Forest Carbon Partnership Facility (FCPF) Carbon Fund ER Monitoring Report (ER-MR)	
ER Program Name and Country:	Payment for emission reductions project around the Taï National Park
Reporting Period covered in this report:	01-01-2024 to 31-12-2024
Number of FCPF ERs:	8,947,977
Quantity of ERs allocated to the Uncertainty Buffer:	454,673
Quantity of ERs to allocated to the Pooled Reversal Buffer:	1,964,190
Number of FCPF ERs from enhanced removals through afforestation/ reforestation	0
Number of FCPF ER from High Forest Low Deforestation (HFLD)	0
Date of Submission:	11-11-2025
Version	V3.1.2

WORLD BANK DISCLAIMER

The boundaries, colors, denominations, and other information shown on any map in ER-MR does not imply on the part of the World Bank any legal judgment on the legal status of the territory or the endorsement or acceptance of such boundaries.

The Facility Management Team and the REDD Country Participant shall make this document publicly available, in accordance with the World Bank Access to Information Policy and the FCPF Disclosure Guidance.

General guidelines on completing the ER-MR. Guidance text within the ER Monitoring template shall be considered as requirements and shall be met by the ER Program.

ER Programs shall comply with the requirements of the FCPF Methodological Framework's version available at the time of ERPA signature and the latest version of other FCPF requirements such as the Buffer Guidelines, Process Guidelines, Validation and Verification Guidelines, and the Guidelines on the application of the Methodological Framework. These versions may be found in here: https://www.forestcarbonpartnership.org/requirements-and-templates

Purpose of the ER-MR

ER Programs that have been included in the portfolio of the FCPF Carbon Fund shall implement the ER Program and report on performance, in particular ERs generated. By completing and submitting the ER Monitoring Report, a REDD Country Participant or its authorized entity officially reports on its performance to the Carbon Fund.

The FCPF Glossary of Terms provides definitions of specific terms used in the Methodological Framework, Buffer Guidelines and other requirements. Unless otherwise defined in this ER-MR template, any capitalized term used in this ER-MR template shall have the same meaning ascribed to such term in the FCPF Glossary of Terms.

Guidance on completing the ER-MR

All sections of the ER-MR shall be completed. If sections of the ER-MR are not applicable, explicitly state that the section is "Intentionally left blank" and provide an explanation why this section is not applicable. All instructions, including this section, should be deleted when submitting the ER-MR to the Facility Management Team of the FCPF.

Font of the body text shall be Calibri 10 black font.

Provide definitions of key terms that are used and use these key terms, as well as variables etc, consistently using the same abbreviations, formats, subscripts, etc. If the ER –MR contains equations, please number all equations and define all variables used in these equations, with units indicated.

The presentation of values in the ER-MR, including those used for the calculation of Emission Reductions, should be in international standard format e.g 1,000 representing one thousand and 1.0 representing one. Please use International System Units (SI units – refer to http://www.bipm.fr/enus/3_SI/si.html) unless the MF or the IPCC Guidelines indicate otherwise (e.g. tons vs Mg).

REDD Country Participants should note that if the Reporting Period does not coincide with the beginning and end of a natural year it shall apply the Guidelines on the application of the MF Number 3 on reporting periods. In this case, net ERs shall be estimated for the Monitoring Period and they shall be allocated to the Reporting Period pro-rata on the number of months. In the template Monitoring Report refers to the period used for monitoring ERs, while Reporting period refers to the period defined in the ERPA and for which ERs are paid for.

REDD Country Participants should also note that if Technical Corrections to the Reference Level have been applied in accordance with the Guidelines on the application of the methodological framework number 2 on technical corrections, then the technically corrected RL shall be reported in Annex 4 and will be subject to Validation by the Validation and Verification Body.

TABLE OF CONTENTS

LIST OF ACRONYMS

AFOLU	Agriculture Forestry and Other Land Use
AD	Activity Data
AFOR	Rural Land Agency
AGB	Above-ground Biomass
AIC	Akaike Information Criterion
ANDE	Environment National Agency
BFAST	Breaks for Additive Season and Trend
BGB	Below Ground Biomass
BNETD	National Office for Technical Studies and Development
C2D	Debt Reduction and Development Contract
CAP	Community Action Plan
CCDC	Continuous Change Detection and Classification
CF	Classified Forest
CFI	Cocoa and Forests Initiative
CH_4	Methane
CI	Confidence Interval
CIGN	Geospatial and Digital Information Center
CMC	Complaints Management Committee
CMM	Complaint Management Mechanism
CNF	National Floristic Center
CNTIG	National Committee for Remote Sensing and Geographic Information
CO_2	carbon dioxide
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
CSOs	Civil society Organization
CSRS	Swiss Center for Scientific Research
CURAT	University Center for Research and Application in Remote Sensing
DBH	Diameter at Breast Height
DGM	Dedicated Grant Mechanism
EDF	European Development Fund
EF	Emission Factors
ERP	Emission Reduction Program
ERPA	Emission Reductions Payment Agreement
ERPD	Emissions Reduction Program Document
ESA	European Space Agency
ESRI	Environmental Systems Research Institute
EU	European Union
FAO	Food and Agriculture Organization of the United Nations

FCPF	Forest Carbon Partnership Facility
FGRM	Feedback and Grievance Redress Mechanism
FIP	Forest Investment Project
FL	Forest Land
FMT	Facility Management Team
FPRCI	Foundation for Parks and Reserves of Côte d'Ivoire
FREL	Forest Reference Emission Level
FRL	Forest Reference Levels
GCF	Green Climate Fund
CIGN	Geographic and Digital Information Center
GFC	Global Forest Change
GHG	Greenhouse Gas
GPS	Global Positioning System
GRM	Grievance and Redress Mechanism
IFFN	National Wildlife Forest Inventory
IGN-FI	National Institute of Geographical and Forestry Information France International
IGT	Institute of Tropical Geography
INPHB	Félix Houphouët-Boigny National Polytechnic Institute
IPCC	Intergovernmental Panel on Climate Change
ISLA	Initiative for sustainable Land Use
M&E	Monitoring & Evaluation
MEF	Ministry of Economy and Finance
MEMINADER	Ministry of State Ministry of Agriculture and Rural Development
MINEDD	Ministry of the Environment and Sustainable Development
MINEF	Ministry of Waters and Forests
MRV	Measurement, Reporting and Verification
N_2O	Protoxide nitrogen
NFI	National Forest Inventory
NFMS	National Forest Monitoring System
NGO	Non- Governmental Organization
OIPR	Ivorian Office of Parks and Reserves
OL	Other Lands
PAD	Project Appraisal Document
PCRMF	Physical Cultural Resource Management Framework
PES	Payment for Environmental Services
PESM	Prescription of Environmental and Social Measures
PMP	Pest Management Plan
PNSFR	National Rural Land Security Program
QA	Quality Assurance

QC	Quality Control
REDD+	Reducing Emissions from Deforestation and forest Degradation
RL	Reference Level
SEP REDD+	Permanent Executive Secretariat for Reducing Emissions from Deforestation and Forest Degradation
SESA	Strategic Environmental and Social Assessment
SESMP	Simplified Environmental and Social Management Plan
SIS	Safeguards Information System
SLM	Spatial Land Monitoring
SN-REDD+	Strategy National REDD+
SODEFOR	Forest Development Corporation
SOP	Standard Operational Procedure
STI	Sustainable Trade Initiative
TMF	Tropical Moist Forest
TNP	Tai National Park
TOR	Terms of Reference
UNFCCC	United Nations Framework Convention on Climate Change
URPCI	Union of Rural Radios of Côte d'Ivoire
WB	World Bank

1 IMPLEMENTATION AND OPERATION OF THE ER PROGRAM DURING THE REPORTING PERIOD

1.1 Implementation status of the ER Program and changes compared to the ER-PD

Status of actions and interventions undertaken under the ERP

In Côte d'Ivoire, the drivers of deforestation and forest degradation are classified into 2 categories. These are direct and indirect drivers. In terms of direct drivers, the expansion of agricultural land is the main cause of deforestation and forest degradation. Agriculture accounts for 62% of the direct drivers of forest loss. Within this sector, the main crops with a significant impact on deforestation and forest degradation are cocoa, rubber and oil palm, with 38%, 23% and 11% respectively. After agriculture comes illegal logging, which accounts for 18% of deforestation. The extension of infrastructures such as housing (rural and urban) and transport (roads, railways) play a role in the loss of forest cover. The contribution of this sector is estimated at 10%. Illegal gold mining and bush fires also play a minor role, ranking fourth (8%) and fifth (3%).

In terms of indirect drivers, which are factors that encourage deforestation, several elements are listed:

- Economic factors (economic attractiveness, notably the price of agricultural commodities);
- Factors linked to the absence of regional development schemes or plans;
- Demographic factors (high population growth);
- Political and institutional factors (non-compliance with regulations due to weak governance in the forestry sector).

Details of this classification of the drivers of deforestation can be found in the report of the study on the analysis of the drivers of deforestation and forest degradation in Côte d'Ivoire (page 14 to 64). The document is available here.

To address these drivers of deforestation and forest degradation, the ERP is being implemented using a landscape approach to address all drivers of deforestation and forest degradation in a coordinated and effective manner. This landscape approach builds on the linkages between agricultural development, natural resource management and governance and aims to maximize economic, environmental and social benefits.
The ERP as designed will capitalize on emission reductions from (i) reducing deforestation, (ii) reducing forest degradation, (iii) preserving residual forests, and (iv) increasing forest carbon stocks. To this end, several projects and initiatives underway in the program area are aligned to contribute to the achievement of the program's GHG emission reduction objectives. These include:

Table 1: Ongoing projects and initiatives in the ER-Program area

Project	Activity	Summary of progress achieved
FIP (2nd phase) 2022-2029	The Development Objective is to conserve and increase the forest stock and improve access to sources of income from sustainable forest management for selected communities in target zones. The objectives are: i. Support the development of participatory forest management plans (PFMP); ii. Support the implementation of participatory forest management plans; iii. Support the sustainable management of national parks and nature reserves.	- 1 framework for the resettlement of populations infiltrated in classified forests was developed based on the Environmental and Social Standard of the World Bank. The document is available from this link. - 1 Livelihood Restoration Strategy for People Affected by Forest Restoration has been developed for the classified forests of : Haute Dodo, Rapides Grah and Scio. - 1,451 hectares, representing a completion rate of 100%. Find it at this address page 33;

		- Eight (8) regional stakeholder awareness workshops were held with 500 participants. See here page 33; - In addition, 100 community meetings were organized to raise farmers' awareness, with 16,640 participants, 27% of whom were women. More details at page 33; - Nine (9) Participatory Management Committees (PMCs) for classified forests were established. See at page 34. - A mission was carried out in the NAWA and SAN PEDRO regions to collect primary data in order to identify the communities and document the activities they have carried out as part of this project. See details at page 85-86.
Earthworm and Nestle (2020-2026)	By 2026, this project aims to: - Prevent deforestation and promote forest regeneration; - Improve the resilience of small producers; - Improve the protection of children's rights; - Establish transparent and traceable supply chains for cocoa and rubber;	- The signing of new partnership with the Swiss Confederation/SECO, Touton, and Cocoa source to continue the project for phase-2 that will last 3 years again. During this phase several activities will be done. The information can be checked in the activity report on this site p21.
SCOLUR (2024 -2027)	The project is about to Scaling up transformative innovations in food systems, land use, and cocoa-based land restoration; - rehabilitate landscapes in three regions, including Cavally and Guémon over an area of more than 5,000 hectares; - Promotion of sustainable agroforestry practices; ıstainable cocoa production;	- A workshop was held to officially launch the project and begin its related activities. - In the Guémon and Cavally regions, five information and awareness meetings were organized. A total of 384 people took part, with a female participation rate of 23%. More details at page 35-36.
ISLA (Initiative for Sustainable Land Use) IDH 2021-2025	Develop a balance between forest, agriculture, and populations; in doing so, ISLA will support the implementation of public and private sector commitments towards net zero deforestation and green growth on the ground in the TNP area.	• Development of a Regional Scheme for Planning and Sustainable Development of the Cavally Territory (SRADT) with a green growth strategy; • Promotion of agroforestry practice • Restoration of forest cover ; • Diversification of producers' activities through the financing of income-generating activities in order to reduce

		pressure on timber and non-timber resources; • Development of financial incentive measures and the creation of a public-private investment mechanism for sustainable and ecological land development. The report is available here
Regional Indicative Program - 11th EDF Union 2021-2027	PIR- 11th EDF West Africa - Priority Area 3: Resilience, Food and Nutrition Security and natural resources - Support for Tai National Park	- Protection and conservation of Taï National Park (TNP); - Development of the territory around TNP; - Support for local development around TNP; - Fight against land degradation; - Improvement of the productivity of food and energy wood sectors (agroforestry), to sustainably generate production surpluses and jobs, particularly for women in both rural and peri-urban areas; - Integration of trees into production systems for their contribution to soil management; - Respect for sustainable land management techniques, including measures related to sustainable natural resource management. The National Indicative Program in question covers the period from 2021 to 2027. It is available at the following link.
Spatial Forest Monitoring and Deforestation Early Warning System	The Geoportal for Land Monitoring System (LMS) is a web portal that aims to visualize and provide access to updated national data on the evolution of natural resources. The early warning system for deforestation should allow for the rapid detection of forest infiltrations and trigger follow-up and control operations on the ground to remedy them.	Consultations with various national stakeholders enabled finalizing the specifications for the Land Monitoring and Early Warning System for deforestation. It was adopted by the government in March 2023. In 2024, a consultant was recruited to develop the deforestation early warning platform. Technical meetings and training sessions were organized.

Strategic updates established to mitigate/minimize displacement

Efforts are made to minimize emissions displacement outside the program area. This is mainly because the proposed measures are mostly incentives rather than coercive measures that could lead to emissions displacement outside the program area.
In addition, the MRV system uses satellite monitoring procedures and tools to assess and track annual deforestation at the national level to ensure that there is no additional deforestation/forest degradation outside the program area due to program implementation. A geoportal as part of the national forest monitoring system is available. it is

accessible from this link: http://sst.geoportailsst.com/Accueil. It makes it possible to monitor the evolution of deforestation and control actions implemented by the country.
The causes of deforestation remain unchanged, all the strategies described in the ERPD (Table 2) are being implemented and the risk of displacement is still assessed and classified as low for (i) cocoa farming expansion and (ii) artisanal gold panning and medium for (i) illegal logging and (ii) demographic pressure because of population migrations to the program area.

Table 2: Strategies to combat deforestation and forest degradation

Drivers of deforestation or degradation	Displacement risk	Strategy / Action
Expansion of agriculture	Low	• From 2020 to April 2024, a total of 1,104 regular patrols and 14 large-scale patrols were carried out in and around Taï National Park by rangers and local community assistants, using advanced technology such as drones couvering more than 95% of the park area and 50% vulnerable zone. See it at page 7-8. • A total of 3,824 hectares of reforestation were carried out by SODEFOR. In addition, 954 hectares were planted under partnership agreements, and 2,106 hectares by timber operators. Furthermore, 15,807 hectares of reforested land were maintained. See the report page 10. • An ecological monitoring program is carried out each year to ensure the presence of the ecological values of the protected areas, particularly their forest cover. See the report page 13. • Launch of the operationalization of the pilot project on the deforestation alert management procedure link. OIPR develops awareness, information, education, and communication programs in the peripheral zones of Taï National Park and Mount Peko National Park to achieve a change in behavior in the relationships between local communities and nature. Globally 1 081 attendees (page 18).
Illegal logging of timber and fuelwood	Medium	Production of fuelwood, timber, and the use of improved stoves, promotion of butane gas and the use of agricultural residues and agro-industrial by-products. All these actions can be verified in the following documents: National Energy Pact for the Republic of Côte d'Ivoire (2024) Report on the Progress of the Ecological Transition in Côte d'Ivoire (2024) National Report on Climate Assessment in Côte d'Ivoire 2024
Artisanal gold panning	Low	• Strengthen the surveillance capacity of officers p.27 (both human and material resources) to prevent any intrusions and monitor these gazetted forest. • Security missions are regularly carried out by SODEFOR and OIPR officers. Nearly 293 illegal gold miners p.9-10 have been apprehended and 30 illegal gold mining sites p.16 have been destroyed. • Identify artisanal gold miners, restructure the sector with the implementation of the mining code. The gold panning rationalization program can be viewed at the following link.

Demographic Pressures (migration into the ERP zone)	Medium	• The development of the management plan for the Kroziale gazetted forest, including participatory management with local communities through the establishment of participatory forest management committees. See here p.15. • GIZ, through the (GPRLP) program, supported the digitization of land registration via the mobile application ContraTerre, developed by ProPFR and the NGO Audace Institut Afrique. Trained youth in 33 villages in western Côte d'Ivoire facilitated its use, leading to the issuance of over 2,000 property titles. Cheick here p9. • the Rural Land Security Strengthening Program (PRESFOR) led by AFOR in 2024 covers around thirty regions, including the Cavally, Guemon and Nawa regions. It aims to provide rural communities with land certificates free of charge. The terms of reference for its implementation can be viewed here. The list of all areas covered by the PRESFOR project is available on this map - Clarification and securing of land tenure and conflict resolution through the National Program for Securing Rural Land (PNSFR) which was launched in July 2018 and is led by AFOR through the PNSFR, which is implemented through several projects including PAFR which can be viewed view here.
Economic factors	Low	- In the framework of the ERP project, beneficiaries already received a ffirst paymentfrom the sale of emissions reduction generated at the first monitoring period. These include 13 257 directs beneficiaries. This information can be found here. The report of the payment launch ceremony can be viewed here. It should be remembered that payments are still in progress. • Identification of beneficiaries of monetary payments for emissions reductions, a platform has been developed for the management of beneficiaries and is available here. Statistics on potential beneficiaries registered to receive payments can be viewed from this link. • initiatives led by local communities are supported through the implementation of 64 community micro-projects and the introduction of Green Prizes, in order to reduce pressure on the natural resources of the Taï National Park and its surrounding areas. Page 23. • 55 microprojects, also called income-generating activities (AGR), were approved. This concerns 941 beneficiaries, 31% of whom are women. There are 37 collective projects and 18 individual projects.
Factors linked to the absence of regional development schemes or plans	Low	- A national land use map was produced in 2023 whose reference year is 2020 is still in effect. It serves as the basis for developing local development plans in each region. This map is available here. - Intensifying awareness-raising, information, training, and communication campaigns. Details of this information can be found at this link Page 72 -76

		- Involvement of local administrative authorities in awareness raising (Capacity building report)

Effectiveness of organizational arrangements and involvement of partner organizations

Institutional arrangements for program implementation are in place and effective. The entities and partners involved in the implementation of the program are the same as those in the first notification.

The political and cross-sectoral commitment of the various ministries for REDD+ is materialized by the creation, by Decree, of a **National REDD+ Commission,** an intersectoral organization for analysis, counselling and guidance for the implementation of the REDD+ mechanism in Côte d'Ivoire. It is composed of:

- a **National REDD+ Committee** (CN-REDD+) in charge of steering the REDD+ mechanism;
- a **REDD+ Interministerial Technical Committee** (CTI REDD+) in charge of intersectoral coordination, proposing to CN-REDD+ the main guidelines for reducing emissions from deforestation and forest degradation, and planning the implementation of CN-REDD+ decisions;

and a **REDD+ Permanent Executive Secretariat** (SEP-REDD+) which is responsible for implementing the REDD+ process, mechanisms, and tools at the national level. It is responsible for coordinating the actions and investments of all players to achieve the objectives in terms of reducing emissions and compliance with environmental and social safeguard directives. It also ensures (i) the monitoring of reduced emissions, (ii) the monitoring of the implementation and compliance with environmental and social safeguard standards, the monitoring of complaints and appeals and the application of conflict resolution decisions and (iii) reporting to the World Bank carbon fund.

The Ministry of Economy and Finance (MEF), signatory of the ERPA contracts, is the entity responsible for the implementation and success of the program. It is responsible for managing the register of carbon transactions and transfers of emission reduction titles resulting from the implementation of the program. It transferred responsibility of distributing monetary benefits to program beneficiaries, as per a subsidiary agreement, to the **Foundation for Parks and Reserves of Côte d'Ivoire** (FPRCI).

The Ministry of the Environment is the administrative authority of SEP-REDD+, OIPR and ANDE.

- Ivorian Office of Parks and Reserves (OIPR): (OIPR): Created by decree n°2002-359 on july, 24 2002 is responsible for managing a system of 19 parks and reserves in Côte d'Ivoire including two (2) parks and one reserve located in the ERP area making this zone the largest West African primary tropical forest under protection (the Taï National Park, Mount Peko National Park and the N'zo natural reserve complex). To ensure the sustainable management and conservation of representative samples of the national biological diversity within protected areas, the OIPR implements six (6) management programs such as: (i) Monitoring and protection, (ii) Ecological monitoring and research, (iii) Support to local communities,(iv) Land use planning, (v)Ecotourism and (vi) Management forest cover tracking, the natural regeneration of degraded areas, and the monitoring of key conservation targets

- National Environment Agency [1](ANDE): The ANDE's fundamental mission is to ensure that environmental concerns are considered in policies, plans, programs (PPP), and development projects initiated in Côte d'Ivoire. As such, it aims to effectively encourage all project holders to comply with national environmental regulatory requirements and to integrate their activities into a sustainable development approach. To do so, it has three (03) tools based on current regulatory texts that constitute the core of its major activities: (i) Strategic Environmental Assessment (SEA), (ii) Environmental and Social Impact Assessment (ESIA), and (iii) Environmental Audit (EA). All project activities included in the PRE receive support from ANDE in this regard. The Forest Investment Project (Phase 1) is among the projects receiving such support.

[1] www.ande-ci.com

The Ministry of Water and Forest (MINEF): Responsible for the preparation and implementation of Government policy on the management of forest, wildlife and water resources. It also coordinates the cocoa and forests initiative and it is the supervisory ministry for:

- The **Forest Development Company** (SODEFOR): whose mission is to participate in the development and implementation of Government policy in terms of enriching the national forest heritage, developing forest production, enhancing the value of products and safeguarding forest areas. It is responsible for the management of 234 classified forests spread throughout the national territory, including 24 in the program area.

The **Ministry of State, Ministry of Agriculture and Rural Development** (MEMINADER): Responsible for the implementation of agricultural policy at the national level. It is also the administrative guardian of:

  - **National Rural Development Support Agency** (ANADER): its mission is to "contribute to the improvement of living conditions in the rural world through the professionalization of farmers and professional agricultural organizations by designing and implementing appropriate tools and approaches, programs adapted to ensure sustainable and controlled development". As such, it provides support to farmers in the program area regarding the implementation of sustainable practices.
  - Coffee-Cocoa Board: is responsible for managing all activities related to the Coffee-Cocoa sector in Côte d'Ivoire. It has several missions, including regulating, stabilizing and developing the sector. Its role is to bring technological innovations and scientific research closer to producers and to support rural producers in adopting best practices related to smart agriculture, intensification and agroforestry.

- Private operators in the agricultural sector and the timber sector
- NGOs
- Bilateral agencies.

Their role is to develop and implement activities aimed at reducing greenhouse gas emissions in the program area.

For the smooth running of the emissions reduction project (ERP) 4 meetings including 2 for the steering committee and 2 for the technical committee during 2024. All reports attached to the lists of participants are available here.

Updates on the assumptions in the financial plan and any changes in circumstances that positively or negatively affect the financial plan and the implementation of the ER Program:

About the financial plan, the ERP, like all REDD+ projects, is results-based and aims to capitalize on the efforts of the programs, projects and initiatives (Table 1) and public and private investments implemented in the area. It should be remembered that the country obtained USD 35,000,000 from the revenues generated by the sale of emission reductions (7,016,884 Tco2eq) during the first notification.

Côte d'Ivoire submitted its second monitoring report reporting its performance of emissions reductions achieved over the 2022–2023 period. This resulted in the receipt of USD 15,000,000 the amount equivalent to the volume of 3,000,000 Tco2eq of emissions reductions to be delivered in order to fulfill its contract.

These funds are managed by the Foundation for the Parks and Reserves of Côte d'Ivoire (FPRCI) and are used for the day-to-day management of the project, MRV activities, estimating reduced emissions and monitoring the implementation of activities in compliance with environmental and social safeguards. These funds are also intended to reward the beneficiaries (direct and indirect) of the ERP based on a benefit-sharing plan. Details of the distribution of benefits from the first notification are available in Annex 2.

1.2 Update on major drivers and lessons learned

The drivers of deforestation and forest degradation initially described in the program area through Nitidae and BNETD (2016)[2] have not changed since the ERPD was written.
These are mainly agriculture, with cocoa farming in the lead, uncontrolled logging, bush fires (accidental or intentional, often linked to agriculture or hunting) and mining, particularly illegal artisanal gold panning. This information has been confirmed by the data assessment work on activities, the detailed results of which can be found in Section 3.
To address these factors of deforestation and forest degradation, various measures are taken while minimising the risk of displacement of populations from the program area. These measures include agroforestry and agricultural intensification with sustainable agricultural practices, land-use planning and development, rehabilitation of gold panning sites in addition to income-generating activities, participatory management of classified forests between local communities and managers, and the issuing of land certificates. These measures are detailed in section 1.1.

All these measures are implemented through various projects, including the FIP, PRESFOR, SCOLUR, the activities of the private cocoa sector, and the National Rural Land Tenure Security Program (PNSFR) and the cocoa and forest initiative, described in detail in section 1.1 by the partner entities also presented in section 1.1.
Several lessons have been learned in mitigating displacement risks. Thus, the strategies associated with these risks show that they are low for agricultural expansion and artisanal gold mining, and medium for illegal exploitation of energy wood and timber, and the displacement of populations outside the program area. The activities implemented to mitigate displacement risks are adapted to local economic and social conditions, and are mainly based on incentives, rationalization and sustainable management of natural resources exploitation and the valorization of non-carbon benefits. With regard to demographic pressure exerted on the program area, all activities currently being carried out at the national or regional level have helped limit the effect of demographic pressures. These are:

- Planning of land use and development, through support for the integration of development and management plans for protected areas (SRADT) Community plantations - food and energy wood associations in classified forests;
- Strengthening the capacities of local communities in forest management through the Forest Investment Project phase 2.
- The creation of income-generating activities by funding non-agricultural initiatives, Through the Green Awards granted by the OIPR, the prize money allows communities to carry out other activities.
- Programs such as PREFOR, led by AFOR, make it easier for rural communities to obtain land certificates free of charge, in order to secure ownership of their land.
- Various awareness campaigns, including radio programs in different local languages in ERP area are been made.

Finally, the traceability program developed as part of the Cocoa and Forests Initiative and the “zero-deforestation” policy for monitoring the cocoa supply chain coupled with the National Forest Monitoring System (NFMS) make it possible to track and detect deforestation and degradation through satellite image interpretation and on the ground. Movement surveillance is monitored both inside and outside the program boundaries.

1.3 Methodological deviations

No methodological deviations were identified during the current reporting period. The method used for the Côte d'Ivoire forest reference level submitted to the UNFCCC in 2024 is the same as that used for the emission reduction program There is therefore no impact on the estimate of the reference level and emission reductions. Côte d’Ivoire Reference Level validated by UNFCCC can be check here.

[2] Nitidae and BNETD (2016):Qualitative analysis of drivers of deforestation and forest degradation in Côte d'Ivoire http://reddplus.ci/download/analyse-qualitative-des-facteurs-de-deforestation-et-de-degradation-des-forets-en-cote-divoire-2/

2 SYSTEM FOR MEASUREMENT, MONITORING AND REPORTING EMISSIONS AND REMOVALS OCCURRING WITHIN THE MONITORING PERIOD

2.1 Forest Monitoring System

The monitoring system, whose role is to assess the country's performance in reducing emissions from deforestation and forest degradation, is implemented with several national actors according to their fields of competence.
In Côte d'Ivoire, SEP-REDD+ has the lead on National Forest Monitoring System (NFMS) activities. As such, it coordinates the work of stakeholder organisations, both at the national level and in the ERP zone, for (i) estimating data on land use change activities, (ii) estimating biomass and emission factors for the different relevant vegetation strata, (iii) estimating GHG emissions/removals due to REDD+ activities, and (iv) notifying GHGI to partners for verification.
The organisations in charge of producing activity data (AD) are:

- BNETD/CIGN is the national reference centre for map production (topographic maps and thematic maps). It produces mapping data and develops geographic information systems necessary for the study, implementation, and operation of land use planning. It coordinates and controls mapping and remote sensing work on behalf of the State of Côte d'Ivoire. In general, these are "wall-to-wall" maps that are produced from satellite image processing coupled with data collection campaigns in the field;
- CNTIG which is responsible for defining policy, organising and coordinating programmes in the field of geoinformation and applied remote sensing;
- SODEFOR is the entity responsible for providing data (geographical, socio-economic, and other statistics) related to the sustainable management of classified forests;
- OIPR is responsible for providing data (geographical, socio-economic, and other statistics) related to the management of parks and reserves;
- SEP-REDD+ is responsible for the compilation, quality control and archiving of data collected by national entities and the estimation of uncertainties associated with the surface areas of the strata
- Universities and research centres (CURAT, IGT, CNF, CSRS and INPHB) contribute to the development of methodologies and quality control of data collected by other organisations producing data on activities. In addition, the data ;

The organisations in charge of producing data on biomass and emission factors are:

- The Ministry in charge of forests (MINEF) which is the national organisation in charge of carrying out forest and wildlife inventories. As such, a national inventory of forest and wildlife resources was carried out between 2019 and 2021, in partnership with SODEFOR, OIPR and ANADER;
- SEP-REDD+, which in 2016, in partnership with SODEFOR, conducted a forest inventory to estimate the biomass of forests;
- SODEFOR, which collects dendrometric data as part of the development inventories of the classified forests under its management;
- Universities and research centres which, as part of their research work, collect dendrometric data in various ecosystems, both forest and agricultural, which are used to estimate emission factors. They also participate in the quality control of the data collected by the above-mentioned entities.

The estimation of GHG emissions/removals and emission reductions achieved from the implementation of projects and other policies on land use/land cover changes is the responsibility of SEP-REDD+.

- **Selection and management of GHG data and information**

The data used for the GHG inventory come, as indicated in the previous paragraph, from different sources. The choice of data to be used depends on a number of factors including: (i) the spatial and temporal coverage of the data, (ii) the suitability of the methodology used for its production and standard operating procedures.
National data are preferred when they meet the above conditions. Otherwise, or in the absence of relevant national data, data are sought from relevant international databases.

For the same category of data, the data are compiled, cleaned, consolidated, and archived in databases designed for this purpose and available on the SEP-REDD+ servers. This makes it possible to make them accessible later for processing but also and above all for any verifications that may be necessary.
Thus, the mapping data used for the calculation of the country's emissions or the ERP were produced by BNETD/CIGN following a methodology validated at the national level by the various stakeholders such as universities, research centres and competent national organisations. This methodology also includes the process of validation of the data produced, which meets national and international standards.
Missing biomass data are selected based on different sources of information such as research results conducted in the country or in the sub-region and published, e.g. the values used for agroforestry and cocoa biomass.

- **Process for collecting, processing, consolidating and reporting GHG data and information**

Initially, for the production of activity data, data collection was carried out by BNETD/CIGN with the participation of other organisations such as CNTIG, SODEFOR, OIPR and universities and research centres (CURAT, IGT).
This data collection was carried out at two levels : the collection of satellite images on relevant websites[3] and the collection of field data to serve as training data for classification algorithms. The data produced underwent validation at national level before publication. This validation consisted of photo-interpretation, using tools such as Collect Earth or free open-source mapping software of sample units produced according to a stratified random design.

However, it should be noted that the methodology for estimating the AD has been improved in terms of the type of sampling and size. This change is in response to technological developments in data, tools and new technical considerations (Pagliarella & al., 2017[4]; McRoberts & al., 2018[5]; Olofsson & al., 2020[6]; Sandker & al., 2021[7]). This is the same approach we used for the first and second Monitoring report.

Indeed, accurate and precise estimates of land cover/land use change area are essential to compare and measure the effect of policies and activities to mitigate, adapt or prevent climate change impact. However, individual maps contain errors which, when combined to make land cover area estimates, increase bias and prevent the characterisation of land use change to the standards required by the international community.

The methodological approach developed in 2018 for the ERPD described area estimates through a combination of data based on visual interpretation of sampling units and the use of maps. In practice, it consisted of using classified and combined maps to design a reference sample according to the practices described by Olofsson (2013[8], 2014[9]). This approach used by SEP REDD+ in 2018 for the FREL development of the ERP was updated in October 2022 with support from the World Bank, FAO and the Institut Géographique National-France International (IGN- FI), to measure reduced emissions in a robust and more accurate manner.

In the new approach, the interpreted sampling units for the estimation of land use change areas are distributed according to a systematic sampling grid spaced at 1 km, which leads to a very dense sampling design (i.e. 46415 points over the ERP area, 4,000 of which are intended for visual and fixed interpretation.

In the process, once the sampling grid was established, information from several global layers (GFC, TMF, ESA, DW, ESRI, etc.) was extracted for each point, as well as a time series of standardized vegetation indices, from different

[3] CNES website for Spot Word Heritage : https://regards.cnes.fr/user/swh/modules/60
Earth explorer : https://regards.cnes.fr/user/swh/modules/60
European Space Agency website : https://sentinels.copernicus.eu/access-to-sentinel-data-via-the-copernicus-data-space
[4]Pagliarella, et al. 2017. Spatially-balanced sampling versus unbalanced stratified sampling for assessing forest change: evidences in favor of spatial balance. https://sci-hub.wf/10.1007/s10651-017-0378-y
[5]McRoberts, et al. 2018. The effects of imperfect reference data on remote sensing-assisted estimators of land cover class proportions.https://sci-hub.wf/10.1016/j.isprsjprs.2018.06.002
[6] Olofsson & al., 2020: Mitigating the effects of omission errors on area and area change estimates. https://www.sciencedirect.com/science/article/pii/S0034425719305115
[7]Sandker & al., 2021: The Importance of High–Quality Data for REDD+ Monitoring and Reporting. https://www.mdpi.com/1999-4907/12/1/99
[8]Olofsson, et al. 2013. Making better use of accuracy data in land change studies: Estimating accuracy and area and quantifying uncertainty using stratified estimation. https://sci-hub.wf/10.1016/j.rse.2012.10.031
[9]Olofsson, et al. 2014. Good practices for estimating area and assessing accuracy of land change. https://sci-hub.wf/10.1016/j.rse.2014.02.015

remote sensing sensors (Landsat, Sentinel). The breaks in these series of indices were determined using different algorithms (BFAST, CUSUM, CCDC, LandTrendR, as well as standard statistical descriptors). All this information was integrated into a clustering model in order to identify the trajectory (stable or change) of each of the points. Taking into account the time and resources available, a sample of 4000 points sufficiently representative of the set of 46415 was selected from the combined Dalenius-Neyman method.

the same sampling will be used for the collection of past and future data. In order to harmonise the interpretations between the different operators and to reduce as much as possible the interpretation errors that could induce noise in the results, the process of sampling unit visual interpretation has been standardised by developing interpretation keys (link available here).

The information on emission/absorption factors comes from the 2016 national forest inventory conducted by MINEDD through SEP-REDD+ and SODEFOR.

To update the activity data for the preparation of the third ERP Monitoring report, the SEP-REDD+ MRV team has recruited 10 national photo-interpretation consultants specialising in remote sensing and geographic information systems, to visually interpret the 4,000 sampling units over the period 2024.

- **Systems and processes that ensure the accuracy of data and information**

Various processes and systems are in place to ensure the accuracy of the data and information produced by the MRV system. These are:

- The implementation of QA/QC processes in all data production processes;
- The development of standard operating procedures (SOPs) for the collection, processing, archiving and management of data. They are described in detail in the below paragraphs ;

Thus, for the period 2024, the experts of the Côte d'ivoire MRV team have built the capacities of the 10 photo-interpreter consultants in accordance with the SOPs initially defined for the first notification and which was used for the second notification.

- To ensure that changes, and more specifically deforestation, have not been overestimated or underestimated, the MRV team, with technical support from the FAO, generated a sample of 509 points based on the probability of change over the period 2024 (year of notification). It should be noted that this dataset of 509 plots is different from the 4,000 points initially used. The idea is to capture new changes over the period from January 1, 2024, to December 31, 2024. The idea was to find out whether the trend toward deforestation was significant. The comparison of the deforestation trend in the two interpreted data sets is similar and confirms that the estimates are neither underestimated nor overestimated. Thus, the same approach that was initially used to determine 4,000 points was used (The algorithms were run again to see the probability of change). It is described in Figure 3 of the ER-MR on page 42. The deforestation trend (2 plots out of 509, or 0.4%) is considered low. This trend is consistent with the one observed with the 4,000 points interpreted over the same period in 2024 (3 points of deforestation). This confirms that deforestation is neither underestimated or overestimated.

- **Design and maintenance of the Forest Monitoring System**

A geoportal has been developed as part of the national forest monitoring system. This portal is developed by the CNTIG and allows the sharing of information with the large public.
In addition to a specific platform has been developed for the registration and management of project beneficiaries. this makes it possible, among other things, to identify the different initiatives contributing to the reduction of emissions in the program area and also to implement the benefit sharing plan.
Improvements are underway to facilitate public consultation of data in the form of a register of emissions reduction initiatives in the PRE area.

- **Systems and processes that support the Forest Monitoring System, including Standard Operating Procedures (SOPs) and QA/QC procedures**

The daily management of classified forests is carried out by SODEFOR. While that of the rural domain is carried out by the MINEF. It should also be noted that the parks and reserves are monitored and administered by the OIPR. All these entities are responsible for carrying out forest monitoring actions in their respective areas of intervention. For Quality, Assurance and Quality Control have been produced.

Implementation of QA/QC processes in all data production processes:

Case of forest inventory data. A field data collection manual has been developed to serve as a guide. This manual is available here. Subsequently, training of data collection teams was carried out with a view to strengthening their competence. A pilot phase of data collection allowed the teams to understand the collection process; In the field, data collection was done in 2 formats, paper (field sheet) and digital (tablets on which the Collect tool was installed). The verification of the conformity of the data collected on the field sheets and tablets made it possible to make corrections if necessary;- The establishment of mixed teams (SEPREDD+, universities and research centers, and civil society organizations) for missions of control and verification of the data inventoried in the field.

- In terms of activity data, 4 standard operating procedure (SOP) documents have been established.
They are described in detail and accessible at the following links:

- SOP1 : Design of the sampling plan. This document describes a spatially referenced, probability-based sampling design and a balanced geographic distribution for estimating land use and land change.
- SOP2 : Response System. This procedure describes how to assign labels (occupancy or land use category) to a sample unit. The response plan provides the best available classification of changes for each spatial unit sampled and contains all the information necessary to replicate the process of labeling the sampling unit. The response plan establishes an objective procedure that interpreters can follow and that reduces interpretation bias.
- SOP3 : Baseline Data Collection. This SOP explains how to set up and execute data collection for visual sample interpretation using primarily remote sensing data for sample information collection and quality management.
- SOP4 : Analysis system. This SOP describes how area estimates and their uncertainties through the combined use of reference data and maps.

- **Role of local communities**

-The National Federation of Environmental and Sustainable Development Networks, NGOs and Associations (FEREAD) has been carrying out awareness-raising and beneficiary mapping actions taking gender into account in 2024. Preparation and training workshops for this network of NGOs carried out in 2024 are available here.
– Traditional authorities and NGOs participate in information, awareness-raising and stakeholder mobilization activities for the implementation of project activities and ensure their continuity.
– Local communities organized into NGOs, associations and others are responsible for contributing to the identification, mapping, and monitoring of the achievements of the direct beneficiaries of the project.
As part of the identification of project beneficiaries, a Notice of Expression of Interest was launched and allows the registration of communities and populations having carried out activities that have contributed to the reduction of emissions. All data (geolocated plots) can be integrated into the national forest monitoring system.
The project carried out several awareness-raising activities through radio broadcasts in local languages and announcements shared via press books. The contracts and reports related to partnerships with the ten radio stations and the project can be found here.

- The first wave of beneficiaries from local communities who received their payments have committed to raising awareness in their villages. Video footage of the payment ceremony for the first cohort is available here.

- **Use of basic technical procedures, their uniformity in the country and their consistency with the National Forest Monitoring System**

All procedures and methodologies to produce AD and Emission Factors (EFs) are defined and validated at the national level by all actors in the NFMS. The methodologies designed by these structures (BNETD, CURAT, IGT, CNTIG, SODEFOR, OIPR MINEF), are the same and respond to the local and international context and the roles and responsibilities of the different national organisations remain identical.
The map captions have been harmonised and are used by all the national organisations in their various productions (land use maps and NFI).
The collection procedures on EFs are the same used at national and sub-national level. It should be recalled that the procedure for producing DAs is the one currently used for determining AD at both subnational and national levels in the context of developing FRELs.

2.2 Updates to the monitoring approach

The monitoring approach has not been updated (compared to the description of the monitoring plan that was provided in the validated version of annex 4 of the first Monitoring Report). As such, this section is not applicable.

2.3 Measurement, monitoring and reporting approach

2.3.1 Line Diagram

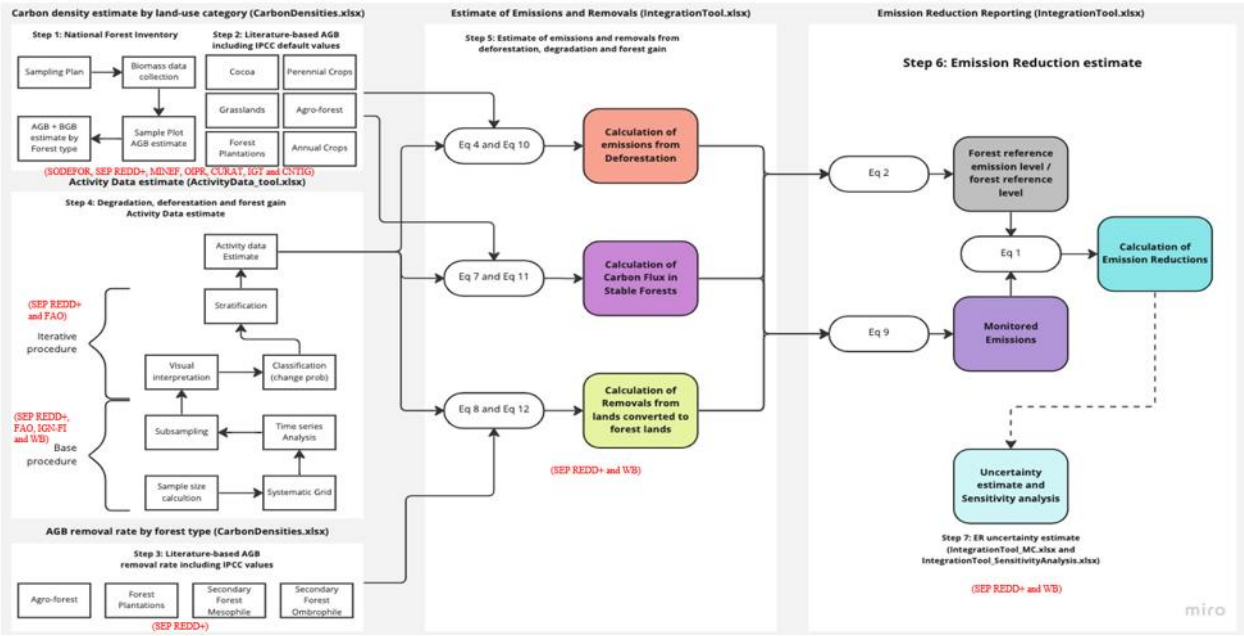


Figure 1: Organizational structure and GHG estimation method

2.3.2 Calculation

>

Emission reduction calculation ($ER_{ERP,t}$):

To determine GHG emission reductions, the same IPCC methods and equations described in Section 8.3 of the first ER-MR [10]were used over the monitoring period.

$$ER_{ERP,t} = RL_t - GHG_t \qquad \textit{Equation 1}$$

Where:

ER_{ERP}	=	Emission Reductions under the ER Program in the Reporting Period; tCO_2.
RL_{RP}	=	Net missions of the Reference Level over the Reference Period; tCO_2e. This is sourced from Annex 4 of the first ER Monitoring Report and equations are provided below.
GHG_t	=	Monitored emissions during the Reporting Period; tCO_2e;
T	=	Number of years during the reporting period; dimensionless.

Reference Level (RL_{RP})

The RL estimation may be found in Annex 4 of the first ER-MR, yet a description of the equations is provided below.

Net emissions of the RL from deforestation over the Reference Period (RL_{RP}) are estimated as the sum of annual change in total biomass carbon stocks (deforestation and degradation), and annual removals (ΔC_{B_t}) during the reference period.

$$RL_{RP} = \frac{\sum_t^{RP} \Delta C_{LU_{RP,i,t}}}{RP} \qquad \textit{Equation 2}$$

Where:

$\Delta C_{LU_{RP,i,t}}$	=	Balance of emissions during the Reference Period in the Accounting Area of the ER Program that corresponds to the sum of annual change in carbon stocks and removals for each of i REDD+ activities at year t; tCO_2*year^{-1}.
RP	=	Reference period; years.

Technical corrections: The reference level for the ERP was initially determined for 16 years (January 1, 2000 to December 31, 2015) in line with the reference level submitted to the UNFCCC in 2017. However, according to criteria 11.2 and 16 of the Methodological Framework, the reference period should not exceed 15 years. To correct this issue, a pro-rata estimate of a 15-year Forest Reference Emission Level / Forest Reference Level was calculated. Considering that the reference period was estimated based on two monitoring events (2000-2010 and 2010-2015), the emission of the 2000-2010 period was pro-rated to an adjusted period 2001-2010. Finally, the new Reference Level was calculated by adding adjusted emissions of 2001-2010 with emissions of 2010-2015 to obtain the reference level emission adjusted to 15-year reference period.

Annual change in total biomass carbon stocks forest land converted to another land-use category ($\Delta C_{B_{defo,t}}$)

Emissions from deforestation were estimated based on the Deforestation Sheet of Activity data tool following the 2006 IPCC Guidelines, the annual change in total biomass carbon stocks forest land converted to other land-use category ($\Delta C_{B_{defo,t}}$) would be estimated through the following equation:

$$\Delta C_{B_{defo,t}} = \Delta C_G + \Delta C_{CONVERSION} - \Delta C_L \qquad \textit{Equation 3} \text{ (Equation 2.15, 2006 IPCC GL)}$$

10 https://www.forestcarbonpartnership.org/sites/default/files/documents/civ_1st_fcpf_emission_reductions_monitoring_report_v1.2_19.03.2024_final_0.pdf

Where:

$\Delta C_{B_{defo,t}}$	Annual change in carbon stocks in biomass on land converted to other land-use category, in tones C yr^{-1};
ΔC_G	Annual increase in carbon stocks in biomass due to growth on land converted to another land-use category, in tones C yr^{-1};
$\Delta C_{CONVERSION}$	Initial change in carbon stocks in biomass on land converted to other land-use category, in tones C yr^{-1}; and
ΔC_L	Annual decrease in biomass carbon stocks due to losses from harvesting, fuel wood gathering and disturbances on land converted to other land-use category, in tones C yr^{-1}.

Following the recommendations set in chapter 2.2.1 of the GFOI Methods Guidance Document[11] for applying IPCC Guidelines and guidance in the context of REDD+, the above equation will be simplified and it will be assumed that: a) the annual change in carbon stocks in biomass ($\Delta \boldsymbol{C_B}$) is equal to the initial change in carbon stocks ($\Delta \boldsymbol{C_{CONVERSION}}$); b) it is assumed that the biomass stocks immediately after conversion is the biomass stocks of the resulting land-use. Therefore, the annual change in carbon stocks would be estimated as follows:

$$\Delta \boldsymbol{C_B} = \Delta \boldsymbol{C_{CONVERSION}}$$

$$\Delta C_{B_t} = \sum_{j,i} \left\{ \left(B_{After,i} - B_{Before,j} \right) \times A(j,i)_{RP} \right\} \times CF \times \frac{44}{12} \qquad \textbf{\textit{Equation 4}} \text{ (Equation 2.16, 2006 IPCC GL)}$$

Where:

$A(j,i)_{RP}$	Area converted/transited from forest type j to non-forest type *i* during the Reference Period, in hectares per year. In this case, twenty-four forest land conversions are possible:

1 Agro-forest to Cocoa
2 Agro-forest to Grassland
3 Agro-forest to Human settlement
4 Agro-forest to Other crops
5 Agro-forest to Other lands
6 Agro-forest to Perennial crops
7 Dense Forest to Cocoa
8 Dense Forest to Grassland
9 Dense Forest to Human settlement
10 Dense Forest to Other crops
11 Dense Forest to Other lands
12 Dense Forest to Perennial crops
13 Forest plantations / reforestation to Cocoa
14 Forest plantations / reforestation to Grassland
15 Forest plantations / reforestation to Human settlement
16 Forest plantations / reforestation to Other crops
17 Forest plantations / reforestation to Other lands
18 Forest plantations / reforestation to Perennial crops
19 Secondary Forest to Cocoa
20 Secondary Forest to Grassland

[11]Page 44, GFOI (2013) Integrating remote-sensing and ground-based observations to estimate emissions and removals of greenhouse gases in forests: Methods and Guidance from the Global Forest Observations Initiative: Pub: Group on Earth Observations, Geneva, Switzerland, 2014.

21 Secondary Forest to Human settlement
22 Secondary Forest to Other crops
23 Secondary Forest to Other lands
24 Secondary Forest to Perennial crops

Technical corrections. Initially, in the ERPD, activity data was determined based on the combination of several maps on which a random sampling system is applied to carry out visual interpretations through operators, as recommended by Olofsson et al. (2013 and 2014). Although this approach reduces the errors of omission of change, they remain significant. A hybrid approach for estimating areas has been adopted to correct these errors and obtain relevant and precise results.

$B_{Before,j}$ Total biomass of forest type j before conversion/transition, in tons of dry matter per ha. This is equal to the sum of aboveground ($AGB_{Before,j}$) and belowground biomass ($BGB_{Before,j}$) and it is defined for each forest type.

$B_{After,i}$ Total biomass of non-forest type i after conversion, in tons dry matter per ha. This is equal to the sum of aboveground ($AGB_{After,i}$) and belowground biomass ($BGB_{After,i}$) and it is defined for each of the non-forest IPCC Land Use categories.

Technical corrections. **Forest carbon densities**: Dense Forest and secondary forest biomass values have been updated considering the recommendations of Carbon Fund participants in 2019 relating to the plot stratification approach. Indeed, the initial approach developed in the ERPD indicated a classification of the sampling units of the forest inventory based on the rate of cover estimated from the visual interpretation of satellite images, deemed irrelevant. Data updating is based on direct field observations that inventory teams provide during surveys. Field sheets[12] and database[13] describing the land cover category of the sampling units are available. Biomass values related to agroforests and forest plantations under the ER Program were obtained through the literature. These are the results from work carried out by Asigbaase et al., (2021)[14] in Ghana. Indeed, before the submission of the ERPD in January 2019, no legal texts were ruling on the agroforest category as a forest class. Since the clarification provided by the forest code LAW N ° 2019-675 OF JULY 23, 2019, available here, this correction has been considered by integrating emission factors from the agroforest category. **Non-Forest carbon densities**: Initially, it was assumed that Cocoa biomass is carbon density for non-forest land use. Other non-forest land use was included in the carbon accounting due to the re-calculation of activity data. Therefore, the following carbon densities were included in the calculation of emissions from deforestation: perennial crops, annual crops, and grassland. The biomass values for these land uses were obtained through the literature.

[12] NFI Field sheets: https://drive.google.com/drive/folders/1FZjLxTm6qc5RakJ0x2GoOuQNqVbaTNLg?usp=share_link
[13] NFI land cover category database - http://reddplus.ci/download/forest-type-biomass/
[14] https://www.sciencedirect.com/science/article/abs/pii/S0167880920303789?via%3Dihub

For the aboveground biomass of the annual crop category, the value from IPCC GL 2006, TABLE 5.9, Volume 4, Chapter 5 was used as country specific data is not available[15].

Land category	AGB			
Other crop (annual)	**AGB (t/C/ha)**	**AGB (tdm/ha)**	90% Confidence Interval [tdm/ha]	90% Confidence Interval [%]
	2.6	5.53	4.15	75%

CF — Carbon fraction of dry matter in tC per ton dry matter. The value used is:

- **0.47** is the default for (sub)tropical forest as per IPCC AFOLU guidelines 2006, Table 4.3.

44/12 — Conversion of C to CO_2

Annual change in carbon stocks in biomass on forestland remaining forestland ($\Delta \boldsymbol{C}_{\boldsymbol{B}_{deg,t}}$)

Following the 2006 IPCC Guidelines the annual change in carbon stocks in biomass on forestland remaining forestland ($\Delta \boldsymbol{C}_{\boldsymbol{B}_{DEG}}$) could be estimated through the Gain-Loss Method or the Stock-Difference Method as described in Chapter 2.3.1.1 of Volume 4 of the 2006 IPCC Guidelines.

$$\Delta \boldsymbol{C}_{\boldsymbol{B}} = \Delta \boldsymbol{C}_{\boldsymbol{G}} - \Delta \boldsymbol{C}_{\boldsymbol{L}}$$ **Equation 5** (Equation 2.7, 2006 IPCC GL)

$$\Delta \boldsymbol{C}_{\boldsymbol{B}} = \frac{(\boldsymbol{C}_{\boldsymbol{t_2}} - \boldsymbol{C}_{\boldsymbol{t_1}})}{(\boldsymbol{t_2} - \boldsymbol{t_1})}$$ **Equation 6** (Equation 2.8 (a), 2006 IPCC GL)

$\Delta \boldsymbol{C}_{\boldsymbol{B}}$ — Annual change in carbon stocks in biomass for each land sub-category, in tones C yr^{-1} .ha

$\Delta \boldsymbol{C}_{\boldsymbol{G}}$ — annual increase in carbon stocks due to biomass growth for each land sub-category, considering the total area, tones C yr-

$\Delta \boldsymbol{C}_{\boldsymbol{L}}$ — annual decrease in carbon stocks due to biomass loss for each land sub-category, considering the total area, tones C yr-1

$\boldsymbol{C}_{\boldsymbol{t_2}}$ — total carbon in biomass for each land sub-category at time $\boldsymbol{t_2}$, tonnes C

$\boldsymbol{C}_{\boldsymbol{t_1}}$ — total carbon in biomass for each land sub-category at time $\boldsymbol{t_1}$, tonnes C

Following the recommendations set in chapter 2.2.2 of the GFOI Methods Guidance Document[16] for applying IPCC Guidelines and guidance in the context of REDD+, the above equation will be simplified, and it will be assumed that: a) the annual change in carbon stocks in biomass ($\Delta \boldsymbol{C}_{\boldsymbol{B}}$) due to degradation is equal to the annual decrease in carbon stocks (b) the decrease in carbon stocks occurs the year of conversion. The long-term decrease in carbon stocks indicated in equation (1) of the GFOI MGD is assumed here to be zero. Therefore, considering the GFOI MGD the IPCC equation for forest degradation could be expressed as an Emission Factor time activity data as follows:

$$\Delta \boldsymbol{C}_{\boldsymbol{B}_{DEG}} = \sum_{\boldsymbol{j}} \{\boldsymbol{EF}_{\boldsymbol{j}} \times \boldsymbol{A}(\boldsymbol{a}, \boldsymbol{b})_{\boldsymbol{RP}}\}$$ **Equation 7**

[15] IPCC 2006, Volume 4, Chapter 5 https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_05_Ch5_Cropland.pdf

[16] Page 48, GFOI (2013) Integrating remote-sensing and ground-based observations for estimation of emissions and removals of greenhouse gases in forests: Methods and Guidance from the Global Forest Observations Initiative: Pub: Group on Earth Observations, Geneva, Switzerland, 2014.

Where:

$\mathbf{EF_j}$ Emission factor for degradation of forest type a to forest type b, tones CO2 ha^{-1}.

$A(a,b)_{RP}$ Area of forest type a converted to forest type b (transition denoted by a,b) during the Reference Period, ha yr^{-1}.

Technical corrections. Initially, the forest degradation emissions estimate corresponded to the area of forest land remaining in the Forest Land category with a decrease in cover and biomass in the Ombrophilics and mesophilic areas. It had been considered as forest degradation in those forest areas with a forest cover rate of more than 70% in 2000, which decreased to a forest cover rate between 30-70% in 2015. Now, this calculation corresponds to the areas of forested lands converted into other forest types. All transitions between secondary and dense forests, agroforests, and forest plantations are considered

The below equations are the result of the technical corrections applied to the Program:

Annual change in carbon stocks in biomass on non-forestland converted in forestland ($\Delta C_{B_{reg}}$)

Land converted to forest land CO2 removals has been estimated following the recommendations set in the Guidance Note for accounting of legacy emissions/removals of the FCPF (version 1). Since the FCPF Methodological Framework requires IPCC Tier 2 or higher method, the net annual CO2 removals are calculated using equations 2.15 and 2.16 from the 2006 IPCC Guidelines, Volume 4, Chapter 2. These equations were simplified by assuming that the conversion from non-forest to forest occurs during a period from average carbon stocks in non-forest to average carbon stocks in forests. A conservative default period of 20 years is assumed for the forest to grow from the carbon stock levels of non-forest to the level of biomass in the average forest. The removal estimate considers changes in carbon stocks in aboveground biomass. Using the outcome of equation 2.15 and 2.16, it was determined the changes in the total carbon stocks in biomass (removals) during the reference period as the sum of the total carbon stocks in biomass of all land units. From the point of view of notations, the emission factors in equation EQ7 above would be replaced by $\mathbf{RF}_{SREG}$ in enhancement of carbon stocks in new forests.

$$\Delta C_{B_{reg}} = \sum_{LU=1}^{n} \{RF_{reg} \times A(i,j)_{RP}\} \qquad \textbf{Equation 8}$$

Where:

RF_{reg} enhancement of carbon stocks in new forests [tCO2*ha*$year^{-1}$].

$A(j,i)_{RP}$ Area of non-forestland *i* converted to forestland *j* (transition denoted by *i,j*) in the Reference Period, ha yr^{-1}.

LU Land unit.

Technical corrections. Carbon removals estimate include all secondary forest cohorts regenerated after 2000. The Secondary Forest regenerated before the reference period is assumed as Degraded Forests. Land converted to forest land CO_2 removals have been estimated following the recommendations set in the Guidance Note for accounting of legacy emissions/removals of the FCPF (version 1). A conservative default period of 20 years is assumed for the forest to grow from the carbon stock levels of non-forest to the level of biomass in the average forest. The removal estimate considers changes in carbon stocks in aboveground biomass. The changes in the total carbon stocks in biomass (removals) during the reference period were determined as the sum of the total carbon stocks in biomass of all land units. **Removal factors**: in the ER-PD the removals estimate is based on native forest regeneration only. Forest plantation and Agro-forest removals were included. For forest plantations and agroforestry systems IPCC (2006) values of tables 5.2 and 4.10 were used.

Domain	ecological zone	**AGB**

Tropical	Tropical moist deciduous	RF_{reg} < 20 years	tdm/ha	90% Confidence Interval [tdm/ha]	90% Confidence Interval [%]
			195.5 tdm/ha	175.95	90%

IPCC 2019 refinement to the 2006 Guidelines, volume 4. table 4.8 (updated) aboveground biomass (AGB) in forest *Tectona grandis* plantations (tonnes d.m. ha-1) available here.

BGB annual growth was excluded.

Tectona grandis is used as evidence because this species is indicated as the major species in reforestation in Côte d'Ivoire. This can be verified in the report on the general state of the forest, fauna and flora on page 42. This document is available here. Furthermore, of the values proposed by the IPCC (IPCC 2019 refinement to the 2006 Guidelines, volume 4. table 4.8 updated aboveground biomass in forest plantations), only the species *tectona grandis* is used for reforestation in the ERP area.

Monitored emissions (GHG_t)

Annual GHG emissions over the monitoring period in the Accounting Area (GHG_t) are estimated as the sum of annual change in total biomass carbon stocks (ΔC_{B_t}).

$$GHG_t = \frac{\sum_t^T \Delta C_{LU_{MP,i,t}}}{T} \qquad \textbf{Equation 9}$$

Where:

$\Delta C_{LU_{MP,i,t}}$ = Balance of emissions during the Monitoring Period in the Accounting Area of the ER Program that corresponds to the sum of annual change in carbon stocks and removals for each of i REDD+ activities at year t; tCO_2*year^{-1}.

T = Number of years during the monitoring period; dimensionless.

Annual change in total biomass carbon stocks forest land converted to another land-use category ($\Delta C_{B_{defo,t}}$)

The annual change in total biomass carbon stocks forest land converted to other land-use category ($\Delta C_{B_{defo,t}}$) would be estimated through **Equation 4** above. Making the same assumptions as described above for the RL the change of biomass carbon stocks could be expressed with the following equation:

$$\Delta C_{B_t} = \sum_{j,i} \left\{ \left(B_{After,i} - B_{Before,j} \right) \times A(j,i)_{RP} \right\} \times CF \times \frac{44}{12}$$ ***Equation 10*** (Equation 2.16, 2006 IPCC GL)

Where:

$A(j,i)_{RP}$ Area converted/transited from forest type j to non-forest type *i* during the Monitoring Period, in hectares per year. In this case, twenty-four forest land conversions are possible:

1 Agro-forest to Cocoa
2 Agro-forest to Grassland
3 Agro-forest to Human settlement
4 Agro-forest to Other crops
5 Agro-forest to Other lands

6 Agro-forest to Perennial crops
7 Dense Forest to Cocoa
8 Dense Forest to Grassland
9 Dense Forest to Human settlement
10 Dense Forest to Other crops
11 Dense Forest to Other lands
12 Dense Forest to Perennial crops
13 Forest plantations / reforestation to Cocoa
14 Forest plantations / reforestation to Grassland
15 Forest plantations / reforestation to Human settlement
16 Forest plantations / reforestation to Other crops
17 Forest plantations / reforestation to Other lands
18 Forest plantations / reforestation to Perennial crops
19 Secondary Forest to Cocoa
20 Secondary Forest to Grassland
21 Secondary Forest to Human settlement
22 Secondary Forest to Other crops
23 Secondary Forest to Other lands
24 Secondary Forest to Perennial crops

$B_{Before,j}$	Total biomass of forest type j before conversion/transition, in tons of dry matter per ha. This is equal to the sum of aboveground ($AGB_{Before,j}$) and belowground biomass ($BGB_{Before,j}$) and it is defined for each forest type.
$B_{After,i}$	Total biomass of non-forest type i after conversion, in tons dry matter per ha. This is equal to the sum of aboveground ($AGB_{After,i}$) and belowground biomass ($BGB_{After,i}$) and it is defined for each of the non-forest IPCC Land Use categories.
CF	Carbon fraction of dry matter in tC per ton dry matter. The value used is: • **0.47** is the default for (sub)tropical forest as per IPCC AFOLU guidelines 2006, Table 4.3.
$44/12$	Conversion of C to CO_2

Annual change in carbon stocks in biomass on forestland remaining forestland ($\Delta \boldsymbol{C_{B_{deg,t}}}$)

The Annual change in carbon stocks in biomass on forestland remaining forestland ($\Delta \boldsymbol{C_{B_{deg,t}}}$) would be estimated through **Equation 7** above. Making the same assumptions as described above for the RL the change of biomass carbon stocks could be expressed with the following equation:

$$\Delta \boldsymbol{C_{B_{DEG}}} = \sum_{j} \{\boldsymbol{EF_j} \times \boldsymbol{A(a,b)_{MP}}\} \qquad \textbf{Equation 11}$$

Where:

$\mathbf{EF_j}$	Emission factor for degradation of forest type a to forest type b, tones CO2 ha^{-1}.
$\boldsymbol{A(a,b)_{MP}}$	Area of forest type a converted to forest type b (transition denoted by a,b) during the Monitoring Period, ha yr^{-1}.

Annual change in carbon stocks in biomass on non-forestland converted in forestland ($\Delta \boldsymbol{C_{B_{reg}}}$)

Annual change in carbon stocks in biomass on forestland remaining forestland ($\Delta C_{B_{reg}}$) would be estimated through **Equation 8** above. Making the same assumptions as described above for the RL the change of biomass carbon stocks could be expressed with the following equation:
:

$$\Delta C_{B_{reg}} = \sum_{LU=1}^{n} \{RF_{reg} \times A(i,j)_{MP}\} \qquad \textbf{Equation 12}$$

Where:

RF_{reg}	enhancement of carbon stocks in new forests [tCO2*ha*year^{-1}].
$A(j,i)_{MP}$	Area of non-forestland *i* converted to forestland *j* (transition denoted by *i,j*) in the Monitoring Period, ha yr^{-1}.
LU	Land unit.

3 DATA AND PARAMETERS

3.1 Fixed Data and Parameters

Parameter:	$AGB_{Before,j}$
Description:	*Aboveground biomass of forest before conversion,*
Data unit:	*ton of dry matter per ha*
Source of data or description of the method for developing the data including the spatial level of the data (local, regional, national, international):	The data used in this document are from Tier 2 level (country-specific data) and come from the National Forest Inventory of 2017 for forests (dense forest and secondary forest in the ombrophilic sector; dense forest and secondary forest in the mesophilic sector). All NFI data and script can be found here. Each teaching unit has 4 plots, for a total of 600 plots. The data are sufficiently representative of the program area and allowed accurate estimates of emission factors. The biomass of forest strata before conversion was obtained using a 3-phase approach: (i) sampling plan development, (ii) field data collection and (iii) biomass estimation. **i. Sampling plan** The sampling plan adopted for collecting forest biomass data in Côte d'Ivoire is stratified random and was based on the country's phytogeographical zoning (ombrophilous, Mesophilic, pre-forest and Sudanese). This sampling technique has several advantages, including (i) the elimination of any subjectivity in the choice of sampling units to be measured, (ii) the calculation of parameters per stratum and of the distinct sampling error for certain strata, and (iii) the reduction of the variability of a parameter of a given stratum. Sampling units are available via this link. The sampling units are clusters of 500 m x 500 m consisting of four rectangular observation plots of 25 m x 200 m. Each SU thus covers an area of 25 hectares. The coordinates of the centre of

these units correspond to the coordinates of the points on the survey plan. Once the centre of the SU is located and established, the four plots are set up inside the SU and arranged in a cross pattern. They are each located 50 m from the centre of the SU and are numbered clockwise from 1 to 4.

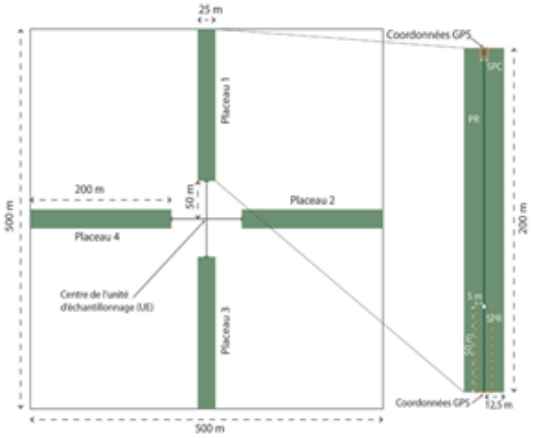


figure 2: Sampling unit

The forest strata resulting from the inventory are recorded in the table below:

IPCC Category	Phytogeographic zones	Forest class
Forest land	Ombrophilous	Dense forest
		Secondary forest
	Mesophilic	Dense forest
		Secondary forest

ii. Data gathering

A three-level collection system is implemented within each SU, corresponding to three different levels of readings:

- level 1 consists of four rectangular plots of 25 m x 200 m each intended for measuring trees with a DBH ≥ 10 cm, standing, dead wood standing, dead wood lying on the main strip (axis of the plot);
- Level 2 consists of a rectangular sub-plot of 10 mx 50 m each located inside each rectangular space. It is intended for measuring trees with small diameters (5 cm ≤ DBH < 10 cm);
- Level 3 consists of a square sub-plot of 5 m x 5 m in each plot and intended for the assessment of biodiversity (count of individuals of woody species with DBH < 5 cm and height ≥ 1.30 m).

For levels 1 and 2, the measurements related to the height, the diameter at breast height (DBH = 1.30 m) and observations on the health status of the tree. The diameter of lying dead wood was measured on the 200 m of the main section of the plot (level 1). For level 3, observations focused on the presence or absence of woody species whose total height is greater than or equal to 1.30 m and diameter less than 5 cm.

<table>
<tr><td></td><td>
The details of the collection method can be viewed from the following link.
iii. Estimation of above-ground biomass (AGB) at the sample level
The pantropical allometric equation developed by Chave et al. (2014) was used to convert field measurements into estimates of aboveground biomass (AGB) because it is considered more robust (s= 0.357; Akaike Information Criterion (AIC)=3130 and df=4002), recent and covers a wide range of vegetation types, for a total of 4004 trees ranging in trunk diameter from 5 cm to 212 cm, and includes data from other pantropical equations including Brown's equation (1997), the Chave (2005) and that of Fayolle (2013).
Model 4 of the Chave et al. (2014) was used for biomass estimates. It is based on the diameter at breast height (DBH), the height of the tree and the basic density of the wood. The mathematical expression of this allometric equation is:
$AGB = 0.0673 \times (r\ DHP^2\ H)^{0.976}$
Where :
- AGB is the estimated aboveground biomass in Kg;
- DHP is the diameter at breast height in cm;
- H is the total height of the tree (m);
- r is the specific density of the wood (g.cm-3)
</td></tr>
<tr><td>Value applied:</td><td>
The Aboveground Biomass for the forest land category from the NFI are recorded in the following table.
<table>
<tr><th rowspan="2">Phytogeographic zone</th><th rowspan="2">Forest land category</th><th>AGB</th></tr>
<tr><th>tdm/ha</th></tr>
<tr><td rowspan="2">Mesophilic</td><td>Dense forest</td><td>134.70</td></tr>
<tr><td>Secondary forest</td><td>67.89</td></tr>
<tr><td rowspan="2">Ombrophilous</td><td>Dense forest</td><td>204.57</td></tr>
<tr><td>Secondary forest</td><td>107.71</td></tr>
</table>

The Aboveground Biomass Spreadsheet can be viewed via this link and all carbon densities here.
</td></tr>
<tr><td>QA/QC procedures applied</td><td>
To ensure data quality, the following QA/QC procedures were applied:
- Design of a field data collection manual to serve as a guide. The manual can be viewed from the following link;
- Training of collection teams;
- Collection of field data in 2 formats, paper (field sheet) and digital (tablets on which the Collect tool of the Open Foris platform has been installed;
- Verification of the conformity of the data collected in the field sheets and tablets;
- Constitution of 2 mixed teams for the verification on the ground of 8% of the total of the formed sampling units. These teams were made up of SEP-REDD+, universities and research centres and civil society organizations.
</td></tr>
</table>

This control consisted in carrying out measurements on 8% of all the SUs in order to make comparisons with the measurements collected by the collection teams. In each SU, a plot is randomly selected and information such as plot dimensions, type of occupation and land use, DBH and height and species names were recorded.

This information made it possible to correct some gaps.

- **Clearance and aggregation**

The information contained on the sheets and in the tablets was checked after the field phase to ensure their compliance and consistency. The field sheets have been digitized and archived. These files can be consulted here. Then, a cross between the 2 information sources made it possible to correct the names of the species, the input errors, the omissions and the commissions in the recording of the data. These operations resulted in a final database, which was used for the calculations of emission factors.

Uncertainty associated with this parameter:

Uncertainties in above-ground biomass (AGB) estimates for dense and secondary forests (sheet sommaireUE)

	Above ground biomass (AGB)			
	Dense forest		Secondary forest	
Parameter	Ombrophilous	Mesophilic	Ombrophilous	Mesophilic
Standard error [tdm/ha]	17.44	12.91	9.11	5.60
Absolute error [tdm/ha]	29.83	22.74	15.52	9.62
Relative error [%]	14.58	16.88	14.41	14.17

Any comment:

Parameter:	BGB $_{Before,j}$
Description:	Belowground biomass of category forest j before conversion
Data unit:	Ton of dry matter per hectare
Source of data or description of the method for developing the data including the spatial level of the data (local,	Belowground biomass is calculated by applying the stem to root ratio on AGB for tropical forest as reported in Table 4.4 IPCC 2006 vol 4 (IPCC, 2006).

<table>
<tr><td>regional, national, international):</td><td></td></tr>
<tr><td>Value applied:</td><td>
<table>
<tr><th rowspan="2">Forest land category</th><th>BGB</th></tr>
<tr><th>tdm/ha</th></tr>
<tr><td>dense mesophilic forest</td><td>30.60</td></tr>
<tr><td>Mesophilic secondary forest</td><td>13.58</td></tr>
<tr><td>Dense Rainforest</td><td>75.69</td></tr>
<tr><td>Secondary rain forest</td><td>39.85</td></tr>
</table>

The spreadsheet can be viewed here.
All resources (spreadsheets, script and input data) are available here.</td></tr>
<tr><td>QA/QC procedures applied</td><td>Refer to the QA/QC process of AGB before j</td></tr>
<tr><td>Uncertainty associated with this parameter:</td><td>Uncertainties in belowground biomass estimates for dense and secondary forests
<table>
<tr><th></th><th colspan="4">Below-ground biomass (BGB)</th></tr>
<tr><th></th><th colspan="2">Dense forest</th><th colspan="2">Secondary forest</th></tr>
<tr><th>Parameter</th><th>Ombrophilous</th><th>Mesophilic</th><th>Ombrophilous</th><th>Mesophilic</th></tr>
<tr><td>Standard error [tdm/ha]</td><td>6.45</td><td>3.46</td><td>3.37</td><td>1.12</td></tr>
<tr><td>Absolute error [tdm/ha]</td><td>11.04</td><td>6.09</td><td>5.74</td><td>1.92</td></tr>
<tr><td>Relative error [%]</td><td>14.58</td><td>19.92</td><td>14.41</td><td>14.17</td></tr>
</table></td></tr>
<tr><td>Any comment:</td><td></td></tr>
</table>

Parameter:	AGB $_{After,i}$
Description:	Aboveground biomass of the cropland category: cocoa In Côte d'Ivoire, the main driver of deforestation is agriculture, with cocoa production being the lead driver. Forests are largely converted to cocoa plantations, especially in the ER-Program area.
Data unit:	Ton of dry matter per hectare
Source of data or description of the method for developing the data including the spatial level	The biomass for cocoa plantations comes from the study by N'Gbala et al., (2017). Following an inventory carried out in cocoa plantations in the central western zone of the country, they used the diameter measurements at 30 cm from the ground (because cocoa trees generally branch off below 1.30 m) in the allometric equation de Segura et al., (2005), to determine the above-ground biomass of cocoa plantations. The article in PDF can be viewed via this link.

of the data (local, regional, national, international):	
Value applied:	<table><tr><th colspan="2">AGB</th></tr><tr><td rowspan="2">**Cocoa**</td><td>**tdm/ha**</td></tr><tr><td>37.2</td></tr></table>
QA/QC procedures applied	The above-ground biomass of cocoa plantations considered in this work (37.2 tdm/ha) is taken from the study by N'Gbala et al., (2017) see. the full study can be viewed here. This value more or less coincides with that of the study conducted by Nimo et al, (2021) in Ghana. Fully publication can be viewed by the following link. In their study, they estimated the aboveground biomass of cocoa plantations at 32.02 tdm/ha using the same methodological approach. This difference of about 5 tdm/ha between these two studies could be explained by the difference in age of the inventoried plantations, 26 years and 20 years respectively for N'gbala et al, (2017) and Nimo et al, (2021). Thus, with the addition of local context considerations, the value retained (37.2 tdm/ha) is considered relevant as a value of (above-ground) biomass for cocoa plantations in the ERP area.
Uncertainty associated with this parameter:	<table><tr><td>AGB</td><td></td></tr><tr><td>SE (standard error)</td><td>2.9</td></tr><tr><td>90% CI [tdm/ha]</td><td>4.77</td></tr><tr><td>90% CI [%]</td><td>13.34</td></tr></table>
Any comment:	

Parameter:	$BGB_{After,i}$
Description:	Category Belowground Biomass: Cocoa
Data unit:	Ton of dry matter per hectare
Source of data or description of the method for developing the data including the spatial level of the data (local,	The underground biomass for cocoa plantations comes from the study by N'Gbala et al. (2017). This study applied the allometric model r2 = 0.84 developed by Cairns et al., (1997) and widely used by a number of authors (Somarriba et al., 2013). This model is an accepted methodology within the framework of the IPCC on land use, land use change and forestry (Penman et al., 2003).

regional, national, international):	
Value applied:	<table><tr><th colspan="2">BGB</th></tr><tr><td rowspan="2">**Cocoa**</td><td>**tdm/ha**</td></tr><tr><td>8.2</td></tr></table>
QA/QC procedures applied	This data from the literature has been re-evaluated by the MRV team in Côte d'Ivoire, which confirms that the values are consistent with those of the program area.
Uncertainty associated with this parameter:	<table><tr><th colspan="2">BGB</th></tr><tr><td>SE (standard error)</td><td>0.6</td></tr><tr><td>90% CI [tdm/ha]</td><td>0.99</td></tr><tr><td>90% CI [%]</td><td>12.52%</td></tr></table>
Any comment:	

Parameter:	$AGB_{After,i}$
Description:	Aboveground biomass of the category: Perennial crop The category of land of the perennial crop type essentially includes agricultural commodities other than cocoa that are practiced in the ER-Program area. These are particularly rubber and palm oil; <table><tr><th>Category</th><th>Subclass</th></tr><tr><td rowspan="2">Perennial crop</td><td>rubber tree</td></tr><tr><td>Oil palm tree</td></tr></table>
Data unit:	Ton of dry matter per hectare
Source of data or description of the method for developing the data including the spatial level of the data (local, regional, national, international):	The biomass for the perennial crop category is derived from the average biomass of rubber and oil palm plantations. The data for each of them are taken from the literature. These are regional studies carried out in Ghana. Grieco et al., (2012) used information from an inventory in samples of rubber and oil palm plots. They used the sampling protocol used to detect changes in the aboveground biomass carbon pool proposed by the FAO: *Assessing carbon stocks and modelling win-win scenarios of carbon sequestration through land-use changes*. (Ponce Hernandez, 2004). The average age of plantations considered in this study of 10 years and 20 years respectively for rubber and oil palm. The study by Grieco et al., (2012) can be consulted from the link and complete Ponce Hernandez, (2004) study from this link.
Value applied:	<table><tr><th>**AGB**</th></tr></table>

	<table><tr><th>Perennial crop</th><th>tdm/ha</th></tr><tr><td></td><td>86.7</td></tr></table>
QA/QC procedures applied	According to Grieco et al. (2012) each of the crops (rubber and oil palm) have their above-ground biomass estimated in the study: 113.4 tdm for rubber and 60 tdm for oil palm. The relevance of using the average of these values including the applied value has been verified and confirmed by the MRV team in Côte d'Ivoire.
Uncertainty associated with this parameter:	<table><tr><td colspan="2">AGB</td></tr><tr><td>SE (standard error)</td><td>15.20</td></tr><tr><td>90% CI [tdm/ha]</td><td>25</td></tr><tr><td>90% CI [%]</td><td>28.84</td></tr></table>
Any comment:	

Parameter:	BGB $_{After,i}$
Description:	Belowground biomass of the category: Perennial crop The category of land of the perennial crop type essentially includes agricultural commodities other than cocoa that are practiced in the ER-Program area. These are particularly rubber and palm oil; <table><tr><td>Category</td><td>Subclass</td></tr><tr><td rowspan="2">Perennial crop</td><td>rubber tree</td></tr><tr><td>Oil palm tree</td></tr></table>
Data unit:	Ton of dry matter per hectare
Source of data or description of the method for developing the data including the spatial level of the data (local, regional, national, international):	Belowground biomass was calculated by applying the AGB stem-to-root ratio (Cairns et al., 1997; Mokany et al., 2006) considering that the underground biomass represents 20% of the aboveground biomass. All this information can be found in Grieco et al., (2012). Mokany et al (2006) complete study can be viewed by the following link.
Value applied:	<table><tr><th colspan="2">BGB</th></tr><tr><th>Perennial crop</th><th>tdm/ha</th></tr><tr><td></td><td>17.4</td></tr></table>

QA/QC procedures applied	According to Grieco et al. (2012) each of the crops (rubber and oil palm) had its underground biomass estimated in the study: 22.8 tdm for rubber and 12 tdm for oil palm. The relevance of using the average of these values including the applied value has been verified and confirmed by the MRV team in Côte d'Ivoire.
Uncertainty associated with this parameter:	<table><tr><th colspan="2">BGB</th></tr><tr><td>SE (standard error)</td><td>3.02</td></tr><tr><td>90% CI [tdm/ha]</td><td>4.97</td></tr><tr><td>90% CI [%]</td><td>28.58</td></tr></table>
Any comment:	

Parameter:	$AGB_{After,i}$
Description:	Aboveground biomass of category: Grassland In the ERP area, the grassland category consists mainly of shrublands as described in the land use class nomenclature available here.
Data unit:	Ton of dry matter per hectare
Source of data or description of the method for developing the data including the spatial level of the data (local, regional, national, international):	The data of the biomass for the grass category is taken from a regional study (Ilboudo, 2018) conducted in Burkina Faso (located north of Côte d'Ivoire). The author used inventory data (diameter at breast height and height measurements) in sample units to estimate the above-ground biomass of the grassland category using polynomial allometric equations (Mbow, 2009).
Value applied:	<table><tr><th colspan="2">AGB</th></tr><tr><td rowspan="2">grassland</td><td>tdm/ha</td></tr><tr><td>35.33</td></tr></table>
QA/QC procedures applied	The QA/QC procedure consisted of evaluating the differences between the applied value from Ilboudo (2018) and what has been done elsewhere by other authors. Thus, Amougou et al. (2016) obtained values close to Ilboudo (2018) in their study conducted on the carbon stock estimate in two land units in the savannah zone of Cameroon, available at this link. The results obtained were 15.47 tdm/ha and 32.58 tdm/ha. These values, slightly different from those of Ilboudo (2018), can be explained by the use of different allometric equations and the specificity of the different plant

	species. The values of these two studies being noticeably close, that of Ilboudo was retained because of the similar regional context with Côte d'Ivoire.
Uncertainty associated with this parameter:	<table><tr><th colspan="2">AGB</th></tr><tr><td>SE (standard error)</td><td>44.09</td></tr><tr><td>90% CI [tdm/ha]</td><td>72.53</td></tr><tr><td>90% CI [%]</td><td>205.29</td></tr></table>
Any comment:	

Parameter:	BGB $_{After,i}$
Description:	Belowground Biomass Category: Grassland
Data unit:	Ton of dry matter per hectare
Source of data or description of the method for developing the data including the spatial level of the data (local, regional, national, international):	Belowground biomass was calculated by applying the AGB stem-to-root ratio (Cairns et al., 1997). According to Cairns et al., 1997 study, belowground biomass can be calculated from aboveground biomass using a global model that they developed for forest root biomass estimation from total aboveground biomass. The study found that below-ground biomass accounts for about 26% of the total biomass. Complete study is available at this address.
Value applied:	<table><tr><th colspan="2">BGB</th></tr><tr><td rowspan="2">grassland</td><td>tdm/ha</td></tr><tr><td>4.55</td></tr></table>
QA/QC procedures applied	See AGB grassland
Uncertainty associated with this parameter:	<table><tr><th colspan="2">BGB</th></tr><tr><td>SE (standard error)</td><td>4.82</td></tr><tr><td>90% CI [tdm/ha]</td><td>7.93</td></tr><tr><td>90% CI [%]</td><td>174.26</td></tr></table>
Any comment:	

<table>
<tr><td>Parameter:</td><td>AGB After,j</td></tr>
<tr><td>Description:</td><td>Above-ground biomass of the agroforest category</td></tr>
<tr><td>Data unit:</td><td>Ton of dry matter per hectare</td></tr>
<tr><td>Source of data or description of the method for developing the data including the spatial level of the data (local, regional, national, international):</td><td>The biomass for cocoa-based agroforests comes from the study by Asigbaase et al., (2021), available at this link. In their methodological approach, they relied on an inventory of different agroforestry systems in Ghana. Using diameter at breast height (DBH) measurements in the allometric equation of Chave et al., (2014) for shade trees and Andrade et al., (2008) for cocoa.</td></tr>
<tr><td>Value applied:</td><td><table><tr><th colspan="2">AGB</th></tr><tr><td>agroforest</td><td>tdm/ha</td></tr><tr><td></td><td>45.8</td></tr></table></td></tr>
<tr><td>QA/QC procedures applied</td><td>A literature review carried out on the theme related to the quantification of agroforestry systems was carried out in order to confirm our choice of the value applied above. Thus, taking the same approach in Ghana, Nimo et al., (2021) showed that agroforestry systems store around 74 tdm/ha. This difference results from the diversity of the forest species used but especially from the difference of the allometric equations.</td></tr>
<tr><td>Uncertainty associated with this parameter:</td><td><table><tr><th colspan="2">AGB</th></tr><tr><td>SE</td><td>2.6</td></tr><tr><td>90% CI [tdm/ha]</td><td>4.37</td></tr></table></td></tr>
</table>

		90% CI [%]	9.55	
Any comment:				

Parameter:	$BGB_{After,j}$
Description:	Belowground biomass of the agroforest category
Data unit:	Ton of dry matter per hectare
Source of data or description of the method for developing the data including the spatial level of the data (local, regional, national, international):	Belowground biomass was calculated by applying the AGB stem-to-root ratio (Cairns et al., 1997). The article is available at the following link.
Value applied:	**BGB** **agroforest** / **tdm/ha**: 8.4
QA/QC procedures applied	See AGB table agroforest
Uncertainty associated with this parameter:	**BGB** SE: 0.66 90% CI [tdm/ha]: 1.11 90% CI [%]: 13.22
Any comment:	

Parameter:	$AGB_{After, RFreg}$
Description:	Removals due to carbon sequestration due to creation of forest plantation
Data unit:	Ton of dry matter per hectare per year (tdm/ha)

<table>
<tr><td>Source of data or description of the method for developing the data including the spatial level of the data (local, regional, national, international) :</td><td>The biomass sequestered due to the establishment of forest plantations in the ER-Program area was obtained using the value of aboveground biomass teak (Tectona grandis) default IPCC guidelines (2006) improved in 2019, volume 4 table 4.8 considering the humid tropical zone as an ecological zone.</td></tr>
<tr><td>Value applied:</td><td><table>
<tr><th rowspan="2">Category</th><th>AGB</th></tr>
<tr><th>tdm/ha</th></tr>
<tr><td>Forest plantations / reforestation < 20 yrs</td><td>195.5</td></tr>
<tr><td>Forest plantations / reforestation > 20 yrs</td><td>428.9</td></tr>
</table></td></tr>
<tr><td>QA/QC procedures applied</td><td>These data from the literature were confirmed by the MRV team in Côte d’Ivoire, which ensured the consistency of the values for the program area.</td></tr>
<tr><td>Uncertainty associated with this parameter:</td><td><table>
<tr><th rowspan="2">Parameter</th><th colspan="2">AGB</th></tr>
<tr><th>Forest plantations / reforestation < 20 yrs</th><th>Forest plantations / reforestation > 20 yrs</th></tr>
<tr><td>90% CI [tdm/ha]</td><td>175.95</td><td>386.01</td></tr>
<tr><td>Relative error [%]</td><td>90</td><td>90</td></tr>
</table></td></tr>
<tr><td>Any comment:</td><td></td></tr>
</table>

Parameter:	BGB $_{\text{After, RFreg}}$
Description:	Removals in the BGB due to carbon sequestration due to creation of forest plantation
Data unit:	Ton of dry matter per hectare per year (tdm/ha)
Source of data or description of the	The root shoot ratio developed by MOKANY, KAREL & Raison, RJ & Prokushkin, Anatoly in 2005 was used: Critical analysis of root: Shoot ratios in terrestrial biomes. Available at this address.

method for developing the data including the spatial level of the data (local, regional, national, international):	
Value applied:	<table><tr><th rowspan="2">Category</th><th>BGB</th></tr><tr><th>tdm/ha</th></tr><tr><td>Forest plantations / reforestation < 20 yrs</td><td>45.94</td></tr><tr><td>Forest plantations / reforestation > 20 yrs</td><td>100.8</td></tr></table>
QA/QC procedures applied	These data from the literature were confirmed by the MRV team in Côte d'Ivoire, which ensured the consistency of the values for the program area.
Uncertainty associated with this parameter:	<table><tr><th rowspan="2">Parameter</th><th colspan="2">BGB</th></tr><tr><th>Forest plantations / reforestation < 20 yrs</th><th>Forest plantations / reforestation > 20 yrs</th></tr><tr><td>90% CI [tdm/ha]</td><td>3.68</td><td>8.06</td></tr><tr><td>Relative error [%]</td><td>8</td><td>8</td></tr></table>
Any comment:	

Parameter:	$A(j,i)$
Description:	***Area converted from forest type j to non-forest type i during the reference period (2000-2015).***
Data unit:	*Hectare per year.*
Value monitored during this Monitoring /	**Deforestation between 2000 and 2015 (reference period)**

Reporting Period:

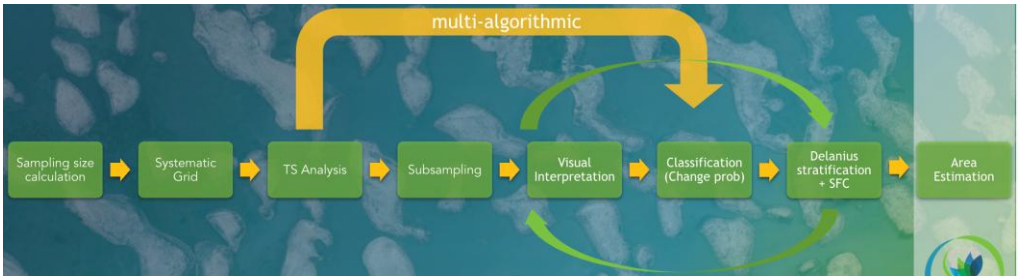
	Transition	Mesophile Forest						Ombrohile Forest					
		2000-2010			2011-2015			2000-2010			2010-2015		
		Area (ha)	CI	%Error	Area (ha)	CI	%Error	Area (ha)	CI	%Error	Area (ha)	CI	%Error
Deforestation	AF-CC	3,126	2,289	73%	6,192	4,631	75%	6,389	4,385	69%	6,757	4,721	70%
	AF-GG	625	1,027	164%	625	1,027	164%	609	1,000	164%	609	1,000	164%
	AF-HH	-	-	-	-	-	-	1,217	1,414	116%	-	-	-
	AF-OC	1,875	1,776	95%	3,126	2,289	73%	2,737	3,640	133%	1,217	1,414	116%
	AF-OL	-	-	-	-	-	-	-	-	-	-	-	-
	AF-PC	-	-	-	-	-	-	-	-	-	609	1,000	164%
	DF-CC	26,224	8,098	31%	5,137	3,794	74%	81,269	13,201	16%	28,789	7,954	28%
	DF-GG	5,260	3,642	69%	-	-	-	12,059	5,177	43%	6,822	3,997	59%
	DF-HH	-	-	-	-	-	-	609	1,000	164%	-	-	-
	DF-OC	3,506	2,986	85%	625	1,027	164%	16,707	6,783	41%	8,039	4,239	53%
	DF-OL	-	-	-	625	1,027	164%	-	-	-	-	-	-
	DF-PC	-	-	-	-	-	-	609	1,000	164%	-	-	-
	PP-CC	-	-	-	-	-	-	-	-	-	-	-	-
	PP-GG	-	-	-	-	-	-	-	-	-	-	-	-
	PP-HH	-	-	-	-	-	-	-	-	-	-	-	-
	PP-OC	-	-	-	-	-	-	-	-	-	-	-	-
	PP-OL	-	-	-	-	-	-	-	-	-	-	-	-
	PP-PC	-	-	-	-	-	-	-	-	-	-	-	-
	SF-CC	32,893	9,816	30%	25,477	8,073	32%	58,149	12,568	22%	81,012	15,669	19%
	SF-GG	5,382	3,471	65%	11,255	6,267	56%	12,560	5,705	45%	8,866	4,992	56%
	SF-HH	-	-	-	625	1,027	164%	-	-	-	934	1,536	164%
	SF-OC	12,014	5,076	42%	12,065	6,966	58%	27,333	8,949	33%	12,625	5,120	41%
	SF-OL	-	-	-	2,060	3,388	164%	-	-	-	-	-	-
	SF-PC	-	-	-	2,685	3,540	132%	7,672	3,874	51%	12,188	6,856	56%

Degradation between 2000 and 2015 (reference period)

	Transition	Mesophile Forest						Ombrohile Forest					
		2000-2010			2011-2015			2000-2010			2010-2015		
		Area (ha)	CI	%Error	Area (ha)	CI	%Error	Area (ha)	CI	%Error	Area (ha)	CI	%Error
Degradation	AF	104,091	18,981	18%	105,097	19,095	18%	155,153	25,166	16%	158,197	25,255	16%
	AF-DF	-	-	-	-	-	-	-	-	-	-	-	-
	AF-PP	-	-	-	-	-	-	-	-	-	-	-	-
	AF-SF	625	1,027	164%	-	-	-	-	-	-	609	1,000	164%
	DF	18,575	7,948	43%	7,749	5,525	71%	744,177	52,628	7%	682,492	51,449	8%
	DF-AF	4,009	3,341	83%	1,250	1,452	116%	3,369	2,521	75%	3,369	2,521	75%
	DF-PP	-	-	-	-	-	-	-	-	-	-	-	-
	DF-SF	13,082	6,271	48%	3,188	3,862	121%	67,090	12,779	19%	15,274	7,326	48%
	PP	-	-	-	-	-	-	-	-	-	-	-	-
	PP-AF	-	-	-	-	-	-	-	-	-	-	-	-
	PP-DF	-	-	-	-	-	-	-	-	-	-	-	-
	PP-SF	-	-	-	-	-	-	-	-	-	-	-	-
	SF	89,503	17,551	20%	45,732	13,038	29%	183,164	26,178	14%	120,595	21,512	18%
	SF-AF	5,186	4,089	79%	4,561	3,960	87%	7,649	4,790	63%	16,771	8,526	51%
	SF-DF	-	-	-	-	-	-	-	-	-	2,128	3,500	164%
	SF-PP	-	-	-	-	-	-	-	-	-	-	-	-

Forest between 2000 and 2015 (reference period)

	Transition	Mesophile Forest						Ombrohile Forest					
		2000-2010			2011-2015			2000-2010			2010-2015		
		Area (ha)	CI	%Error	Area (ha)	CI	%Error	Area (ha)	CI	%Error	Area (ha)	CI	%Error
Forest Gain	SF-Before 00-10	103,210	18,411	18%	49,667	13,544	27%	250,255	28,719	11%	134,629	22,770	17%
	SF-00_10	1,250	1,452	116%	625	1,027	164%	2,128	3,500	164%	2,128	3,500	164%
	SF-10_15	-	-	-	3,936	3,825	97%	-	-	-	3,369	2,521	75%
	SF-15_20	-	-	-	-	-	-	-	-	-	-	-	-
	SF-20_21	-	-	-	-	-	-	-	-	-	-	-	-
	PP-Before 00-10	-	-	-	-	-	-	-	-	-	-	-	-
	PP-00_10	-	-	-	-	-	-	-	-	-	-	-	-
	PP-10_15	-	-	-	-	-	-	-	-	-	-	-	-
	PP-15_20	-	-	-	-	-	-	-	-	-	-	-	-
	PP-20_21	-	-	-	-	-	-	-	-	-	-	-	-
	AF-Before 00-10	113,287	19,584	17%	103,344	18,996	18%	166,779	25,707	15%	157,588	25,238	16%
	AF-00_10	1,753	2,120	121%	1,753	2,120	121%	-	-	-	-	-	-
	AF-10_15	-	-	-	8,056	6,114	76%	-	-	-	9,126	5,696	62%
	AF-15_20	-	-	-	-	-	-	-	-	-	-	-	-
	AF-20_21	-	-	-	-	-	-	-	-	-	-	-	-

	Dense Forest – DF; Secondary Forest – SF; Forest plantations / reforestation – PP; Agro-forest – AF; Cocoa – CC; Perennial crops – PC, Other crop – OC; Human settlement – HH; Grassland – GG; Other lands – OL. All these values are available here .
Source of data and description of measurement/ calculation methods and procedures applied:	The activity data used for the reference period was obtained from a sampling approach for estimating areas that incorporates the following characteristics: A sufficiently dense and balanced sample size to capture changes in land cover classes. Hybrid machine (algorithm) / human (visual) interpretation to assign land cover classes and changes: Several change detection algorithms, from several sources of satellite images and/or other spatially explicit information and visual interpretation were used to detect change classes. Cross-validation principle, both for machine interpretation (convergence of evidence) and human interpretation (elimination of subjective bias). This required the formalization of decision rules. Quality control and integrated quality assurance at all stages of the process. 5. The FAO technical team in charge of forest monitoring has developed tools to facilitate the design and implementation of this approach. All these tools and resources are available via this link: The figure below shows the different stages of the process:  *Figure 3: Steps in the methodological process for estimating activity data* **Sampling design** An empirical analysis with a reference product (ESA CCI map 2015-2020) shows that a systematic sampling of 1km x 1km over the ERP area is required to capture the changes with a relative sampling error of less than 15% on the land cover change classes. On this basis a rectangular systematic grid of 46,415 points was generated as illustrated in the figure below. The tool erp_01_sbae_design was developed to generate the samples.

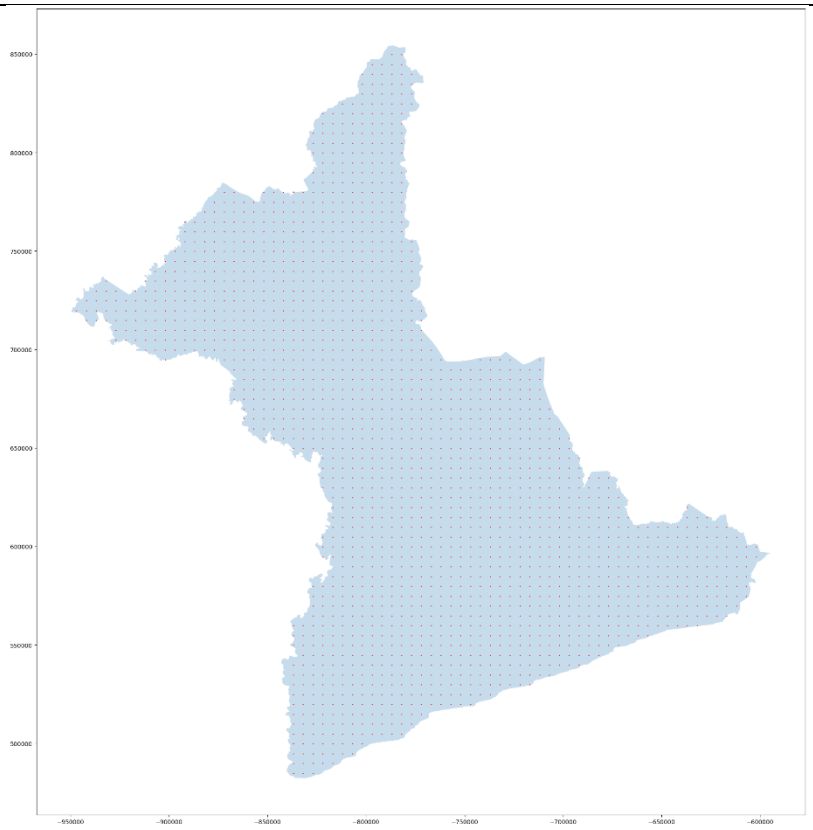


Figure 4: 1 sqkm grid adapted in the ERP

This established sampling system is stable over time and can be re-used for the regular updating of land cover change statistics.
Extraction of data (variables) from the assembly approach
Information from several global layers (TMF, GFC, ESA, DW, ESRI) is extracted for each of the points, as well as the normalized vegetation indices, from the entire Landsat archive. These index series are also analyzed with several algorithms (BFAST, CUSUM, CCDC, LandTrendR, and standard statistical descriptors). The list of variables used for this set approach is shown in the following table. These operations were performed using the notebook erp_02_extract_ts.

Name	Variables	Description	Reference	Link
SRTM DEM	aspect', 'elevation', 'slope'	Digital elevation model variables	Farr et *al*. 2007	https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2005RG000183
Dynamic World	dw_class_mode', 'dw_tree_prob__max', 'dw_tree_prob__min', 'dw_tree_prob__stdDev',	Dominant Dynamic World land cover class and tree probabilities	Brown et *al*., 2022	https://www.nature.com/articles/s41597-022-01307-4

	'dw_tree_prob_mean'			
ESA LC 2020	esa_lc20'	Global land cover product at 10 m resolution for 2020 based on Sentinel-1 and 2 data	Zanaga et *al*. 2021	https://worldcover2020.esa.int/
ESRI LC 2020	esri_lc20'	Sentinel-2 10m land cover time series of the world from 2017-2021	Karra, et *al*. 2021	https://www.arcgis.com/home/item.html?id=d3da5dd386d140cf93fc9ecbf8da5e31
GFC	gfc_gain', 'gfc_loss', 'gfc_lossyear', 'gfc_tc00'	Global Forest Change variables	Hansen et al. 2013	https://earthenginepartners.appspot.com/science-2013-global-forest
Canopy height model	lang_tree_height'	Tree height	Lang et al., 2022	https://arxiv.org/abs/2204.08322
Forest canopy heigh t	potapov_tree_height'	Tree height	Potapov et al., 2020	https://www.sciencedirect.com/science/article/pii/S0034425720305381
TMF	tmf_20xx' .. 'tmf_20yy', 'tmf_defyear', 'tmf_degyear', 'tmf_main', 'tmf_sub'	Tropical Moist Forest variables, including yearly land cover	Vancutsem et al., 2021	https://www.science.org/doi/10.1126/sciadv.abe1603
Landsat Time series	dates', 'ts', 'images', 'mon_images'	Dates, spectral values and total number of USGS Landsat 4 to 9 acquisitions, Level 2, Collection 2, Tier 1	USGS, 2008	https://www.usgs.gov/landsat-missions/landsat-collection-2-level-1-data
CCDC	ccdc_change_date', 'ccdc_magnitude'	Continuous change detection and classification of land cover using all available Landsat data	Zhu and Woodock, 2014	https://www.sciencedirect.com/science/article/pii/S0034425714000248
LandTrendR	ltr_magnitude', 'ltr_dur', 'ltr_yod', 'ltr_rate',	Temporal segmentation for forest disturbance and recovery	Kennedy et al., 2010	https://www.sciencedirect.com/science/article/pii/S0034425710002245

	'ltr_end_year'			
BFAST	bfast_change_date', 'bfast_magnitude', 'bfast_means'	Near real-time disturbance detection using satellite image time series	Verbesselt et al., 2013	https://www.sciencedirect.com/science/article/pii/S0034425712001150?via%3Dihub
CUSUM	cusum_change_date', 'cusum_confidence', 'cusum_magnitude'	Cumulative Sum Test to Detect Land-Cover Changes	Kellndorfer, etal. 2019	https://gis1.servirglobal.net/TrainingMaterials/SAR/Ch3-Content.pdf

Using the tool erp_02_extract_ts.*made it possible to associate the information above with each sample.*

Unsupervised aggregation of points

The information is injected into a cluster model that identifies points with similar trajectories for the different products. The clusters have different sizes, and correspond to homogeneous groupings of points, a priori distinguishing between change points and stable points. The goal is to make an unsupervised classification of the information on the points, to have different a priori batches of points with different trajectories of change. This allows points to be selected from all clusters to have a representative training dataset to be interpreted.

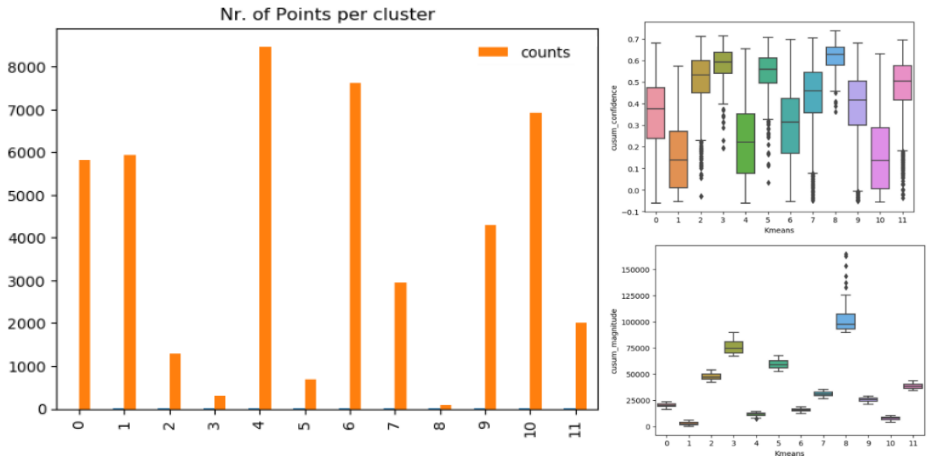


Figure 5 : Unsupervised cluster analysis (12 clusters 30 pts max / cluster 339 points)

The next step was to draw a small number of points (here ~30) in each of the clusters (339 in total) to produce a training dataset with descriptive variables of land use status and trends. https://app.collect.earth/collection?projectId=32912

A project has been generated to collect this information by visual interpretation.

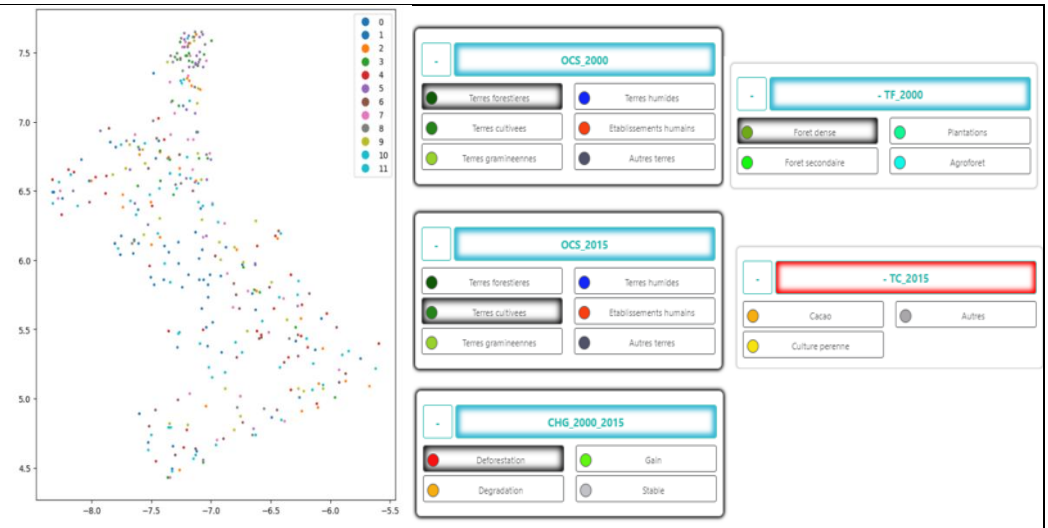


Figure 6: First interpreted dataset and survey form.

The collection of this reduced set of points is also an opportunity to check the robustness of the [interpretation keys](#).

Supervised classification 1

CLUSTER	0	1	2	3	4	5	6	7	8	9	10	11
Deforestation	8	5	10	11	14	8	1	16	3	10	13	12
Degradation	1	0	1	1	0	0	2	0	0	1	0	0
Stable	21	25	19	18	16	22	27	14	6	19	17	18
Prop. Defor.	27%	17%	33%	37%	47%	27%	3%	53%	33%	33%	43%	40%
Total	7298	4372	1074	7617	1865	129	6187	8657	9	2953	5800	454

```
Maximum probability of stable for change points
0.8421333333333332
Reasonable probability of stable for change points
0.4904000000000006
Number of points above thshld (considered stable)
235 out of 339
Number of actual change points left in stable
11
```

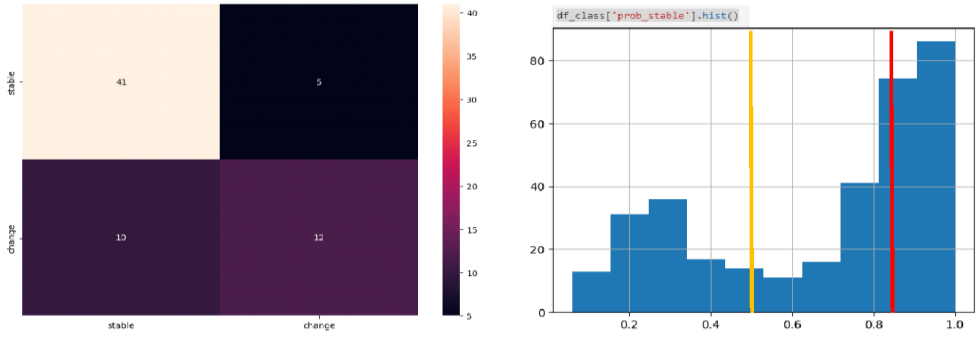


Figure 7: Distribution of probabilities of being stable in the interpreted data set (339 points)

The data is then used to perform a supervised classification of the set of points with respect to land use change types.

Figure 7 illustrates the results of the supervised classification with two classes (deforestation and stable), through the distribution of the probabilities of being stable, for each of the 339 points. The red bar indicates the probability threshold (0.84) beyond which no change points were recorded, and the yellow bar indicates the 90% percentile (probability of 0.49). The 339 sample points were considered statistically insufficient to represent the entire sample.

To address this shortcoming a second training dataset with a number of points was determined based on the approach described by Hidiroglou, M.A. and Kozak, M. (2018) and Dalenius, T. and Hodges Jr, J.L. (1957). It increases the precision of estimates by assigning different sampling fractions to strata. For this dataset, we have 692 samples (Figure 8).

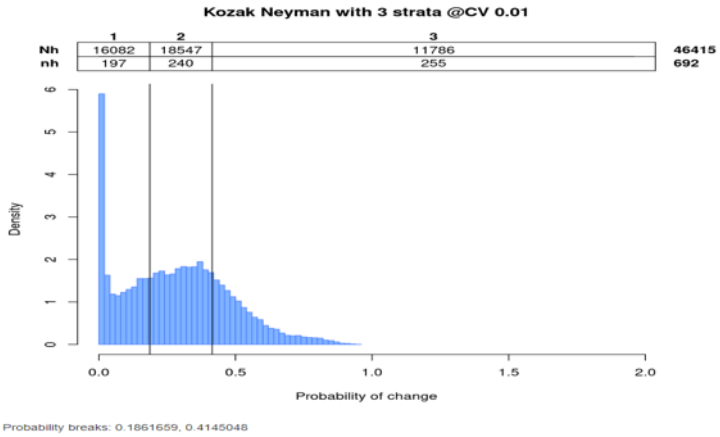


Figure 8: Change probability de changement according to Kozak Neyman

Supervised classification 2

The dataset of 692 points was interpreted according to the selection in the previous figure in order to serve as training for supervised classification using the *Random Forest* algorithm. This classification gives a good distribution and confirms the good representativeness of the 692 points in relation to the whole.

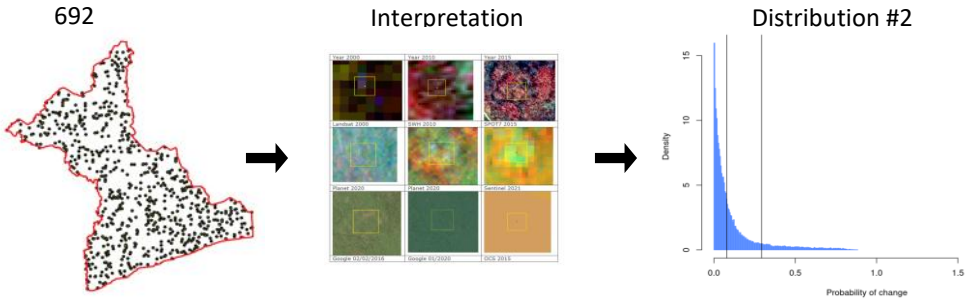


Figure 9: Supervised classification to achieve better class separation.

Final selection

Using the actual observed variance of the 692 points already interpreted, the combined Dalenius - Neyman method with 3 strata could be applied to arrive at the final selection of 3308 points, i.e. a total of 4000 points (with 692 points already interpreted) as illustrated in Figure 10. below.

These points were then interpreted in order to obtain the different classes of change in the ERP area over the period 2000 to 2021, thus covering the reference period (2000-2015) and the monitoring period (2020-2021).

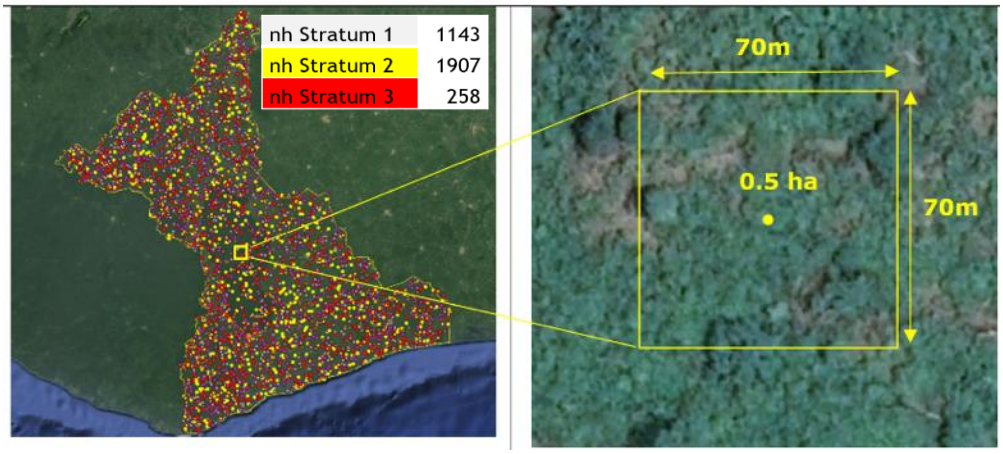


Figure 10 : Final Sample and exemple of a sample point

Sample Interpretation

The interpretation rules mentioned above were then presented and implemented during a workshop held in Paris, France from December 12 to 16, 2022 with the presence of IGN FI, World Bank and SEP REDD+ teams. This workshop helped harmonize the interpretations and reduce the margins of uncertainty. Following this workshop, all 4,000 selected points were interpreted. An analysis of the disagreements between interpretations was made possible by the double interpretation of the 692 points.

Following the analysis of the disagreements on the 692 points, it was necessary to perform a more thorough quality control in order to reduce the potential errors of interpretation as much as possible. Therefore, the points on which at least one change had been detected during the period 2000-2015 and 2020-2021 were reinterpreted representing 995 samples out of a total of 4,000.

Statistical analysis

All 4,000 samples, including those that were reinterpreted, were used as the basis for calculating area estimates and their uncertainty.

The estimation of activity data was done using the stratified random estimator based on the formulas described by Cochran (1977) and GFOI (2020). Estimates are made for each of the land use categories considered (11 classes) and in terms of changes from one period to another representing a total of more than 60 effective combinations.

Estimates and associated uncertainties are produced for each combination and for each phytogeographic zone (Mesophilic, Ombrophilous and Sub-Sudanian) considering the stratification applied. A detailed description of the calculation methods is available in the SOP_4_Data analysis_RCI.docx document.

QA/QC procedures applied:

The QA/QC procedures applied consisted of:

First, standard operating procedures (SOPs) were developed as described in section 2.1

Interpretation was done by highly qualified professionals from the French Digital Engineering Abroad (IGN-FI) based in France) who are specialized in the interpretation of land cover with satellite imagery.

Also, a cross-interpretation of the first series of sample points (692) was carried out by expert photo-interpreters from IGN-FI who had not taken part in the first interpretation and the MRV experts from SEP REDD+.

This step made it possible to assess the accuracy and bias of the photointerpretation to ensure better calibration. Following the analysis of the disagreements of the cross-interpretation, it appeared necessary to reinterpret a little less than 1000 samples in order to minimize the potential interpretation errors.

The statistics associated with the different land use changes to determine the Activity Data were carried out by IGN-FI. The accuracy of the calculations and formulas used were independently verified by the FAO using an experienced statistician.

Uncertainty for this parameter:

Quantification of uncertainties over the reference period (2000-2015)

Uncertainty of deforestation between 2000 and 2015 (reference period)

	Transition	Mesophile Forest						Ombrohile Forest					
		2000-2010			2011-2015			2000-2010			2010-2015		
		Area (ha)	CI	%Error	Area (ha)	CI	%Error	Area (ha)	CI	%Error	Area (ha)	CI	%Error
Deforestation	AF-CC	3,126	2,289	73%	6,192	4,631	75%	6,389	4,385	69%	6,757	4,721	70%
	AF-GG	625	1,027	164%	625	1,027	164%	609	1,000	164%	609	1,000	164%
	AF-HH	-	-	-	-	-	-	1,217	1,414	116%	-	-	-
	AF-OC	1,875	1,776	95%	3,126	2,289	73%	2,737	3,640	133%	1,217	1,414	116%
	AF-OL	-	-	-	-	-	-	-	-	-	-	-	-
	AF-PC	-	-	-	-	-	-	-	-	-	609	1,000	164%
	DF-CC	26,224	8,098	31%	5,137	3,794	74%	81,269	13,201	16%	28,789	7,954	28%
	DF-GG	5,260	3,642	69%	-	-	-	12,059	5,177	43%	6,822	3,997	59%
	DF-HH	-	-	-	-	-	-	609	1,000	164%	-	-	-
	DF-OC	3,506	2,986	85%	625	1,027	164%	16,707	6,783	41%	8,039	4,239	53%
	DF-OL	-	-	-	625	1,027	164%	-	-	-	-	-	-
	DF-PC	-	-	-	-	-	-	609	1,000	164%	-	-	-
	PP-CC	-	-	-	-	-	-	-	-	-	-	-	-
	PP-GG	-	-	-	-	-	-	-	-	-	-	-	-
	PP-HH	-	-	-	-	-	-	-	-	-	-	-	-
	PP-OC	-	-	-	-	-	-	-	-	-	-	-	-
	PP-OL	-	-	-	-	-	-	-	-	-	-	-	-
	PP-PC	-	-	-	-	-	-	-	-	-	-	-	-
	SF-CC	32,893	9,816	30%	25,477	8,073	32%	58,149	12,568	22%	81,012	15,669	19%
	SF-GG	5,382	3,471	65%	11,255	6,267	56%	12,560	5,705	45%	8,866	4,992	56%
	SF-HH	-	-	-	625	1,027	164%	-	-	-	934	1,536	164%
	SF-OC	12,014	5,076	42%	12,065	6,966	58%	27,333	8,949	33%	12,625	5,120	41%
	SF-OL	-	-	-	2,060	3,388	164%	-	-	-	-	-	-
	SF-PC	-	-	-	2,685	3,540	132%	7,672	3,874	51%	12,188	6,856	56%

Uncertainty of degradation between 2000 and 2015 (reference period)

	Transition	Mesophile Forest						Ombrohile Forest					
		2000-2010			2011-2015			2000-2010			2010-2015		
		Area (ha)	CI	%Error	Area (ha)	CI	%Error	Area (ha)	CI	%Error	Area (ha)	CI	%Error
Degradation	AF	104,091	18,981	18%	105,097	19,095	18%	155,153	25,166	16%	158,197	25,255	16%
	AF-DF	-	-	-	-	-	-	-	-	-	-	-	-
	AF-PP	-	-	-	-	-	-	-	-	-	-	-	-
	AF-SF	625	1,027	164%	-	-	-	-	-	-	609	1,000	164%
	DF	18,575	7,948	43%	7,749	5,525	71%	744,177	52,628	7%	682,492	51,449	8%
	DF-AF	4,009	3,341	83%	1,250	1,452	116%	3,369	2,521	75%	3,369	2,521	75%
	DF-PP	-	-	-	-	-	-	-	-	-	-	-	-
	DF-SF	13,082	6,271	48%	3,188	3,862	121%	67,090	12,779	19%	15,274	7,326	48%
	PP	-	-	-	-	-	-	-	-	-	-	-	-
	PP-AF	-	-	-	-	-	-	-	-	-	-	-	-
	PP-DF	-	-	-	-	-	-	-	-	-	-	-	-
	PP-SF	-	-	-	-	-	-	-	-	-	-	-	-
	SF	89,503	17,551	20%	45,732	13,038	29%	183,164	26,178	14%	120,595	21,512	18%
	SF-AF	5,186	4,089	79%	4,561	3,960	87%	7,649	4,790	63%	16,771	8,526	51%
	SF-DF	-	-	-	-	-	-	-	-	-	2,128	3,500	164%
	SF-PP	-	-	-	-	-	-	-	-	-	-	-	-

Uncertainty of forest gain between 2000 and 2015 (reference period)

		Mesophile Forest						Ombrohile Forest					
Transition		2000-2010			2011-2015			2000-2010			2010-2015		
		Area (ha)	CI	%Error	Area (ha)	CI	%Error	Area (ha)	CI	%Error	Area (ha)	CI	%Error
Forest Gain	SF-Before 00-10	103,210	18,411	18%	49,667	13,544	27%	250,255	28,719	11%	134,629	22,770	17%
	SF-00_10	1,250	1,452	116%	625	1,027	164%	2,128	3,500	164%	2,128	3,500	164%
	SF-10_15	-	-	-	3,936	3,825	97%	-	-	-	3,369	2,521	75%
	SF-15_20	-	-	-	-	-	-	-	-	-	-	-	-
	SF-20_21	-	-	-	-	-	-	-	-	-	-	-	-
	PP-Before 00-10	-	-	-	-	-	-	-	-	-	-	-	-
	PP-00_10	-	-	-	-	-	-	-	-	-	-	-	-
	PP-10_15	-	-	-	-	-	-	-	-	-	-	-	-
	PP-15_20	-	-	-	-	-	-	-	-	-	-	-	-
	PP-20_21	-	-	-	-	-	-	-	-	-	-	-	-
	AF-Before 00-10	113,287	19,584	17%	103,344	18,996	18%	166,779	25,707	15%	157,588	25,238	16%
	AF-00_10	1,753	2,120	121%	1,753	2,120	121%	-	-	-	-	-	-
	AF-10_15	-	-	-	8,056	6,114	76%	-	-	-	9,126	5,696	62%
	AF-15_20	-	-	-	-	-	-	-	-	-	-	-	-
	AF-20_21	-	-	-	-	-	-	-	-	-	-	-	-

Dense Forest – DF; Secondary Forest – SF; Forest plantations / reforestation – PP; Agro-forest – AF; Cocoa – CC; Perennial crops – PC, Other crop – OC; Human settlement – HH; Grassland – GG; Other lands – OL.

Any comment:

3.2 Monitored Data and Parameters

Parameter:	A(j,i)
Description:	Area converted from forest type j to non-forest type i during the monitoring periods (2024). Calculation of emission reductions for the third ER-MR is monitoring periods: 1/1/2024 to 12/31/2024. Three activities were monitored during this period: A- Degradation B- Deforestation C- Forest gain
Data unit:	Hectare per year
Value monitored during this Monitoring / Reporting Period:	**A-Monitoring degradation during 2024**

	Transition	Mesophile Forest 2024			Ombrohile Forest 2024		
		Area (ha)	CI	%Error	Area (ha)	CI	%Error
Degradation	AF	92,910	18,010	19.4%	167,690	25,889	15.4%
	AF-DF	-	-	-	-	-	-
	AF-PP	-	-	-	-	-	-
	AF-SF	-	-	-	-	-	-
	DF	5,064	4,251	84.0%	641,395	50,505	7.9%
	DF-AF	-	-	-	-	-	-
	DF-PP	-	-	-	-	-	-
	DF-SF	-	-	-	-	-	-
	PP	625	1,027	164.4%	-	-	-
	PP-AF	-	-	-	-	-	-
	PP-DF	-	-	-	-	-	-
	PP-SF	-	-	-	-	-	-
	SF	23,051	9,733	42.2%	111,618	21,458	19.2%
	SF-AF	-	-	-	-	-	-
	SF-DF	-	-	-	-	-	-
	SF-PP	-	-	-	-	-	-

B- Monitoring deforestation during 2024 [17]

	Transition	Mesophile Forest 2024			Ombrohile Forest 2024		
		Area (ha)	CI	%Error	Area (ha)	CI	%Error
Deforestation	AF-CC	-	-	-	609	1,000	164.3%
	AF-GG	-	-	-	609	1,000	164.3%
	AF-HH	-	-	-	-	-	-
	AF-OC	-	-	-	-	-	-
	AF-OL	-	-	-	-	-	-
	AF-PC	-	-	-	-	-	-
	DF-CC	-	-	-	-	-	-
	DF-GG	-	-	-	-	-	-
	DF-HH	-	-	-	-	-	-
	DF-OC	-	-	-	-	-	-
	DF-OL	-	-	-	-	-	-
	DF-PC	-	-	-	-	-	-
	PP-CC	-	-	-	-	-	-
	PP-GG	-	-	-	-	-	-
	PP-HH	-	-	-	-	-	-
	PP-OC	-	-	-	-	-	-
	PP-OL	-	-	-	-	-	-
	PP-PC	-	-	-	-	-	-
	SF-CC	-	-	-	-	-	-
	SF-GG	-	-	-	934	1,536	164.4%
	SF-HH	-	-	-	-	-	-
	SF-OC	-	-	-	-	-	-
	SF-OL	-	-	-	-	-	-
	SF-PC	-	-	-	-	-	-

C- Monitoring Forest gain during 2024

17 The zero deforestation observed in the mesophilic zone in 2024 can be explained by several factors:
Many actions implemented as part of sustainability programs in a public-private partnership; the strengthening of SODEFOR and OIPR services, whose sovereign mission is to protect forests, have been effective. We should also mention the numerous awareness-raising initiatives in villages and various communities, with the active involvement of the prefectural authorities and civil society organizations. The population's growing awareness of the effects of climate change. The numerous income-generating activities enabling the population to diversify their sources of income. Reforestation and forest conservation promotion activities. The first monetary payments received by the population have also contributed to this performance. All these actions have been described in section 1.

Transition		Mesophile Forest 2024			Ombrohile Forest 2024		
		Area (ha)	CI	%Error	Area (ha)	CI	%Error
Forest Gain	SF-Before 00-10	30,482	11,380	37.3%	83,007	18,455	22.2%
	SF-00_10	-	-	-	2,128	3,500	164.4%
	SF-10_15	1,250	1,452	116.1%	1,217	1,414	116.2%
	SF-15_20	-	-	-	1,826	1,732	94.8%
	SF-20_21	-	-	-	-	-	-
	SF-22_23	-	-	-	-	-	0.0%
	SF-J_D_24	-	-	-	-	-	0.0%
	PP-Before 00-10	-	-	-	-	-	-
	PP-00_10	-	-	-	-	-	-
	PP-10_15	-	-	-	-	-	-
	PP-15_20	-	-	-	-	-	-
	PP-20_21	-	-	-	-	-	-
	PP-22_23	-	-	-	-	-	0.0%
	PP-J_D_24	-	-	-	-	-	0.0%
	AF-Before 00-10	64,869	14,859	22.9%	108,467	21,443	19.8%
	AF-00_10	625	1,027	164.4%	-	-	-
	AF-10_15	5,371	4,999	93.1%	5,780	4,270	73.9%
	AF-15_20	1,875	1,776	94.7%	7,951	5,673	71.3%
	AF-20_21	2,060	3,388	164.4%	3,086	2,589	83.9%
	AF-22_23	-	-	-	-	-	-
	AF-J_D_24	-	-	-	609	1,000	164.3%

Dense Forest – DF; Secondary Forest – SF; Forest plantations / reforestation – PP; Agro-forest – AF; Cocoa – CC; Perennial crops – PC, Other crop – OC; Human settlement – HH; Grassland – GG; Other lands – OL.

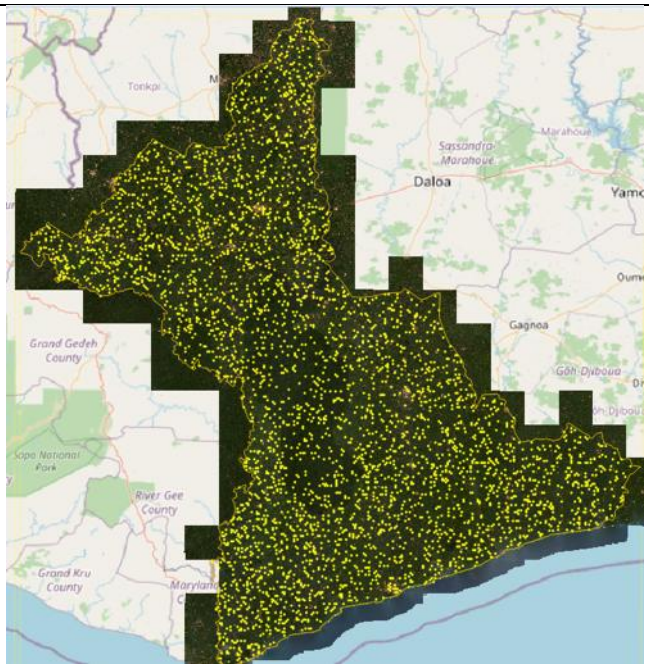
All these values are available here. In the Worksheet Summary, between columns AX and BE

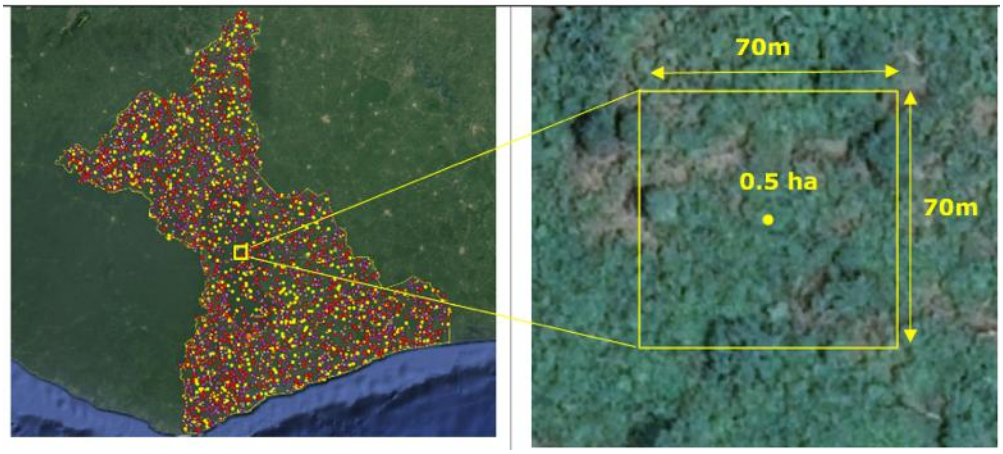
Source of data and description of measurement /calculation methods and procedures applied:

The 4,000 sampling unit points interpreted for the estimation of activity data for the reference period (2000-2015) and the first monitoring period (2020-2021),the second reporting period (2022 -2023) were used for the interpretation of the third reporting period (2024). This is a fixed-point grid. That is to say, the same sampling is used for the collection of past and current data in order to harmonize interpretations and minimize interpretation errors that could induce noise in the system.

Thus, for the period 2024 , the experts of the MRV team of Côte d'Ivoire have recruited 10 photo-interpreters consultants for image interpretation in order to detect changes in land cover.

The database of 4,000 sample points during 2024 in addition to historical interpretations 2000-2021 and 2022-2023 is available here.

	 Figure 10 : Spatial distribution of the 4,000 points The algorithms were run again to see the probability of change. This was done on a dataset of 509 new points that were different from the 4,000 points. The idea was to find out whether the trend toward deforestation was significant. The comparison of the deforestation trend in the two interpreted data sets is similar and confirms that the estimates are neither underestimated nor overestimated. The data and description are available in section 2.1, specifically on page 17.
QA/QC procedures applied:	The QA/QC procedures applied consisted of: First, standard operating procedures (SOPs) were developed as described in section 2.1 Thus, for the period 2024 , the experts of the Côte d'ivoire MRV team have built the capacities of the 10 photo-interpreter consultants in accordance with the SOPs initially defined for the first and second notification. The interpretation was carried out by photo interpreters who are specialists in interpreting land use with satellite imagery. Also, a cross-interpretation was carried out on 1596 sampling points out of the 4000 or 39.9 % by the MRV experts of the SEP REDD+ knowing that they did not participate in the first interpretation. This step made it possible to evaluate the precision and bias of the photo interpretation to ensure better calibration. 0,18 % of the selections in the first review were changed due to interpretation issues. Given that only a few land cover changes were identified 2024, the Ivory Coast MRV team agreed with FAO to update the change probabilities and select additional sampling of 509 points different of the 4,000 points to ensure that deforestation was not underestimated or overestimated. Comparison of the deforestation trend in the 2 interpreted datasets is similar and confirms that the estimates are neither underestimated nor overestimated.

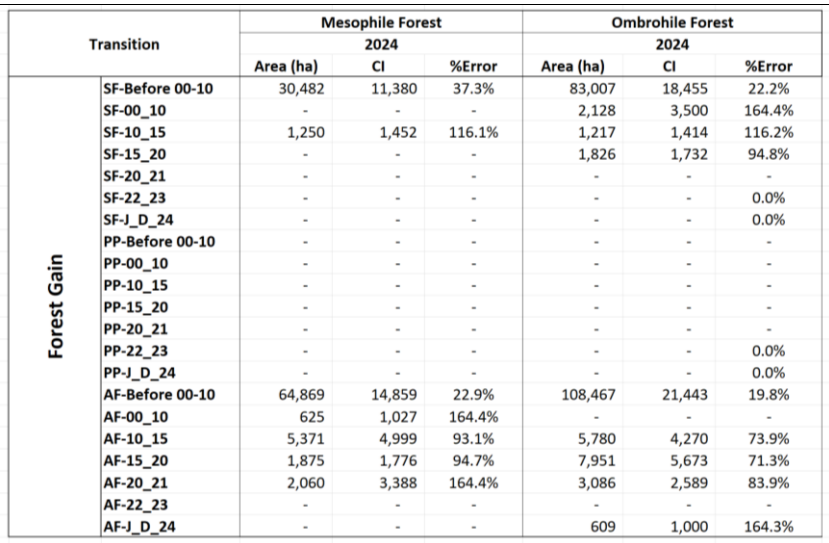
	The statistics associated with the different land use changes to determine the Activity Data were produced by the MRV experts of the SEP REDD+. The accuracy of the calculations and formulas used has been independently verified by an international expert (WB).  Figure 10 : Final Sample and example of a sample point **Statistical analysis** All 4,000 samples, including those that were reinterpreted, were used as the basis for calculating area estimates and their uncertainty. The estimation of activity data was done using the stratified random estimator based on the formulas described by Cochran (1977) and GFOI (2020). Estimates are made for each of the land use categories considered (11 classes) and in terms of changes from one period to another. Estimates and associated uncertainties are produced for each combination and for each phytogeographic zone (Mesophilic, Ombrophilous and Sub-Sudanian) considering the stratification applied. A detailed description of the calculation methods is available in the SOP4.
Uncertainty for this parameter:	Quantification of uncertainties **degradation uncertainties**

Transition		Mesophile Forest			Ombrohile Forest		
		2024			2024		
		Area (ha)	CI	%Error	Area (ha)	CI	%Error
Degradation	AF	92,910	18,010	19.4%	167,690	25,889	15.4%
	AF-DF	-	-	-	-	-	-
	AF-PP	-	-	-	-	-	-
	AF-SF	-	-	-	-	-	-
	DF	5,064	4,251	84.0%	641,395	50,505	7.9%
	DF-AF	-	-	-	-	-	-
	DF-PP	-	-	-	-	-	-
	DF-SF	-	-	-	-	-	-
	PP	625	1,027	164.4%	-	-	-
	PP-AF	-	-	-	-	-	-
	PP-DF	-	-	-	-	-	-
	PP-SF	-	-	-	-	-	-
	SF	23,051	9,733	42.2%	111,618	21,458	19.2%
	SF-AF	-	-	-	-	-	-
	SF-DF	-	-	-	-	-	-
	SF-PP	-	-	-	-	-	-

Deforestation uncertainties

Transition		Mesophile Forest			Ombrohile Forest		
		2024			2024		
		Area (ha)	CI	%Error	Area (ha)	CI	%Error
Deforestation	AF-CC	-	-	-	609	1,000	164.3%
	AF-GG	-	-	-	609	1,000	164.3%
	AF-HH	-	-	-	-	-	-
	AF-OC	-	-	-	-	-	-
	AF-OL	-	-	-	-	-	-
	AF-PC	-	-	-	-	-	-
	DF-CC	-	-	-	-	-	-
	DF-GG	-	-	-	-	-	-
	DF-HH	-	-	-	-	-	-
	DF-OC	-	-	-	-	-	-
	DF-OL	-	-	-	-	-	-
	DF-PC	-	-	-	-	-	-
	PP-CC	-	-	-	-	-	-
	PP-GG	-	-	-	-	-	-
	PP-HH	-	-	-	-	-	-
	PP-OC	-	-	-	-	-	-
	PP-OL	-	-	-	-	-	-
	PP-PC	-	-	-	-	-	-
	SF-CC	-	-	-	-	-	-
	SF-GG	-	-	-	934	1,536	164.4%
	SF-HH	-	-	-	-	-	-
	SF-OC	-	-	-	-	-	-
	SF-OL	-	-	-	-	-	-
	SF-PC	-	-	-	-	-	-

Forest gain uncertainties

Transition		Mesophile Forest 2024			Ombrohile Forest 2024		
		Area (ha)	CI	%Error	Area (ha)	CI	%Error
Forest Gain	SF-Before 00-10	30,482	11,380	37.3%	83,007	18,455	22.2%
	SF-00_10	-	-	-	2,128	3,500	164.4%
	SF-10_15	1,250	1,452	116.1%	1,217	1,414	116.2%
	SF-15_20	-	-	-	1,826	1,732	94.8%
	SF-20_21	-	-	-	-	-	-
	SF-22_23	-	-	-	-	-	0.0%
	SF-J_D_24	-	-	-	-	-	0.0%
	PP-Before 00-10	-	-	-	-	-	-
	PP-00_10	-	-	-	-	-	-
	PP-10_15	-	-	-	-	-	-
	PP-15_20	-	-	-	-	-	-
	PP-20_21	-	-	-	-	-	-
	PP-22_23	-	-	-	-	-	0.0%
	PP-J_D_24	-	-	-	-	-	0.0%
	AF-Before 00-10	64,869	14,859	22.9%	108,467	21,443	19.8%
	AF-00_10	625	1,027	164.4%	-	-	-
	AF-10_15	5,371	4,999	93.1%	5,780	4,270	73.9%
	AF-15_20	1,875	1,776	94.7%	7,951	5,673	71.3%
	AF-20_21	2,060	3,388	164.4%	3,086	2,589	83.9%
	AF-22_23	-	-	-	-	-	-
	AF-J_D_24	-	-	-	609	1,000	164.3%

Dense Forest – DF; Secondary Forest – SF; Forest plantations / reforestation – PP; Agro-forest – AF; Cocoa – CC; Perennial crops – PC, Other crop – OC; Human settlement – HH; Grassland – GG; Other lands – OL.

Any comment:	All these values are available here In the Worksheet Summary, between columns AX and BE.

4 QUANTIFICATION OF EMISSION REDUCTIONS

4.1 ER Program Reference level for the Monitoring / Reporting Period covered in this report

Year of Monitoring/Reporting period *t*	Average annual historical emissions from deforestation over the Reference Period (tCO_{2-e}/yr)	If applicable, average annual historical emissions from forest degradation over the Reference Period (tCO_{2-e}/yr)	If applicable, average annual historical removals by sinks over the Reference Period (tCO_{2-e}/yr)	If applicable, enhanced removals from other activities besides A/R (tCO_{2-e}/yr)	Adjustment, if applicable (tCO_{2-e}/yr)	Reference level (tCO_{2-e}/yr)
2024	7,692,978	1,779,971	-51,602	0	0	9,421,347
Total	**7,692,978**	**1,779,971**	**-51,602**	**0**	**0**	**9,421,347**

Excel table with FRL full calculation can be viewed at following links:

- Integration tool: available here ;
- Integration tools including Monte Carlo simulation: available here ;
- Integration tools including sensitivity analysis: available here ;
- Activity Data tool: available here .
- All calculation files are available in a folder here

4.2 Estimation of emissions by sources and removals by sinks included in the ER Program's scope

Year of Monitoring/Reporting Period	Emissions from deforestation (tCO_{2-e}/yr)	If applicable, emissions from forest degradation (tCO_{2-e}/yr)*	If applicable, removals by sinks (tCO_{2-e}/yr)		Net emissions and removals (tCO_{2-e}/yr)
2024	197,603	0	-2,143,096	0	-1,945,493
Total	**197,603**	**0**	**-2,143,096**	**0**	**-1,945,493**

Note: The Reference Level and emissions monitoring methods have been shared publicly in the first ER-MR report, which can be found on the FCPF website (https://www.forestcarbonpartnership.org/sites/default/files/documents/civ_1st_fcpf_emission_reductions_monitoring_report_v1.2_19.03.2024_final_0.pdf) . The report also contains links that allow unrestricted access to all the data and calculation tools.

4.3 Calculation of Emission Reductions

Jan 1rst to Dec 31st-2024.

	Deforestation	If applicable, forest degradation	If applicable, enhanced removals from afforestation/ reforestation (A/R)	If applicable, enhanced removals from other activities besides A/R*	Adjustment, if applicable	Total (tCO_{2-e})
Emission or removals in the Reference Level (tCO_{2-e})	7,692,978	1,779,971	-51,602	0	0	9, 421,347
Emission or removals under the ER Program during the Reporting Period (tCO_{2-e})	197,603	0	-2,143,096	0	0	-1,945,493
Emission Reductions during the Reporting Period (tCO_2-e)	7,495,375	1,779,971	2,091,494	0	0	11,366,840

Excel table with emission reduction full calculation can be viewed at the following link .
All calculations including Monte Carlo and sensitivity analysis are available here.

The ratio between the **emission reductions resulting from the increase in absorptions linked to afforestation** [18]in relation to the **total reduced emissions**[19] made it possible to determine the contribution of the absorptions in the reduction of project emissions over the monitoring period. This absorption contribution is in the following table.

Emission Reductions from enhanced removals from afforestation/reforestation as a percentage of the total FCPF ERs (%)	18.39%

[18] emission reductions resulting from the increase in absorptions linked to afforestation (2 091 494tCO2-e)

[19] total reduced emissions (11 366 840 tCO2-e)

5 UNCERTAINTY OF THE ESTIMATE OF EMISSION REDUCTIONS

5.1 Identification, assessment and addressing sources of uncertainty

Sources of uncertainty	Systematic	Random	Analysis of contribution to overall uncertainty	Contribution to overall uncertainty (High / Low)	Addressed through QA/QC?	Residual uncertainty estimated?
Activity Data						
Measurement	☑	☑	The AD measurement's contribution is largely considered to be influenced by bias factors. However, the impact of random factors has been minimized by optimizing the sample size and location in land use change classes that were previously defined using satellite imagery information. The primary factor that remains significant is linked to the visual photointerpretation process, which poses a challenge in determining land use changes based on color, size, shape, structure, texture, and their arrangement with neighboring objects observed in the satellite imagery. The identification of the 4,000 points was carried out by visual interpretation of the satellite images. For each point and on each reference date (2000, 2005, 2010, 2015) and for the years of notification (2020-2021; 2022-2023 and 2024), a land cover class code was assigned according to the 11 classes defined in the nomenclature (to refer to SOP2 -response design). The photo-interpreter should especially indicate whether the nature of the point has changed over time if there has been a real land cover/land use changes at that location. Photointerpretation is a probabilistic science whose certainty of the choice of the land cover/use class can vary according to the difficulty of identifying this class. Indeed, a land cover class is characterized by its colour, size, shape, structure, texture, and its arrangement with neighboring objects.	High (bias) & Low random)	Yes	No

Sources of uncertainty	Systematic	Random	Analysis of contribution to overall uncertainty	Contribution to overall uncertainty (High / Low)	Addressed through QA/QC?	Residual uncertainty estimated?
			On a satellite image, an object class can appear under different colours and shapes and the same colour can belong to different land cover classes. The same class can be represented by several colours depending on the nature of the soil and the nature, structure, and composition of the vegetation cover. Moreover, in tropical and subtropical regions seasonality phenomena have a strong influence on the radiometry and spectral signature of biophysical objects, which sometimes can be confused and considered as a real change of land cover/land use between two dates. The difficulties to interpret these land cover classes can lead to confusions between the 11 land cover classes which are summarized in the confusion matrices provided in the FORM 3 .Interpretation difficulties may be more prevalent for some land cover classes. As seen from the confusion matrices provided in FORM 3. In the forest classes (class 11, 12, 13, 14), it is obviously the mixed heterogeneous classes where the confusions are the most important especially the transition forest class (class 12) and agroforestry (class 14). Agroforestry (class 14) is a complex system composed of an association of forest species forming a tree layer and shrubby / perennial crops (including palm trees) and/or rainfed crops. In Ivory coast a cocoa plot (class 21) with tree cover will be assigned to this class and the tree density should be comprised between 20% and 70%. Concerning the secondary forest (class 12), the tree crowns are no longer joined			

Sources of uncertainty	Systematic	Random	Analysis of contribution to overall uncertainty	Contribution to overall uncertainty (High / Low)	Addressed through QA/QC?	Residual uncertainty estimated?
			but are still important and are still made up of local natural tree species. The tree density should be comprised between 30% and 70% resulting from degradation of a natural forest or regeneration or a secondary status to a forest stage. Hence, the difference between these two classes (class 12 and class 14) concern the lower strata of shrub and grass and therefore whether this stratum is cultivated or not. The confusion of these two classes is understandable. In a few cases some confusion between class 12 transitional woodland and class 50 Grass, scrub and shrub land have been found. This class 50 refers to a mixed formation composed of grassy, shrubs and thickets stratum. The shrub layer may be more or less dense and associated with scattered trees and according to the density of trees, this class could be confused with class 12. Less fundamental to the ERP but quite frequent are the confusions between the cropping systems (class 21, 22, 23) and class 50 Grass, scrub and shrub land. Indeed, these shrubby formations may be the result of natural regeneration of agricultural land through rotation or shifting cultivation. According to the age of the fallow land (old or young fallow land) confusion between these two classes (class 12 and class 50) may be possible. The SOPs describe in detail the treatments carried out. They are available here for checking.			
Representativeness	☑	☒	Sampling was carried out over the entire study area and all reference and monitoring periods. It can	Low (bias)	Yes	No

Sources of uncertainty	Systematic	Random	Analysis of contribution to overall uncertainty	Contribution to overall uncertainty (High / Low)	Addressed through QA/QC?	Residual uncertainty estimated?
			therefore be concluded that the impact of this source of uncertainty is low.			
Sampling	☒	☑	The sampling method is probabilistic based on a stratified approach with an optimal allocation of samples by strata according to Neyman's method on the basis of a first sub-sample to estimate the variance of each stratum in order to estimate the variance of each stratum in terms of characterization of changes. However, the changes are numerous, diffuse and individually cover relatively small areas in the study area. Therefore, they are difficult to characterize and despiDte the collection of large number of samples, some categories of change show high variance. The selection of the estimator follows the recommendations of Cochran (1977) available at this link and the GFOI MGD (2020) available here.	Low (random)	Yes	Yes
Extrapolation	☑	☒	The estimates were made on the basis of the samples collected and for which the interpretation of the land cover classes are exhaustive and cover the whole reference and monitoring periods. This source of error is therefore unlikely to be present in the approach adopted.	Low (bias)	Yes	No
Approach 3	☑	☒	This source of uncertainty exists when there is no land monitoring or Approach 3 of the IPCC monitoring, which is the case for Côte d'Ivoire. Indeed, Côte d'Ivoire uses country-specific and spatially explicit data whose estimation is described above in the measurement section of this table	Low (bias)	Yes	No
Emissions factors						

Sources of uncertainty	Systematic	Random	Analysis of contribution to overall uncertainty	Contribution to overall uncertainty (High / Low)	Addressed through QA/QC?	Residual uncertainty estimated?
DBH measurement	☑	☑	In order to guarantee the quality of data, the following QA/QC procedures have been applied: • Design of a field data collection manual to serve as a guide; • Training of data collection teams; • Conducting a pilot phase that allowed teams to understand the collection process; • Field data collection in 2 formats, paper (field sheet) and digital (tablets on which the Collect tool was installed); • Verification of the conformity of the data collected on the field sheets and tablets, allowing for corrections if necessary; • The creation of 2 mixed teams for on-site verification of 8% of the total sample units already inventoried. These teams were made up of SEP-REDD+, universities and research centers, and civil society organizations. • Data cleaning based on a cross-check between the 2 information sources (digital file and paper format) allowed for error correction.	*Low (random)*	*YES*	*NO*
H measurement	☑	☑		*High (bias) & Low (random)*	*YES*	*NO*
Plot delineation	☑	☑	Sampling units are clusters of 500 m x 500 m consisting of four rectangular observation plots of 25 m x 200 m. Each SU thus covers an area of 25 hectares. The coordinates of the center of these units correspond to those of the points on the survey plan. The inventory teams were trained in delimiting and installing the sampling units. Tools such as GPS, compasses, and marking equipment were used for this purpose. All procedures are described in the inventory guide.	*Low (random)*	*YES*	*NO*

Sources of uncertainty	Systematic	Random	Analysis of contribution to overall uncertainty	Contribution to overall uncertainty (High / Low)	Addressed through QA/QC?	Residual uncertainty estimated?
Wood density estimation	☑	☑	The allometric equation for biomass prediction involves the specific wood density. A correspondence to obtain wood densities of these species has been established based on tree measurements. For each species, a correspondence is sought in the Global Wood Density Database and a mean wood density is associated with each tree, at the lowest level (species, genus or family). For all trees whose scientific names do not correspond or do not have known scientific names, a default value of the basic wood density of 0.58 g.m-3 which is the average value for tropical Africa (Reyes et al., 1992 and FAO,1997).	*High (bias) & Low (random)*	*YES*	*NO*
Biomass allometric model	☑	☑	In the absence of allometric equations specific to forest formations in Côte d'Ivoire, the use of Globallometry has been put to use. The estimation of above-ground biomass (AGB) was made using a pantropical allometric equation. Queries made in the Globallometree database showed that at least 73 allometric equations are specific to Côte d'Ivoire. Most of these equations are specific to forest plantations (Teak, Gmelina, Acacia, etc.) and/or certain timber and woodworking species (Mahogany, Niangon, etc.). However, these equations are not suitable for national-scale application and all phytogeographic zones of the country. In order to represent all types of forests, the pantropical allometric equation (4) developed by Chave et al. (2014) was used to convert field	*High (bias) & Low (random)*	*YES*	*NO*

Sources of uncertainty	Systematic	Random	Analysis of contribution to overall uncertainty	Contribution to overall uncertainty (High / Low)	Addressed through QA/QC?	Residual uncertainty estimated?
			measurements into estimates of above-ground biomass as it is estimated to be more robust and includes data from other pantropical equations including Brown's equation (1997), Chave's equation (2005) and Fayolle's equation (2013). This equation includes tree data from Africa. It is based on diameter at breast height (DBH), tree height, and wood basic density. This process is described in the biomass study report.			
Other parameters (e.g. Carbon Fraction, rootto-shoot ratios)	☑	☑	The QA/QC process applied to biomass from the literature consisted first of a comparison with results from other authors who worked under the same conditions and ecological zones. The idea here is to ensure that the results are substantially similar. Then a check of the calculations was carried out by redoing the calculations. The objective is to obtain the same values as the author using their data. The values for each of the parameters considered are detailed in section 3.1 of the document (fixed parameters).	*High (bias) & Low (random)*	*YES*	*NO*
Representativeness	☑	☒	Data used within ERP are at the Tier 2 level (country-specific data) and come from the national forest inventory of 2017 for forests (dense and secondary forest of the ombrophilic sector; dense and secondary forest of the mesophilic sector). There are a total of 150 sample units, each with 4 plots, for a total of 600 plots. The data are sufficiently representative of the program area and have allowed for precise estimates of emission factors. Details can be found in section 3.1 and via this link.	*Low (bias)*	*YES*	*NO*
Integration						

Sources of uncertainty	Systematic	Random	Analysis of contribution to overall uncertainty	Contribution to overall uncertainty (High / Low)	Addressed through QA/QC?	Residual uncertainty estimated?
Model	☑	☒	Control Mechanisms of material errors have been included in emission and removal calculation tools, i.e., sums of sampling points by forest type coincide with sample size ensuring no double counting in the sample-based activity data estimate. See the check of deforested areas in cells O29-T29 and the check of Forest Gain areas in cells S321-X321 in the Integration Tool. QA/QC procedure during ERs estimates includes ensuring all these cells show an "Ok" label before reporting ER estimates.	Low (bias)	*YES*	*NO*
Integration	☑	☒	Activity Data and Emission Factors are comparable. Carbon densities have been estimated according to the forest types, and non-forest land uses interpreted in the visual assessment.	Low (bias)	*YES*	*NO*

5.2 Uncertainty of the estimate of Emission Reductions

- ***Parameters and assumptions used in the Monte Carlo method***

Côte d'ivoire' s ER Program applied Monte Carlo methods (IPCC Approach 2) for quantifying the Uncertainty of the Emission Reductions. Because the MC propagation analysis includes 247 parameter values, it has been provided access to uncertainty and emission factor calculation tool[20] to see all parameter values used in the analysis. The sources of uncertainty propagated in the Monte Carlo (MC) analysis are provided in the following Table. All calculation files are available in a folder

Parameter included in the model	Parameter values	Error sources quantified in the model (e.g. measurement error, model error, etc.)	Probability distribution function	Assumptions
Deforestation and Degradation Emission Factors	The MC analysis included **13** Carbon density values for forest types and non-forest land uses categories considered in emission estimate. See all values in the Uncertainty calculation tool "Input_data&Models" Sheet – (cells F6-f15 and F17-F19)	90% Confidence Interval.	Normal	Truncated Normal distribution (values > 0).
Removal factors	The MC analysis included **4** Removal factors. See all values in the Uncertainty calculation tool "Input_data&Models" Sheet cells F22, F24, F26 and F28	90% Confidence Interval.	Normal	Truncated Normal distribution (values > 0).
Deforestation Activity Data	**Forty-six** values for the Reference Period, **29** activity data for the first Monitoring Periods **2** activity data for the second Monitoring Periods and **3** activity data for the third Monitoring period were included in MC analysis. See all values in the Uncertainty calculation tool, "Input_data&Models" sheet, cells G32..G127 for Reference Period, cells G128..G223 for the first Monitoring Periods, G224..G271 for the second Monitoring period and G272..G319 for the third Monitoring period.	90% Confidence Interval.	Normal	Truncated Normal distribution (values > 0).
Activity Data for estimating inherited removals	The MC analysis included **32** Activity Data values for estimating inherited removals for the first monitoring periode , **16** for the second monitoring period and **16** for the last (3rd) monitoring period. See all values in the Uncertainty calculation tool "Input_data&Models" sheet, cells G324..G485.	90% Confidence Interval.	Normal	Truncated Normal distribution (values > 0).

[20] Uncertainty calculation tool can be accessed at the following link here

Permanent Forest's Degradation	**Fifteen** values for the Reference Period and **56** activity data for the first Monitoring Periods ,**8** for the second monitoring period and **7** activity data were included in MC analysis. See all values in the Uncertainty calculation tool, "Input_data&Models" sheet, cells G494..G557 for Reference Period, cells G558..G621 for the first Monitoring Periods, cells G622..653 for the second Monitoring period and cells G654..G685 for the trird Monitoring period.	90% Confidence Interval.	Normal	Truncated Normal distribution (values > 0).

- ***Quantification of the uncertainty of the estimate of Emission Reductions***

the Monte Carlo results point to a robust and well-calibrated ER estimate. the simulation median (11.55 $MtCO_2e$) and comfortably within the 90% CI, indicating a prudent, conservative stance. The ~21% 90% relative half-width translates appropriately to a 4% uncertainty discount under FCPF rules, which requires a 4% conservativeness factor in cases the aggregate uncertainty of ERs is between 15 to 30%.

		Reporting Period	Crediting Period
		Total Emission Reductions*	**Total Emission Reductions***
A	**Median**	**11,552,139**	**38,065,452**
B	**Upper bound 90% CI** (Percentile 0.95)	**14,032,503.1**	**46,536,684.45**
C	**Lower bound 90% CI** (Percentile 0.05)	**9,287, 826.5**	**30,437,241.4**
D	**Half Width Confidence Interval at 90% (B – C)/ 2**	**2,372,338.3**	**8,049,721.52**
E	**Relative margin (D / A)**	**21%**	**21%**
F	**Uncertainty discount**	**4%**	**4%**

5.3 Sensitivity analysis and identification of areas of improvement of MRV system

The following table shows the contribution of each parameter to the uncertainty of emissions reduction. Two parameters contribute to 58.60% of the total ER uncertainty: i. Carbon density of the stratum of dense forests (30.6%) and ii. Removal Factor of agro-forest under 20 years (28.0%). Details of the sensitivity analysis are available from here. Future improvements include maintaining the pool of national photointerpreter experts and building their capacity to collect activity data for the next monitoring cycle. We intend to disseminate the standard operating procedures (SOPs) to ensure quality in the data collection and analysis process.

Input Variable	Corresponding Input Value			Percent	
	Low Output	Base Case	High Output	Swing	Swing^2
CD-Dense Forest-ombrophileDF	248.45	280.26	312.07	1,646,892	30.6%
RF-Agro-foret-<20 yr	-2.90	-11.59	-20.28	1,575,187	28.0%
RF-Secondary Forest-ombrophile < 20yr	-7.97	-12.06	-16.16	706,637	5.6%

AD-Defo_2000-2010_ombrophile_DF-CC	68,067.38	81,268.77	94,470.15	647,523	4.7%
AD-Defo_J_D_2024_ombrophile_SF-GG	2,469.78	934.12	- 601.54	569,972	3.7%
CD-Secondary Forest-ombrophileSF	131.02	147.57	164.11	557,636	3.5%
AD-ForestGain_J_D_2024_ombrophile_Before 00-10-SF	64,551.73	83,007.18	101,462.64	445,268	2.2%
AD-Defo_2010-2015_ombrophile_DF-CC	20,834.15	28,788.64	36,743.12	429,277	2.1%
CD-Grassland-GG	84.23	39.88	-4.47	389,352	1.7%
AD-Defo_2000-2010_ombrophile_DF-OC	9,923.35	16,706.53	23,489.70	389,192	1.7%
CD-Cocoa-CC	50.27	45.40	40.53	373,126	1.6%
AD-Defo_2010-2015_ombrophile_SF-CC	65,343.65	81,012.16	96,680.68	367,825	1.5%
AD-StableForest_2000-2010_ombrophile_DF-SF	54,311.61	67,090.13	79,868.65	354,132	1.4%
AD-ForestGain_J_D_2024_mesophile_Before 00-10-AF	50,009.97	64,869.37	79,728.77	344,342	1.3%
CD-Dense Forest-mesophileDF	141.76	165.30	188.84	314,628	1.1%
AD-Defo_2000-2010_ombrophile_SF-CC	45,580.78	58,148.89	70,717.00	268,160	0.8%
AD-Defo_2010-2015_ombrophile_DF-OC	3,799.87	8,039.35	12,278.83	267,629	0.8%
AD-Defo_2000-2010_ombrophile_SF-OC	18,384.32	27,333.00	36,281.68	265,445	0.8%
AD-Defo_2000-2010_ombrophile_DF-GG	6,882.35	12,059.02	17,235.69	259,881	0.8%
AD-StableForest_2010-2015_ombrophile_DF-SF	7,948.24	15,273.97	22,599.71	223,371	0.6%
AD-Defo_2010-2015_ombrophile_DF-GG	2,824.74	6,822.03	10,819.32	220,790	0.5%
CD-Secondary Forest-mesophileSF	71.65	81.46	91.28	210,835	0.5%
AD-Defo_2000-2010_mesophile_DF-CC	18,126.24	26,224.11	34,321.97	202,769	0.5%
AD-StableForest_2010-2015_ombrophile_SF-AF	8,244.72	16,770.57	25,296.42	182,908	0.4%
AD-Defo_2010-2015_ombrophile_SF-OC	7,505.18	12,625.42	17,745.65	167,107	0.3%
CD-Perennial crops-PC	129.59	104.10	78.61	134,777	0.2%
AD-ForestGain_J_D_2024_ombrophile_15_20-AF	2,278.27	7,950.90	13,623.54	131,454	0.2%
AD-StableForest_2010-2015_ombrophile_DF-AF	848.20	3,368.75	5,889.30	130,929	0.2%
AD-Defo_2000-2010_ombrophile_SF-GG	6,854.71	12,560.06	18,265.41	128,309	0.2%
AD-Defo_2010-2015_ombrophile_SF-GG	3,873.43	8,865.85	13,858.27	123,532	0.2%
AD-Defo_2010-2015_mesophile_SF-OC	5,098.81	12,065.31	19,031.81	121,549	0.2%
AD-StableForest_2000-2010_ombrophile_DF-AF	848.20	3,368.75	5,889.30	119,000	0.2%
AD-ForestGain_J_D_2024_mesophile_10_15-AF	371.35	5,370.63	10,369.90	115,850	0.2%
AD-StableForest_2000-2010_mesophile_DF-SF	6,811.42	13,082.36	19,353.31	109,794	0.1%
AD-StableForest_2010-2015_ombrophile_SF-DF	5,628.33	2,128.35	- 1,371.64	106,719	0.1%
AD-Defo_2010-2015_mesophile_DF-CC	1,343.50	5,137.46	8,931.42	104,523	0.1%
AD-Defo_2000-2010_mesophile_DF-OC	520.23	3,506.39	6,492.55	99,637	0.1%

AD-ForestGain_J_D_2024_ombrophile_10_15-AF	1,510.10	5,780.29	10,050.49	98,954	0.1%
AD-Defo_2000-2010_mesophile_DF-GG	1,617.48	5,259.59	8,901.70	95,396	0.1%
AD-StableForest_2000-2010_ombrophile_SF-AF	2,858.99	7,648.53	12,438.07	93,390	0.1%
CD-Other crops-OC	9.68	5.53	1.38	91,565	0.1%
AD-ForestGain_J_D_2024_ombrophile_00_10-SF	- 1,371.64	2,128.35	5,628.33	84,443	0.1%
AD-Defo_2000-2010_mesophile_SF-OC	6,937.64	12,013.66	17,089.67	80,495	0.1%
AD-ForestGain_J_D_2024_mesophile_20_21-AF	- 1,327.70	2,060.20	5,448.11	78,509	0.1%
AD-StableForest_2000-2010_mesophile_DF-AF	668.00	4,009.37	7,350.75	77,526	0.1%
AD-ForestGain_2000-2010_ombrophile_00_10-SF	5,628.33	2,128.35	- 1,371.64	76,766	0.1%
AD-StableForest_2010-2015_mesophile_DF-SF	- 674.07	3,188.29	7,050.65	74,403	0.1%
AD-Defo_2000-2010_mesophile_SF-CC	23,077.70	32,893.24	42,708.78	73,925	0.1%
AD-Defo_2010-2015_ombrophile_SF-PC	5,332.43	12,188.42	19,044.41	68,474	0.1%
AD-Defo_2010-2015_mesophile_SF-CC	17,404.12	25,476.87	33,549.62	66,894	0.1%

The second table shows the sensitivity analysis on cumulative emissions reductions for the first, second and third reporting periods.

Input Variable	Corresponding Input Value			Percent	
	Low Output	Base Case	High Output	Swing	Swing^2
CD-Dense Forest-ombrophileDF	248.45	280.26	312.07	6,371,315	38.3%
RF-Agro-foret-<20 yr	-2.90	-11.59	-20.28	3,348,004	10.6%
AD-Defo_2000-2010_ombrophile_DF-CC	68,067.38	81,268.77	94,470.15	2,700,022	6.9%
CD-Grassland-GG	84.23	39.88	-4.47	2,243,341	4.7%
CD-Secondary Forest-ombrophileSF	131.02	147.57	164.11	2,117,291	4.2%
AD-Defo_2010-2015_ombrophile_DF-CC	20,834.15	28,788.64	36,743.12	1,789,986	3.0%
AD-Defo_2000-2010_ombrophile_DF-OC	9,923.35	16,706.53	23,489.70	1,622,841	2.5%
AD-StableForest_2020-2021_ombrophile_DF-SF	5,628.33	2,128.35	- 1,371.64	1,600,783	2.4%
AD-Defo_2010-2015_ombrophile_SF-CC	65,343.65	81,012.16	96,680.68	1,533,746	2.2%
AD-Defo_2022-2023_ombrophile_SF-OC	8,025.30	4,911.53	1,797.76	1,524,344	2.2%
CD-Cocoa-CC	50.27	45.40	40.53	1,481,680	2.1%
AD-StableForest_2000-2010_ombrophile_DF-SF	54,311.61	67,090.13	79,868.65	1,476,649	2.1%
AD-Defo_2022-2023_ombrophile_SF-CC	6,884.53	3,062.46	- 759.60	1,345,868	1.7%
CD-Dense Forest-mesophileDF	141.76	165.30	188.84	1,301,420	1.6%
AD-Defo_2000-2010_ombrophile_SF-CC	45,580.78	58,148.89	70,717.00	1,118,166	1.2%
AD-Defo_2010-2015_ombrophile_DF-OC	3,799.87	8,039.35	12,278.83	1,115,952	1.2%
AD-Defo_2000-2010_ombrophile_SF-OC	18,384.32	27,333.00	36,281.68	1,106,844	1.2%
AD-Defo_2000-2010_ombrophile_DF-GG	6,882.35	12,059.02	17,235.69	1,083,644	1.1%

AD-StableForest_2010-2015_ombrophile_DF-SF	7,948.24	15,273.97	22,599.71	931,406	0.8%
AD-Defo_2010-2015_ombrophile_DF-GG	2,824.74	6,822.03	10,819.32	920,644	0.8%
AD-Defo_2020-2021_mesophile_SF-OC	5,448.11	2,060.20	- 1,327.70	886,664	0.7%
AD-Defo_2000-2010_mesophile_DF-CC	18,126.24	26,224.11	34,321.97	845,500	0.7%
RF-Secondary Forest-ombrophile < 20yr	-7.97	-12.06	-16.16	815,598	0.6%
AD-StableForest_2010-2015_ombrophile_SF-AF	8,244.72	16,770.57	25,296.42	762,684	0.5%
CD-Secondary Forest-mesophileSF	71.65	81.46	91.28	717,875	0.5%
AD-Defo_2010-2015_ombrophile_SF-OC	7,505.18	12,625.42	17,745.65	696,798	0.5%
AD-StableForest_2022-2023_ombrophile_DF-SF	2,631.54	1,217.32	- 196.91	646,820	0.4%
AD-Defo_J_D_2024_ombrophile_SF-GG	2,469.78	934.12	- 601.54	569,972	0.3%
CD-Perennial crops-PC	129.59	104.10	78.61	556,443	0.3%
AD-StableForest_2010-2015_ombrophile_DF-AF	848.20	3,368.75	5,889.30	545,944	0.3%
AD-Defo_2000-2010_ombrophile_SF-GG	6,854.71	12,560.06	18,265.41	535,019	0.3%
AD-Defo_2010-2015_ombrophile_SF-GG	3,873.43	8,865.85	13,858.27	515,100	0.3%
AD-Defo_2010-2015_mesophile_SF-OC	5,098.81	12,065.31	19,031.81	506,832	0.2%
AD-StableForest_2000-2010_ombrophile_DF-AF	848.20	3,368.75	5,889.30	496,203	0.2%
AD-Defo_2020-2021_ombrophile_SF-OC	1,608.99	608.66	- 391.67	489,711	0.2%
AD-StableForest_2000-2010_mesophile_DF-SF	6,811.42	13,082.36	19,353.31	457,816	0.2%
AD-ForestGain_J_D_2024_ombrophile_Before 00-10-SF	64,551.73	83,007.18	101,462.64	445,268	0.2%
AD-StableForest_2010-2015_ombrophile_SF-DF	5,628.33	2,128.35	- 1,371.64	444,994	0.2%
AD-Defo_2010-2015_mesophile_DF-CC	1,343.50	5,137.46	8,931.42	435,837	0.2%
AD-Defo_2000-2010_mesophile_DF-OC	520.23	3,506.39	6,492.55	415,464	0.2%
AD-Defo_2000-2010_mesophile_DF-GG	1,617.48	5,259.59	8,901.70	397,779	0.1%
AD-StableForest_2000-2010_ombrophile_SF-AF	2,858.99	7,648.53	12,438.07	389,415	0.1%
AD-Defo_2020-2021_ombrophile_SF-HH	1,608.99	608.66	- 391.67	371,279	0.1%
AD-ForestGain_J_D_2024_mesophile_Before 00-10-AF	50,009.97	64,869.37	79,728.77	344,342	0.1%
AD-Defo_2000-2010_mesophile_SF-OC	6,937.64	12,013.66	17,089.67	335,646	0.1%
AD-StableForest_2000-2010_mesophile_DF-AF	668.00	4,009.37	7,350.75	323,266	0.1%
AD-StableForest_2020-2021_mesophile_SF-AF	5,448.11	2,060.20	- 1,327.70	318,347	0.1%
AD-StableForest_2010-2015_mesophile_DF-SF	- 674.07	3,188.29	7,050.65	310,243	0.1%
AD-Defo_2000-2010_mesophile_SF-CC	23,077.70	32,893.24	42,708.78	308,250	0.1%
AD-Defo_2010-2015_ombrophile_SF-PC	5,332.43	12,188.42	19,044.41	285,521	0.1%
AD-ForestGain_2022-2023_mesophile_10_15-AF	1,942.17	8,055.94	14,169.70	283,352	0.1%
AD-Defo_2010-2015_mesophile_SF-CC	17,404.12	25,476.87	33,549.62	278,932	0.1%

AD-ForestGain_2000-2010_ombrophile_00_10-SF	5,628.33	2,128.35	- 1,371.64	266,218	0.1%
AD-ForestGain_2022-2023_ombrophile_10_15-AF	3,429.91	9,125.96	14,822.00	263,992	0.1%
AD-ForestGain_2022-2023_ombrophile_15_20-AF	2,278.27	7,950.90	13,623.54	262,908	0.1%
AD-Defo_2010-2015_mesophile_SF-GG	4,988.47	11,255.32	17,522.18	249,678	0.1%
CD-Other crops-OC	9.68	5.53	1.38	243,106	0.1%

6 TRANSFER OF TITLE TO ERS

6.1 Ability to transfer title

In Côte d'Ivoire, **the State is the owner of the ER titles**, as described in Article 1 of Decree 2021-674 dated 03 November 2021. A legal and regulatory framework has been put in place specifically for the transfer of ER titles resulting from the implementation of the ERP and is exclusive to the geographical scope and duration of the ERP. It is reflected in Decree 2021-674 of 03 November 2021. This decree can be viewed at the following link. Which stipulates that a contractual volume of 10 million tonnes of carbon equivalent are exclusively transferred to the carbon fund for the FCPF in accordance with the provisions of the Tranche A and B ERPAs signed on 30 October 2020. This agreement can be viewed at the following link. The terms and conditions for the management of ERs are specified in the interministerial decree 0183/ MEF/MEMINADER/MINEF/MBPE/MINEDD dated 16 February 2022. It can be viewed at the following link. Subsequently, the carbon credits resulting from the additional volume of ERs under this programme are transferred to the FCPF's carbon fund after negotiation and approval by the parties of the ERPAs.The government of Côte d'Ivoire, through the Ministry of Economy and Finance (MEF), is the only legal entity that holds and transfers ER titles to a third party.

6.2 Implementation and operation of Program and Projects Data Management System

The SEP REDD+ is in charge of supervising REDD+ projects at the national level. To fully play this role, it is necessary to ensure that the REDD+ activities that are implemented in the territory comply with the guidelines and commitments made in the National REDD+ Strategy. To meet this requirement, and in accordance with its mission according to its creation decree. It can be viewed at the following link. The SEP-REDD+ key role is the following :

- Manages the national data management system for REDD+ programs and projects (precise geographic limits of the target area or geolocation to avoid possible overlap, description of planned activities, scope and carbon pools concerned, MRV data, applicable environmental and social safeguards, etc.);
- Communicates all ER information generated by REDD+ projects to the entity in charge of the ER transaction registry, in this case the MFB;
- Avoids multiple reporting of emissions reductions or double counting. A recording and geolocation register of emissions reduction initiatives has been developed to record the reduced emissions of the project and thus ensure that they are not counted twice. This register is integrated into the national geoportal. Gather all the basic information relating to REDD+ projects and programmes, including the ERP (it will make it possible to specify: who owns the emissions reductions; what the precise geographical boundaries are with geolocation; the planned activities, the duration of the project, the emissions reduced, etc.);
- Resolve problems of possible overlap between projects and initiatives to avoid double counting;
- Specify the technical elements of the project (carbon pools selected, baseline scenario, etc.).
- Make all information relating to projects and initiatives underway in the region available in a clear, centralised and free manner.

The information is available online, in the country's official language (French).

6.3 Implementation and operation of ER transaction registry

In order to be able to issue its own legal documents, Côte d'Ivoire needs a so-called transaction registry. That is, a registry that allows for the issuance, serialisation and management of legal titles evidencing ERs. This registry, which is required by international carbon standards, is more akin to the control and legitimacy that the project owner must exercise in the intervention area. It is different from the one described in section 6.2 above. Since August, 2024 Côte d'Ivoire has designed a national transaction registry as presented by this website. That registry will permit it to label, monitor transparently its carbon offsets in 16 sectors. However, it is still not-operational. The carbon market office is the official entity ability to manage the registry. It has been set up by decree N°2024-658 in August, 2024 (See the decree) and took up its duties in March, 2025. Found here the link toward the launching of its activities. Due to the non-operational status of such an instrument, Côte d'Ivoire has decided to keep relying on the FCPF-CF's transaction register (*Carbon Assets Trading System (CATS)*). Thus all carbon transaction of Côte d'Ivoire will be done from the FCPF registry.

6.4 ERs transferred to other entities or other schemes

The ERP is the first emission reduction programme in Côte d'Ivoire. The country has signed, in 2020, an ERPA for 10 million TeqCO2 that will be fully (100%) transferred to the FCPF and an additional call option for 6.5 million TeqCO2 according to the agreement. The transfer has therefore not been made to date, neither to third parties nor to other programs. 10 million TeqCO2 has been transferred to the FCPF as part of the performance of the first and second notification reports for the periods 2020-2021 and 2022-2023. In this program, only the transfer to the FCPF will be valid. An agroforestry project developed by RABOBANK in the Nawa region reportedly sold 122,457 emission reduction credits during the first reporting period (2020-2021). These volumes were temporarily subtracted from the total emissions reduced in the first reporting period to avoid the risk of double counting. Moreover, in the second reporting period (2022-2023), the Government of Côte d'Ivoire by letter requested RABOBANK to suspend all its emission reduction activities in the ERP area to avoid the risk of double counting. In response to the Government, RABOBANK confirmed the suspension of its activities in the ERP area. As a result, RABOBANK did not generate any emission reductions during the second reporting period (2022-2023) and the last reporting period (2024).

7 REVERSALS

7.1 Occurrence of major events or changes in ER Program circumstances that might have led to the Reversals during the Reporting Period compared to the previous Reporting Period(s)

>> There have not been any major events or changes in ER Program circumstances that have led to the Reversals during the Reporting Period

7.2 Quantification of Reversals during the Reporting Period

Intentionally left blank because no reversals occurred during the current reporting period.

7.3 Quantification of pooled reversal buffer replenishments

This section is not applicable given that no reversals occurred during previous reporting periods.

7.4 Reversal risk assessment

Risk Factor	Risk indicators	Default Reversal Risk Set-Aside Percentage	Discount	Resulting reversal risk set-aside percentage
Default risk		**10 %**		*10 %*
Lack of broad and sustained stakeholder support	Some vulnerable groups, particularly women and youth, took part in a capacity-building session on gender, social inclusion, and other social aspects organized by the project. The report related to this activity can be found at this address. The participation of regional and departmental REDD+ committees in the capacity-building workshop on the Call for Expression of Interest (CEI) also led to the establishment of 10 grievance management committees (GMCs) in the regions and departments concerned by the project. Traditional authorities are actively involved in raising awareness and mobilizing communities. The latest version of the benefit sharing plan, previously approved by all stakeholders, was officially approved by the FCPF in January 2024. As part of the national land security program (PNSFR), a Project to Strengthen Rural Land Security in Côte d'Ivoire (PRESFOR) was developed by AFOR and the World Bank in 2022. It is currently being implemented 16 regions of the country including 5 regions in the ERP zone (Nawa, Guémon and Cavally) The National Strategy for the Fight Against Corruption (SNLC 2024–2028) was adopted in June 2024 thanks to AFOR through its PRESFOR project. It serves as the strategic reference framework for coordinating the government's various actions in the prevention and fight against corruption. Actors such as the Ministry of Water and Forests, SODEFOR, Earthworm Foundation, and Nestlé supported the assisted natural regeneration of 7,000 hectares, and 1,500 hectares were directly restored under community supervision (see page 14 here)	**10 %**	*Medium risk -5%.*	*5 %*

Lack of institutional capacities and/or ineffective vertical/cross sectorial coordination	All sectoral administrative entities involved in the PRE participate in the meetings of the national REDD+ committee (Copil, which is the decision-making body of the project) and the interministerial technical committee (Cotech); As such, they regularly participate in the various meetings organized by these 2 bodies, i.e. 4 workshops during 2024. The private cocoa sector, through the cocoa and forest initiative, facilitates collaboration at the national and regional levels, with the Regional REDD+ Committees in each Region of the ERP zone As part of a public-private partnership. As part of the objectives of the Forest Preservation, Restoration, and Extension Strategy (FPRES) define by MINEF in collaboration with by SEP REDD+ and Phase 2 of the Forest Investment Program run by SODEFOR, over 35,000 hectares of agroforests are being developed in the Rapides-Grah area, within a total area of 273,804 hectares (page 19). The Ministry of Water and Forests, SODEFOR, and ICF worked together to restore 5,000 hectares of degraded forest in the classified forests of Scio, Haut Dodo, and Rapides Grah (page 16). The Coffee-Cocoa Council (CCC) supported ICF's efforts by introducing more than 8.5 million forest and fruit tree seedlings that are compatible with cocoa farming. See here page 21.	**10 %**	*Low risk* *-10 %*	*0 %*
Lack of long term effectiveness in addressing underlying drivers	ERP interventions are directly focused on two of the main drivers and agents of deforestation and degradation in the region (cocoa farming and unsustainable logging). The ERP incorporates a series of measures that maintain the production levels of the main commodities causing deforestation and degradation while streamlining their territorial space. The measures listed in section 1 and table 2 address these factors. In general, the actions can be summarised as follows: • The establishment of a legal and regulatory framework conducive to the achievement of long-term REDD+ objectives is underway; • The monetary benefit sharing plan validated in 2023 by all parties provides financial incentives that can encourage the support of populations and are capable of contributing to the economic decoupling due to deforestation and forest degradation, including beyond the life of the project;	**5 %**	*Low risk* *-5 %*	*0%*

	• This benefit sharing plan also takes into account non-carbon benefits for beneficiaries and stakeholders; In 2024, the Ministry of Water and Forests (MINEF) developed a legal and institutional framework to integrate Payments for Environmental Services (PES) and REDD+ carbon projects into the national strategy for sustainable forest management. This framework aims to create financial incentives for local communities and farmers who adopt environmentally friendly practices, such as agroforestry and forest conservation. See at page 18 Environ 600 producteurs ont signé des contrats afin de bénéficier de paiements échelonnés sur plusieurs années, favorisant la plantation d'arbres et la réduction des émissions (page 18). Many complementary initiatives such as beekeeping and the promotion of improved cookstoves were implemented to diversify farmers' incomes while reducing pressure on forest cover through better energy resource management. More details can be found here page 21. lSome public institutions, such as OIPR, have signed agreements with local communities for the sustainable management of natural resources around the PNT. Another agreement is being prepared for the integrated management of the area around the source of the Hana River, aiming to reduce pollution, and prevent conflicts between farmers and gold miners. see here page 23. The implementation of the PRESFOR project, which is currently underway, aims to deliver land certificates to rural populations in 16 regions of Côte d'Ivoire, including the Cavally, Guémon, and Nawa regions. See the following link for more details. The promotion of sustainability programmes and the development of possible emission reduction projects are also underway.			
Exposure and vulnerability to natural disturbances	The ERP sees no significant natural risks due to fire, drought, extreme weather events or other natural hazards regarding this study. The forest areas remain wet even during dry periods and therefore have a low fire risk.	**5 %**	*Medium risk* *-2 %*	*3 %*

	For fires, FIP 2 (2022-2029) has strengthened SODEFOR's monitoring resources for classified forests and OIPR for the Taï National Park and protected areas. The Special Surveillance and Intervention Unit of the Directorate of Water and Forests has also been set up and a squadron of aircraft has been created for surveillance, intervention and mapping. The project carried out several awareness-raising activities through radio broadcasts in local languages and announcements shared via press books. The contracts and reports related to partnerships with the ten radio stations and the project can be found here. The project also took part in COP 29, which gave it greater visibility. Three firms were hired to check the quality of the information, including beneficiary plots, to ensure the data is reliable, accurate, and correct. More than 45,000 identifiers were given to them for field verification. The activity reports can be found at this address. In addition, actions aimed at mitigating any risk linked to natural disturbances Various actions have also been carried out. • A national forest monitoring system (NFMS) has been set up by the REDD+ Permanent Secretariat, with the main objective of monitoring forest areas to detect natural disturbances and other changes. In this context, a workshop was organized to develop the 2025–2030 action plan, including prevention and response measures to natural events. See here the report • Existence of a valid Plague management plan, available here. • The Cocoa & Forests Initiative supported the REDD+ Permanent Secretariat and enabled the expansion of the (NFMS), which now covers 12 forest regions, with 1,189 alerts verified and over 3,500 field missions carried out in 2024 (page 15). • In August 2024, the government established an ecological corridor along the Saro River in the Taï department to help limit the spread of diseases, wildfires, and other natural disasters.			

	The national fire and bushfire control program is still operating;			
		Total reversal risk set-aside percentage		***18 %***
		Total reversal risk set-aside percentage from previous monitoring report		*23%*

Efforts have been made by the program to address and reduce the risks of reversal. Thus, at the institutional level: sectoral ministries, the program coordination unit, and regional capacities have been sufficiently strengthened.
With the underlying factors of deforestation identified and addressed by the policies and measures put in place, the incentive provided by the first monetary benefit payments must also be added. In addition, numerous initiatives currently under development will enable the program to stay on course in the medium and long term.

Public awareness of the harmful effects of climate change and the opportunities offered by the program and numerous awareness campaigns are contributing significantly to the support of much of population.
Details of all actions taken are available in the table above.

8 EMISSION REDUCTIONS AVAILABLE FOR TRANSFER TO THE CARBON FUND

			2024	TOTAL
A.	**Emission Reductions during the Reporting period (tCO_2-e)**	*from section 4.3*	11,366,840	11,366,840
B.	**If applicable, number of Emission Reductions from reducing forest degradation that have been estimated using proxy-based estimation approaches (use zero if not applicable)**		0	0
C.	**Number of Emission Reductions estimated using measurement approaches (A-B)**		11,366,840	11,366,840
D.	**Percentage of ERs (A) for which the ability to transfer Title to ERs is clear or uncontested**	*from section 6.1*	100%	
E.	**ERs sold, assigned or otherwise used by any other entity for sale, public relations, compliance or any other purpose including ERs accounted separately under other GHG accounting schemes or ERs that have been set-aside to meet Reversal management requirements under other GHG accounting schemes**	*from section 6.4*	0	0
	If applicable, any buffer replenishments	*section 7.3 P*	0	0
F.	**Total ERs [(B+C)*D-E] minus, if applicable, any replenishments as per section 7.3, P**		11,366,840	11,366,840

G.	**Conservativeness Factor to reflect the level of uncertainty from non-proxy based approaches associated with the estimation of ERs during the Crediting Period**	*from section 5.2*	4%	
H.	**Quantity of ERs to be allocated to the Uncertainty Buffer (0.15*B/A*F)+(G*C/A*F)**		454,673	454,673
I.	**Total reversal risk set-aside percentage applied to the ER program**	*from section 7.4*	18%	
J.	**Quantity of ERs to be allocated to the Pooled Reversal Buffer (F-H)*I**		1,964,190	1,964,190
K.	**Number of FCPF ERs (F- H – J)**		8,947,977	8,947,977
L.	**Percentage of Emission reductions from enhanced removals from afforestation/reforestation as a percentage of the total FCPF ERs [Optional if the country wishes to generate enhanced removals]**	*From section 4.3*	18.39995988%	
M	**Number of FCPF ERs from enhanced removals from afforestation/reforestation (L * K) [Optional if the country wishes to generate enhanced removals]**		1,646,424	1,646,424