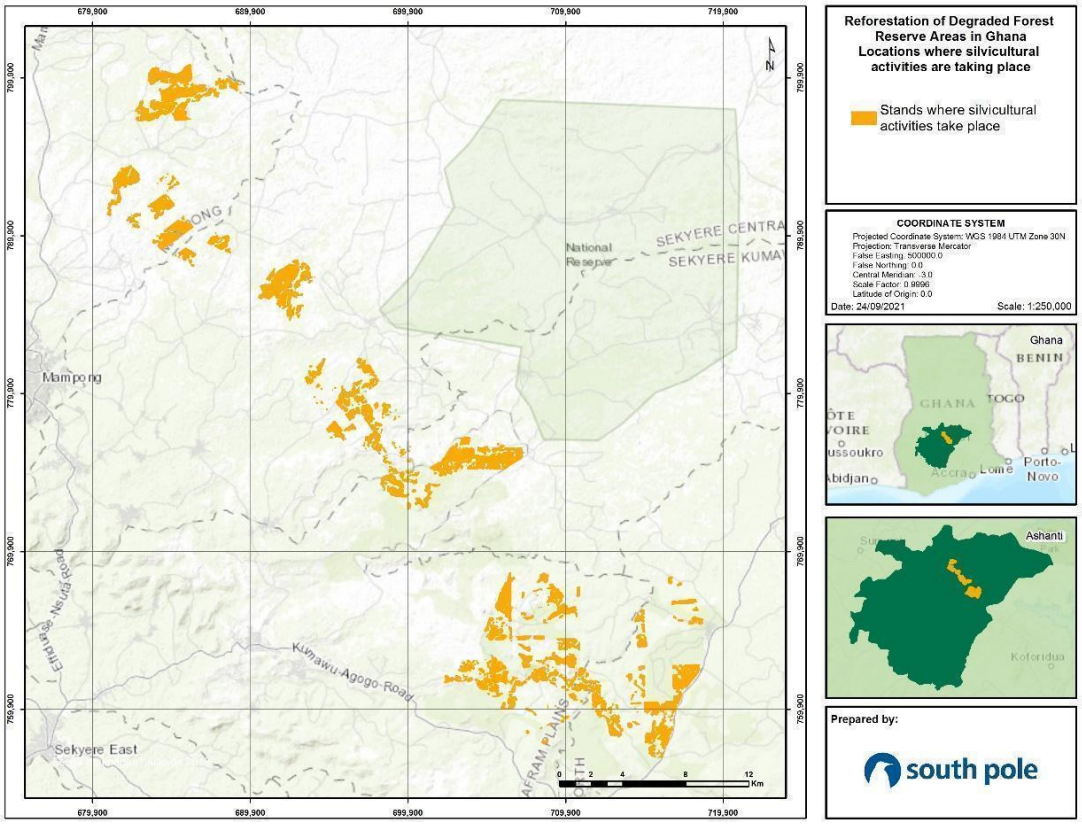



**Figure 15**. Map of the locations of where silvicultural activities are taking place

The eligible area for the same period (2016 to 2022) is provided in table 6. It should be noted that an eligibility analysis was performed for the 2020 - 2022 period and are summarised below, however these areas are not being verified during this monitoring period and are simply represented to show Miro Forestry's planting areas since 2019. The complete eligibility analysis for this period can be found in the supports[64]. As mentioned above these compartments were planted in 2020 and will be included in future verifications when the trees are big enough to be measured.

Table 6. Eligible areas for the selected periods

| Period | Eligible | Non-eligible | No information |
|---|---|---|---|
| 2006-2016 | 1,277.87 | 62.83 | 10.69 |

[64] Supporting information/PO Information/Eligibility AR_Miro Second Verification Ghana new areas

| | | | |
|---|---|---|---|
| 2007-2017 | 693.43 | 807.28 | 4.98 |
| 2008-2018 | 1,270.74 | 94.49 | 9.16 |
| 2009-2019 | 954.12 | 286.94 | 0.00 |
| 2010-2020 | 882.87 | 4.8 | 0.00 |
| 2011-2021 | 488.64 | 447.28 | 0 |
| 2012-2022 | 75.33 | 40.07 | 0 |

The main species to be cultivated in the Abrimasu Forest Reserve will be industrial timber species including Gmelina as well as an element of high value species including teak. Both will be managed according to the predominant best practice methods understood worldwide. The targeted products are poles for power transmission and rural electrification, sawn timber for the local and regional markets and ply for the construction industry. Thinning will be carried out in each annual coupe to ensure that the final crop develops under conditions that will maximise volume increment[65]. Thinned biomass can be seen in Table 7.

Table 7: Thinned biomass per hectare

| Period | MU | Specie | Strata Area (ha) | Biomass per year after thinning (ton/strata) | Total biomass before thinning (AGB+Thinned) (ton/strata) | Thinned biomass (ton/ha) | Thinned biomass per ha(ton/ha) | Thinning from entire strata (%) |
|---|---|---|---|---|---|---|---|---|
| 2019 | 1.1 | *Acacia mangium* | 183.60 | 72.8 | 96.82 | 24.02 | 0.13 | 33 |
| 2019 | 1.3 | *Tectona grandis* | 227.10 | 52.4 | 76.50 | 24.10 | 0.11 | 46 |
| 2019 | 2.2 | *Eucalyptus spp* | 386.10 | 38.4 | 51.07 | 12.67 | 0.03 | 33 |
| 2020 | 2.1 | *Acacia mangium* | 129.40 | 62.8 | 83.52 | 20.72 | 0.16 | 33 |
| 2020 | 2.4 | *Tectona grandis* | 48.40 | 55.6 | 81.18 | 25.58 | 0.53 | 46 |
| 2020 | 2.5 | *Corymbia* | 49.70 | 92.8 | 123.42 | 30.62 | 0.62 | 33 |
| 2020 | 3.2 | *Eucalyptus spp* | 717.30 | 26.9 | 35.78 | 8.88 | 0.01 | 33 |
| 2020 | 3.5 | *Corymbia* | 131.10 | 56.4 | 75.01 | 18.61 | 0.14 | 33 |
| 2020 | 3.3 | *Tectona grandis* | 56.45 | 54 | 71.82 | 17.82 | 0.32 | 33 |
| 2021 | 3.1 | *Acacia mangium* | 188.00 | 58.9 | 78.34 | 19.44 | 0.10 | 33 |
| 2021 | 4.2 | *Eucalyptus spp* | 343.80 | 30.3 | 40.30 | 10.00 | 0.03 | 33 |

[65] Supporting documents/Preliminary Environmental Report Abrimasu Forest Reserve

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2021 | 4.3 | *Tectona grandis* | 17.4 | 27.4 | 36.44 | 9.04 | 0.52 | 33 |
| 2021 | 4.5 | *Corymbia* | 13.6 | 42.1 | 55.99 | 13.89 | 1.02 | 33 |

Monitoring of leakage

As described in full detail in the PD, including sections 1.17. Leakage, 9. Baseline and 10. Monitoring Plan, the monitoring of leakage can be neglected because leakage only occurs with the displacement of agriculture activities (according to the methodology AR-ACM0003 and AR-TOOL 15 "Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activities"). No displacement of agricultural activities occurs in the project; therefore, leakage can be counted as zero and does not need to be monitored or managed.

Risk factor

The risk factor was assessed using the VCS Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination. Project risks and activities described to uphold the project permanence are described in the PDD in section 4.4. Identification of risks that may substantially affect the project's GHG emission reductions or removal enhancements are checked at each verification. For this verification, the buffer risk was set at 10%, according to the potential risk and mitigation measurements of the project as assessed during this monitoring period. Detailed information is presented in the supporting information, Miro Ghana VCS Non-Permanence Risk Report[66].

## 3.3 Deviations

### 3.2.1 Methodology Deviations

No Methodology Deviations were applied for the second monitoring period.

### 3.2.2 Project Description Deviations

The following project description deviation was noted for the project:

A deviation was made with regards to the establishment of permanent sample plots (PSPs) within the project boundary. As noted in section 5.3 of the PDD: "To estimate the total CO2e content captured by the project plantations with a sampling error of 10% or less, 822 circular (313) and square (509) plots of 500m$^2$ and 400m$^2$, were established and distributed across all the defined strata". For the second verification, the number of PSPs that were surveyed was calculated according to the CDM_A/R Methodological Tool" Calculation of the number of sample plots for measurements within A/R CDM project activities Version 02.1"[67].

- This tool can be used for calculation of the number of sample plots required for estimation of biomass stocks from sampling-based measurements in the baseline and project scenarios of an A/R CDM project activity.

[66] Supporting documents/NPRT/ Miro Ghana VCS-Non-Permanence Risk Report v4.0

[67] This methodology tool is available online: https://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-03-v2.1.0.pdf

- The tool calculates the number of required sample plots based on the specified targeted precision for biomass stocks to be estimated.
- For the purpose of this tool all parameters used in calculation of plot level biomass stock (e.g., biomass expansion factors, root-shoot ratios) are considered fixed constants. Similarly, all models used for calculation of plot level biomass stock (e.g., volume tables or equations, allometric equations) are exact.

This deviation does not impact the applicability of the methodology, additionality, or appropriateness of the baseline scenario and therefore the project remains in compliance with the applied methodology. The deviation does not relate to any other part of the methodology and does not affect the conservativeness of the quantification of the GHG emission reductions or removals as described below.

Miro Forestry previously utilized the sampling recommendations as per the FSC Guidelines and as per their own operational and research needs which resulted in the establishment and monitoring of 822 plots. During the previous monitoring period, all enumeration data for the 822 PSPs that was available was used for the ex-post calculations for estimation of the biomass within the project boundary. However, the monitoring of such a high number of PSP's during any given monitoring period is a tedious task which requires lengthy timeframes with a big enumeration team which is not ideal for the monitoring of PSPs for this carbon project. Therefore, a deviation is undertaken to determine the correct sample size of PSPs required for the project area/boundary. By determining the correct sample size of PSPs required for the project area (lower sample size) the monitoring of the PSPs can be conducted within a faster timeframe by the enumeration team for the carbon project. The reduced PSPs can still also be used to determine the biomass within the project area with high precision and without compromising the accuracy of the sample. The decrease in the number of PSP's from the previous monitoring period does not affect the estimation of biomass of the strata as the margin of error is maintained at 5% and at a 95% confidence level, guaranteeing the best accuracy for the relevant stratums biomass estimation. All plots will also be measured at 500$m^2$.

Under normal conditions the CDM_A/R Methodological Tool" Calculation of the number of sample plots for measurements within A/R CDM project activities Version 02.1 should be used to determine the correct sample size for the project area/boundary of interest. Should the tool have been run during the project design or at the previous monitoring period the permanent sample plots would be statistically determined and found to be 152[68] instead of 822 as originally put forth. The number of plots calculated in this verification was 152 plots[69], therefore no further calculation is required as per the requirements of the tool. Given that the project has multiple strata, the allocation of the total number of PSPs for each stratum were also then stratified based on the proportion of the PSP's that were monitored at the past verification. The calculation of the PSPs therefore takes into consideration the conservativeness for each stratum by ensuring the correct proportion of plots are monitored in relation to the previous monitoring period.

In addition, the tool will be updated when new PSP's will need to be established for new strata affiliated with a new planting year and species for additional eligible areas that are added into the total project boundaries. This deviation becomes effective for this monitoring period. Therefore, the deviation taken

[68] Supporting information/Estimations/Project Area and Sample Plot Calculation Ghana

[69] Supporting information/Estimations/Project Area and Sample Plot Calculation Ghana

affects all monitoring periods henceforth. Having determined that the correct sample size for the PSPs was 152, a random selection of 152 plots from within the 822 currently established PSP's were undertaken using Microsoft Excel and ArcGIS. Therefore these 152 PSPs are a subset of the previously established 822 PSPs and therefore no biomass was lost and the end result of the biomass estimation within the project boundary is not compromised and the accuracy of the biomass estimation is maintained as per the requirements of the standard. In addition, the inclusion of an additional 21 PSPs for strata 3.3, 4.3, 4.5 and 4.6 have been added for the relevant monitoring units bringing the total number of PSP's established to date as 173 for the project area.

# 4 DATA AND PARAMETERS

## 4.2 Data and Parameters Available at Validation

The data and parameters used in the quantification of project removals are shown below. Most of the parameters were defined based on the environmental and climatic conditions described in the project location section.

| | |
|---|---|
| **Data/parameter** | Root to shoot ratio for mixed tropical broadleaf species ($R_{mix}$) |
| **Data unit** | Dimensionless |
| **Description** | Converts the above-ground biomass to the above- and belowground biomass |
| **Source of data** | 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (TABLE 4.4 (UPDATED) RATIO OF BELOW-GROUND BIOMASS TO ABOVE-GROUND BIOMASS (R) [TONNE ROOT D.M. (TONNE SHOOT D.M.)-1]) |
| **Value applied:** | 0.232 |
| **Justification of choice of data or description of measurement methods and procedures applied** | Conservatively chosen for Primary tropical/subtropical moist forest |
| **Purpose of data** | Calculation of project emissions |
| **Comments** | N/A |

| | |
|---|---|
| **Data/parameter** | Biomass expansion factor ($BEF$) |

| | |
|---|---|
| **Data unit** | Dimensionless |
| **Description** | Converts trunk biomass to total above and belowground tree biomass |
| **Source of data** | IPCC 2003, Good Practice Guidance for Land Use, Land-Use Change, and Forestry[70]. Table 3A.1.10. Page 3.178. |
| **Value applied:** | 1.5 |
| **Justification of choice of data or description of measurement methods and procedures applied** | Tropical, broadleaf, over bark |
| **Purpose of data** | Estimation of belowground biomass |
| **Comments** | N/A |

| | |
|---|---|
| **Data/parameter** | Carbon fraction |
| **Data unit** | Dimensionless |
| **Description** | Tonnes of carbon per tonne of biomass dry matter |
| **Source of data** | 2006 IPCC Guidelines for National Greenhouse Gas Inventories[71]. Table 4.3. Page 4.48. |
| **Value applied:** | All species: 0.47 |
| **Justification of choice of data or description of measurement methods and procedures applied** | It is used for the whole tree part calculation |
| **Purpose of data** | Calculation of project emissions |
| **Comments** | N/A |

| | |
|---|---|
| **Data/parameter** | $SOC_{REF},i$ |
| **Data unit** | tonne C $ha^{-1}$ |
| **Description** | Reference soil organic carbon stock |

[70] IPCC, 2003. https://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf_files/GPG_LULUCF_FULL.pdf
[71] IPCC, 2006. https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_04_Ch4_Forest_Land.pdf

| | |
|---|---|
| **Source of data** | CDM_AR_tool_16."Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities[72]". Version 01.1.0. Table 3. Page 3. |
| **Value applied:** | 56 |
| **Justification of choice of data or description of measurement methods and procedures applied** | Tropical, moist. Average (HAC and LAR) for the tropical forest as PP project lies on the border of the moist forest zone. |
| **Purpose of data** | Baseline estimations |
| **Comments** | N/A |

## 4.2 Data and Parameters Monitored

| | |
|---|---|
| **Data / Parameter** | DBH (Diameter breast height) |
| **Data unit** | Centimetres (cm) |
| **Description** | Diameter of the tree at 1.37 m of height |
| **Source of data** | Measured by the project proponent |
| **Description of measurement methods and procedures to be applied** | Is measured in temporal sample plots, see chapter 5.3 of the PDD for elaboration |
| **Frequency of monitoring/recording** | According to the management objectives shown on the monitoring plan (chapter 5.3) of the PDD |
| **Value monitored** | Variable ranges from 3.1 cm to 36 cm |
| **Monitoring equipment** | Masser Excalliper II |
| **QA/QC procedures to be applied** | Microforest platform database check, outliers' revision and measurement approval, according to the enumeration procedure |
| **Purpose of the data** | Calculation of project emissions |
| **Calculation method** | N/A |
| **Comments** | N/A |

[72] This methodology tool is available online: https://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-16-v1.1.0.pdf

| | |
|---|---|
| **Data / Parameter** | Ht (height) |
| **Data unit** | Meters (m) |
| **Description** | Total height of the trees |
| **Source of data** | Measured by the project proponent |
| **Description of measurement methods and procedures to be applied** | Measured in temporal sample plots, see chapter 5.3 of the PDD for elaboration |
| **Frequency of monitoring/recording** | According to the management objectives shown on the monitoring plan (chapter 5.3) of the PDD |
| **Value monitored** | Depending on age between 0.5 and 30 m |
| **Monitoring equipment** | Vertex IV Hypsometer: accuracy +/-10 cm<br>Measuring tape: accuracy +/- 1 cm |
| **QA/QC procedures to be applied** | Microforest platform database check, outliers' revision and measurement approval, according to the enumeration procedure |
| **Purpose of the data** | Calculation of project emissions |
| **Calculation method** | N/A |
| **Comments** | N/A |

| | |
|---|---|
| **Data / Parameter** | Plot location |
| **Data unit** | Latitude, longitude |
| **Description** | Plot's location coordinates |
| **Source of data** | Project proponent measurements |
| **Description of measurement methods and procedures to be applied** | The geographic coordinate of each monitoring plot |
| **Frequency of monitoring/recording** | According to the management, objectives showed on the monitoring plan (chapter 5.3) of the PDD |
| **Value monitored** | Variable |
| **Monitoring equipment** | GPS of the calliper with an accuracy of 0.5 m<br>GPS navigator |

| | |
|---|---|
| **QA/QC procedures to be applied** | Internal audit, according to the data quality steps, described in chapter 5.3 of the PDD |
| **Purpose of the data** | Sampling error |
| **Calculation method** | Direct measurement |
| **Comments** | N/A |

| | |
|---|---|
| **Data / Parameter** | Plot area $A_{plot}$ |
| **Data unit** | Square metres ($m^2$) |
| **Description** | Total area of sample plots |
| **Source of data** | PP field monitoring |
| **Description of measurement methods and procedures to be applied** | Plot area is measured to guarantee quality and accuracy in the estimations. |
| **Frequency of monitoring/recording** | According to the management, objectives showed on the monitoring plan (chapter 5.3) |
| **Value monitored** | Circular plots: 500 $m^2$ (Radius: 12.62 m) |
| **Monitoring equipment** | Vertex IV Hypsometer: accuracy +/-10 cm |
| **QA/QC procedures to be applied** | Internal audit, according to the data quality steps, described in chapter 5.3 of the PDD |
| **Purpose of the data** | Sampling error and calculation of project emissions |
| **Calculation method** | N/A |
| **Comments** | N/A |

| | |
|---|---|
| **Data / Parameter** | Subsistence farming activity displaced $A_{disp.subistence\ farming}$ |
| **Data unit** | Hectares (ha) |
| **Description** | Total area of subsistence farming displaced before the plantation starts |
| **Source of data** | PP field monitoring |

| | |
|---|---|
| **Description of measurement methods and procedures to be applied** | It will be measured by field identification by the PP, stakeholder consultations. After aerial maps would be used to complement this information |
| **Frequency of monitoring/recording** | Every time that new areas included in the verification are planted |
| **Value monitored** | Variable (always in hectares) |
| **Monitoring equipment** | - |
| **QA/QC procedures to be applied** | Cross-checking the information collected on the field with aerial maps |
| **Purpose of the data** | This parameter is measured for the leakage calculation. |
| **Calculation method** | N/A |
| **Comments** | N/A |

## 4.3 Monitoring Plan

This monitoring plan provides guidance on monitoring and standard operational procedures for the ARR project activity. It fulfils the requirement that the project activity should have credible and accurate monitoring procedures in place to enable the evaluation of project performance and verification of the net anthropogenic GHG emission removals. The project participants use Standard Operation Procedures (SOPs) for data collection[73]. All measured and experimental data are documented and archived. Operational procedures under this monitoring plan are defined as those that enable measuring and estimating net carbon stock changes associated with the plantations under the project activity, as well as general monitoring of forestry operations. The project participants keep records of all activities, like changes in the actual planted areas, site preparation and forest management using the Microforest database by following and using Miro Forestry SOPs[74] that are in place and can project activities can be consulted in the Adaptive Management Plan[75].

The detailed monitoring plan is described in the PDD under Section 5.3 Monitoring Plan.

To estimate the carbon stock in tree biomass at a given point in time, the tool “Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities AR-TOOL14 Version 04.1” was used. The carbon content below-ground (in dead wood and litter) and soil carbon organic content to project activities will not be monitored. The SOC will be estimated by using default values and suggested methods using the tools CDM_AR_tool_16."Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities".

[73] Supporting documents/PO Information/Ghana_Planning_Enumeration_S0P_Procedures.pdf
[74] Supporting documents/PO Information/Ghana_Planning_Enumeration_S0P_Procedures.pdf
[75] Supporting documents/ PO Information/ Adaptive Management Plan 2019

Miro Forestry already has a procedure in place that addresses the management of the timber growing stock (volumes) on the plantations and ensures that timber is harvested sustainably as per the FSC Standards. The forest inventories are called “enumerations” by the company and are managed through the following organisational structure as seen in Figure 16.

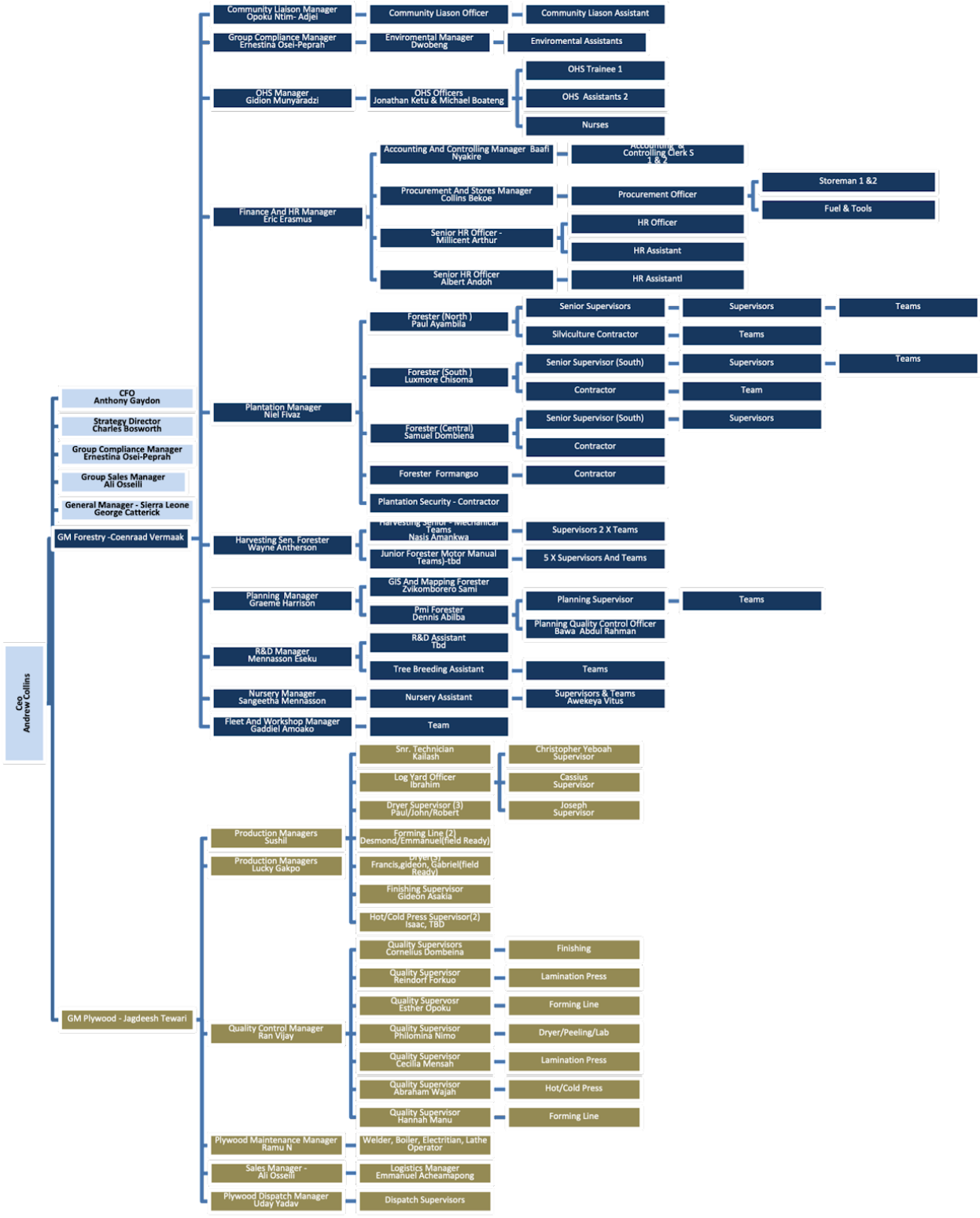



**Figure 16**. Miro Forestry organogram

The following positions (Table 8) in the organisation are responsible for ensuring compliance with the enumeration (inventory) procedure and performing the corresponding audits to the measurements:

**Table 8. Positions in the organisation responsible for enumerations**

| | |
|---|---|
| **Overall:** | Country general manager |
| **Data management and quality control:** | Planning forester/manager |
| **Enumerations:** | Planning forester/manager |
| **Marking for thinnings:** | Enumerators |
| **Audits:** | Planning forester/manager |

The outcomes from the enumerations (Table 9) are saved directly into these sites:

**Table 9. Monitoring data record**

| Record | Responsibility | Location | Retention |
|---|---|---|---|
| Microforest database | Planning forester/manager | Microforest | Ongoing |
| Enumeration sheets | Planning forester/manager | Microforest | Permanent |
| Audits | Planning forester/manager | Planning office | Five years |

Considering the methodology AR ACM0003 are required elements to verify:

- The Precision requirements: For this methodology, the precision requirements were estimated using equation 15 of the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities.
- Verification of changes in carbon stocks in the pools selected

Monitoring periods and frequency

The project monitoring is expected to cover the crediting period of 30 years, starting from 2016. The crediting period started from 24-03-2016 to 30-06-2045 and the first monitoring period from (24-03-2016 to 01-11-2020. Moreover, the second monitoring period from (02/11/2020 to 19/09/2022). The project participants use the VCS buffer approach to address any loss of permanence. From the NPRT Report, a buffer of 10 % is considered for this monitoring period.

Stratification and sampling

According to the "AR-ACM0003 A/R Large-scale Consolidated Methodology: Afforestation and reforestation of lands except wetlands Version 02.0", if biomass distribution over the project area is not homogeneous, stratification should be carried out to improve the precision of biomass estimation. Different stratifications may be appropriate for the baseline and project scenarios to achieve optimal precision of the estimation of net GHG removals by sinks.

In particular:

For actual net GHG removals by sinks, the stratification for ex-ante estimations is based on the project planting schedule plan (see Table 10).

Table 10. Stratums defined for GHG emission reductions and removals estimations

| Species | Year | Eligibility | Area (ha) | Strata |
|---|---|---|---|---|
| *Acacia mangium* | 2016 | Eligible | 183.6 | 1.1 |
| *Eucalyptus spp* | 2016 | Eligible | 611.2 | 1.2 |
| *Tectona grandis* | 2016 | Eligible | 227.1 | 1.3 |
| *Corymbia citriodora* | 2016 | Eligible | 130.2 | 1.4 |
| *Acacia mangium* | 2017 | Eligible | 129.4 | 2.1 |
| *Eucalyptus spp* | 2017 | Eligible | 386.1 | 2.2 |
| *Gmelina arborea* | 2017 | Eligible | 6.8 | 2.3 |
| *Tectona grandis* | 2017 | Eligible | 48.4 | 2.4 |
| *Corymbia* | 2017 | Eligible | 49.7 | 2.5 |
| *Acacia mangium* | 2018 | Eligible | 188.0 | 3.1 |
| *Eucalyptus spp* | 2018 | Eligible | 717.3 | 3.2 |
| *Tectona grandis* | 2018 | Eligible | 56.4 | 3.3 |
| *Gmelina arborea* | 2018 | Eligible | 77.2 | 3.4 |
| *Corymbia citriodora* | 2018 | Eligible | 131.1 | 3.5 |
| *Other sp* | 2018 | Eligible | 6.4 | 3.6 |
| *Acacia mangium* | 2019 | Eligible | 33.3 | 4.1 |
| *Eucalyptus spp* | 2019 | Eligible | 343.8 | 4.2 |
| *Tectona grandis* | 2019 | Eligible | 17.4 | 4.3 |
| *Gmelina arborea* | 2019 | Eligible | 511.0 | 4.4 |
| *Corymbia citriodora* | 2019 | Eligible | 13.6 | 4.5 |
| *Other sp* | 2019 | Eligible | 2.9 | 4.6 |
| **TOTAL** | | | **3,871** | |

### Permanent sample plots

During the first verification 822 plots were established and distributed across all the defined strata to estimate the total CO2e content captured by the project plantations with a sampling error of 10% or less.

During the second verification the amount of sample plots needed to meet the 10% sample error or less was calculated using "A/R Methodological Tool" for "Calculation of the number of sample plots for measurements within A/R CDM project activities. V2.1.0[76]" and the determined number of plots were randomly selected as a subset from within the current 822 established plots and then measured in the field.

The number of plots to be established and measured will be estimated as follows:

$$n = \frac{N * t^2 * \left(\sum_{i=1}^{I} wi * s_i\right)^2}{N * E^2 + t^2 * \sum_{i=1}^{I} wi * s_i^2}$$

[76] This methodology tool is available online: https://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-03-v2.1.0.pdf

Where:

n Number of sample plots required for estimation of biomass stocks within the project boundary; dimensionless

I Total number of strata within the project boundary

I 1, 2, 3, … biomass stock estimation strata within the project boundary

N Total number of possible sample plots within the project boundary (i.e., the sampling space or the population); dimensionless

t Two-sided Student's t-value, at infinite degrees of freedom, for the required confidence level; dimensionless

wi Relative weight of the area of stratum

i (i.e., the area of the stratum i divided by the project area); dimensionless

si Estimated standard deviation of biomass stock in stratum i; (t ha-1 )

E Acceptable margin of error in estimations of biomass stock within the project boundary; t d.m. (or t d.m. ha-1), i.e. in the units used for si

If the number of sample plots n calculated in the first iteration using the equation is above 30 or more, then no further iteration is carried out and the value of n obtained in the first iteration is the final value of n. The number of plots calculated in this verification was 152 plots[77], therefore no further calculation is required. 21 additional plots for strata 3.3, 4.3, 4.5 and 4.6 have also been added for the relevant monitoring units bringing the total number of PSP's established to date as 173.

### Establishment of the plot in field

The sample plots are used to take measurements such as tree height, DBH and species type, with the objective of registering the sampling over time and to measure and monitor changes of the relevant carbon stocks.

### Location of monitoring plots

The plots were systematically located randomly in each stratum to avoid subjective choice of plot locations. The plot location has been identified with the help of a GPS device in the field. For each plot the geographic position (GPS coordinate) and compartment series number is recorded and archived.

### Organisational structure, responsibilities, and competencies

The project monitoring team consists of the Planning Forester, Dennis Abilba, the Officer of Planning Quality Control, Abdulai Bawa Abdul-Rahman, and Joshua Donbeinaa as Supervisors of Planning. Moreover, twelve enumerators were supported throughout the monitoring process. The personnel involved in the measurement of carbon pools were fully trained in field data collection and analysis by the technical manager. Table 11 presented the technical team involved in the remeasurement of the plot for this second verification.

Table 11. Miro Forestry (Ghana) staff for the monitoring process

| Technical Team | Job Description |
|---|---|

[77] Supporting information/Estimations/Project Area and Sample Plot Calculation Ghana

| | |
|---|---|
| Dennis Abilba | Planning Forester |
| Abdulai Bawa Abdul-Rahman | Officer: Planning Quality Control |
| Joshua Donbeinaa | Supervisor: Planning |
| George Benjamin Azampana | Enumerator: Senior |
| Ernest Osei Asamoah | Enumerator |
| Moro Tijani Sulemana | Enumerator |
| Nathaniel Abugri | Enumerator |
| Felix Zagdong | Enumerator |
| Prince Akwasi Gyimah | Enumerator: Junior |
| Joseph Obeng Badu | Enumerator: Junior |
| Moses Dombeina | Enumerator: Junior |
| Solomon Taasun | Enumerator: Junior |
| Linda Webadou Akanwonge | Enumerator: Junior |
| Emmanuel Assem | Enumerator: Junior |
| Abdullah Razak Hamidu | Enumerator: Junior |
| Vitus Kakari | Enumerator: Junior |

### Procedures of internal auditing and quality assurance and quality check

A QA/QC procedure was implemented and monitored to ensure that net anthropogenic GHG removals by sinks are measured and precisely, and are credible, verifiable, and transparent.

- Training for all relevant personnel on all data collection and analysis procedures.
- Steps are taken to control mistakes in sampling and data analysis to develop a credible plan for measuring and monitoring carbon stock change in the project. The same procedures are used throughout the project lifetime to ensure continuity.
- An internal QA/QC of the values registered in field is done by the technical manager of the project
- Another QA/QC is developed by South Pole, to analyse the variation of the data and the changes presented in the plantation in comparison with the past verification. This process involves a comparison of the tree growth, starting with the diameter register and verified possible out layers in the data, e.g., extreme high values or “reduction” in the diameter and high values. In this case, if they are not a justification for these changes in the field forms, like mechanical damage of the trees or mortality of them, it is necessary to make a verification in the field.

The main activities implemented in the QA/QC process are presented in Table 12. All the QC procedures were developed for this second verification.

Table 12. Verification and checklist considered to guarantee the quality of the information gathered and its management

| QC activity | Procedures | Observation |
|---|---|---|
| Check for transcription errors in data input and reference | • Confirm that bibliographical data references are properly cited in the internal documentation<br>• Cross-check a sample of input data (either measurements or parameters used in calculations) for transcription errors | OK |
| Check that removals are calculated correctly | • Reproduce a representative sample of removal calculations | OK |
| Check that parameter and units are correctly recorded and that appropriate conversion factors are used | • Check that units are properly labelled in calculation sheets<br>• Check that units are correctly carried through from the beginning to the end of calculations<br>• Check that conversion factors are correct<br>• Check that temporal and spatial adjustment factors are used correctly | OK |
| Check the integrity of database files | • Confirm that the appropriate data processing steps are correctly represented in the database<br>• Confirm that data relationships are correctly represented in the database<br>• Ensure that data fields are properly labelled and have the correct design specifications<br>• Ensure that adequate documentation of database and model structure and operation are archived | OK |
| Check that the movement of inventory data among processing steps is correct | • Check that removal data are correctly reported when preparing summaries<br>• Check that removal data are correctly transcribed between different intermediate products | OK |
| Check that uncertainties in removals are estimated or calculated correctly | • Check that qualifications, assumptions, and expert judgments are recorded<br>• Check that calculated uncertainties are complete and calculated correctly, following the methodology requirements | OK |

| | | |
|---|---|---|
| Undertake review of internal documentation | • Check that there is detailed internal documentation to support the estimates and to enable the reproduction of the emission and removal estimates<br>• Check that inventory data, supporting data, and inventory records are archived and stored to facilitate detailed reviews<br>• Check the integrity of any data archiving arrangements of outside organizations involved in inventory preparation | OK |
| Undertake completeness checks | • Confirm that estimates are reported for all years<br>• Check that known data gaps that may result in incomplete emissions estimates are documented and treated conservatively | OK |
| Compare estimates to previous estimates | • Current inventory estimates should be compared to previous estimates, if available. If there are significant changes or departures from expected trends, re-check estimates and explain the differences | OK |

### Analysis of the monitored data and parameter

Data recorded in the forest inventory (DBH and height) will be the input for the volume equation that will define the total biomass accumulated for the project at the time of monitoring. For ex-post estimates, the default parameters, and equations (sections 3.1 and 3.2) will be the same ones used for ex-ante estimations, unless better values exist at the verification time. These will always follow the AR tool for carbon stock estimation. See section 4.1 for ex-ante net GHG emission reductions and removals.

The average monitoring inventory was performed at 1.01 % intensity, according to Table 13.

Table 13. Monitoring plots intensity

| Year | MU | Species | Eligible Area (Ha) | No. of plots | Monitored area | Intensity |
|---|---|---|---|---|---|---|
| 2016 | 1,1 | Aman | 183.6 | 10 | 0.50 | 0.27% |
| 2016 | 1,2 | Eucs | 611.2 | 11 | 0.55 | 0.09% |
| 2016 | 1,3 | Teak | 227.1 | 5 | 0.25 | 0.11% |
| 2016 | 1,4 | Corym | 130.2 | 5 | 0.25 | 0.19% |
| 2017 | 2,1 | Aman | 129.4 | 5 | 0.25 | 0.19% |
| 2017 | 2,2 | Eucs | 386.1 | 22 | 1.10 | 0.29% |
| 2017 | 2,4 | Teak | 48.4 | 8 | 0.40 | 0.83% |
| 2017 | 2,5 | Corym | 49.7 | 5 | 0.25 | 0.50% |
| 2017 | 2,3 | Gmelina | 6.8 | 5 | 0.25 | 3.68% |

| Year | MU | Species | Eligible Area (Ha) | No. of plots | Monitored area | Intensity |
|---|---|---|---|---|---|---|
| 2018 | 3,1 | Aman | 188.0 | 8 | 0.40 | 0.21% |
| 2018 | 3,2 | Eucs | 717.3 | 17 | 0.85 | 0.12% |
| 2018 | 3,5 | Corym | 131.1 | 5 | 0.25 | 0.19% |
| 2018 | 3,4 | Gmelina | 77.2 | 5 | 0.25 | 0.32% |
| 2018 | 3,6 | Other | 6.4 | 5 | 0.25 | 3.93% |
| 2019 | 4,1 | Aman | 33.3 | 5 | 0.25 | 0.75% |
| 2019 | 4,2 | Eucs | 343.8 | 12 | 0.60 | 0.17% |
| 2019 | 4,4 | Gmelina | 511.0 | 19 | 0.95 | 0.19% |
| 2018 | 3,3 | Teak | 56.45 | 8 | 0.40 | 0.71% |
| 2019 | 4,3 | Teak | 17.4 | 5 | 0.25 | 1.44% |
| 2019 | 4,5 | Corym | 13.6 | 5 | 0.25 | 1.84% |
| 2019 | 4,6 | Other | 2.9 | 3 | 0.15 | 5.14% |
| Total | **N/A** | **N/A** | **3871** | **173** | **8.66** | **1.01%** |

The map of the monitoring plots is zoomed into a few areas due to the scale of the polygons – the support's shapefile has the complete plot information. Figure 12 shows the monitoring plots that were sampled during the second verification and Figure 13 shows the strata and monitoring plots sampled during the first verification period. It should be noted that during the second monitoring period, areas that was previously classed as zone 4 was classed into zone 3 as depicted in Figure 17 and 18.

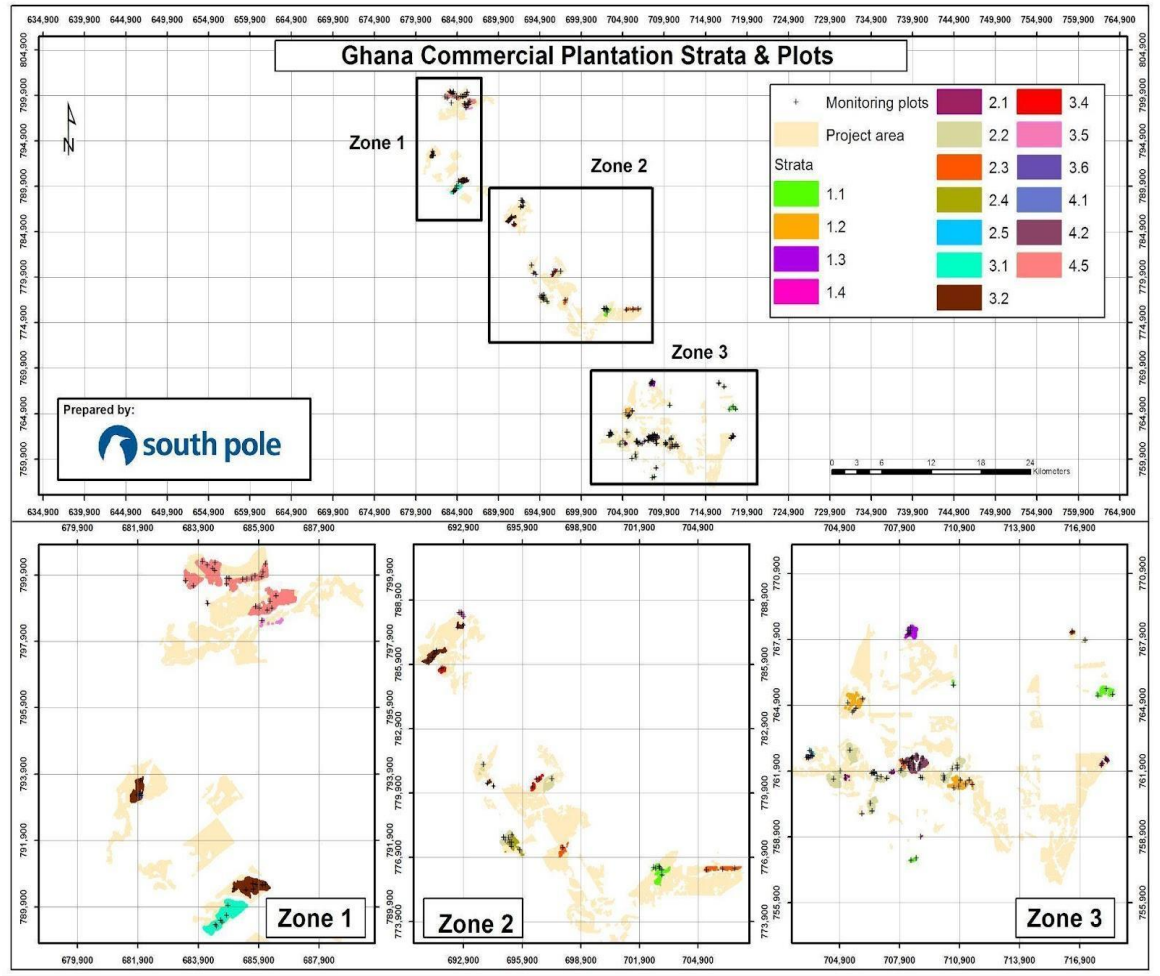



**Figure 17.** Monitoring plots sampled during the second verification period

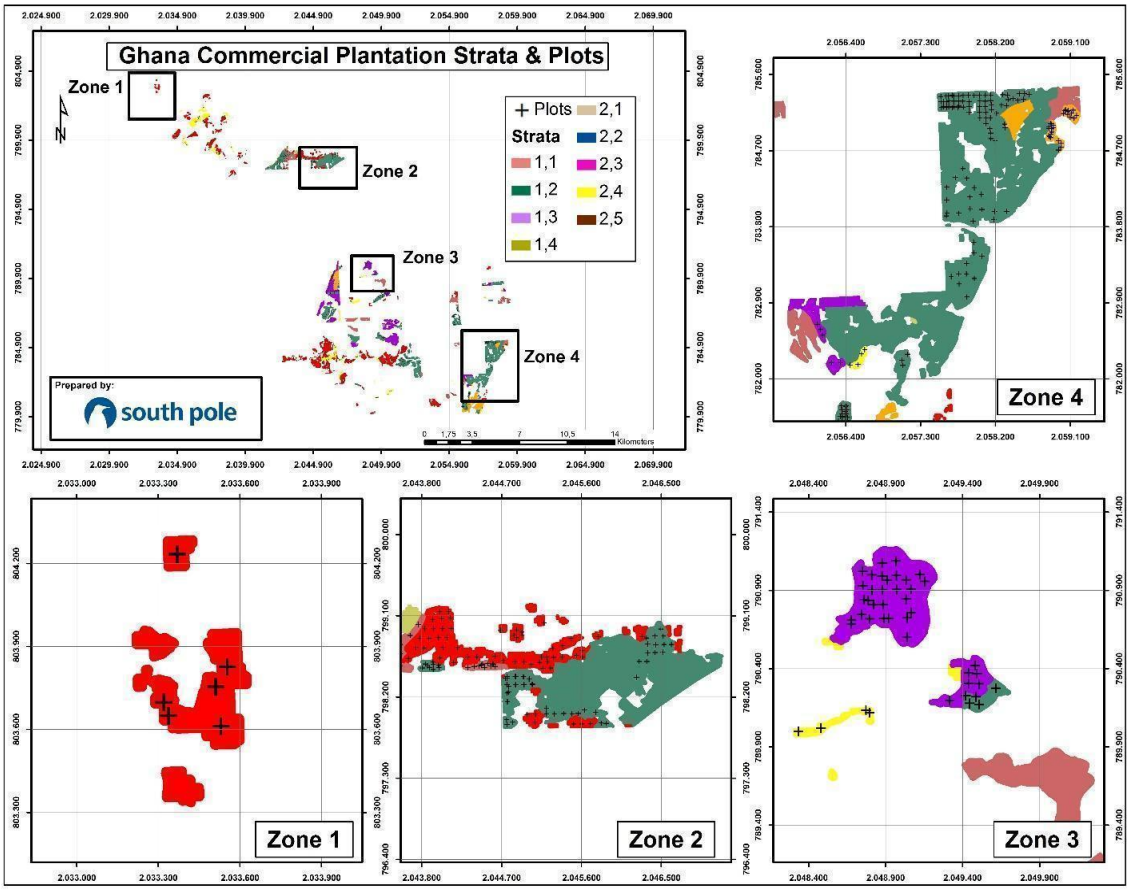



**Figure 18.** Monitoring plots sampled during the first verification period

# 5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

## 5.2 Baseline Emissions

The methodology "AR-ACM0003 A/R Large scale Consolidated Methodology: Afforestation and reforestation of lands except for wetlands (Version 2.0)" was considered. As required by the methodology and given that biomass distribution over the project area is not homogeneous, project area was stratified by land cover type to calculate the GHG baseline.

Details on the GIS processing can be found in section 1.3 Eligibility of the PDD. From that section, it can be concluded that the main land cover present in the project area, after discounting forested areas and wetlands areas, is Grassland. However, in the districts where the project area is located, the most common vegetation type are grasslands, a result of agriculture and fire. Due to the dynamic of the agricultural practice in the area, the fallow periods are short, which is insufficient for forest regeneration or the establishment of the local flora, which leads to a non-significant carbon stock in the baseline scenario.

According to the methodology (Section 5.5 paragraph 14) “GHG emissions resulting from removal of herbaceous vegetation, combustion of fossil fuel, fertilizer application, use of wood, decomposition of litter and fine roots of N-fixing trees, construction of access roads within project boundary, and transportation attributable to the project activity shall be considered insignificant and therefore accounted as zero. As a result of this, baseline stock was zero and no estimations are required.

## 5.3 Project Emissions

Removals by sinks

According to AR-ACM0003 GHG emissions resulting from removal of herbaceous vegetation, combustion of fossil fuel, fertilizer application, use of wood, decomposition of litter and fine roots of N-fixing trees, construction of access roads within the project boundary, and transportation attributable to the project activity shall be considered insignificant and therefore accounted as zero. The quantification of project emissions and/or removals was calculated following the section 5.5 of the AR-ACM003 methodology ““A/R Large-scale Consolidated Methodology Afforestation and reforestation of lands except wetlands”.

$$\Delta C_{ACTUAL,\,t} = \Delta C_{P,t} - GHG_{E,t}$$

Where:

$\Delta C_{ACTUAL,\,t}$ Actual net GHG removals by sinks, in year t; $tCO_2e$

$\Delta C_{P,t}$ Change in the carbon stocks in project, occurring in the selected carbon pools, in year t; $tCO_2e$

$GHG_{E,t}$ Increase in non-$CO_2$ GHG emissions within the project boundary as a result of the implementation of the A/R CDM project activity, in year t, as estimated in the tool “Estimation of non-$CO_2$ GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity”; $tCO_2e$

The increase in non-CO2 GHG emissions within the project boundary as a result of the implementation of the A/R CDM project activity, in year t, is estimated as presented in the tool “Estimation of non-CO2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity”. This tool can be used for estimation of non-CO2 GHG emissions resulting from burning of biomass and forest fires. The tool does not apply because fire is not used in site preparation or land clearing. Therefore, emissions resulting from burning of biomass and forest fires are accounted for as zero.

The change in the carbon stocks occurring in the project for its selected carbon pools in year t shall be calculated as follows:

$$\Delta C_{P,t} = \Delta C_{TREE_PROJ,t} + \Delta C_{SHRUB_PROJ,t} + \Delta C_{DW_PROJ,t} + \Delta C_{LI_PROJ,t} + \Delta SOC_{AL,t}$$

Where:

$\Delta C_{TREE_PROJ,t}$ Change in carbon stock in tree biomass in project in year t, as estimated using the tool “Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities”; $tCO_2e$.

$\Delta C_{SHRUB_PROJ,t}$ Change in carbon stock in shrub biomass in project in year t, as estimated using the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; $tCO_2e$.

$\Delta C_{DW_PROJ,t}$ Change in carbon stock in dead wood in project in year t, as estimated using the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; $tCO_2e$.

$\Delta C_{LI_PROJ,t}$ Change in carbon stock in litter in project in year t, as estimated using the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; $tCO_2e$.

$\Delta SOC_{AL,t}$ Change in carbon stock in SOC in project in year t, in areas of land meeting the applicability conditions of the tool "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities", as estimated in the same tool; $tCO_2e$.

**Estimating carbon stock in trees at given point in time**

**Tree carbon estimation**

To estimate the carbon stock in tree biomass at a given point in time, the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities AR-TOOL14 Version 04.1" was used. According to section 8.2 of this tool, this method is used for ex-ante estimation of the carbon stock in tree biomass.

***Step 1. Volume estimation***

Since the beginning of the plantation project, Miro Forestry has been recording and analysing crop data using the Microforest software and enumerations in the field[78]. Table 14 summarises the annual average increase (MAI) per species:

Table 14. Average MAI data per species

| Species | MAI ($m^3$/ha/yr) | Source |
|---|---|---|
| *Eucalyptus pellita* | 20.0 | Yepes et al. (2011). Protocol for national and subnational biomass-Carbon estimation in Colombia. Table 11. |
| *Acacia mangium* | 26.0 | Yepes et al. (2011). Protocol for national and subnational biomass-Carbon estimation in Colombia. Table 11. |
| *Corymbia citriodora* | 16.0 | FAO - Forest Resources of Tropical Africa (The MAI value employed is an average between 12 and 20 m3/ha/yr) |
| *Gmelina arborea* | 13.7 | UST, P. (1994). Growth and biomass production of Gmelina arborea in conventional plantations in Ghana. Ghana Journal of Forestry, 1, 5. |

[78] Referring to PDD Joint Miro Ghana section 4.1

| | | |
|---|---|---|
| *Tectona grandis* | 10.3 | Mattia, S. B., & Sesay, S. (2020). Ground Forest Inventory and Assessment of Carbon Stocks in Sierra Leone, West Africa. In Natural Resources Management and Biological Sciences. |
| Other species | 6,8 | Project data |

Ex-ante or projected estimations were made based on the MAI of each species planted in the project area, which is the average growth per species extracted from literature. The MAI per species is averaged from the project start date to obtain a more representative and realistic value.

***Step 2. Biomass estimation***

The estimation of standing tree biomass for each stratum was calculated according to equation 13 of the AR-TOOL14 and the equation 5 of the Appendix 1 of the AR-TOOL14:

$$B_{tree} = A \times b_{tree}$$

| | |
|---|---|
| $B_{TREE}$ | Tree biomass in the tree biomass estimation strata; t d.m. |
| A | Sum of areas of the tree biomass estimation strata; ha |
| $b_{TREE}$ | Mean tree biomass per hectare in the tree biomass estimation strata; t d.m. $ha^{-1}$ |

And,

$$b_{TREE} = [V_{TREE} \times D \times BEF_2] \times (1+R)$$

| | |
|---|---|
| $b_{TREE}$ | Mean tree biomass per hectare in the tree biomass estimation strata; t d.m. $ha^{-1}$ |
| $V_{TREE}$ | Mean tree volume per hectare in the tree biomass estimation strata; $m^3$ $ha^{-1}$. For this case, it will be the MAI value of each species multiplied by the respective year of plantation establishment. |
| $D$ | Basic wood density; t $m^{-3}$ |
| $BEF_2$ | Biomass Expansion Factor; dimensionless |
| $R$ | Root-to-shoot ratio; dimensionless |

**Step 3: Mean carbon stock in terms of CO2e**

The conversion of the standing tree biomass for each stratum in term of carbon units was calculated according to equation 12 of the AR-TOOL14:

$$C_{TREE} = \frac{44}{12} \times CF_{tree} \times B_{tree}$$

| | |
|---|---|
| $C_{TREE}$ | Carbon stock in trees in the tree biomass estimation strata; $tCO_2e$ |
| $CF_{TREE}$ | Carbon fraction of tree biomass; t C $(t\ d.m.)^{-1}$ |

$B_{TREE}$ Tree biomass in the tree biomass estimation strata; t d.m.

Carbon in deadwood and litter was calculated using equations 9 and 15 of "A/R Tool 12 Estimation of carbon stocks and change in carbon stocks in dead Wood and litter in A/R CDM projects activities" of the AR-ACM0003 methodology, which accepts the use of a conservative default value that relates the carbon content (in deadwood and litter) as a percentage of the total carbon in the tree's biomass.

$$CDW,i,t = CTREE,i,t \; x \; DFDW$$

Where,

$\boldsymbol{CTREE}$, $\boldsymbol{i}$, $\boldsymbol{t}$ Carbon stock in the biomass of trees in stratum I at a time point in year t ($tCO_2e$).

Conservative default value expressing carbon stock in deadwood as a percentage of carbon stock in tree biomass ($tCO_2e$).

$$CLI,i,t = CTREE,i,t \; x \; DFLI$$

Where,

$\boldsymbol{CLI}$, $\boldsymbol{i}$, $\boldsymbol{t}$ Leaf litter carbon stock in stratum I at a time point in year t ($tCO_2e$)

$\boldsymbol{CTREE}$, $\boldsymbol{i}$, $\boldsymbol{t}$ Carbon stock in the biomass of trees in stratum I at a time point in year t ($tCO_2e$)

The conservative default value that expresses the carbon stock in the litter as a percentage of the carbon stock in the tree biomass ($tCO_2e$).

**SOC** was calculated using equations 1, 2, 6 and 8 of the "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities" of the AR-ACM0003 methodology.

$$SOCInitial,i = SOCRef,i \; x \; fLU,i \; x \; fMG,i \; x \; fIN,i$$

Eq. 1

Where,

$\boldsymbol{SOCInitial}$, SOC stock at the start of the project activity in stratum i of the soil areas (tC/ha).

$\boldsymbol{fLU}$, $\boldsymbol{i}$ Relative factor of change of stock for land use at baseline in stratum i of soil areas (dimensionless).

$\boldsymbol{fMG}$, $\boldsymbol{i}$ Relative factor of change of the stock for the management regime in the baseline in the stratum i of the soil areas (dimensionless).

$\boldsymbol{fIN}$, $\boldsymbol{i}$ Relative factor of change of the stock for the regime of reference inputs in stratum i of the soil areas (dimensionless).

$\boldsymbol{SOCRef}$, $\boldsymbol{i}$ Reference of the soil organic carbon stock corresponding to the reference of native soil condition by climatic region and soil type applicable to stratum i of the soil areas (tC/ha).

$SOC_{LOSS,i} = SOC_{INITIAL,i} * 0.1$

Eq. 2

Where:

$SOC_{LOSS,i}$, SOC loss caused by disturbances attributable to the AR project activity, in stratum i of the soil area; tC/ha

1. Approximate proportion of SOC loss within the first five years from the year of preparation

The values of $SOC_{Ref,i}$, $f_{LU,i}$, $f_{MG,i}$, $f_{IN,i}$ are taken from tables 3 and 6 of the tool "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities". The values taken are consistent with the type of soil and the management used in the project baseline.

The project did not use machinery for silvicultural activities; therefore, there was no disturbance in the soil. Thus, carbon loss is accounted for as follows:

$$SOC_{LOSS,i} = 0$$

$dSOCt,I = \frac{SOC\ Ref,i - (SOC\ INITIAL,i - SOC\ LOSS,i)}{20\ years}$ Eq.6

Where:

$dSOC_{t,i}$, Rate of change in the SOC stock in stratum i of the soil areas, in year t; tC/ha * year.

$\Delta SOC_{AL,t} = \frac{44}{12} \sum_t Ai\ dSOC_{t,i} \times 1\ year$ Eq.8

Where:

$\Delta SOC_{AL,t}$ Change in the SOC stock in the soil areas that meet the applicability conditions of this tool, in the year; $tCO_2e$

$A_i$ Area of stratum i of soil areas; ha

**Calculation of tCERs and lCERs**

According to the standard requirements, for those projects where harvesting practices are contemplated on project activities, the loss of carbon due to harvesting shall be included in the quantification of the project emissions. Due to the project activities contemplate an increment on project area with different rotation periods per specie, the long-term average (LTA) GHG benefit was calculated as follows:

$$LA = \frac{\sum_{t=0}^{n} PE_t - BE_t}{n}$$

Where:

LA The long-term average GHG benefit

PEt The total to-date GHG emission reductions and removals generated in the project scenario ($tCO_2e$). Project scenario emission reductions and removals shall also consider project emissions of $CO_2$, $N_2O$, $CH_4$ and leakage.

BEt The total to-date GHG emission reductions and removals projected for the baseline scenario ($tCO_2e$). Accounted

t Year.

n Total number of years in the established time-period

The LTA[79] was calculated accounting a total of 1,122,992 tCO2e. As the rotation cycles have not changed during the 2nd verification the only data modified (compared to the 1st verification) was the addition of the new planted areas to the project.

The project will quantify and monitor the non-$CO_2$ GHG emissions resulting from any fire occurrences (forest fires) within the project boundary, whose accumulated area affected by such fires in a year is $\geq$ 5% of the project area. These events will be monitored, and the affected area will be recorded. Emissions of non-$CO_2$ GHGs resulting from the loss of above-ground tree biomass due to fire will be calculated in each verification period by using: the above-ground biomass in trees of relevant strata calculated in the previous verification, the default values for the combustion factor, the emission factors, and the global warming potential.

For this monitoring period, the accumulated areas affected by fires was less than 5 percent[80] of the project area and therefore estimations using this tool does not need to be quantified.

The project follows the modalities and procedures for A/R project activities to estimate net GHG removal by sinks, actual net GHG removal by sinks, and net anthropogenic removal by sinks. Equation 15 of the AR-TOOL 14 was used to calculate the uncertainty in tree volume. The uncertainty value of 6.20%[81] was estimated for the current monitoring period at a 95% confidence level and $\alpha$ = 0.05 – according to the methodological tool, there is no discount necessary (< 10% uncertainty). These estimations can be consulted in the ex-post estimations spreadsheet[82]. The sampling error is also found to be 3.81% and was calculated at a 95% Confidence level and $\alpha$ = 0.05.

## 5.4 Leakage

- **Introduction**

The project is located in Ghana's Ashanti region, in the Asante Akim North, Sekyere East and Sekyere West districts. The most common land uses are agriculture (39.76%), degraded forest (22.91%) and savannah (22,86%)[83]. These land uses are connected through a mosaic in the landscape.

[79] Supporting information/Estimations/Ghana Ex-ante UPDATED.xlms

[80] Supporting information/Estimations/Fire Report and Analysis Ghana

[81] Supporting information/Estimations/ Ghana Ex-post

[82] Supporting information/Estimations/ Ghana Ex-post

[83] Khan, Sazzad. (2019). ASHANTI REGION IN GHANA Köln, 2020 PROJECT I REPORT CONTENT.

Before the start of the project within the forest reserves (a total of 3871 eligible hectares) occurred 2 main activities:

1. **Cattle ranching:** there is cattle grazing with the presence of Fulani[84], a nomad herdshed group from Burkina Faso that moves their cattle inside of degraded Forest Reserves.

2. **Subsistence agriculture:** Despite Ghana's policy prohibiting farming activities within the forest reserves this activity occurred in the past. These activities inside of the project area were predominantly smallholder, traditional and rain-fed, dedicated mainly to satisfying the consumption of the domestic units (FAO, 2019)[85]. Based on Miro records the small-subsistence agriculture area were around 300 hectares in total (7.15% of the total project area) based on information from Miro Ghana[86].

Once Miro started the project in 2016, two approaches were used for these 2 activities happening in the reserves:

- First, leakage emissions attributable to cattle ranching activities should not be considered because this activity has not been displaced.
    - The nomadic cattle herdsmen (popularly known as the Fulani) also use the reserve as a grazing area for their cattle[87]. Cattle guards keep the cattle away from the young trees and Miro inform the Fulani where they can move where the trees are mature with no negative impact on Miro seedlings (See Section 2.1. No net harm in Open grazing animals section to see more records for more information). Forest guards are currently employed to assist with security by patrolling the reserve and guide the Fulani through this more mature compartments.
    - Furthermore, these activities are not linked to the forest reserve areas because it is not permanent but seasonal activity. So during the times of the year when the Fulani crosses the project area, Miro provides them a route to not cause harm to the trees but without displacing their movement across the reserves (See the map[88] Section 2.1. No net harm in Open grazing animals section for more information) showing evidence of them moving inside the reserves.
- Second, subsistence agriculture falls into the definition of displacement of agricultural activities (Definition 4.7.d) which refers to shifting of the agricultural activities from areas of land within the project boundary to areas of land outside the project boundary. In Miro's case this number was identified as approximately 100 ha of farms were identified on the ground, but studies of aerial maps suggest that another 150-200 hectares may exist in other parts according to the

[84] https://en.wikipedia.org/wiki/Fula_people

[85] FAO. (2019). Ghana at a glance. Retrieved from: http://www.fao.org/ghana/fao-in-ghana/ghana-at-a-glance/en/

[86] Supporting information/PO Information/ESIA/NMFC Livelihood Study_Development Plan (2014. 08.06)

[87] 01_Supporting Information\PO Information\EHSS and Reports\Adaptive_Management_Plan_2019.pdf

[88] 01_Supporting Information\PO Information\ESIA\Fulani routes 2019

Livelihood Study and Development Plan[89] (See Annex IV of the report for more information), to sum a total around 300 hectares (7.15% of the total project area). However, for the sake of conservativeness, it was assume that they were in 10% of the total project area (corresponding to 387.1 ha).

To assess the leakage the A/R Methodological tool: Estimation of the increase in GHG emissions attributable to the displacement of pre-project agricultural activities in A/R CDM project activity, v2.0 (AR-TOOL15)[90] was applied.

- **Leakage estimation**

Following the steps provided by the AR-TOOL15:

9. Leakage emission attributable to the displacement of agricultural activities due to the implementation of an A/R CDM project activity is estimated as the decrease in carbon stocks in the affected carbon pools of the land receiving the displaced activity.

- In this case the leakage emission is attributed to the displacement of the small-scale subsistence farms that were illegally placed on the reserves before the project started.
- The activity increases the GHG emissions due to bushfires happening due to the land clearing activities for cultivation and new forage for cattle by migrant farmers and cattle ranchers[91] (Note 1 from the AR-TOOL15). The displacement of activities is not attributed to secondary effects of the project activity (Note 2 from the AR-TOOL15 – Figure 19)

Note 1. Displacement of an agricultural activity by itself does not result in leakage emission. Leakage emission occurs when the displacement leads to an increase in GHG emissions relative to the GHG emissions attributable to the activity as it exists within the project boundary.

Note 2. Increase in GHG emission occurring outside the project boundary attributable to the secondary effects of the A/R CDM project activity (e.g. changes in demand, supply or price of goods) is considered insignificant for the purpose of this tool and hence accounted as zero.

**Figure 19.** Note 1 and 2 from the AR-TOOL 15

10. Leakage emission is attributable to the displacement of grazing activities under the following conditions is considered insignificant and hence accounted as zero:

[89] Supporting information/PO Information/ESIA/NMFC Livelihood Study _ Development Plan (2014.08.06).pdf

[90] AR-TOOL15 A/R Methodological tool: Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity Version 02.0

[91] Supporting information's/ EHSS document/preliminary environmental report Abrimasu Forest Reserve

(a) Animals are displaced to existing grazing land and the total number of animals in the receiving grazing land (displaced and existing) does not exceed the carrying capacity of the grazing land;

(b) Animals are displaced to existing non-grazing grassland and the total number of animals displaced does not exceed the carrying capacity of the receiving grassland;

(c) Animals are displaced to cropland that has been abandoned within the last five years;

(d) Animals are displaced to forested lands, and no clearance of trees, or decrease in crown cover of trees and shrubs, occurs due to the displaced animals;

(e) Animals are displaced to a zero-grazing system.

- As previously explained the activity is not displaced because it still happens through the project area, and under the same conditions and intensity.

11. In all other cases, the lands within the project boundary from which the pre-project agricultural activities are to be displaced outside the project boundary are delineated and their area is estimated. Leakage emission resulting from the displacement of the activities is estimated as follows (Figure 20):

$$LK_{AGRIC,t} = \frac{44}{12} \times \left(\Delta C_{BIOMASS,t} + \Delta SOC_{LUC,t}\right) \quad \text{Equation (1)}$$

$$\Delta C_{BIOMASS,t} = [1.1 \times b_{TREE} \times (1 + R_{TREE}) + b_{SHRUB} \times (1 + R_S)] \times CF \times A_{DISP,t} \quad \text{Equation (2)}$$

$$\Delta SOC_{LUC,t} = SOC_{REF} \times (f_{LUP} \times f_{MGP} \times f_{INP} - f_{LUD} \times f_{MGD} \times f_{IND}) \times \quad \text{Equation (3)}$$

Where:

$LK_{AGRIC,t}$ = Leakage emission resulting from displacement of agricultural activities in year *t*; t $CO_2e$

$\Delta C_{BIOMASS,t}$ = Decrease in carbon stock in the carbon pools of the land receiving the activity displaced in year *t*; t d.m.

Note. The factor of 1.1 is used to account for the carbon stock in the dead wood and litter pools as a fixed percentage of the carbon stock in living trees.

$CF$ = Carbon fraction of woody biomass; dimensionless.

A default value of 0.47 is used unless transparent and verifiable information can be provided to justify a different value.

$A_{DISP,t}$ = Area of land from which agricultural activity is being displaced in year *t*; ha

$b_{TREE}$ = Mean above-ground tree biomass in land receiving the displaced activity; t d.m. $ha^{-1}$

The value of this parameter is obtained by applying one of the applicable methods from the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities" to the land receiving the displaced activity.

Where the land receiving the displaced activity is unidentified, value of $b_{TREE}$ is set equal to the applicable value of mean above-ground biomass in forest in the region or country where the A/R CDM project activity is located, as obtained from Table 3A.1.4 of the *IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry* (IPCC GPG-LULUCF 2003) unless transparent and verifiable information can be provided to justify a different value.

| | | |
|---|---|---|
| $R_{TREE}$ | = | Root-shoot ratio for trees in the land receiving the displaced activity; dimensionless.<br>A default value of 0.25 is used unless transparent and verifiable information can be provided to justify a different value. |
| $b_{SHRUB}$ | = | Mean above-ground shrub biomass in land receiving the displaced activity; t d.m. $ha^{-1}$.<br>The value of this parameter is obtained by applying one of the applicable methods from the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities" to the land receiving the displaced activity. |
| $R_s$ | = | Root-shoot ratio for shrubs in the land receiving the displaced activity; dimensionless.<br>The default value of 0.40 is used unless transparent and verifiable information can be provided to justify a different value. |
| $\Delta SOC_{LUC,t}$ | = | Change in soil organic carbon (SOC) stock due to land-use change in the land receiving the displaced activity in year *t*; tC $ha^{-1}$.<br>The value of this parameter may be set to zero if:<br>(a) The only displaced activity being received in the land is grazing activity; or<br>(b) The value of the parameter as estimated from Equation (3) is less than zero (i.e. negative). |
| $SOC_{REF}$ | = | SOC stock corresponding to the reference condition in native lands by climate region and soil type applicable to the land receiving the displaced activity; t C $ha^{-1}$.<br>The value of this parameter is taken from Table 3 of the "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities". |
| $f_{LUP}$, $f_{MGP}$, $f_{INP}$ | = | Relative SOC *stock change factors* for land-use, management practices, and inputs respectively, applicable to the receiving land before the displaced activity is received; dimensionless.<br>The value of these parameters is taken from Tables 4, 5, and 6 of the "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities". |
| $f_{LUD}$, $f_{MGD}$, $f_{IND}$ | = | Relative SOC *stock change factors* for land-use, management practices, and inputs respectively, applicable to the receiving land after the displaced activity has been received; dimensionless.<br>The value of these parameters is taken from Tables 4, 5, and 6 of the "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities". |
| $t$ | = | *1, 2, 3,* …years elapsed since the start of the A/R CDM project activity |

**Figure 20.** Screenshot of leakage equations (Eq. 2 and 3.) in step 11 of the AR-TOOL 15

In the districts where the project area is located the land cover is a complex mosaic of grasslands, shrubland, agriculture, degraded forest, and savannah. The activity is more likely to be displaced to grasslands[92] or shrublands were by simple burning of the vegetation (grasses or small bushes) they can easily create a new farm (See *Annex III* for more information).

The area of land from which agricultural activity is being displaced ($A_{disp,t}$) is calculated by first estimating the number of illegal farms inside of the reserves. Using data from the reserve of Boumfoum, within its eligible area there were found 100 hectares of small-scale subsistence farms

[92] Referring to PDD Miro Ghana, in section 5.1.

illegally established on the reserve. Also, aerial maps estimate that another 150-200 hectares more could be found within the reserve, this accounts for 7.15% of the total eligible area of the reserve (which is the largest)[93].

As it was difficult to define the exact number of illegal farms within the reserve a value of 10% (which equals to 387.1 ha.) was selected to make the calculations on the area that has been displaced due to the project activity.

See al parameters in Table 15:

Table 15. Parameters used for the leakage calculation

| Parameter | Value | Criteria | Source (all the annex references could be seen in the report[94]) |
|---|---|---|---|
| $LK_{AGRIC,t}$ (t CO2) | Calculated | AR-TOOL15 equation | See *final result* section |
| $\Delta C_{Biomass,t}$ (t.d.m.) | Calculated | AR-TOOL15 equation | See *final result* section |
| $\Delta SOC_{LUC,t}$ (t C/ha) | Calculated | AR-TOOL15 equation | See *final result* section |
| CF (dimensionless) | 0.47 | Default value | IPCC "Good Practice Guidance for LULUCF". 2006. Table 4.3. |
| $A_{disp,t}$ (ha) | 387 | Calculated as the 10% of the project area | See *final result* section to see the amount per year and strata |
| $b_{TREE}$ (t d.m. ha-1) | 0 | The biomass of trees was considered 0 because the trees in the land classes selected were scattered across the landscape (less than 5 per hectare). | See *Annex III* for more information:<br>Land Cover of Ghana (Globcover Regional)<br>Google Earth images |
| $R_{TREE}$ (dimensionless) | 0 | Not considered because the $b_{TREE}$ is not used | - |

[93] Supporting information/PO Information/ESIA/NMFC Livelihood Study_Development Plan (2014. 08.06)

[94] 01_Supporting Information\Estimations\Leakage\Leakage Miro Ghana 2nd verification.pdf

| | | | |
|---|---|---|---|
| $b_{SHRUB}$ (t d.m. ha-1) | 14.8 | Shrub savannah in Central Ghana | Koranteng, A., Adu-Poku, I., & Zawila-Niedzwiecki, T. (2017). Drivers of land use change and carbon mapping in the savannah area of Ghana. Folia Forestalia Polonica. Series A. Forestry, 59(4). |
| $R_S$ (dimensionless) | 0.40 | Default value | AR-TOOL15 A/R Methodological tool: Estimation of the increase in GHG emissions attributable to displacement of preproject agricultural activities in A/R CDM project activity Version 02.1 |
| SOC ref | 50.47 | Calculated through GIS analysis using a buffer of 10 km to the project areas and information from Earth Map and calculating the average based on the distribution of soil types | Table 3. of the CDM: "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities<br><br>See *Annex I* for more information on the calculations |
| $f_{LUP}$ (dimensionless) | 1 | All permanent grassland is assigned a land-use factor of 1 | Table 6. of the CDM: "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities<br><br>See *Annex II* to see the references and criteria for the selected value |
| $f_{MGP}$ (dimensionless) | 0.97 | Overgrazed or moderately degraded grassland, with somewhat reduced productivity (relative to the native or nominally managed grassland) and receiving no management inputs in Tropical regions | |
| $f_{INP}$ (dimensionless) | 1 | All grassland without input of fertilizers is assigned an input factor of 1 | |

| | | | |
|---|---|---|---|
| $f_{LUD}$ (dimensionless) | 0.82 | Area has been managed for crops for less than 20 years and/or the area is cropland that has been in a fallow state for less than five years at any point during the last 20 years in Moist/Wet areas | Table 4: Relative stock change factors for different management activities on cropland (net effect over a period of 20 years)<br><br>See *Annex II* to see the references and criteria for the selected value |
| $f_{MGD}$ (dimensionless) | 1.15 | Primary and/or secondary tillage but with reduced soil disturbance (usually shallow and without full soil inversion). Normally leaves surface with >30% coverage by residues at planting in tropical Moist/Wet regions | |
| $f_{IND}$ (dimensionless) | 0.92 | Low inputs in Tropical Moist/Wet areas<br><br>There is removal of residues (via collection or burning), or frequent bare-fallowing, or production of crops yielding low residues (e.g. vegetables, tobacco, cotton), or no mineral fertilization or N-fixing crops | Table 5: Relative stock change factors for different levels of nutrient input on cropland (net effect over a period of 20 years)<br><br>See *Annex II* to see the references and criteria for the selected value |

- **Final results**

The final leakage (Table 16) due to agricultural activities considering a 10% of the activity shifting data would have been displaced to the surrounding lands is:

Table 16. Final results for leakage calculation

| Equation | Eq (2) | Eq (3) | Eq (1) |
|---|---|---|---|
| Parameter | $\Delta C_{Biomass,t}$ | $\Delta SOC_{LUC,t}$ | $LK_{AGRIC,t}$ |
| Value | 3770 | 527 | **15757** |

This broken down per strata and year is depicted in the following table 17:

Table 17. Leakage per strata during the whole project lifespan

| | | | | | Eq (2) | Eq (3) | Eq (1) |
|---|---|---|---|---|---|---|---|
| **Name** | **Planting Year** | **Total Area (Ha)** | **Area where displacement happened ($A_{disp}$) (Ha)** | **Strata** | **ΔCBiomass,t** | **ΔSOCLUC,t** | **LKAGRIC,t** |
| Acacia | 2016 | 183.6 | 18.4 | 1.1 | 178.8 | 25.0 | 747.4 |
| Eucalyptus | 2016 | 611.2 | 61.1 | 1.2 | 595.2 | 83.3 | 2488.0 |
| Teak | 2016 | 227.1 | 22.7 | 1.3 | 221.2 | 30.9 | 924.5 |
| Corymbia | 2016 | 130.2 | 13.0 | 1.4 | 126.8 | 17.7 | 530.0 |
| Acacia | 2017 | 129.4 | 12.9 | 2.1 | 126.0 | 17.6 | 526.8 |
| Eucalyptus | 2017 | 386.1 | 38.6 | 2.2 | 376.0 | 52.6 | 1571.7 |
| Gmelina | 2017 | 6.8 | 0.7 | 2.3 | 6.6 | 0.9 | 27.7 |
| Teak | 2017 | 48.4 | 4.8 | 2.4 | 47.1 | 6.6 | 197.0 |
| Corymbia | 2017 | 49.7 | 5.0 | 2.5 | 48.4 | 6.8 | 202.3 |
| Acacia | 2018 | 188.0 | 18.8 | 3.1 | 183.1 | 25.6 | 765.3 |
| Eucalyptus | 2018 | 717.3 | 71.7 | 3.2 | 698.5 | 97.7 | 2919.9 |
| Teak | 2018 | 56.4 | 5.6 | 3.3 | 54.9 | 7.7 | 229.6 |
| Gmelina | 2018 | 77.2 | 7.7 | 3.4 | 75.2 | 10.5 | 314.3 |
| Corymbia | 2018 | 131.1 | 13.1 | 3.5 | 127.7 | 17.9 | 533.7 |
| Other sp | 2018 | 6.4 | 0.6 | 3.6 | 6.2 | 0.9 | 26.1 |
| Acacia | 2019 | 33.3 | 3.3 | 4.1 | 32.4 | 4.5 | 135.6 |
| Eucalyptus | 2019 | 343.8 | 34.4 | 4.2 | 334.8 | 46.8 | 1399.5 |
| Teak | 2019 | 17.4 | 1.7 | 4.3 | 16.9 | 2.4 | 70.8 |
| Gmelina | 2019 | 511.0 | 51.1 | 4.4 | 497.6 | 69.6 | 2080.2 |
| Corymbia | 2019 | 13.6 | 1.4 | 4.5 | 13.2 | 1.9 | 55.4 |
| Other sp | 2019 | 2.9 | 0.3 | 4.6 | 2.8 | 0.4 | 11.8 |
| **TOTAL** | | **3871** | **387** | | **3770** | **527** | **15757.5** |

And the broken down per plantation year (Table 18):

Table 18. Leakage per year of planted strata

| Plantation Year areas | Sum of LKAGRIC,t |
|---|---|
| Plantation areas in 2016 | 4689.9 |
| Plantation areas in 2017 | 2525.5 |
| Plantation areas in 2018 | 4788.8 |
| Plantation areas in 2019 | 3753.2 |
| **TOTAL** | **15757.5** |

The plantation areas leakage does not mean that it was calculated for that year but for the when the different strata's were planted (E.g. Th plantation areas in 2016 includes strata no. 1.1, 1.2,1.3, and 1.4; the leakage was calculated the whole period (2016-2022) for these 4 strata planted in 2016)

## 5.5 Net GHG Emission Reductions and Removals

The anthropogenic net removal of GHG by the reservoirs was estimated according to the equation of the AR-ACM0003 presented below:

$$\Delta C_{AR\text{-}CDM,t} = \Delta C_{ACTUAL,t} - \Delta C_{BSL,t} - LK_t$$

Eq.5

Where:

$\Delta C_{AR\text{-}CDM,t}$ Net anthropogenic removal of GHG by reservoirs in year t; $tCO_2e$

$\Delta C_{ACTUAL,t}$ Net current GHG removal from reservoirs in year t; $tCO_2e$

$\Delta C_{BSL,t}$ Net GHG removals by reservoirs at baseline in year t; $tCO_2e$

$LK_t$ GHG emissions due to leaks in year t; $tCO_2e$

Since baseline removals as stated in the Baseline Emissions sections, considering the characteristics of the baseline vegetation, is equal to zero; and emissions due to leakage were considered zero, as explained in section 1.17 and 4.3, net anthropogenic removals are expressed according to the formula:

$$\Delta C_{AR\text{-}CDM,t} = \Delta C_{ACTUAL,t}$$

The project proponents applied a buffer discount of a reserve of 10% to cover the aspects related to the risk of non-permanence. The complete non-permanence risk tool can be consulted in the supports folder.

Table 19: Net GHG emissions for the second monitoring period.

| Year | Baseline emissions or removals ($tCO_2e$) | Project emissions or removals ($tCO_2e$) | Leakage emissions ($tCO_2e$) | VCUs past verification (tCO2e) | Net GHG emission reductions or removals ($tCO_2e$) second verification | Buffer pool allocation ($tCO_2e$) | VCUs eligible for issuance ($tCO_2e$) |
|---|---|---|---|---|---|---|---|
| 24-03 2016 to 01-11-2020 | 0 | | | 220,414 | | | |
| 02-11-2020 to 31-12-2020 | 0 | 42,092 | | | 21,466 | 2,147 | 19,319 |
| 01-01-2021to 31-12-2021 | 0 | 256,061 | | | 130,584 | 13,058 | 117,526 |
| 01-01-2022 to 19-09-2022 | 0 | 183,802 | 15758 | | 93,734 | 9,373 | 84,361 |
| Total | **0** | **481,955** | **15758** | | **245,784** | **24,579** | **221,205** |

Note that, the leakage has been updated and discounted to the 1st verification and 2nd verification (summing a total of 15758 t $CO_2e$)[95] before the buffer adjustments per strata.

Table 20: Estimated ex-ante GHG emission reductions and removals and the achieved emissions reductions and removals for this monitoring period.

| Ex-ante emissions reductions/removals | Achieved emissions reductions/removals | Percent difference | Justification for the difference |
|---|---|---|---|
| Total 406,128[96] tCO2e | Total 481,955 tCO2e | 15.73% | The ex-ante emissions has been updated for this monitoring period (according to real planted areas) and the achieved emissions reductions/ removals is higher than initially reported as the growth rate (MAI values) of some species was found to be higher than |

[95] 01_Supporting Information\Estimations\Ghana Ex-post 19012024 updated

[96] 01_Supporting Information\Estimations\Ghana Ex-ante UPDATED. Tab 12 LTA (Column Q – Annual change in GHG benefit): Result of the sum of 2016, 2017, 2018, 2019, 2020, and 2021 (355; 25,928; 35,968; 60,524; 95,364; 134,087 tCO2e respectively), plus 262 days of 2022 (99,729 tCO2e) to reach a total of 406,128 tCO2e

| | | | |
|---|---|---|---|
| | | | what was stated in the literature. This was seen in the case of Gmelina. |

# APPENDIX 1: REFERENCE


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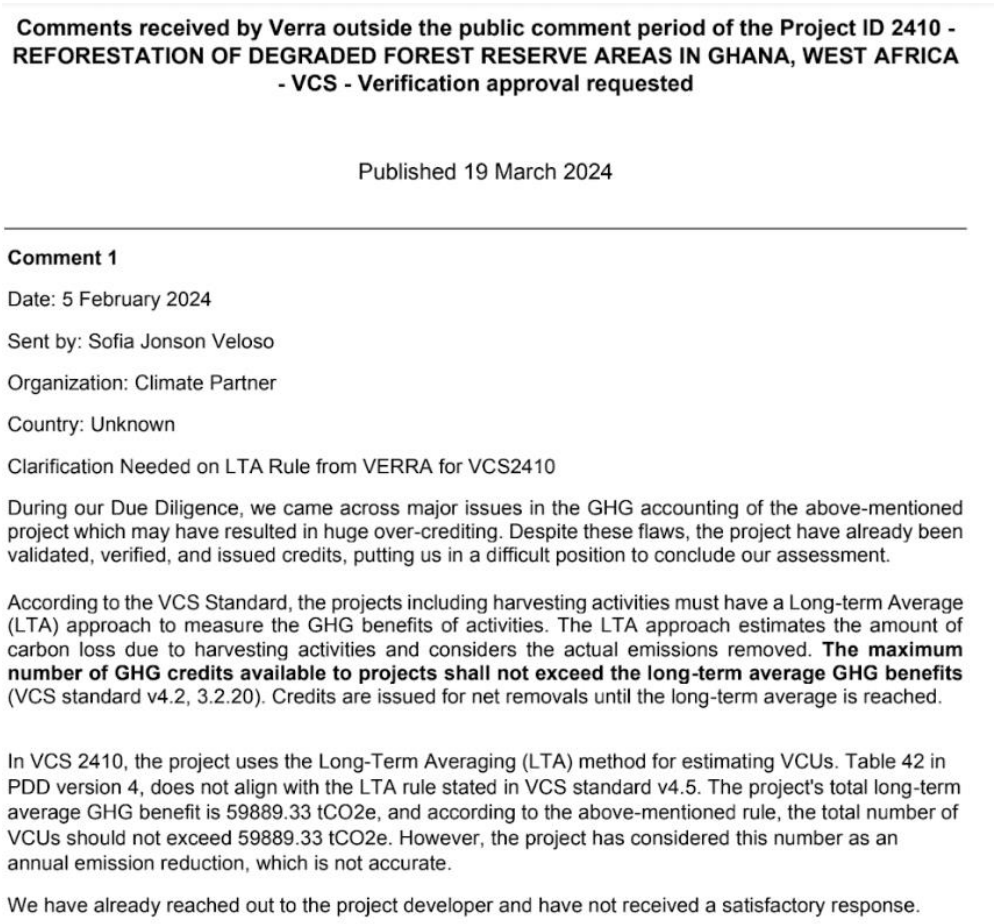
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# APPENDIX 2: COMMENTS RECEIVED

This section covers the comments received inside and outside the public comment period. In the case of the project, there was only one comment received outside of the public comment period (Figure 21).



**Comments received by Verra outside the public comment period of the Project ID 2410 - REFORESTATION OF DEGRADED FOREST RESERVE AREAS IN GHANA, WEST AFRICA - VCS - Verification approval requested**

Published 19 March 2024

**Comment 1**

Date: 5 February 2024

Sent by: Sofia Jonson Veloso

Organization: Climate Partner

Country: Unknown

Clarification Needed on LTA Rule from VERRA for VCS2410

During our Due Diligence, we came across major issues in the GHG accounting of the above-mentioned project which may have resulted in huge over-crediting. Despite these flaws, the project have already been validated, verified, and issued credits, putting us in a difficult position to conclude our assessment.

According to the VCS Standard, the projects including harvesting activities must have a Long-term Average (LTA) approach to measure the GHG benefits of activities. The LTA approach estimates the amount of carbon loss due to harvesting activities and considers the actual emissions removed. **The maximum number of GHG credits available to projects shall not exceed the long-term average GHG benefits** (VCS standard v4.2, 3.2.20). Credits are issued for net removals until the long-term average is reached.

In VCS 2410, the project uses the Long-Term Averaging (LTA) method for estimating VCUs. Table 42 in PDD version 4, does not align with the LTA rule stated in VCS standard v4.5. The project's total long-term average GHG benefit is 59889.33 tCO2e, and according to the above-mentioned rule, the total number of VCUs should not exceed 59889.33 tCO2e. However, the project has considered this number as an annual emission reduction, which is not accurate.

We have already reached out to the project developer and have not received a satisfactory response.

**Figure 21.** Comment outside of the public comment period received by Verra

After, the comment was received the person that made it (Sofia Jonson Veloso) and their organisation (Climate Partner) was contacted by South Pole on the 8th of April, and an answer to the comment was made. Below, it is depicted the email chain, including the answers. The chronology was:

Table 21. Chronology of the public comment answer

| Date | Action | Screenshot figure (See below) |
|---|---|---|
| 19/03/2024 | Public comment on the project ID 2410 was published | Figure 21 |
| 08/04/2024 | South Pole contacted the person and company that made the comment providing an answer to the comment | Figure 22 |

| | | |
|---|---|---|
| 08/04/2024 | Email reception by Climate Partner (Sofia Jonson) and forwarded to Usman Tahir | Figure 23 |
| 10/04/2024 | Exchange of emails about the answer provided for the comment received | Figure 24 |
| 11/04/2024 | Climate Partner expert (Usman Tahir) request for more information and ask if South Pole can elaborate the answer in order to clarify it | Figure 25 |
| 11/04/2024 | South Pole clarified the answer written in previous emails and offers more details about it | Figure 26 |
| 12/04/2024 | Climate Partner through Usman Tahir expressed satisfaction with South Pole reply and the comment is closed. | Figure 27 |

# Answering comment Project ID 2410 - REFORESTATION OF DEGRADED FOREST RESERVE AREAS IN GHANA, WEST AFRICA

External Inbox × NBS/ARR/ARR Miro/2ndver/Ghana ×

**Jorge Castañer Plá** <j.castaner@southpole.com> 8 Apr 2024, 12:39 (3 days ago)
to sofia.jonsonveloso, Maria, Tania, Pauline, Jaco

Dear Sofia,

Here you can see the answer to the comment raised for the project in Ghana. In the public comment, you mentioned "We have already reached out to the project developer and have not received a satisfactory response." We do not know who you contacted before and we would like to have some clarification on this point since we have responded to all the emails.

Concerning the question on the LTA approach followed in the PDD (version 4) Table 42.

In VCS 2410, the project uses the Long-Term Averaging (LTA) method for estimating VCUs. Table 42 in PDD version 4, does not align with the LTA rule stated in VCS standard v4.5. The project's total long-term average GHG benefit is 59889.33 tCO2e, and according to the above-mentioned rule, the total number of VCUs should not exceed 59889.33 tCO2e. However, the project has considered this number as an annual emission reduction, which is not accurate.

Yes the table in the PDD includes the GHG reductions after the LTA, not really the Net GHG reductions. The 1,796,683 VCUs are already the LTA. As you can see the LTA is calculated with the accumulated values, and Table 4.2 as you can see are not accumulated since they are not growing every year, as you can see they are indeed annual GHG. Please check the LTA guidelines from Verra. The 59,889 is just an indicative number for the reader of the potential of the project. In fact, if the LTA of a plantation of 12,871 ha was just 59,889 in a 30 year crediting period, this will mean the project will have 0.15VCUs/ha/year, and this value is extremely low for an ARR project, you can review all ARR projects in the Verra registry to get a better overview of the expected potential of NbS projects in the market. You can also check Gold Standard with clear explanations of the calculations for ARR projects.

Table 42. Net ex-ante removal of GHG emissions

| Year | Estimated baseline emissions or removals (tCO2e) | Estimated project emissions or removals (tCO2e) | Estimated leakage emissions (tCO2e) | Estimated GHG emission reductions or removals (tCO2e) |
|---|---|---|---|---|
| 2016 | 0 | 355 | 0 | 355 |
| 2017 | 0 | 43,595 | 0 | 43,595 |
| 2018 | 0 | 61,783 | 0 | 61,783 |
| 2019 | 0 | 102,439 | 0 | 102,439 |
| 2020 | 0 | 124,838 | 0 | 124,838 |
| 2021 | 0 | 176,398 | 0 | 176,398 |
| 2022 | 0 | 223,155 | 0 | 223,155 |
| 2023 | 0 | 271,129 | 0 | 271,129 |
| 2024 | 0 | 318,290 | 0 | 318,290 |
| 2025 | 0 | 366,957 | 0 | 366,957 |
| 2026 | 0 | 107,744 | 0 | 107,744 |
| 2027 | 0 | 0 | 0 | 0 |
| 2028 | 0 | 0 | 0 | 0 |
| 2029 | 0 | 0 | 0 | 0 |
| 2030 | 0 | 0 | 0 | 0 |
| 2031 | 0 | 0 | 0 | 0 |
| 2032 | 0 | 0 | 0 | 0 |
| 2033 | 0 | 0 | 0 | 0 |
| 2034 | 0 | 0 | 0 | 0 |
| 2035 | 0 | 0 | 0 | 0 |
| 2036 | 0 | 0 | 0 | 0 |
| 2037 | 0 | 0 | 0 | 0 |
| 2038 | 0 | 0 | 0 | 0 |
| 2039 | 0 | 0 | 0 | 0 |
| 2040 | 0 | 0 | 0 | 0 |
| 2041 | 0 | 0 | 0 | 0 |
| 2042 | 0 | 0 | 0 | 0 |
| 2043 | 0 | 0 | 0 | 0 |
| 2044 | 0 | 0 | 0 | 0 |
| 2045 | 0 | 0 | 0 | 0 |

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| | | | | |
|---|---|---|---|---|
| Total estimated ERs | | | | 1,796,683 |
| Total number of crediting years | | | | 30 |
| Average annual ERs | | | | **59,889** |

To clarify better the accumulated values used to calculate the LTA according to the Verra guidance, we are sending the table with the cumulated values It was sent like that because the auditor only wanted to see to credits produced. See below how the accumulated number of credits reached the LTA is the moment when no more credits are accounted for:

To clarify better the accumulated values used to calculate the LTA according to the Verra guidance, we are sending the table with the cumulated values It was sent like that because the auditor only wanted to see to credits produced. See below how the accumulated number of credits reached the LTA is the moment when no more credits are accounted for:

| Year | Estimated baseline emissions or removals (tCO2e) | Total estimated project emissions or removals (tCO2 e) | Estimated leakage emissions (tCO2e) | Estimated GHG emission reductions or removals (tCO2e) |
|---|---|---|---|---|
| 2016 | 0 | 355 | 0 | 355 |
| 2017 | 0 | 43,950 | 0 | 43,595 |
| 2018 | 0 | 105,733 | 0 | 61,783 |
| 2019 | 0 | 208,172 | 0 | 102,439 |
| 2020 | 0 | 333,010 | 0 | 124,838 |
| 2021 | 0 | 509,408 | 0 | 176,398 |
| 2022 | 0 | 732,563 | 0 | 223,155 |
| 2023 | 0 | 1,003,691 | 0 | 271,129 |
| 2024 | 0 | 1,321,981 | 0 | 318,290 |
| 2025 | 0 | 1,688,939 | 0 | 366,957 |
| 2026 | 0 | 2,104,283 | 0 | 107,744 |
| 2027 | 0 | 2,518,307 | 0 | - |
| 2028 | 0 | 2,938,062 | 0 | - |
| 2029 | 0 | 2,845,005 | 0 | - |
| 2030 | 0 | 2,980,326 | 0 | - |
| 2031 | 0 | 2,865,330 | 0 | - |
| 2032 | 0 | 2,956,267 | 0 | - |
| 2033 | 0 | 2,754,392 | 0 | - |
| 2034 | 0 | 2,555,211 | 0 | - |
| 2035 | 0 | 2,353,731 | 0 | - |
| 2036 | 0 | 2,151,017 | 0 | - |
| 2037 | 0 | 1,946,132 | 0 | - |
| 2038 | 0 | 1,740,479 | 0 | - |
| 2039 | 0 | 2,155,823 | 0 | - |
| 2040 | 0 | 2,569,848 | 0 | - |
| 2041 | 0 | 2,989,602 | 0 | - |
| 2042 | 0 | 2,896,545 | 0 | - |
| 2043 | 0 | 3,031,867 | 0 | - |
| 2044 | 0 | 2,916,870 | 0 | - |
| 2045 | 0 | 3,007,807 | 0 | - |
| | **LTA (average of accumulated GHG)** | **1,796,682.5** | | **1,796,682.5** |

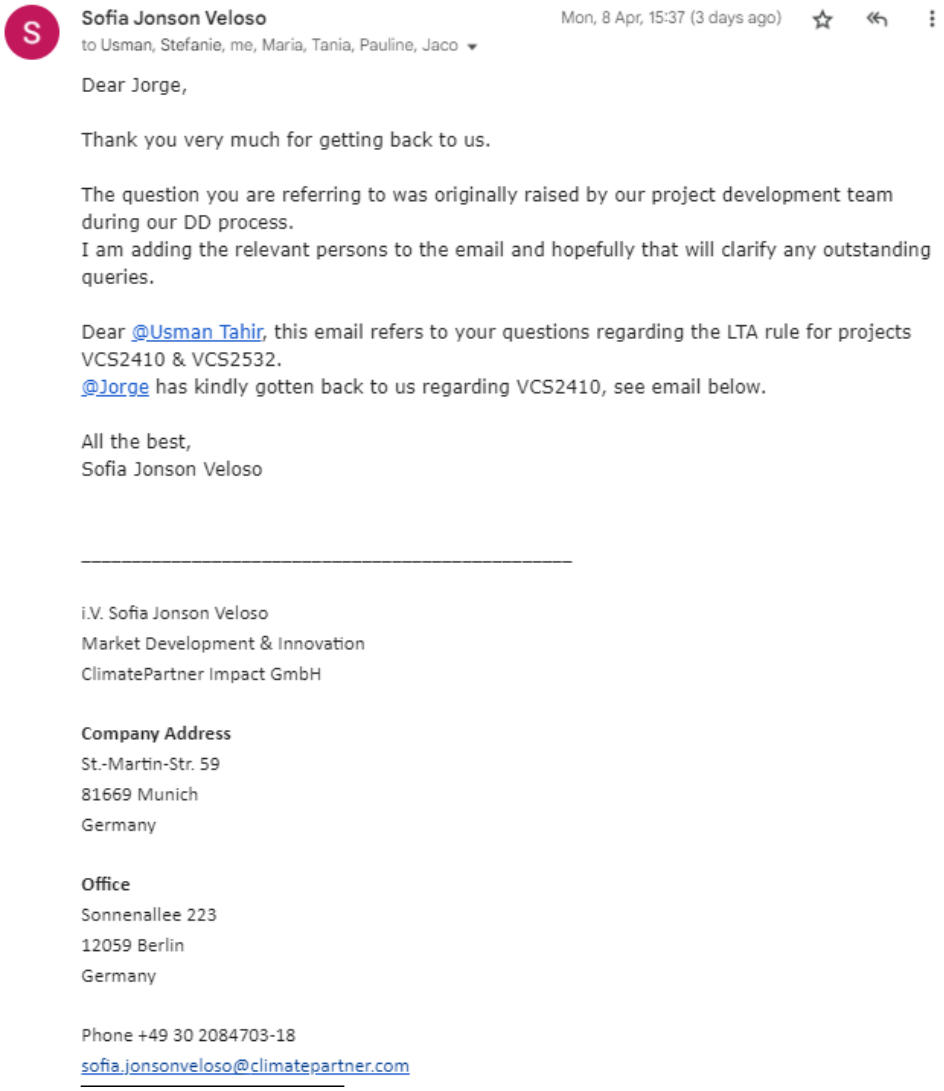
Highlighted in red in the table is when the LTA is reached so the net is calculated as the difference between the LTA and the accumulated VCU's the previous year. After the LTA is reached no more VCUs are accounted for. At every verification, this Ex-ante and LTA are recalculated with the most recent growth of the plantations.

I hope this answer your comment

Best regards,

--
**Jorge Castañer Plá**
Senior Coordinator: African Nature-based Solutions projects
**South Pole** · southpole.com
j.castaner@southpole.com · +34 686519162
**Global sustainability solutions since 2006**

**Figure 22.** South Pole first answer to the comment received



**Sofia Jonson Veloso** Mon, 8 Apr, 15:37 (3 days ago)
to Usman, Stefanie, me, Maria, Tania, Pauline, Jaco

Dear Jorge,

Thank you very much for getting back to us.

The question you are referring to was originally raised by our project development team during our DD process.
I am adding the relevant persons to the email and hopefully that will clarify any outstanding queries.

Dear @Usman Tahir, this email refers to your questions regarding the LTA rule for projects VCS2410 & VCS2532.
@Jorge has kindly gotten back to us regarding VCS2410, see email below.

All the best,
Sofia Jonson Veloso

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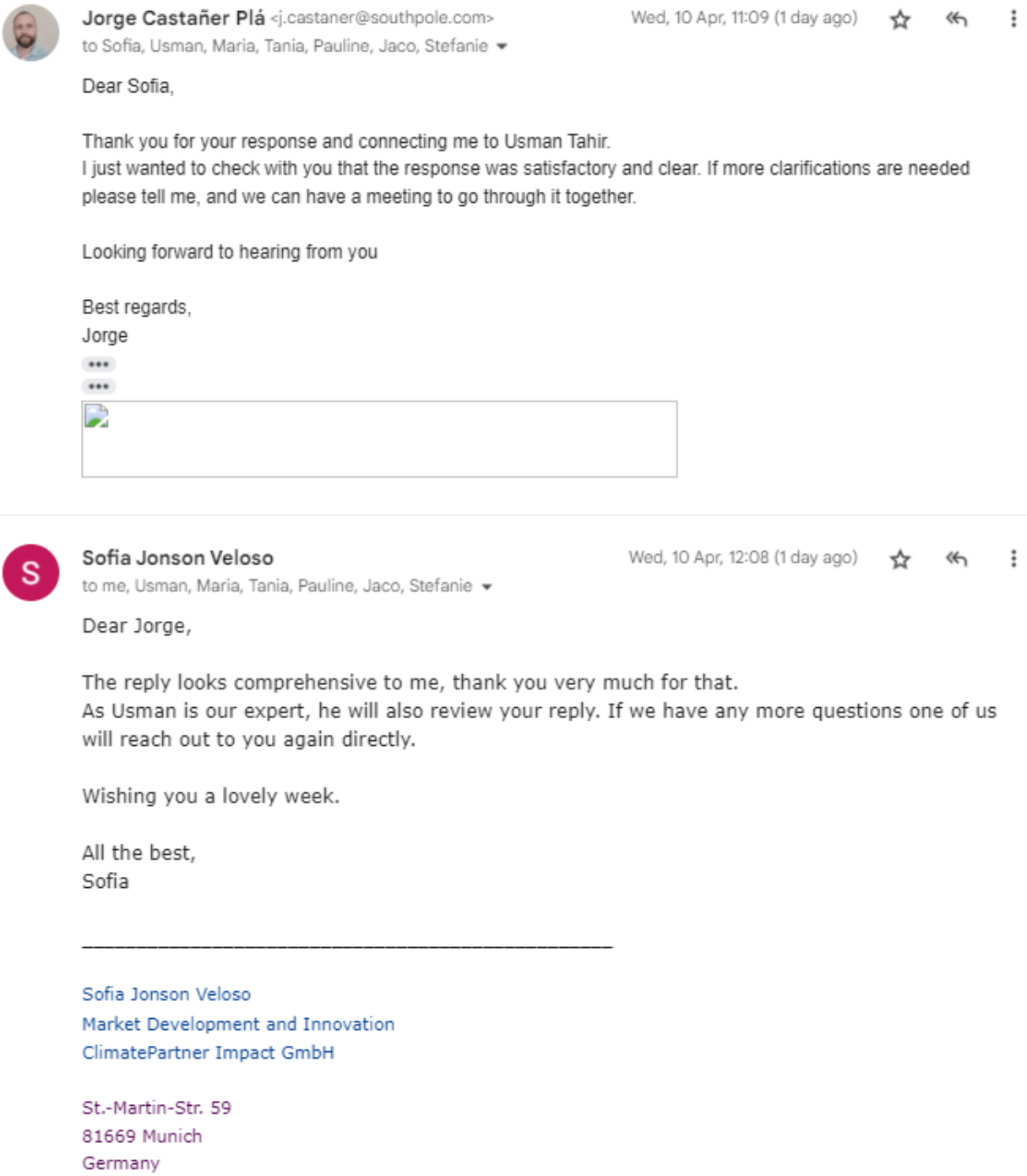
i.V. Sofia Jonson Veloso
Market Development & Innovation
ClimatePartner Impact GmbH

**Company Address**
St.-Martin-Str. 59
81669 Munich
Germany

**Office**
Sonnenallee 223
12059 Berlin
Germany

Phone +49 30 2084703-18
sofia.jonsonveloso@climatepartner.com

**Figure 23.** Email reception by Climate Partner



**Jorge Castañer Plá** <j.castaner@southpole.com> Wed, 10 Apr, 11:09 (1 day ago)
to Sofia, Usman, Maria, Tania, Pauline, Jaco, Stefanie

Dear Sofia,

Thank you for your response and connecting me to Usman Tahir.
I just wanted to check with you that the response was satisfactory and clear. If more clarifications are needed please tell me, and we can have a meeting to go through it together.

Looking forward to hearing from you

Best regards,
Jorge

**Sofia Jonson Veloso** Wed, 10 Apr, 12:08 (1 day ago)
to me, Usman, Maria, Tania, Pauline, Jaco, Stefanie

Dear Jorge,

The reply looks comprehensive to me, thank you very much for that.
As Usman is our expert, he will also review your reply. If we have any more questions one of us will reach out to you again directly.

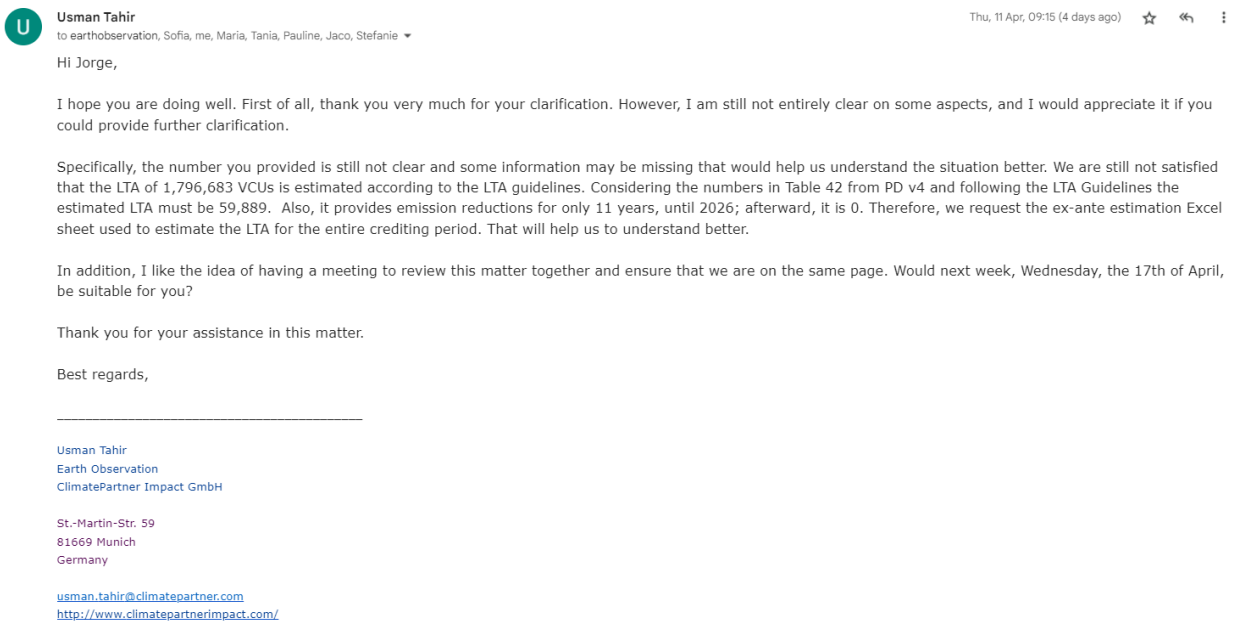
Wishing you a lovely week.

All the best,
Sofia

Sofia Jonson Veloso
Market Development and Innovation
ClimatePartner Impact GmbH

St.-Martin-Str. 59
81669 Munich
Germany

**Figure 24.** Exchange of message about the answer provided



**Usman Tahir** Thu, 11 Apr, 09:15 (4 days ago)

to earthobservation, Sofia, me, Maria, Tania, Pauline, Jaco, Stefanie

Hi Jorge,

I hope you are doing well. First of all, thank you very much for your clarification. However, I am still not entirely clear on some aspects, and I would appreciate it if you could provide further clarification.

Specifically, the number you provided is still not clear and some information may be missing that would help us understand the situation better. We are still not satisfied that the LTA of 1,796,683 VCUs is estimated according to the LTA guidelines. Considering the numbers in Table 42 from PD v4 and following the LTA Guidelines the estimated LTA must be 59,889. Also, it provides emission reductions for only 11 years, until 2026; afterward, it is 0. Therefore, we request the ex-ante estimation Excel sheet used to estimate the LTA for the entire crediting period. That will help us to understand better.

In addition, I like the idea of having a meeting to review this matter together and ensure that we are on the same page. Would next week, Wednesday, the 17th of April, be suitable for you?

Thank you for your assistance in this matter.

Best regards,

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Usman Tahir
Earth Observation
ClimatePartner Impact GmbH

St.-Martin-Str. 59
81669 Munich
Germany

usman.tahir@climatepartner.com
http://www.climatepartnerimpact.com/

**Figure 25.** Request for more information and elaboration on the answer



**Jorge Castañer Plá** <j.castaner@southpole.com> 11 Apr 2024, 16:29 (4 days ago)

to Usman, Sofia, Maria, Tania, Pauline, Jaco, earthobservation, Stefanie

Hi Usman,

I will try to clarify the information in the email above. I am sorry but we cannot share the original Excel file including the calculations because this is sensitive information and belongs to the 'know-how' and intellectual property of South Pole. However, we can provide an explanation and share part of the material with you.

I think first it is important to understand the logic of the LTA concept. It is determined *by averaging the expected total GHG benefit for the length of the project*. This means that you need to consider all the crediting periods (in our case from 2016 to 2045).

**Please review the LTA concept** so, you can also see in the examples that the LTA, meaning the maximum amount of credits is reached for instance in the year 10, and after that the project will not continue receiving credits

**Table 2** from the LTA concept from Verra

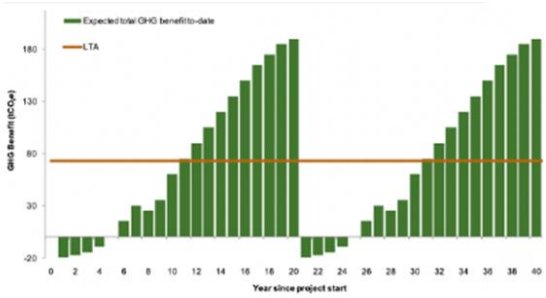
**Scenario 2: ARR project with two harvest cycles and a return to baseline at the end of the harvest cycle**

An ARR project is developed on grassland where the GHG emission reductions and removals in the baseline scenario (BE) are 20 $tCO_2e$ annually. The project crediting period is 40 years. A harvest of all the standing stock is planned in year 41. The long-term average GHG benefit shall be calculated over the 41 year period. This simplified scenario assumes no project or leakage emissions of $CO_2$, $N_2O$ or $CH_4$ are generated from activities in the project scenario.

The method for calculating the long-term average GHG benefit is the same for scenario 2 as in scenario 1 above. Because of the expected harvest, the long-term average GHG benefit (LA) is 72.80 $tCO_2e$ in this scenario.

The graph on the following page illustrates the expected total GHG benefit of the project and the long-term average.

| | Baseline scenario: to-date GHG emission reductions and removals at year t | Project scenario: to-date GHG emission reductions and removals at year t | Annual change in GHG benefit | Expected total GHG benefit to-date | Total credits available each year |
|---|---|---|---|---|---|
| Year | $tCO_2e$ | $tCO_2e$ | $tCO_2e$ | $tCO_2e$ | VCUs |
| *t* | *BE* | *PE* | $PE_t - PE_{t-1}$ | $PE_t - BE_t$ | |
| 0 | 20 | 20 | 0 | 0 | 0 |
| 1 | 20 | 0 | -20 | -20 | 0 |
| 2 | 20 | 2.5 | 2.5 | -17.5 | 0 |
| 3 | 20 | 5 | 2.5 | -15 | 0 |
| 4 | 20 | 10 | 5 | -10 | 0 |
| 5 | 20 | 20 | 10 | 0 | 0 |
| 6 | 20 | 35 | 15 | 15 | 15 |
| 7 | 20 | 50 | 15 | 30 | 15 |
| 8 | 20 | 45 | -5 | 25 | 0 |
| 9 | 20 | 55 | 10 | 35 | 10 |
| 10 | 20 | 80 | 25 | 60 | 25 |
| 11 | 20 | 95 | 15 | 75 | 7.80 |
| 12 | 20 | 110 | 15 | 90 | 0 |
| 13 | 20 | 125 | 15 | 105 | 0 |
| 14 | 20 | 140 | 15 | 120 | 0 |
| 15 | 20 | 155 | 15 | 135 | 0 |
| 16 | 20 | 170 | 15 | 150 | 0 |
| 17 | 20 | 185 | 15 | 165 | 0 |
| 18 | 20 | 195 | 10 | 175 | 0 |
| 19 | 20 | 205 | 10 | 185 | 0 |
| 20 | 20 | 210 | 5 | 190 | 0 |
| 21 | 20 | 0 | -210 | -20 | 0 |
| 22 | 20 | 2.5 | 2.5 | -17.5 | 0 |
| 23 | 20 | 5 | 2.5 | -15 | 0 |
| 24 | 20 | 10 | 5 | -10 | 0 |
| 25 | 20 | 20 | 10 | 0 | 0 |
| 26 | 20 | 35 | 15 | 15 | 0 |
| 27 | 20 | 50 | 15 | 30 | 0 |
| 28 | 20 | 45 | -5 | 25 | 0 |
| 29 | 20 | 55 | 10 | 35 | 0 |
| 30 | 20 | 80 | 25 | 60 | 0 |
| 31 | 20 | 95 | 15 | 75 | 0 |
| 32 | 20 | 110 | 15 | 90 | 0 |
| 33 | 20 | 125 | 15 | 105 | 0 |
| 34 | 20 | 140 | 15 | 120 | 0 |
| 35 | 20 | 155 | 15 | 135 | 0 |
| 36 | 20 | 170 | 15 | 150 | 0 |
| 37 | 20 | 185 | 15 | 165 | 0 |
| 38 | 20 | 195 | 10 | 175 | 0 |
| 39 | 20 | 205 | 10 | 185 | 0 |
| 40 | 20 | 210 | 5 | 190 | 0 |
| 41 | 20 | 20 | -190 | 0 | 0 |
| Sum | | | | 2985 | 72.80 |
| LA | | | | 72.80 | |



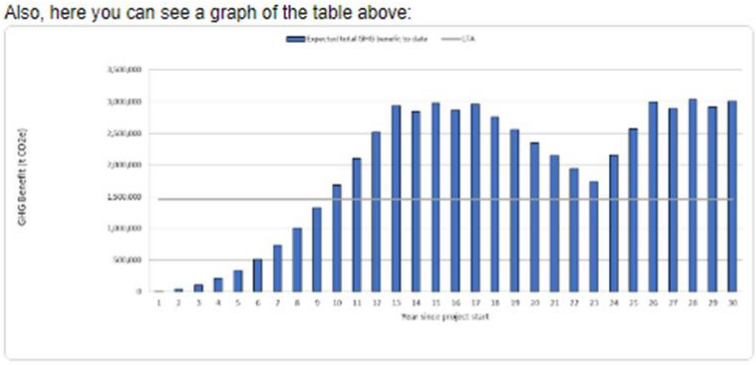

I remade the table previously shared to show you how it is calculated. Avoiding the explanation of the first, second, and fourth columns (year, baseline, and leakage respectively) let´s focus on the remaining:

- 3rd column: Total estimated project emissions or removals (tCO2 e):
  - This is the total accumulated tonnes of CO2 during the project lifetime. As you can see it is always growing until reaching an oscillating value between 1,9 and 3 million tonnes. This makes total sense for timber companies to ensure a constant flow of wood, so there is a minimum biomass threshold that the projects need to maintain (independently of the harvesting).
  - The cell in red (in the year 2026), you can see when the LTA is reached
  - At the bottom, it is depicted the value of the LTA. It was calculated as explained above by averaging the total estimated project emissions or removals.
  - Also, as required by Verra during 2023, during the latest updates in terms of LTA, it is necessary to include complete cycles of each stratum. That is why there are rows in red, further from the crediting period, and just to meet Verra's requirements (See numbers in red after 2045) to reach the final value of **1,796,682.5**. What is more, if we had calculated only including the crediting period the LTA would have increased (1,940,823). Therefore this new Verra approach is more conservative.
- 4th column: Annual change in GHG benefit (t CO2 e):
  - It depicts the change during certain years of the project, as you can see sometimes is negative (between brackets) when harvesting is done. This value only makes sense when compared to the 3rd column to dimension the gains or the losses concerning the total standing volume.
- 6th column: Estimated GHG emission reductions or removals (tCO2e)
  - This is the same value as depicted in the 4th column (Annual change in GHG benefit (t CO2 e)) until the year when the LTA is reached (2026). This is calculated as the LTA (1,796,682.5) minus the total removals for the previous year (2025) before reaching the LTA (1,688,939); to reach the final value for the last year (2026) when the project can claim for credits (107,744)
  - This column only offers values up to this year that is when the project surpasses the LTA
  - At the bottom of this column, you can see the value of **59,889** which is the average annual ER´s. This value is mostly used to make future estimations of how many credits the project is going to generate per year.

---

| Year | Estimated baseline emissions or removals (tCO2e) | Total estimated project emissions or removals (tCO2 e) | Annual change in GHG benefit (t CO2 e) | Estimated leakage emissions (tCO2e) | Estimated GHG emission reductions or removals (tCO2e) |
|---|---|---|---|---|---|
| 2016 | 0 | 355 | 355 | 0 | 355 |
| 2017 | 0 | 43,950 | 43,595 | 0 | 43,595 |
| 2018 | 0 | 105,733 | 61,783 | 0 | 61,783 |
| 2019 | 0 | 208,172 | 102,439 | 0 | 102,439 |
| 2020 | 0 | 333,010 | 124,838 | 0 | 124,838 |
| 2021 | 0 | 509,408 | 176,398 | 0 | 176,398 |
| 2022 | 0 | 732,563 | 223,155 | 0 | 223,155 |
| 2023 | 0 | 1,003,691 | 271,129 | 0 | 271,129 |
| 2024 | 0 | 1,321,981 | 318,290 | 0 | 318,290 |
| 2025 | 0 | 1,688,939 | 366,957 | 0 | 366,957 |
| 2026 | 0 | 2,104,283 | 415,344 | 0 | 107,744 |
| 2027 | 0 | 2,518,307 | 414,025 | 0 | - |
| 2028 | 0 | 2,938,062 | 419,755 | 0 | - |
| 2029 | 0 | 2,845,005 | (93,057) | 0 | - |
| 2030 | 0 | 2,980,326 | 135,321 | 0 | - |
| 2031 | 0 | 2,865,330 | (114,997) | 0 | - |
| 2032 | 0 | 2,956,267 | 90,937 | 0 | - |
| 2033 | 0 | 2,754,392 | (201,875) | 0 | - |
| 2034 | 0 | 2,555,211 | (199,181) | 0 | - |
| 2035 | 0 | 2,353,731 | (201,480) | 0 | - |
| 2036 | 0 | 2,151,017 | (202,714) | 0 | - |
| 2037 | 0 | 1,946,132 | (204,885) | 0 | - |
| 2038 | 0 | 1,740,479 | (205,653) | 0 | - |
| 2039 | 0 | 2,155,823 | 415,344 | 0 | - |
| 2040 | 0 | 2,569,848 | 414,025 | 0 | - |
| 2041 | 0 | 2,989,602 | 419,755 | 0 | - |
| 2042 | 0 | 2,896,545 | (93,057) | 0 | - |
| 2043 | 0 | 3,031,867 | 135,321 | 0 | - |
| 2044 | 0 | 2,916,870 | (114,997) | 0 | - |
| 2045 | 0 | 3,007,807 | 90,937 | 0 | - |
| 2046 | 0 | 2,702,817 | (304,990) | 0 | - |
| 2047 | 0 | 2,449,559 | (253,258) | 0 | - |
| 2048 | 0 | 2,150,721 | (298,838) | 0 | - |
| 2049 | 0 | 1,805,091 | (345,630) | 0 | - |
| 2050 | 0 | 1,410,594 | (394,497) | 0 | - |
| 2051 | 0 | 967,949 | (442,645) | 0 | - |
| 2052 | 0 | 1,098,466 | 130,517 | 0 | - |
| 2053 | 0 | 1,229,616 | 131,149 | 0 | - |
| 2054 | 0 | 1,361,372 | 131,756 | 0 | - |
| 2055 | 0 | 977,280 | (384,092) | 0 | - |
| 2056 | 0 | 776,468 | (200,812) | 0 | - |
| 2057 | 0 | 306,023 | (470,445) | 0 | - |
| | LTA (average of accumulated GHG) | 1,796,682.5 | | Average annual ERs | 59,889 |

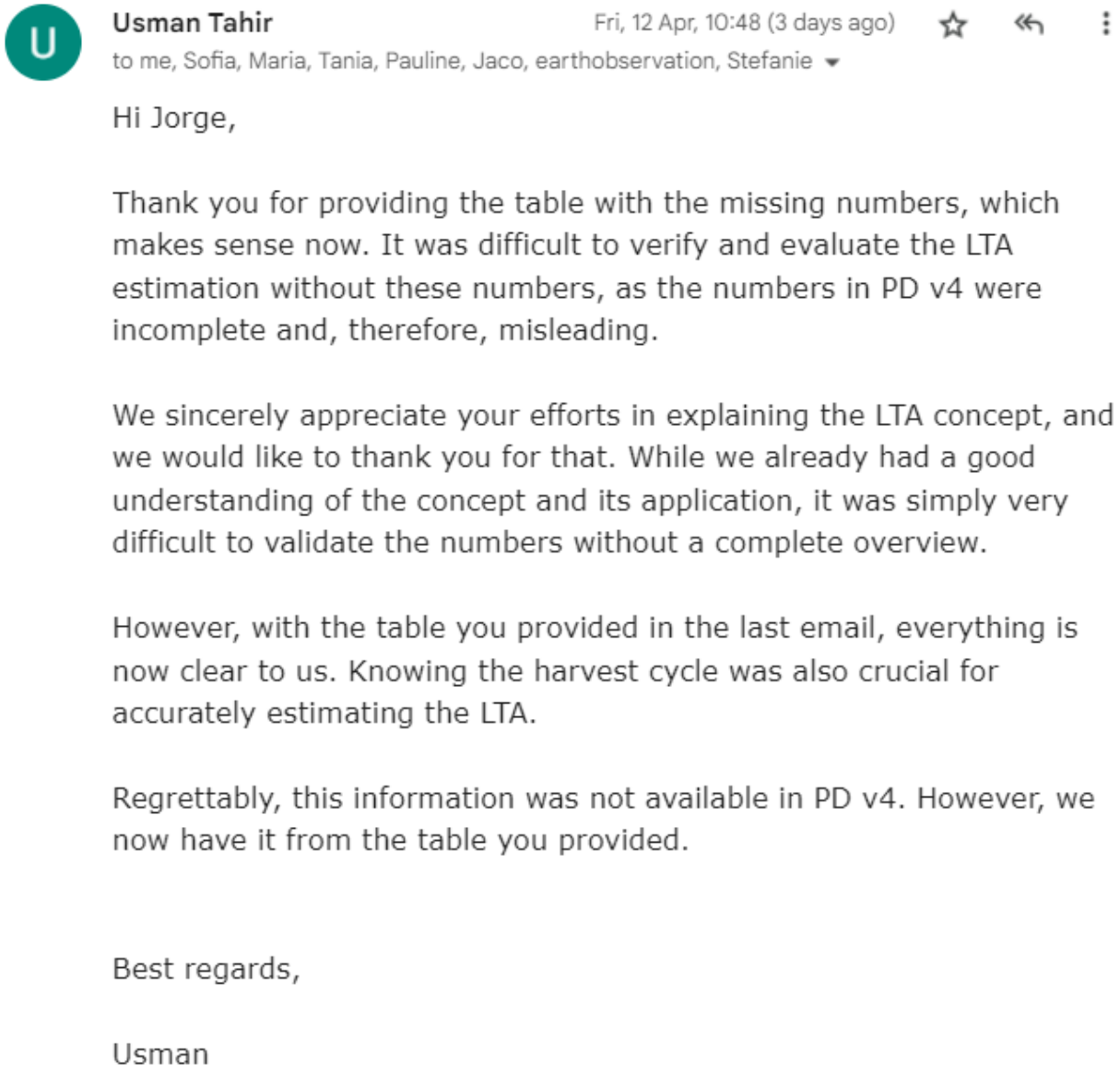
Also, here you can see a graph of the table above:




I hope this clarifies the comment, please feel free to ask any other questions regarding this.
Also if needed we are available to have the meeting on the date proposed.

Best regards,
Jorge

**Figure 26.** Providing more information to Climate Partner expert (Usman Tahir) on the comment received



**Usman Tahir** Fri, 12 Apr, 10:48 (3 days ago)

to me, Sofia, Maria, Tania, Pauline, Jaco, earthobservation, Stefanie

Hi Jorge,

Thank you for providing the table with the missing numbers, which makes sense now. It was difficult to verify and evaluate the LTA estimation without these numbers, as the numbers in PD v4 were incomplete and, therefore, misleading.

We sincerely appreciate your efforts in explaining the LTA concept, and we would like to thank you for that. While we already had a good understanding of the concept and its application, it was simply very difficult to validate the numbers without a complete overview.

However, with the table you provided in the last email, everything is now clear to us. Knowing the harvest cycle was also crucial for accurately estimating the LTA.

Regrettably, this information was not available in PD v4. However, we now have it from the table you provided.

Best regards,

Usman

**Figure 27.** Answer from Climate Partner (Usman Tahir) expressing satisfaction with the answer provided