Gold Standard for the Global Goals

TEMPLATE

# MONITORING REPORT

PUBLICATION DATE **14.10.2020**

VERSION **v. 1.1**

RELATED SUPPORT **- TEMPLATE GUIDE Monitoring Report v. 1.1**

This document contains the following Sections

# KEY PROJECT INFORMATION

## Key Project Information

| | |
|---|---|
| **GS ID (s) of Project (s)** | GS 2940 |
| **Title of the project (s) covered by monitoring report** | Tropical Mix[1] |
| **Version number of the PDD/VPA-DD (s) applicable to this monitoring report** | Version 6.2 |
| **Version number of the monitoring report** | 6.6 |
| **Completion date of the monitoring report** | 20/11/2025 |
| **Date of project design certification** | 23/02/2012 (CarbonFix); 07/10/2013 (Gold Standard) |
| **Date of Last Annual Report** | 20/12/2023 |
| **Monitoring period number** | 3rd (since Transition to GS4GG in 2019) |
| **Duration of this monitoring period** | 08/05/2024 to 15/11/2024<br>(First and last day of the monitoring period, respectively) |
| **Project Representative** | Project Developer:<br>FORLIANCE GmbH<br>Represented by Mr. German Rodriguez |
| **Host Country** | Panama |
| **Activity Requirements applied** | ☐ Community Services Activities<br>☐ Renewable Energy Activities<br>☒ Land Use and Forestry Activities/Risks & Capacities<br>☐ N/A |
| **Methodology (ies) applied and version number** | Gold Standard Afforestation/Reforestation (A/R) GHG Emissions Reduction & Sequestration Methodology Version 2.1 |

[1] Name changed in the registry from "CO2OL Tropical Mix" to "Tropical Mix" on 18/02/2025 upon request by PD

| | |
|---|---|
| **Product Requirements applied** | ☒ GHG Emissions Reduction & Sequestration<br>☐ Renewable Energy Label<br>☐ N/A |

**Table 1: Sustainable Development Contributions Achieved**

| Sustainable Development Goals Targeted | SDG Impact | Amount Achieved | Units/ Products |
|---|---|---|---|
| 13 | Emissions Removals | 552,025 | VER |
| SDG1: No Poverty | Number of local community members benefitting from the project´s investments | 26,168 | number |
| SDG8: Decent Work and Economic Growth | Nr. of persons on Payroll (full-time & part-time employees) | 154 | Persons on payroll |
| | Nr. of working hours per week (m/w), including overtime | 48 | working hours/week |
| | Nr. of training or workshops provided to the employees | 4 | capacity building workshops |
| SDG12: Responsible Consumption and Production | Share (%) of timber volume verified and certified by FSC, and percentage of cocoa volume certified by UTZ in selected areas of the project | 100 | % |
| SDG 15: Life on Land | Areas (ha) of degraded land and soils restored in | 8,539.4 | Ha |

| | | | |
|---|---|---|---|
| | comparison with the baseline scenario | 35.26 | % |
| | Share (%) of conservation areas of the project area | | |

**Table 2: Product Vintages**

| Start - End Dates | Total Ex-Post (VERs) |
|---|---|
| 08/05/2024-15/11/2024 | 552,025 |

# SECTION A. DESCRIPTION OF PROJECT

## A.1. General description of project

### Background and project history

Represented by FORLIANCE GmbH, Tropical Mix Project is part of the implementation and forest management of a carbon reforestation project with the aim of contributing to the mitigation of climate change and social risks in developing countries.

Degraded land, originally forest land, later used for extensive cattle ranching, is reforested with mostly native tree species, and gradually converted into mixed forests. The project provides for sustainable timber production and cocoa cultivation; it protects biodiversity and restores a healthy forest ecosystem. Sustainable forest management and cocoa production offer employment opportunities, therefore, improve the economic and social situation of rural communities and families in the project areas. Moreover, the project helps to promote mutual learning and knowledge transfer.

Tropical Mix has been one of the first in line to be successfully certified under the renowned Gold Standard for land use and forestry projects; the cocoa production areas have been the first agroforestry systems to be certified under the Gold Standard.
The Tropical Mix Project together with local forest plantations companies promotes rural and productive development through reforestation activities with mixed, mainly native tree species, sustainable forestry plantation management and the provision of environmental services. Specific silvicultural and forest management tasks are defined between the participants. The application of a poly-cyclic harvesting system aims to ensure a relatively high average carbon storing capacity in the plantations.

Before the project activity started, the baseline of the project area was a mix of grassland and pioneer shrubs. All these areas were evaluated and classified as applicable planting areas for reforestation and agroforestry activities. Other small patches of forest left were classified and nowadays managed as conservation areas. Other areas (previously planted or due to the project activity) located on the border of a river or other watersheds are also classified as conservation areas. The project's main goal is to create healthy forests and some farms are already one.

## Ownership structure

The carbon ownership lies with the following companies and project participants:

- Eco Cebaco S.A. (EC)
- Forest Finance S.A. (FF)
- Sustainable Timbers S.A. (ST)
- Quetzal Blue S.A. (QB)
- Panama Boca del Monte (PB)

Figure 1 shows the original and current project participants, and the administrators of each project participant.

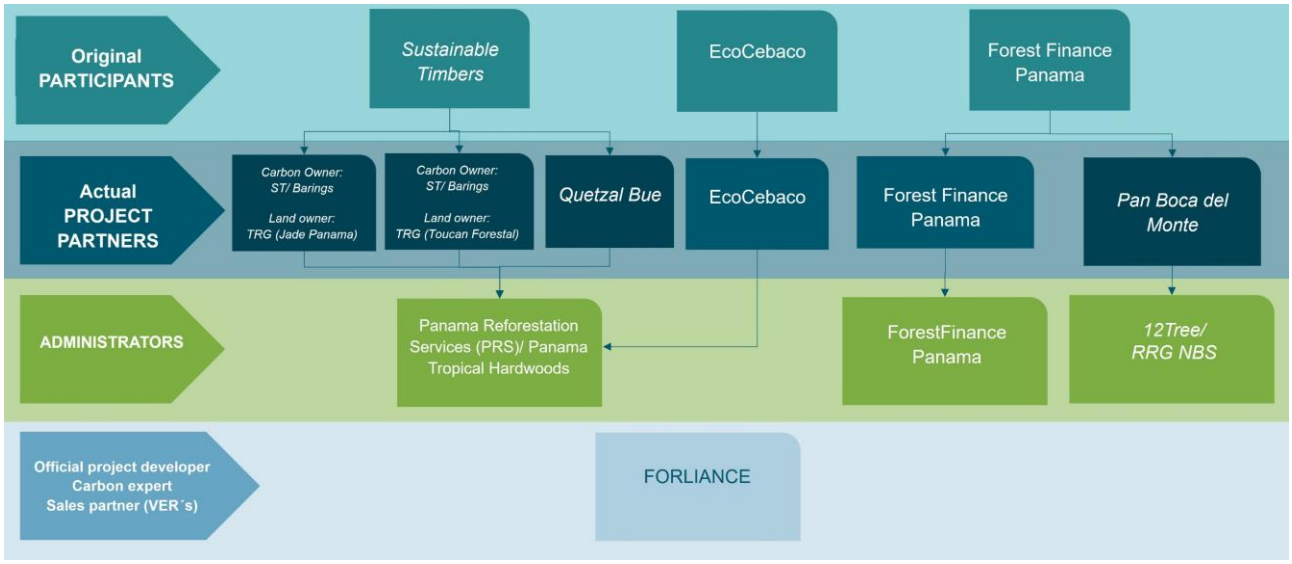


Figure 1: Overview of project management structure

In 2023 and 2024, Sustainable Timbers has sold some areas to The Rohatyn Group (TRG). However, the carbon rights remain with Sustainable Timbers until the end of the crediting period and beyond, as per an agreement between the relevant stakeholders. EcoCebaco and Sustainable Timbers are in practice represented by Panama Reforestation Services (PRS), who manage the project activities on-site (see Figure 1). Since 2019, PRS also manages Quetzal Blue S.A. (QB), an additional company originating from Sustainable Timbers and owning some of ST's former project areas. Furthermore, during the previous monitoring period, ForestFinance had sold the farm "Boca del Monte" ("BMO") (which was previously already included in the project) to Panama Boca del Monte. This land continues to be part of the carbon project and is administered by the companies 12tree and RRG Nature Based Solutions (RRG NBS).

**Objectives and technologies**

The objective of the project is producing high-quality hardwoods in the long-term at the same time as sequestering a high amount of carbon while stabilizing and restoring fragile and degraded areas in an economically, socially, and ecologically viable way.

In contrast to common reforestation schemes in Panama, the project concept also makes use of native tree species in a mix with a round of non-native species, mostly Teak (*Tectona grandis*) of approximately 70%, to create sustainable and species-rich forests with the use of high-quality hardwoods and the creation of an additional income from carbon credits. The carbon offset credits can be traded on international carbon markets and will be certified according to high-quality carbon standards. Overall, the project-specific objectives are the following:

1) Establishment of profitable production- and conservation systems, enabling the enterprises to work in a beneficial way through the creation of investment opportunities, which are economical, ecologically and socially sound.
2) Creating year-round work opportunities in the areas of activity that allow the development of a stable employment for women and men, helps the development of these regions.

List of species planted:

1. *Anacardium excelsum*
2. *Astronium graveolens*
3. *Acacia mangium*
4. *Bombacopsis quinata*
5. *Cordia alliodora*
6. *Cedrela odorata*
7. *Dipteryx panamensis*
8. *Dalbergia retusa*
9. *Hieronyma alchorneoides*
10. *Inga* sp.
11. *Khaya senegalensi*
12. *Ormosia* sp.
13. *Sterculia apetala*
14. *Swietenia macrophylla*
15. *Terminalia amazonia*

16. *Tectona grandis*
17. *Tabebuia guayacan*
18. *Tabebuia rosea*
19. *Theobroma cacao*
20. *Vochysia guatemalensis*
21. *Paulownia imperial*
22. *Paulownia trifolia*
23. *Platymiscium* sp.
24. *Terminalia* sp

**A.2. Location of project**

| **Land Owner** | **Offices (of representative)** | **Location of Project Areas** (Province) |
|---|---|---|
| Forest Finance Panama S.A. | Clayton, Ciudad Del Saber, Edificio 146 A y B<br>Calle Gustavo Lara,<br>Panamá,<br>Panama | Darién, Panamá, Veraguas, Chiriquí, Bocas del Toro |
| Sustainable Timbers | PH Global Plaza<br>22nd Floor, Office A<br>50th Street<br>Panamá,<br>Panama | Darién |
| Quetzal Blue | PH Global Plaza<br>22nd Floor, Office A<br>50th Street<br>Panamá,<br>Panama | Darién |
| EcoCebaco | PH Global Plaza<br>22nd Floor, Office A<br>50th Street<br>Panamá,<br>Panama | Veraguas |

| | | |
|---|---|---|
| Pan Boca del Monte | Comunidad el Maria<br>Boca del Monte<br>Provincia de Chiriquí<br>Panama | Chiriquí |

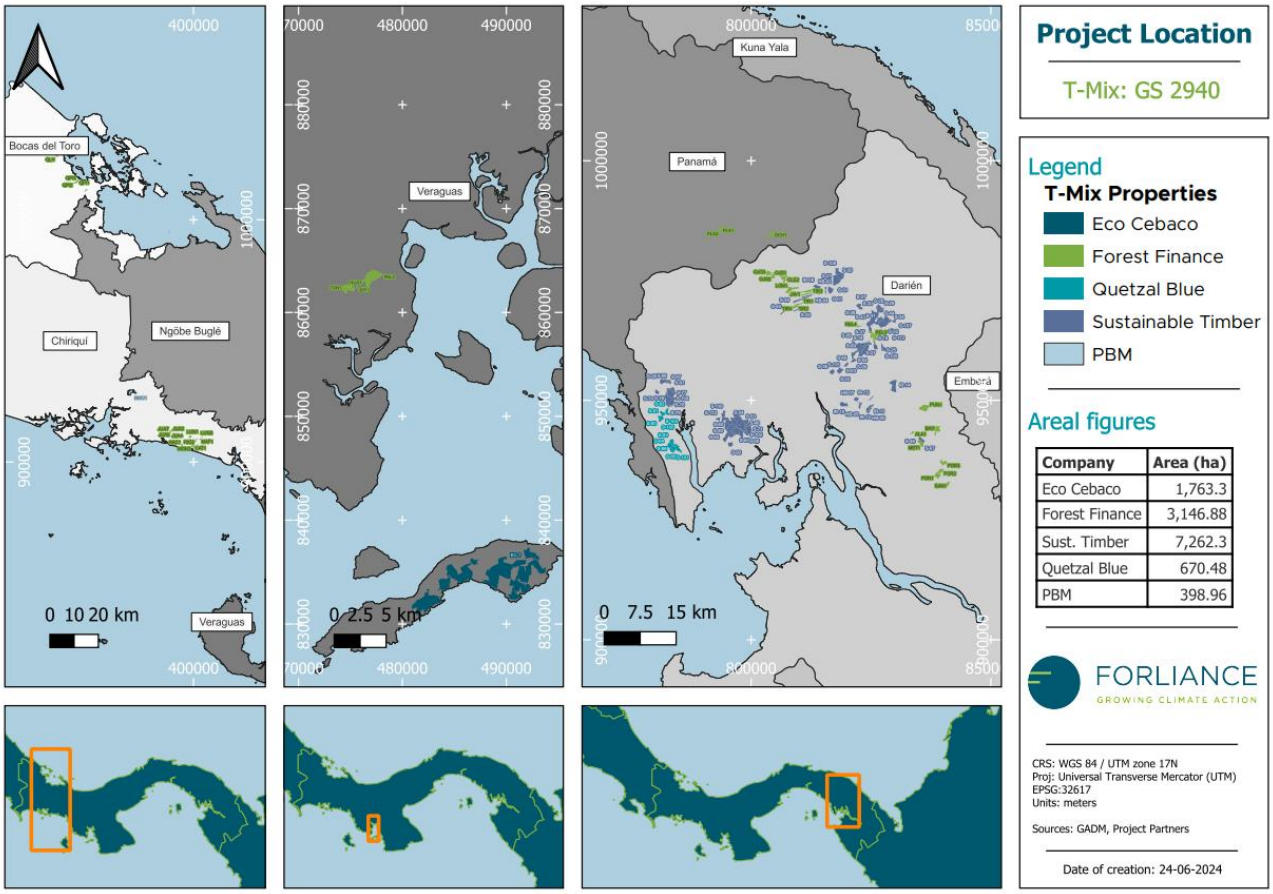


Figure 2: Map showing the location of project sites per company involved

## A.3. Reference of applied methodology

*i.* Gold Standard Afforestation/Reforestation (A/R) GHG Emissions Reduction & Sequestration Methodology (Version 2.1)

ii. The GS Soil carbon tool ("Tool for estimation of changes in soil organic carbon stocks due to the implementation of A/R CDM project activities") was applied.

*iii.* No selected standardized baselines

## A.4. Crediting period of project

01/09/1995-31/12/2024, 29 years and 4 months.
*These dates were defined in the frame of a CAR raised by SustainCERT during the Transition Review in 2019.*

# SECTION B. IMPLEMENTATION OF PROJECT

## B.1. Description of implemented project

The project is in a mature state. All project activities related to plantation establishment were completed before the three previous performance reviews. The project is applying the selective harvesting method and thus thinning, and farm maintenance are the main forestry activities.

For the ForestFinance sites, the activities for the last years depend on timing of the first planting on each farm and parcel and are summarized in the report "FF_Activities_Forestry_2023.pdf". Planting on the farms happened between 1995 and 2017, with the majority between 2005 and 2010. The focus in forest management in 2024 has been mainly on selective harvesting and farm maintenance such as cleaning, weeding, fencing control, disease control and fire watching. In the latest FSC certification, ForestFinance has now adopted the SLIMF Standard. Further, the company's internal policy related to corruption has been updated (see"Reglamento Interno Forest Finance_2024.pdf").

The cocoa plantations continue to be certified as "ecological" by IMOcert. Additionally, the cocoa has been certified as NOP's for organic sales in the United States. The company has also won a prize in the regional SICACAO contest for the organic beans. (see folder "FF_cocoa").

The company has issued an impact report in August 2024 showing the positive standing among communities in the direct vicinity of the project sites ("Analisis del impacto de los proyectos forestales - FoFi 2024.pdf").

For EcoCebaco, planting was conducted between 2009 and 2011. In the different farms, tree growth is monitored yearly. Opposed to the originally formulated management plan (TMIX16-SFM4-Plan implementación cebaco.pdf), no harvesting takes place on the project sites. This is due to the remoteness of the island, which renders timber extraction unviable at current market prices.

Until 2019 the farm Boca del Monte belonged to ForestFinance. Since the previous monitoring period (2019-2024), the farm is managed according to the management

plan of Pan Boca del Monte ("PLAN DE MANEJO BOCA DEL MONTE 2024_202408.pdf"). "Descripción de labores PBM.docx" summarizes the most recent project activities: weed control, pruning, selective harvesting, fire protection and monitoring.

On the project areas in Darién belonging to Sustainable Timbers and Quetzal Blue, planting on the eligible areas happened each year from 2005 to 2015. Ongoing forest management is described in the management plans provided per owner and farm in the folder "Forest_Management". Like in the plantations of Forest Finance and Pan Boca del Monte, the main recent project activities consist of cleaning, weeding, fencing control, disease control, fire watching and selective harvesting. The FSC certification of farms belonging to Sustainable Timber and Quetzal Blue issued in 2018 was verified in a group audit in Q2 2022 *(TMIX22_FSC_2022_ST_QB)* and again renewed in October 2023 (*PRS-FSC-Certificate-2023.pdf*).
As described in Section A.1, there was another change in land ownership for Sustainable Timbers areas. However, since the carbon ownership remains with ST and the plantation management remains in the hand of PRS, the new owners are not included as separate participants.

B.1.1 Forward Action Requests
The following FAR was raised by SustainCERT at the end of the previous Performance Review:

| Round 2 Review: | Date: | 24 February 2025 |
|---|---|---|
| FAR - Since the monitoring frequency SDG 1 Target 1.4 has to be proven through stakeholders consultation evidence regardless of higher/lower/conservative value. However, since the PD is claiming SDG 1 Target 1.4 in the current monitoring period as well, PD shall describe the total number of community members (With documented evidence). CME shall going forward demonstrate SDG impacts for each monitoring period. | | |

The FAR is addressed via updating Section E.2 of this report as well as relevant sections of the PDD.

Further, the following CL was raised:

CL - In the 6.1. Losses -

Query 1. What is reference or the formula used for the commercial volume in the column (Column U); The figures mentioned in the commercial volume column are anecdotal. The PD is requested to provide the formula or reference on how they have arrived at this figure.

Query 2. What is the reference of the Factor commercial value to total = 3 in W12 cell. Similarly, average tCO2/tree (Column Z) reference or equation cannot be located. The PD is request to provide that.

The clarification is referring to the carbon model "TMIX24-1_GS2940_Carbon-model_V3_final", sheet "6.1 Losses".

Query 1: The sources for the harvested commercial volumes are given in cell S12/T12. All mentioned sheets were added to the folder "Forest_Management" in "04_Supporting-Documents". We re-added the folder to this review package.

Query 2: Since only information about harvested commercial volume (based on commercial tree height) was available, the total AGB harvested had to be calculated based on this information. For that, the average ratio of commercial to total tree height was calculated based on raw data from FF and PB, which resulted in a ratio of 0.317 and 0.295 respectively (see "merged_final_output_15.11.24.xlsx", Cell R1 and "RESUMEN PPM_2024.xlsx", Cell Y2). Based on that, an average ration of 1:3 was assumed.
Column Z (Average of tCO2/Tree) is a traceable pivot table with the sheet "3.1 DB_tree" as source.

For the carbon model of PR 2024-2 ("TMIX24-2_GS2940_Carbon-model_V3.xlsx"), the information on harvested volume was not filled in because no thinning or harvesting was conducted during the monitoring period. Additionally, there was no loss event in the same time period.

**B.2. Post-Design Certification changes**

B.2.1. Temporary deviations from the approved Monitoring & Reporting Plan, methodology or standardized baseline

There is one deviation from the Monitoring plan:
MU17 has a different reference year for comparing the MU growth than the rest of the MUs (2019 instead of 2024).
While aboveground biomass per hectare per MU is usually calculated by measuring all trees within several monitoring plots distributed over the planted area, the approach was different for MU 17 in the inventory prepared for the previous verification (Monitoring period from 01/08/2019 to 07/05/2024). This modelling unit belonging to PB consists of *Tectona grandis* planted in 2007 and scattered over 6.4 hectares of two lots of the farm. Instead of establishing sampling plots, the project participant

conducted a census of all trees belonging to this MU. This change to the monitoring plan occurred due to the sale of the Boca del Monte farm during this previous monitoring period, where PB as the new owner established a new monitoring system. Since the census approach was not accepted in that last verification, the carbon increment was not accounted for in the previous carbon model. However, three sample plots of 1000 $m^2$ have now been implemented and measured, and the MU can be included again. To calculate the increment, the previous monitoring data for MU 17 from 2019 is taken for comparison. This is marked clearly in the carbon model.

B.2.2. Corrections

*None*

B.2.3. Changes to start date of crediting period

*None*

B.2.4. Permanent changes from the Design Certified monitoring plan, applied methodology or applied standardized baseline

*None*

B.2.5. Changes to project design of approved project

*None*

## SECTION C. DESCRIPTION OF MONITORING SYSTEM APPLIED BY THE PROJECT

The content of the monitoring plan with a description of each monitored parameters is given in section D.2.

Generally, the parameters to be monitored for SDG impact estimation were chosen based on the parameters already monitored before the transition.

Monitoring data is recorded in paper files or handheld notebooks and afterwards uploaded in the database. Those are related to, amongst others: service quality,

silvicultural management, tree growth for each species, loss of plants through fire or cattle grazing, quantities of machine oil purchased and returned, inputs and grievances, capacity building and growth information system (database of PPMs). Forest management plans and activities are managed and adjusted periodically in line with evaluations of the plantations by project staff. Specific silvicultural and forest management tasks are set in discussions particularly with the workers and project members.

Below, the methodological approach for monitoring each SDG is described, as defined in the Transition Annex from 2019.

**SDG1: No Poverty - End poverty in all its forms everywhere**

**Target**: 1.4: By 2030, ensure that all men and women, in particular, the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance
**Indicator:** Number of local communities benefiting from the project´s investments
**Monitoring frequency**: At each verification (Once per monitoring period).
**Approach**: The local stakeholder consultation information was used as a proxy of how the project has improved local conditions, income and revenue among the local community members, and how many stakeholders are positively impacted.
Project records and reports about socio-economic impacts and benefits are used to support and confirm the information obtained through the local stakeholder consultation. The total number of directly and indirectly impacted community members is identified based on census data for the local communities. The number of directly impacted community members is identified based on PP impact reports.

**SDG 8: Decent Work and Economic Growth - Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all**
**Target**: 8.5: By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value.

**Indicator:** Nr. of persons on Payroll (full-time & part-time employees)

**Monitoring frequency**: Annually
**Approach**: Project participants provide a list of employees and bank excerpts showing salary payments.

**Indicator:** Nr. of working hours per week (m/w), including overtime
**Monitoring frequency**: Annually
**Approach**: Copies of sample contracts are provided.

**Indicator:** Nr. of training or workshops provided to the employees
**Monitoring frequency**: Annually
**Approach**: Numbers of training/workshops provided are monitored using training records, staff register, contractor statements and employment details.

**SDG 12: Responsible Consumption and Production – Ensure sustainable consumption and production patterns**

**Target**: 12.2: By 2030, achieve the sustainable management and efficient use of natural resources
**Indicator:** Share (%) of timber volume verified and certified by FSC, and percentage of cocoa volume certified by UTZ in selected areas of the project
**Monitoring Frequency**: Annually
**Approach**: Review of annual volume of FSC-certified wood produced as well as UTZ certified cocoa. Inventories sheets, invoices, and supporting materials of how these materials are handled, placed and applied will be also taken into account.

**SDG 13: Climate Action – Take urgent action to combat climate change and its impacts**

a. Permanent field plots were established using a random systematic grid over the project area.
b. Field plots are delineated by site quality strata, species and planting year.
c. Plot (tree/shrub) measurements converted to dry weight biomass through allometric formulas.
d. Plot data amalgamated at MU level.
e. Above-ground dry weight converted to $CO_2$-e as follows:
    - Dry weight to Carbon = multiply by 50%

- Carbon to $CO_2$-e = multiply by 3.6667 (=:44/12)

f. Above-ground biomass converted to above- and below-ground $CO_2$-e = multiply by 1.42 (i.e. use 42% and the below-ground factor for the project area).
g. Multiply $CO_2$-e/ha by area (ha) for each MU.
h. Calculations incorporate reductions due to Baseline and Other Emissions or special reductions due to area variations.
i. Net result is the current $CO_2$-e Fixation over the project area.

**SDG15: Life on Land - Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss**

**Target**: 15.3: By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world.
**Indicator:** Areas (ha) of degraded land and soils restored in comparison with the baseline scenario
**Monitoring Frequency**: Annually
**Approach**: Reforested areas, degraded land and soils restored as reported by the project participants.

**Target**: 15.5: Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species
**Indicator:** Share (%) of conservation areas of the project area
**Monitoring Frequency**: Annually
**Approach**: Protected natural ecosystems as reported by project participants via spatial data and/or management plans.

## SECTION D. DATA AND PARAMETERS

### D.1. Data and parameters fixed ex ante or at renewal of crediting period

**SDG 13: Climate Action**

| | |
|---|---|
| Data/parameter | Emission reductions in $tCO_2$-equivalents fixed ex-ante: – Baseline |
| Unit | Tonnes of $CO_2$-equivalents/hectare |
| Description | The Baseline is the estimated carbon stock that would occur in the baseline scenario. The baseline scenario describes the activities that would occur in the absence of the proposed project. |
| Source of data | Scientific literature was used to determinate the existing baseline biomass. To complement the work, we executed a survey that allowed us to classify better the MUs with a lower or higher baseline biomass. The survey found out the existence of two different scenarios:<br>(i) grassland pasture and<br>(ii) shrubland.<br>The values for both scenarios were extracted from the Inventario Nacional Forestal y de Carbono de Panamá. Resultados de la Fase Piloto 2013-2015. Page 28, Table 12. Pasto value. |
| Value(s) applied | 1 Baseline: 20.17 $tCO_2$/ha |
| Choice of data or Measurement methods and procedures | Gold Standard Afforestation/Reforestation (A/R) GHG Emissions Reduction & Sequestration Methodology, Version 2.1. |
| Purpose of data | Calculation of baseline scenario |
| Additional comment | As stated in the Gold Standard Afforestation/Reforestation (A/R) GHG Emissions Reduction & Sequestration Methodology, the baseline is not subjected to monitoring. |

| | |
|---|---|
| Data/parameter | Emission reductions in $tCO_2$-equivalents fixed ex-ante: – Belowground tree biomass |
| Unit | tonnes of $CO_2$-equivalents/hectare |
| Description | The belowground tree biomass is not sampled during inventory activities |
| Source of data | Belowground biomass was calculated from the aboveground tree biomass using a root-to-Shoot ratio, using Gold Standard Afforestation/Reforestation (A/R) |

| | |
|---|---|
| | GHG Emissions Reduction & Sequestration Methodology, Version 2.1. Source data is based on several scientific studies from the trees species used in the project (Baseline) |
| Value(s) applied | 2 Please refer to the carbon model for more details. |
| Choice of data or Measurement methods and procedures | Sample plot above-ground (dry) biomass is determined through the measurement of stem diameter and crown dimensions applied to researched-established allometrics. These calculations are then extended into broad areas (MU's). Gold Standard Afforestation/Reforestation (A/R) GHG Emissions Reduction & Sequestration Methodology, Version 2.1. |
| Purpose of data | Calculation of project scenario |
| Additional comment | - |

| | |
|---|---|
| Relevant SDG Indicator | SDG 13: Climate Action - Emission reductions in $tCO_2$ |
| Data/parameter | Emission reductions in $tCO_2$-equivalents fixed ex-ante: Biomass Expansion Factor (BEF) |

| | |
|---|---|
| Unit | Dimensionless quantity |
| Description | The values were obtained using different scientific sources (see section sources from the carbon model). The values come from different forestry models and based on trees planted in tropical regions across Latin America with similar characteristics and features as the project[2] |
| Source of data | BEF was calculated using Gold Standard Afforestation/Reforestation (A/R) GHG Emissions Reduction & Sequestration Methodology, Version 2.1[3]. Source data is based on several scientific studies from the trees species used in the project (Baseline) as well as different forestry models across Latin America. See carbon model for more details. |
| Value(s) applied | Biomass Expansion Factor (BEF): 1.5 |
| Choice of data or Measurement methods and procedures | Gold Standard Afforestation/Reforestation (A/R) GHG Emissions Reduction & Sequestration Methodology, Version 2.1. |
| Purpose of data | Determine the overall carbon sequestration of the project as a whole |
| Additional comment | - |

| | |
|---|---|
| Relevant SDG Indicator | SDG 13: Climate Action - Emission reductions in $tCO_2$ |
| Data/parameter | Emission reductions in $tCO_2$-equivalents fixed ex-ante: Soil Carbon |
| Unit | tonnes of $CO_2$-equivalents/hectare |
| Description | Projects complying with all A/R Requirements sufficient to certify their project activities with the Gold Standard may use the A/R Soil Carbon Tool in order to earn soil carbon credits with no additional monitoring required. This tool estimates the change in soil organic carbon stocks due to the planting of forests and applies to soils on planting areas only. Once a project has undergone a successful Initial Certification, VERs generated using this tool may be issued for previous vintages following a successful performance certification. |

[3] Source: https://globalgoals.goldstandard.org/403-luf-ar-methodology-ghgs-emission-reduction-and-sequestration-methodology/

| | |
|---|---|
| Source of data | A/R Soil Carbon Tool. Please refer to the carbon model for more information. |
| Value(s) applied | Soil Carbon: 0.81 $tCO_2$/ha/year |
| Choice of data or Measurement methods and procedures | A/R Soil Carbon Tool (Soil Carbon) and carbon model. |
| Purpose of data | Calculation of project scenario |
| Additional comment | - |

| | |
|---|---|
| Relevant SDG Indicator | SDG 13: Climate Action - Emission reductions in $tCO_2$ |
| Data/parameter | Emission reductions in $tCO_2$-equivalents fixed ex-ante: Biomass burn |
| Unit | tonnes of $CO_2$-equivalents/hectare |
| Description | No slash and burn techniques for soil preparation are part of the Sustainable Management Plan. Exceptions are only done in case of dangerous situations for the workers. |
| Source of data | 10% of the baseline was deducted based on the Gold Standard Afforestation/Reforestation (A/R) GHG Emissions Reduction & Sequestration Methodology, Version 2.1 and A/R Soil Carbon Tool. See carbon model and 401.13-AR-T-Baseline_TMIX_2940.docx. |
| Value(s) applied | Biomass burn: 2.01 [$tCO_2$ eq/ha] |
| Choice of data or Measurement methods and procedures | Gold Standard Afforestation/Reforestation (A/R) GHG Emissions Reduction & Sequestration Methodology, Version 2.1. A/R Soil Carbon Tool |
| Purpose of data | Calculation of project scenario |
| Additional comment | - |

| | |
|---|---|
| Relevant SDG Indicator | SDG 13: Climate Action - Emission reductions in $tCO_2$ |
| Data/parameter | Emission reductions in $tCO_2$-equivalents fixed ex-ante: Leakage |
| Unit | tonnes of $CO_2$-equivalents/hectare |
| Description | Leakage are emissions that occur due to a shift of activities from the inside of the project area to the outside of a project area. These shifts of activities can cause four different categories by:<br>(a) Collection of wood (for firewood, charcoal, etc.)<br>(b) Timber harvesting<br>(c) Agriculture (crop cultivation, shrimp cultivation, etc.)<br>(d) Livestock<br><br>Only tree biomass affected by these activities shift shall be considered as mentioned in the Gold Standard |

| | |
|---|---|
| | Afforestation/Reforestation (A/R) GHG Emissions Reduction & Sequestration Methodology, Version 2.1.<br><br>No leakage considered. |
| Source of data | See PDD |
| Value(s) applied | Leakage: 0 $tCO_2$/ha |
| Choice of data or Measurement methods and procedures | Gold Standard Afforestation/Reforestation (A/R) GHG Emissions Reduction & Sequestration Methodology, Version 2.1 |
| Purpose of data | Calculation of leakage |
| Additional comment | Leakage is not subject to monitoring |

| | |
|---|---|
| Relevant SDG Indicator | SDG 13: Climate Action - Emission reductions in $tCO_2$ |
| Data/parameter | Emission reductions in $tCO_2$-equivalents fixed ex-ante:<br>Wood density |
| Unit | grams / $cm^3$ |
| Description | The woody density is the ratio between the mass of dry wood divided by its volume. The values were selected and considered as the most appropriate for the different Modelling Units that compose the project from scientific sources. |
| Source of data | The values were obtained using different scientific sources (see section sources from the carbon model). The values came from different forestry models and were based on trees planted in tropical regions across Latin America with similar characteristics and features as the project. See carbon model. |
| Value(s) applied | |

| **Species** | **Wood density (g/cm³)** |
|---|---|
| *Anacardium excelsum* | 0.410 |
| *Astronium graveolens* | 0.800 |
| *Acacia mangium* | 0.520 |
| *Bombacopsis quinata* | 0.380 |
| *Cordia alliodora* | 0.420 |
| *Cedrela odorata* | 0.460 |
| *Dipteryx panamensis* | 0.720 |
| *Dalbergia retusa* | 0.890 |
| *Hieronyma alchorneoides* | 0.600 |
| *Inga* sp. | 0.490 |
| *Khaya senegalensi* | 0.780 |
| Mix of species | 0.613 |
| *Ormosia* sp. | 0.590 |
| *Sterculia apetala* | 0.330 |

| | | |
|---|---|---|
| | *Swietenia macrophylla* | 0.600 |
| | *Terminalia amazonia* | 0.930 |
| | *Tectona grandis* | 0.670 |
| | *Tabebuia guayacan* | 0.820 |
| | *Tabebuia rosea* | 0.540 |
| | *Theobroma cacao* | |
| | *Vochysia guatemalensis* | 0.520 |
| | *Paulownia imperial* | |
| | *Paulownia trifolia* | |
| | *Platymiscium* sp. | 0.790 |
| | *Terminalia* sp. | 0.930 |
| Choice of data or Measurement methods and procedures | See carbon model for reference data. Gold Standard Afforestation/Reforestation (A/R) GHG Emissions Reduction & Sequestration Methodology, Version 2.1 | |
| Purpose of data | Calculation of project scenario | |
| Additional comment | - | |

## D.2 Data and parameters monitored

### SDG 1

| | |
|---|---|
| Data/parameter | Number of local community members benefiting from the project´s investments |
| Unit | Number |
| Description | Local communities are positively impacted by the project activities; i.e. by increase employment opportunities, investments in to infrastructure and education, etc. |
| Source of data | Initial stakeholder consultation |
| Value(s) applied | Indirectly impacted: 26,168 (Includes 340 directly impacted) |
| Measurement methods and procedures | The total number of directly and indirectly impacted community members is identified based on census data for the local communities. The number of directly impacted community members is identified based on PP impact reports. |
| Monitoring frequency | Crediting period |
| QA/QC procedures | Stakeholder consultation guidelines |
| Purpose of data | Calculation of project scenario |
| Additional comment | |

### SDG 8

| | |
|---|---|
| Data / Parameter | Nr. of persons on Payroll (full-time & part-time employees) |
| Unit | Number |
| Description | Monitor employment generated by project, divided according to company, type of contract and gender of employee |
| Source of data | List of employees provided by participants and payroll |
| Value(s) applied | Number of people employed during Monitoring Period: 154 |
| Measurement methods and procedures | See source of data. No further procedures. |
| Monitoring frequency | Annual basis |
| QA/QC procedures | Employment contracts checked |
| Purpose of data | Calculation of project scenario |
| Additional comment | - |

| | |
|---|---|
| Data / Parameter | Nr. of working hours per week (m/w), including overtime |
| Unit | Average number of working hours per week per employee |
| Description | Monitor employment generated by project |
| Source of data | Sample contracts |
| Value(s) applied | Standard during Monitoring Period: 48 hours |
| Measurement methods and procedures | See source of data. No further procedures. |
| Monitoring frequency | Annual basis |
| QA/QC procedures | Employment contracts checked |
| Purpose of data | Calculation of project scenario |
| Additional comment | - |

| | |
|---|---|
| Data / Parameter | Nr. of training or workshops provided to the employees during the monitoring period |
| Unit | Number |
| Description | Assess opportunities for professional development of workers |
| Source of data | List of workshops provided by participants |
| Value(s) applied | Status Quo 2024: Averagely 4 per year |
| Measurement methods and procedures | See source of data. No further procedures. |
| Monitoring frequency | Annual basis |
| QA/QC procedures | - |
| Purpose of data | Calculation of project scenario |
| Additional comment | - |

**SDG 12**

| | |
|---|---|
| Data / Parameter | Share of timber volume verified and certified by FSC, and percentage of cocoa volume certified by UTZ in selected areas of the project |
| Unit | % |

| | |
|---|---|
| Description | Show type and number of sustainability certification schemes that act as a catalyst bringing economic benefits by opening new markets and customer base diversification |
| Source of data | - Project Developer´s records and customer records<br>- ANARAP Membership from Forest Finance and Sustainable Timber: https://anarap.com/miembros/<br>- Certification documentation |
| Value(s) applied | Status Quo 2024: 100% |
| Measurement methods and procedures | Project participants' documentation |
| Monitoring frequency | Annual basis. |
| QA/QC procedures | FSC and UTZ standard certifications principles and criteria (Guidelines) |
| Purpose of data | Calculation of project scenario |
| Additional comment | - |

**SDG 13**

| | |
|---|---|
| Relevant SDG Indicator/Safeguarding principle | SDG 13: Climate Action<br>Associated and closest Sustainable Monitoring ID, indicator:<br>Climate Project, Air quality |
| Data/ Parameter | Associated chosen parameters:<br>- Compensation of project emissions- Emission reductions in $tCO_2$ eq<br>- Aboveground tree biomass |
| Unit | Tonnes of $CO_2$-equivalents/hectare, [$tCO_2eq/ha$] |
| Description | Aboveground tree biomass is calculated using the stem volume, the Biomass Expansion Factor (BEF), carbon fraction and C to $CO_2$ factor. Data was collected from different scientific studies for each tree species existing inside the project eligible area. The Mean Annual Increment (MAI) and Total Steam Volume ($m^3$) for each species was used to estimate the amount of $tCO_2eq$ according to the project activities. |
| Source of data | Gold Standard Afforestation/Reforestation (A/R) GHG Emissions Reduction & Sequestration Methodology, Version 2.1.<br>Source data is based on several scientific studies from the trees species used in the project (Baseline). MRV specific data is provided from each MU and it is compared to the |

| | |
|---|---|
| | original scientific data basis. See carbon model for more information. |
| Value(s) applied | Please refer to the carbon model for more details. |
| Measurement methods and procedures | Sample plot above-ground (dry) biomass is determined through the measurement of stem diameter and crown dimensions applied to researched-established allometrics. These calculations are then extended into broad areas (MU's).<br>Gold Standard Afforestation/Reforestation (A/R) GHG Emissions<br>Reduction & Sequestration Methodology, Version 2.1. |
| Monitoring frequency | Annual basis. Crediting period |
| QA/QC procedures | Monitoring, Verification and Reporting (MRV) system from all Management Units (MUs) older than 3 years, Mirasilv software, GIS database from the project, Gold Standard Afforestation/Reforestation (A/R) GHG Emissions Reduction & Sequestration Methodology, Version 2.1 |
| Purpose of data | Determine the overall carbon sequestration of the project as a whole |
| Additional comment | --- |

| | |
|---|---|
| Relevant SDG Indicator/Safeguarding principle | SDG 13: Climate Action -<br>Associated and closest Sustainable Monitoring ID,<br>indicator:<br>Climate Project, Air quality |
| Data/ Parameter | Associated chosen parameters:<br>- Compensation of project emissions- Emission reductions in $tCO_2$ eq<br>- Other emissions |
| Unit | Tonnes of $CO_2$-equivalents/hectare, [$tCO_2$/ha] |
| Description | Emissions that result from the use of fertilizers during project activities. Fertilizer 0.005 $tCO_2$ per kg of nitrogen (N) fertilizer shall be deducted. No differentiation is made between synthetic and organic fertilizer. An average of 240kg is used per hectare for any fertilization taking place in the first 5 years. A conservative approach was used. This value was applied to all the MUs.<br>Additionally, 10% of the baseline is assumed to be lost due to site preparation. |
| Source of data | Gold Standard Afforestation/Reforestation (A/R) GHG Emissions Reduction & Sequestration Methodology, Version 2.1.<br>Source data is based on several scientific studies from the trees species used in the project (Baseline).<br>See Carbon model for more information. |
| Value(s) applied | Other emissions: 3.3 [$tCO_2$/ha] (2.1 from baseline + 1.2 from fertilizer) |

| | |
|---|---|
| Measurement methods and procedures | These calculations are then extended into broad areas (MU's).<br>Gold Standard Afforestation/Reforestation (A/R) GHG Emissions<br>Reduction & Sequestration Methodology, Version 2.1.<br>A/R Soil Carbon Calculation Tool |
| Monitoring frequency | Annual basis. Crediting period |
| QA/QC procedures | FSC and UTZ standard certifications principles and criteria. For other MUs, annual amount of fertilizer used submitted in annual reports or records. |
| Purpose of data | Calculation of project scenario |
| Additional comment | --- |

| | |
|---|---|
| Data/ Parameter | Productive area |
| Unit | Hectares, (ha) |
| Description | Productive area is considered as the eligible area where tree planting (or related actions) activities takes place and that meets the applicability conditions of the applied Gold Standard Methodology. |
| Source of data | Mapping of properties. See folder "Project area" |
| Value(s) applied | 8,539.4 |
| Measurement methods and procedures | - Gold Standard Afforestation/Reforestation (A/R) GHG Emissions Reduction & Sequestration Methodology, Version 2.1.<br>- Gold Standard Land-use & Forests Activity Requirements as applicable to A/R Projects in addition to the requirements stipulated in the Principles and Requirements |
| Monitoring frequency | Annual basis. |
| QA/QC procedures | Remote sensing (mapping location accuracy, GIS files), establishment of land tenure arrangements (legal contracts), cadastral mapping and land consolidation procedures. |
| Purpose of data | Determine the overall carbon sequestration of the project as a whole |
| Additional comment | Also relevant for SDG 15 |

**SDG 15**

| | |
|---|---|
| Data / Parameter | Share of conservation areas of the project area |
| Unit | % |
| Description | Conservation areas (also called "protected" areas) |
| Source of data | Mapping |

| | |
|---|---|
| Value(s) applied | Total conservation area: 4,669.75 ha<br>Total project area: 13,242 ha<br>% conservation area: 35.26 %. |
| Measurement methods and procedures | GIS database and remote sensing assessment. |
| Monitoring frequency | Annual |
| QA/QC procedures | Verification of shapefiles with project participants and recent satellite imagery |
| Purpose of data | Calculation of project scenario |
| Additional comment | - |

### D.3. Comparison of monitored parameters with last monitoring period

SDG 1 has not been actively monitored in the previous monitoring periods. Therefore, it is not included in the following table.

| SDG | SDG Impact | Values achieved during last monitoring period | Values achieved during this monitoring period | Difference |
|---|---|---|---|---|
| 13 | Emissions Removals | 572,434 | 552,025 | - 48,457 |
| 8 | Nr. of persons on Payroll (full-time & part-time employees) | 143 | 154 | +69 |
| | Nr. of working hours per week (m/w), including overtime | 48 | 48 | 0 |
| | Nr. of training or workshops provided to the employees | 11 | 4 | -4 |
| 12 | Share (%) of timber volume verified and certified by FSC, and percentage of cocoa volume certified by UTZ in selected areas of the project | 100 | 100 | 0 |
| 15 | Areas (ha) of degraded land and soils restored in comparison with the baseline scenario | 8,539.4 | 8,539.4 | 0 |
| | Share (%) of conservation areas of the project area | 35 | 35.26 | 0 |

The number of emission removals is reduced due to the shorter duration of the monitoring period (1 year compared to 2 and 5 years).

The number of employees has increased mainly because more entities are involved now due to the sale of areas from ST to TRG.

The number of workshops has decreased since the monitoring period does not cover a whole year but only six months.

### D.4. Implementation of sampling plan

**SDG 1, 8, 12 and 15**

No sampling approach, but complete observations.

**SDG 13**

**Description of Implemented Sampling Design**

In the Tropical MIX project, a systematic sampling design was implemented to ensure representative data collection. Sampling plots were established stratified-randomly throughout the plantation, taking into account various site factors such as slope (e.g. low, mid and upper), physical conditions and the different species planted. The project participants have defined in their management plans the size of sample plots and the envisioned share of sample plot area of the planted area. Based on the defined coverage of 1 to 2 %[4], the sample plots were randomly distributed over the project strata using a geographical information system[5]. The random placement of sampling plots within predetermined strata ensures that sampling points are randomly allocated across the plantation area and helped to eliminate bias and ensure a comprehensive assessment of the entire plantation, including areas of poor growth or low stocking.

**Forest Inventory Standard Operating Procedure**

The forest inventories in the project area serve multiple purposes, including providing information for long-term planning, supporting immediate decisions on felling and thinning programs, enabling valuation assessments, and quantifying carbon stocks. The Tropical Mix project utilizes Permanent Sample Plots (PSPs) as the primary method for continuous forest inventory. These plots are distributed throughout the plantations and re-measured at regular intervals.

In 2024, both Eco Cebaco and ForestFinance increased the number of PSPs in several MUs to improve precision and reduce penalties. These new plots are labelled "_extra"

[4] 2 % for ST & QB, 1-2% for PB & FF
[5] See "TMIX-BARCA-MRV-pantaciones 2007-Dauermessparzellen.pdf" p. 5-9 for more details

in the carbon model. ST and QB reduced the number of plots measured to reduce costs, since the precision was previously much higher than needed.

For ther establishment of sample plots a team of 4 people are usually needed, including the 'Booker' who oversees the operation. The different companies apply different plots sizes and shapes (see Table 3 for an overview): EcoCebaco and Sustainable Timbers use only circular plots, while ForestFinance has a mix of circular and rectangular sample plots. All of ForestFinance's plots have a size of 500 $m^2$, apart from the "extra"-plots in the finca Buenos Aires, which are 1000$m^2$. Pan Boca del Monte applies a plot size of 0.1 ha to their *Tectona grandis* plantations and 0.05 to their *Acacia mangium* stands. In the specific case of Quetzal Blue, rectangular plots that include the already existing circular plots were added in 2020. These new plots had an area of 0.1237 ha and were included to ensure enough space to contain 20 remaining trees at the end of the rotation, which means a goal of approximately 200 trees per hectare at the time of clear cutting.

Table 3: Sample plot sizes for different companies

| Company | Specification | Ploz_size ($m^2$) |
|---|---|---|
| QB | All plots | 1237.5 |
| PB | Tectona grandis | 1000 |
| PB | Acacia mangium | 500 |
| FF | BAI1_Extra | 1000 |
| All other farms | NA | 500 |

The precise locations of the measurement plots are recorded using GPS devices and clearly marked on a large-scale map. The center of the plot is marked with a center post. All trees within the plot boundaries should be identified with permanent enamel paint at a height of 1.3 meters. A thorough inspection of the tree distance from the plot center post ensures that all trees fall within the plot boundaries. During the counting and marking process, a systematic sweep is performed from North in a clockwise direction. As the trees in the PSPs reach an adequate size, numbers should be painted on their stems. Alternatively, numbered metal tags can be used, although they pose a risk of theft and need to be nailed onto the trees.

When measuring trees within the PSPs, the prescribed order is to measure the tree from North in a clockwise direction. The Booker stands behind the center post, providing directions on the measurement sequence. In cases where two trees align, the closer one is measured first. Diameter at breast height (DBH) measurements are preferably taken using non-rounded-down DBH tapes. Height measurements were taken using a clinometer.

During subsequent re-measurements of PSPs, having data from the previous measurements readily available is advisable. This facilitates the immediate identification of issues, such as recording discrepancies or unfeasible changes in tree diameter. Any other observations regarding tree conditions, particularly related to tree health, should be documented during PSP measurements.

**Collected Data**

The collected data in the Tropical MIX project included measurements of key tree data needed to estimate the carbon stored in the tree biomass. Measured tree parameters included tree diameter, tree height, and tree species. The measured tree data were then used to calculate further tree measures, such as basal area and tree volume (see following subsection).

Tree diameter is normally measured at breast height (dbh), which should always be 1.3m above ground level. To calculate tree volume (and stand volumes) accurately, tree height is measured. For carbon calculations the total height is required, which is the vertical distance from the base to the tip of the tree.

**Analysis of the Collected Data**

Based on the measured tree data the tree basal area and tree volume can be calculated. The tree volume is then aggregated at the sampling plot level (i.e. total volume in plot) and then further to the hectare-level (i.e. total volume per ha) based on the plot size.

Tree basal area (BA) is the area of the horizontal stem cross section at the base of the tree, calculated based on the stem diameter. BA is calculated from:

$$BA \text{ (in } m^2) = \pi \times (dbh/100)^2$$

Where dbh is measured in cm. and $\pi = 0.7854$

From the tree basal area, the tree stem volume can be calculated under consideration of the tree height. The tree stem volume is estimated as the volume of a cylinder, correcting for stem shape deviation from a perfect cylinder. Accordingly, the stem volume can be estimated using the following equation:

*Total Tree vol. (in m3) = Total height * BA * FF*

Where "Total height * BA" represents the volume of a cylinder and FF is the "form factor". The form factor is a dimensionless parameter used to estimate tree volume by accounting for the tapering of the tree stem as it ascends.

Now the volume of the stand (in $m^3$/ha) can be estimated by summing all the tree in the sample plot, and expanding this summed volume based on the plot area. The plot volume is expanded to stand volume using the following equation:

*Stand Volume (in m3/ha) = Plot volume (in m3) / Plot size (in ha)*

During conventional forest inventory monitoring stand volume is one of the main parameters of interest. Usually, analyses of collected data will not go further than stand volume (and decisions that can be based on these parameters). In the context of carbon projects, stand volume serves as an important input value for further carbon calculations. The procedure of calculating the amount of carbon stored in trees based on the stand volume is outlined in detail in Section E.

**Meeting the required confidence/precision level**

The sampling intensity (i.e. the total area of the measured plots divided by the total project area) was set to be 1-2%. Once the sampling plots had been measured the sampling precision was calculated for all modeling units (MU). If the required sampling precision for a MU was not met, a penalty was applied according to GS guidelines. The inventory error, sampling precision, and penalty calculations are described in detail (including numerical examples) in Section E, as they are part of the Impact Calculation. However, as a short overview, the sampling precision and penalty was calculated using the following equations:

1. Calculation of final inventory error (E):

*E = (Standard Deviation of Volume / sqrt (Number of Plots in MU) * Z-Score) * sqrt ((N - Number of Plots in MU) / (N - 1))*

2. Calculation of sampling precision:

*Precision = (E / Mean Volume Total) * 100*

3. Calculation of penalty based on precision:

*Penalty = If Precision < 20%, then 0%; otherwise, Precision - 20%*

By calculating the sampling precision and applying appropriate penalties an overestimation of the carbon stored in the trees is prevented in the carbon model.

**Quality Assurance for data archiving**

Due to the long-term nature of PSPs, it is essential that the data is stored both in physical (i.e. paper) and digital formats. PSPs should be re-measured at least every two years. The measurement data must be recorded on paper or digitally. The final results must be presented digitally on sheets containing all the farms and PSPs without spacing between the lines but numbered by their continuous ID. Dead or harvested trees will be presented by their Tree ID but without values for diameter and height. Copies of all data analyses and models, any GIS files, maps and copies of all measuring and monitoring reports should be stored in a dedicated and safe place.

# SECTION E. CALCULATION OF SDG IMPACTS

## E.1. Calculation of baseline value or estimation of baseline situation of each SDG Impact

**SDG13**

Before the project activity started, the baseline of the project area was a mix of grassland and shrubs. All these areas were evaluated and classified as applicable planting areas for reforestation activities. Other small patches of forest left were classified and since the beginning managed as conservation areas. Other areas (previously planted or due to the project activity) located in the border of a river or other watershed are also classified as conservation areas.

The applicable planting area used were grasslands which were used in the past as pasture. The project does not remove existing forests to plant new trees. The "Autoridad Nacional del Ambiente" (ANAM) also doesn't allow removing shrubland which is older than 5 years. For previous MUs, scientific literature was used to determinate the existing

baseline biomass. To complement the work, a survey was also conducted that allowed a better classification of the MUs with a lower or higher baseline biomass. The survey determined the existence of two different scenarios:
(i) grassland pasture and
(ii) shrubland.

The values for both scenarios were extracted from the classification of Orrego and del Valle (2001)[6]. The project uses the highest baseline from scenarios, that corresponds to shrubland, with a value of 20,17 $tCO_2$.

Aboveground biomass= 5.437 t/ha
Necromass= 6.308 t/ha

**SDG 1 and 8**

Low employment rates in rural regions. The baseline is assumed to be 0, since without the project, the created job positions would not exist.

**SDG 12**

Project areas were unused land where no monetary value was created anymore. Baseline is assumed to be zero since no concepts for sustainable investment products existed.

**SDG 15**

Project areas were degraded pastureland. Remaining forest patches were dispersed and connectivity limited. Baseline is assumed to be zero, as the areas were not under special protection.

[6]S. Orrego & J. del Valle (2001): Existencias y Tasas de Incremento Neto de la Biomasa y del Carbono en Bosques Primarios y Secundarios de Colombia.
/ Supporting Documents -> SDG_13_Carbon -> TMIX-08-02-Taza de incremento neto de biomasa-Orrego 2001.pdf

## E.2. Calculation of project value or estimation of project situation of each SDG Impact

### SDG 13

The project carbon model performs calculations to determine the total $tCO_2e$ stored by trees in the project area and the corresponding number of Verified Emission Reductions (VERs) for the current performance review period. The calculations involved the following steps:

- Step 1 focuses on calculating total tree volumes and $CO_2$ stored in trees, using previously defined conversion factors.
- Step 2 aggregates the data at MU-level, applying an area-weighted approach after aggregation to the first plot, and then Sub-MU level.
- Step 3 estimates the sampling error and precision while applying penalties to address measurement uncertainties.
- Step 4 compares the present ex-post data with the previous verification(-s) to calculate the increment during the monitoring period and the total number of VERs to be issued as determined based on accumulated carbon, with a portion allocated to the GS buffer pool.
- Step 5 incorporates ex-ante carbon calculations based on Mean Annual Increment (MAI), accounting for baseline emissions, leakage, and soil emission reductions.

**Step 1: Calculate Total Volumes from tree measurements in plots**

To calculate the stem volume of individual trees measured during monitoring, the following equations were utilized:

$$Tree\ Volume = Tree\ Basal\ Area * Tree\ Height * Form\ Factor$$

Where:

$$Tree\ Basal\ Area = (DBH / 2 / 100)^2 * \pi$$

Basal area is provided in $m^2/ha$, and DBH is given in cm.

To calculate the $tCO_2e/ha$ stored in live biomass, the volume was expanded using factors such as Biomass Expansion Factor (BEF), Root-to-shoot ratio (R-t-s), Wood density, Carbon Fraction, and the conversion factor from carbon (C) to $CO_2$ (44/12):

$$tCO_2e/ha = VT\ corrected * Wood\ density * BEF * R\text{-}t\text{-}s * Carbon\ fraction * (44/12)$$

**Step 2: Aggregate data at MU-level**

The tree-level information of stored is aggregated to the monitoring plot level using the pivot function.

The average height and DBH, and the total volume and $tCO_2$were then aggregated for each measurement plot and expanded to a hectare-level based on the plot area:
*Total Volume per ha = Total Volume per plot / Plot Size*

The total volume ($m^3$/ha) for each measurement plot is reported in the sheet "3.2 DB_plot" of the supporting Excel workbook. The total volume ($m^3$/ha) and carbon stock ($tCO_2$/ha) was then summed at the Sub-MU level, as detailed in the " 3.3 Monitoring results sub-MU " sheet.

Here, MU-level data is obtained by applying an area-weighted approach as follows:

*sub-MU weight = sub-MU area / MU area*

Based on these weights, the sub-MU weighted tree volume, carbon stock, and carbon stock variance are calculated:

*Weighted sub-MU carbon stock = sub-MU carbon stock * sub-MU weight*

As the variance is used for the later precision calculations, the finite population correction is here considered. Note that the variance equals the squared standard deviation:

*FPC = (Population size - sample size) / (Population size -1)*

*Weighted sub-MU variance in carbon stock = Variance in carbon stock * FPC * sub-MU weight*

The total population sub-MU population size is equivalent to the total number of measurement plots that would fit into the sub-MU given its area. Accordingly, total population size is given by:

*N = Total area sub-MU/Plot size*

The weighted tree volume and carbon stock are finally summed up in sheet "4. Precision calculations" to obtain the MU totals.

**Step 3: Estimate MU Sampling Error, Precision, and Penalty**

To determine the penalty assigned to subsequent carbon calculations, the plot-level data was employed to estimate the sampling error for each Management Unit (MU). The MU's average total volume, standard deviation, and the number of measurement plots were computed.

The total population size (N) for each MU corresponds to the number of measurement plots that can fit within the MU's area. Mathematically, the total population size is calculated as follows:

*N = Total MU Area / Plot Size*

Next, the inventory error was computed. This error quantifies the deviation between the sample average (per MU) and the confidence intervals at a 90% confidence level. The equation used for the inventory error calculation is as follows:

*Inventory Error = (Standard Deviation of Volume / sqrt (Number of Plots in MU)) * Z-Score*

The Z-Score associated with a 90% confidence level is 1.645.

Furthermore, given the known total population size, a finite population correction (FPC) was applied:

*FPC = sqrt ((N - Number of Plots in MU) / (N - 1))*

Consequently, the final inventory error (E) was calculated using the formula:

*E = (Standard Deviation of Volume / sqrt (Number of Plots in MU) * Z-Score) * sqrt ((N - Number of Plots in MU) / (N - 1))*

To determine the sampling precision, it was defined as the inventory error as a percentage of the sampling average:

*Precision = (E / Mean Volume Total) * 100*

Based on the calculated sampling precision, the appropriate penalty was applied according to the GS guidelines:

*Penalty = If Precision < 20%, then 0%; otherwise, Precision - 20%*

Lastly, the corrected total volume after applying the sampling error penalty was calculated:

*Corrected Total Volume (VT corrected) = Volume Total (VT) - VT deducted*

Where:

*VT deducted = VT * Penalty*

**Step 4: Comparison with previous monitoring period and calculation of total Amount of Verified Emission Reductions (VERs) Issued for the Review Period**

Finally, the total corrected $tCO_2e$ from biomass accumulated in the certification period is compared to the previously ex-post verified $tCO_2e$ per MU to calculate the number of VERs that can be issued based on the presented performance review. The calculations are reported in sheet "5.2 Carbon change prev PR-PR'24 and summarized in sheet "7. Summary carbon and VER".

The number of VERs to be issued based on the current performance review is determined as the difference between the total $tCO_2e$ accumulated and verified at the last performance review (2019 and 2022/2023)

*Change in carbon stored since last PR: Carbon stored in tree biomass in 2019/2023 - Carbon stored in tree biomass in 2024*

In sheet "7. Summary carbon and VER", the carbon stored in soil is added, based on the A/R Soil Carbon Tool presented in sheets 8.1-8.3.

This change in carbon constitutes the total VERs that can be issued for the current performance review/monitoring periods (2019/2023-2024). From this gross number, the buffer credits (20%) are deducted.

As baseline emissions, leakage, and other emissions are only relevant in the year of planting, they were not considered in the calculations of the current monitoring period.

**Step 5: Ex ante Carbon Growth Modelling**

Based on the carbon calculations, ex-ante carbon projections are made for the full certification period. The growth model utilizes the Mean Annual Increment (MAI) of the carbon stored in tree biomass to estimate yearly changes in $tCO_2e$ at the species and

MU level. Baseline emissions and leakage are subtracted from the carbon balance in the MU establishment year, while Soil Emission Reductions (Soil ER) are included for the first 20 years after establishment. The input data for these calculations is sourced from the "4. Precision calculations" sheet. The ex-ante carbon growth projections are performed in sheet "6. Growth model MU".

In the year of MU establishment, the total $tCO_2e$ is calculated based on the area-specific $tCO_2e$ /ha/year, MU area, baseline emissions and leakage:

*Total* $tCO_2e$ *in year 1 = (*$tCO_2e$ */ha/year - Baseline emissions - Leakage - Other emissions) * Monitored MU area*

In the years after MU establishment, the total $tCO_2e$ for each year (t) is calculated by adding the yearly increase in $tCO_2e$ to the total $tCO_2e$ of the previous year (t-1):

*Total* $tCO_2e$ *in year t = Total* $tCO_2e$ *in year t-1* + $tCO_2e$ */ha/year in year t * Monitored MU area*

**Overview carbon model description**

| Sheet name | Description |
|---|---|
| 1. Values, Factors and data | Contains values, factors, data needed for calculations within the carbon model. Values are extracted from scientific literature or reports, or default factors extracted from GS -A/R requirements version 2.1 document. |
| 1.1 Sources | List of sources from which values reported in sheet "1. Values, Factors and data" were extracted |
| 2. GIS | Data from spatial analysis, namely area of MUs at a farm, Sub-MU and MU-level |
| 3.1 DB_tree | Tree-level database of the combined project inventory data. |
| 3.2 DB_ plot | Forest inventory data from 2024 monitoring aggregated at a measurement plot level. |
| 3.3 Monitoring results sub-MU | This sheet presents the 2024 monitoring results at the sub-MU level. Further, the area-weighted MU averages are calculated. |

| | |
|---|---|
| 4. Precision calculations | Precision calculation based on monitoring data. This includes the calculation of the inventory error, the precision, and the penalty. |
| 5.1 Ex-post 24-1 | Monitoring results verified during performance reviews 2019 and 2022/2023. |
| 5.2 Carbon change prev PR-PR'24-2 | Comparison of status quo with previous ex-post data. Calculation of increments during this monitoring period. |
| 6. Growth model MU | Growth model modelling the growth trajectories of the reforestation at a MU-level. |
| 7. Summary Carbon and VER | Here the total emission reductions of the reported monitoring period are calculated. |
| 8.1 Soil Carbon-Background | This tool and its calculations are based on the A/R CDM 'Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities' - http://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-16-v1.1.0.pdf/history_view |
| 8.2 Soil Carbon-Calculator | This spreadsheet is replicates the "Tool for estimation of changes in soil organic carbon stocks due to the implementation of A/R CDM project activities" |
| 8.3 Soil Carbon by Company | Soil carbon calculator results aggregated by company |

**SDG 1**

For SDG 1: No Poverty, we monitor the Number of local community members benefitting from the project´s investments. This is reflected by the total number of indirectly impacted stakeholders from the investment in rural development and road infrastructure, education and provided ecosystem services. It is calculated based on the inhabitants of the directly neighboring municipalities (census data). It includes the directly impacted stakeholders and most of the employees of the companies.

The number of directly impacted stakeholders is also presented for more context. It includes kids and students participating in educational activities and local contractors. It excludes the employees of the companies to avoid doublecounting/overlap with SDG 8.

More specifically, FF reported on 6 directly impacted stakeholders, being locally contracted service providers. FF also reported on 51 directly impacted stakeholders being employees which received bonus payments but to avoid doublecounting with SDG 8, this number is not counted. PB reported on 15 directly impacted stakeholders, being students participating in a school event.
For ST, PRS reported on 39 directly impacted stakeholders being neighboring community members who participate in trainings or provide services. Further, they reported on a total of 280 students at schools where they make donations and offer programs like student internships.
For EC and QB no directly impacted stakeholders were reported.

| PP | Indirectly impacted stakeholders (=local inhabitants) | Directly impacted stakeholders | Comment on direct beneficiaries | Sources |
|---|---|---|---|---|
| FF | 19,937 | 516 | | BENEFICIARIOS DIRECTOS E INDIRECTOS_FOF.xlsx |
| PB | 3,532 | 15 | 15 students participating in school event | https://pueblosdepanama.com/pueblo/provincia-de-chiriqui-boca-del-monte/; email-monitoring-BMO-24-2.pdf; BOM_mail_harvest-communities.pdf |
| ST | 2,405 | 319 | Contractors and school children | Impacto social de las empresas QB, ST junio-octubre 2024.xlsx |
| QB | 9 | 09 | Excludes communities with QB fincas which are not included in Tropical Mix project | Impacto social de las empresas QB, ST junio-octubre 2024.xlsx |
| EC | 285 | ?0 | | Poblacion impactada con el proyecto eco cebaco_085231.xlsx |
| Total | 26,168 | 340 | | |

**SDG 8**

The numbers of employees at the end of the monitoring period are summed up, while the number of weekly working hours and trainings are averaged at project level (sum divided by 5 project participants). Below are the numbers that show that these parameters are met and improved by the project.

Table 4: SDG 8 on PP level

| | Nr. of persons on Payroll (full-time & part-time employees) | Nr. of working hours per week (m/w), including overtime | Nr. of training or workshops provided to the employees |
|---|---|---|---|
| Monitoring frequency | Annually | | |
| FF | Forestry & General: 30 (28 m, 2 f) Cacao: 31 (29 m, 2 f) | 48 | 6 |
| PB | 6 (6 m) | 48 | 3 |
| ST | 32 (25 m, 7 f) | 48 | 9 |
| QB | 39 (34 m, 5 f) | 48 | |
| EC | 16 (15 m, 1 f) | 48 | 0 |
| Total | 154 | 48 | 4 / PP (18 / 5= 3.6, rounded up) |

Topics of capacity building by ForestFinance included Use of Fire Extinguishers, FSC Training, Solid Waste Management, Teak Planting and Fertilization, ILO Conventions, Sustainability in forestry projects and Correct use of safety equipment.

. In addition to full capacity buildings counted for the SDG, the company holds regular "5-minute talks" ("Charlas de 5 minutos") on a total of 68 different topics such as sunburns, security during storms, environmental awareness or work contracts. No capacity buildings were done by Ecocebaco.

On Boca del Monte, three capacity buildings were conducted this year: one each on work risk and use of personal protection equipment, and one workshop dedicated to the forest monitoring.
Trainings conducted with worker employed on ST and QB farms include the following:

- Use and management of agrochemicals
- Aquatic transfer
- Water management
- FSC and Gold Standard
- Use of restraints, ERAS
- Risk prevention in the workplace
- General prevention rules
- Emergency response to natural disasters
- Duties and rights of the ILO + employment contracts
-

**SDG 12**

Indicator: Share (%) of timber volume verified and certified by FSC, and percentage of cocoa volume certified by UTZ in selected areas of the project.

No equations were applied. Participants confirm that all cocoa produced, and all timber sold is certified.

**SDG 15**

No equations applied. Values are derived from project shapefiles.
In this project, the main contribution to SDG 15 – Life on Land is by restoring connectivity in a fragmented landscape. This is achieved by putting areas, especially those with High Conservation Value (HCV), under special protection (see Figure 3). By that, the habitat of regional species that are under threat is restored and reconnected. During the establishment of the HCV areas, an assessment of fauna and flora species present was done.

Table 5: SDG 15 on PP level

| | Areas (ha) of degraded land and soils restored in | Share (%) of conservation areas of the project area |
|---|---|---|

| comparison with the baseline scenario | | | | | |
|---|---|---|---|---|---|
| Monitoring frequency | Monitoring period | | | | |
| Total | **PP** | **Area (ha)** | **PP** | **Area (ha)** | **Source** |
| | **FF** | 2,087.5 | **FF** | 860.03 | Shapefiles |
| | **PB** | 330.3 | **PB** | 61.11 | Shapefiles |
| | **EC** | 1,080.8 | **EC** | 939.04 | Shapefiles |
| | **ST** | 4,661.1 | **ST** | 2,539.10 | Shapefiles |
| | **QB** | 379.7 | **QB** | 270.47 | Shapefiles |
| | **Total** | 8,539.4 | **Total** | 4,669.75 = 35.26 % out of 13,242 ha project area | |
| Source | Shapefile (Mus) | | Shapefile (Landuse) | | |

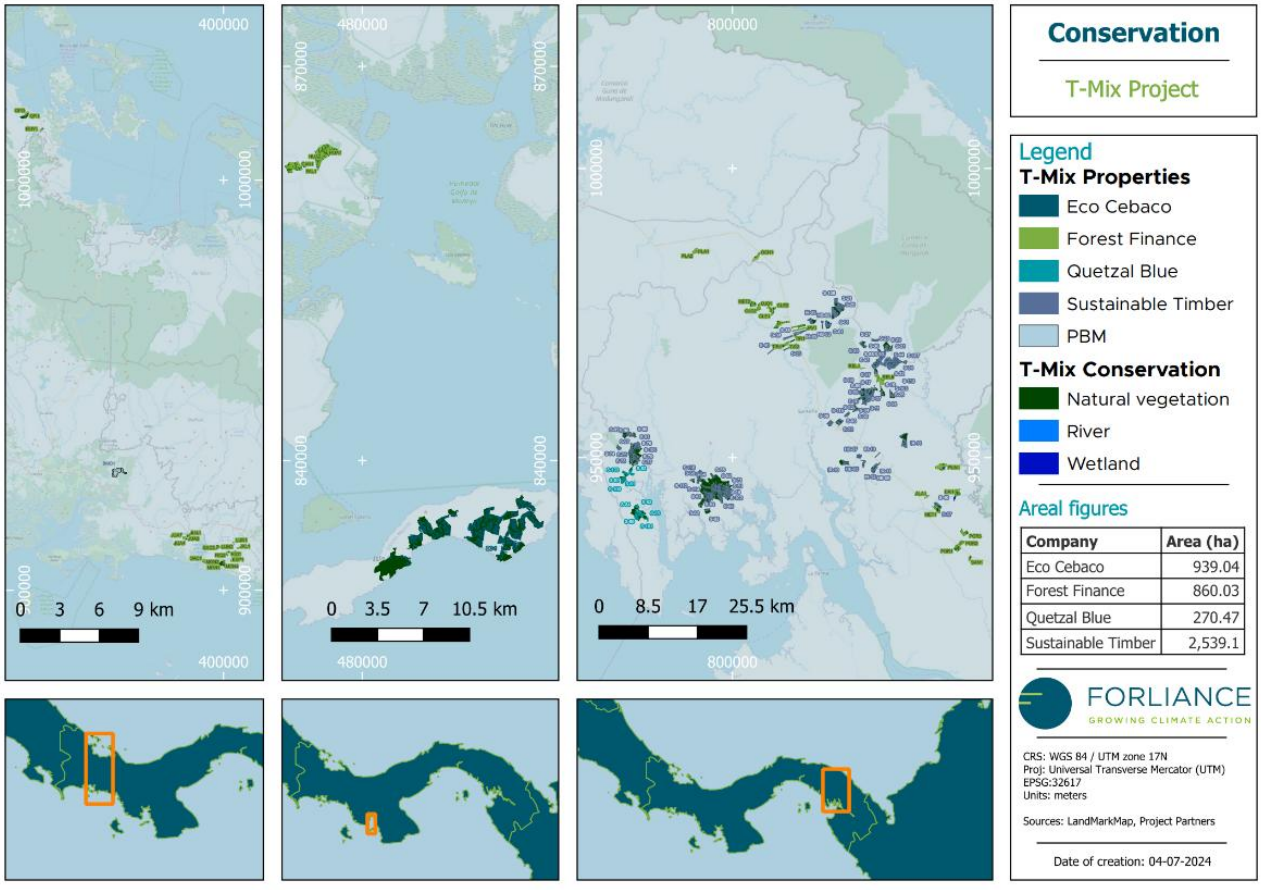


Figure 3: Conservation areas within the project area (dark green).

Species diversity is not actively monitored except for tree species which the project actively protects by cultivating them (*Bombacopsis quinata, Cedrela odorata* etc.). However, below is an overview of the fauna and flora species found in the project sites in past years (see also Folder "SDG:15_Biodiversity").

Table 6: SDG 15 / Threatened species

| | Threatened species observed in project area (all participants) | IUCN Level |
|---|---|---|
| Mammal | *Aloutta palliata* | VU |
| Plant | *Annona spraguei* | VU |
| Bird | *Ara* spp. | LC/EN |
| Plant | *Bombacopsis quinata* | VU |
| Plant | *Cecropia longipes* | EN |
| Plant | *Cedrela odorata* | VU |
| Plant | *Couratari guianensis* | VU |
| Bird | *Crax rubra* | VU |
| Plant | *Dalbergia retusa* | CR |
| Bird | *Harpia harpiya* | VU |
| Plant | *Mora oleifera* | VU |
| Plant | *Mouriri panamensis* | VU |
| Mammal | *Myrmecophaga tridactyla* | VU |
| Mammal | *Panthera onca* | NT* |
| Plant | *Platymiscium pinnatum* | NT* |
| Bird | *Quiscalus mexicanus* | VU |
| Bird | *Spizaetus ornatus* | NT* |
| Plant | *Swietenia macrophylla* | VU |
| Mammal | *Tayassu pecari* | VU |
| Plant | *Vanilla platanifolia* | EN |
| Plant | *Vitex cooperi* | EN |
| Plant | *Zanthoxylum ekmanni* | EN |
| **Total** | **22** | |

*listed because considered "EN" or "VU" by Ministerio de Ambiente.

### E.3. Calculation of leakage

There is no risk of leakage from this project, as the baseline is abandoned grass land.

**E.4. Calculation of net benefits or direct calculation for each SDG Impact**

| SDG | SDG Impact | Baseline estimate | Project estimate | Net benefit |
|---|---|---|---|---|
| 13 | Emissions Removals | 0 (20.71 $tCO_2$/ha in the first year) | 552,025 | 552,025 |
| 1 | Number of local community members benefiting from the project´s investments (indirect and direct) | 0 | 26,168 | 26,168 |
| 8 | Nr. of persons on Payroll (full-time & part-time employees) | | 154 | 154 |
| | Nr. of working hours per week (m/w), including overtime | 0 | 48 | 48 |
| | Nr. of training or workshops provided to the employees | | 4 | 4 |
| 12 | Share (%) of timber volume verified and certified by FSC, and percentage of cocoa volume certified by UTZ in selected areas of the project | 0 | 100 | 100 |
| 15 | Areas (ha) of degraded land and soils restored in comparison with the baseline scenario | 0 | 8,539.4 | 8,539.4 |

| | | | | |
|---|---|---|---|---|
| | Share (%) of conservation areas of the project area | 0 | 35.26 | 35.26 |

## E.5. Comparison of actual SDG Impacts with estimates in approved PDD

| SDG | Values estimated in ex ante calculation of approved PDD for this monitoring period | Actual values[7] achieved during this monitoring period |
|---|---|---|
| 13 | 230,219.95 [8] | 552,025t$CO_2$ |
| 1 | 1000 community members benefitting from the project's investments | 26,168 |
| 8 | - Over 100 permanent work positions<br>- 40 hours/week average working time<br>- Annual capacity building workshops | - 154 employees<br>- 48/week standard work time<br>- Average of 4 workshops per year |
| 12 | - 100% of products certified | - 100 % of products certified |
| 15 | - 8,539.4 ha of degraded lands restored and planted through A/R and Sustainable Forest Management activities.<br>- 30 % (around 5,000 ha) of conservation areas | - 8,539.4 ha restored<br>- 35.26 % protected |

7 Whenever emission reductions are capped, both the original and capped values used for calculations must be transparently reported. Use brackets to denote original values.
[8] Source: TMIX24-1_GS2940_Carbon-model_V3_final .xlsx, Sheet "6. Growth model MU", Cell AR67

E.5.1. Explanation of calculation of value estimated ex ante calculation of approved PDD for this monitoring period

SDG 13:
The ex-post credits issued for some of the project areas in the monitoring period 2019-2023 were deducted from ex-ante estimations for the whole Monitoring Period 2019-2024.

Since the project transitioned to the GS4GG long after the original PDD was constructed, no ex-ante estimation of the SDGs on a monitoring period level other than 13 exists. The ex-ante estimations fixed at the transition were done based on observed impacts by the project.

**E.6. Remarks on increase in achieved SDG Impacts from estimated value in approved PDD**

>> not applicable for afforestation and reforestation (A/R) project activities.

## SECTION F. SAFEGUARDS REPORTING

>>

The project is ensuring that all environmental and social safeguarding principles are continuously met. Many principles are met automatically by the design of the project and are therefore not relevant. Most Safeguard principles with relevance to the project (see table below) do not need mitigation due to reasons explained in the Transition Annex. In these cases, references documents are optional and are provided wherever available. As stated in the LUF Activity Requirements (2.1.5): "2.1.5 With respect to dual certification Gold Standard recognizes that FSC certification can be used to demonstrate conformity with the Safeguarding Principles Assessment and Annual Reporting Requirements". Thus, the annual FSC reports can serve as proof of compliance with most safeguarding principles.

Principles 2 and 6.1 are related to SDG 8 and therefore monitored in Section E. The same is true for Principle 6.2 being related to SDG 12. Compliance with Principles 9.1, 9.6 and 9.7 is ensured by the continuous improvement of and adherence to the forest management plans presented by the project participants.

| Safeguarding principle | Assessment question | Relevant? | Mit. required? | Reference Document |
|---|---|---|---|---|
| 2. Gender Equality | 2. Projects shall apply the principles of nondiscrimination, equal treatment, and equal pay for equal work. | Yes | No | (Optional) |
| | 3. The Project shall refer to the country's national gender strategy or equivalent national commitment to aid in assessing gender risks | Yes | No | (Optional) |
| 6.1 Labour Rights | 1.The Project Developer shall ensure that all employment is in compliance with national labour occupational health and safety laws and with the principles and standards embodied in the ILO fundamental conventions | Yes | No | (Optional) |
| | 2. Workers shall be able to establish and join labour organizations. | Yes | No | (Optional) |
| | 3. Working agreements with all individual workers shall be documented and implemented. These shall at minimum comprise: (a) Working hours (must not exceed 48 hours per week on a regular basis), AND (b) Duties and tasks, AND (c) Remuneration (must include provision for payment of overtime), AND (d) Modalities on health insurance, AND (e) Modalities on termination of the contract with provision for voluntary resignation by employee, AND Provision for annual leave of not less than 10 days per year, not including sick and casual leave. | Yes | No | (Optional)<br>- TMIX22_EJEMPLO Contrato de Roger E. Gallardo |
| | 4. No child labour is allowed (Exceptions for children working on their families' property requires an Expert Stakeholder opinion) | Yes | No | Folder "Employment" |
| | 5. The Project Developer shall ensure the use of appropriate equipment, training of workers, documentation and reporting of accidents and incidents, | Yes | No | Folder "Capacity_building" |

| | | | | |
|---|---|---|---|---|
| | and emergency preparedness and response measures. | | | |
| 6.2 Negative Economic Consequences | The Project Developer shall demonstrate the financial sustainability of the Projects implemented, also including those that will occur beyond the Project Certification period. | Yes | Companies continue to be solvent and are upscaling the project | Sustainable income is generated through sustainable timber production<br><br>See Sections D & E (SDG 12) |
| | The Projects shall consider economic impacts and demonstrate a consideration of potential risks to the local economy and how these have been taken into account in Project design, implementation, operation and after the Project. Particular focus shall be given to vulnerable and marginalised social groups in targeted communities and that benefits are socially-inclusive and sustainable | Yes | No | (Optional)<br>- ST-QB_Informe Socio-economico 2022pdf<br>- PB_Social Impact Follow Up and Updated Progress Plan |
| 9.1 Landscape modification and soil | Does the Project involve the use of land and soil for production of crops or other products? | Yes | Yes | - Folder "Forest_Management" |
| 9.6 Pesticides and fertilizers | Will the Project involve the application of pesticides and/or fertilisers? | Potential | Yes | - Folder "Fores_Management" |

| | | | | | |
|---|---|---|---|---|---|
| 9.7 Harvesting of forests | Will the Project involve the harvesting of forests? | Yes | Yes | - | Folder "Forest_Management" |

## SECTION G. STAKEHOLDER INPUTS AND LEGAL DISPUTES

**G.1. List all Inputs and Grievances which have been received via the Continuous Input and Grievance Mechanism together with their respective responses/mitigations.**

>>

None received

**G.2. Report on any stakeholder mitigations that were agreed to be monitored.**

>> None

**G.3. Provide details of any legal contest that has arisen with the project during the monitoring period**

>> None

## Revision History

| Version | Date | Remarks |
|---|---|---|
| 1.1 | 14 October 2020 | Hyperlinked section summary to enable quick access to key sections<br>Improved clarity on Key Project Information<br>Section for POA monitoring<br>Forward action request section<br>Improved Clarity on SDG contribution/SDG Impact term used throughout<br>Clarity on safeguard reporting<br>Clarity on design changes<br>Leakage section added for VER/CER projects<br>Addition of Comparison of monitored parameters with last monitoring period<br>Provision of an accompanying Guide to help the user understand detailed rules and requirements |
| 1.0 | 10 July 2017 | Initial adoption |