

COMMUNITY BASED AVOIDED DEFORESTATION PROJECT IN GUINEA- BISSAU



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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

IBAP implemented actions and conservation measures in Cacheu (PNTC) and Cantanhez (PNC) National Parks that allowed deforestation to be reduced in the first monitoring period (2011-2016). The backbone of the project's implementation were governance and management activities.

In 2012, the formal establishment of BioGuinea Foundation (FBG), the first Park Management Council Meeting in PNTC and the first Agricultural Community Council in PNTC took place. The initial work and engagement in PNTC focused, mainly, on traditional fishing and rice cultivation aiming to improve community practices and reduce negative impacts in the forest, both terrestrial and mangroves, from slash-and-burn practices. That year also kicked-off the control and surveillance activities in PNTC.

In 2013, IBAP kicked off the process to revise its strategic planning and local level activities fast-tracked in PNTC. In special, 2 community meetings were held (in July and December), 24 surveillance missions launched and 4 scientific incursions. In addition, IBAP installed electrical fences in 139,4ha to reduce conflicts with hippopotamus that were invading rice fields and a community radio was installed. In PNC, Mr. Quecuta was appointed the Park Director starting local level activities in PNC. An initial group of 34 rangers were hired in 2013 followed by a series of training and workshops were carried.

In 2014, IBAP's Strategic Planning was revised (2014-2020) with a clear focus on strengthening the National System of Protected Areas. Communities were involved in reforestation and in coastal monitoring activities. Park Guards and active patrolling were responsible to confiscate 6 chainsaw, 200 fishnets and 35 woodpiles in PNC, and 3 fishing camps and 2 hunting camps were dismantled in PNTC. Two community meetings were organized in each park leading to the creation of a Central Oversight Unit and the draft of the Internal Regulation of PNC. Finally, an additional 681,5ha of rice fields were protected by electrical fences, protecting the production of 1,000 tons of rice. In 2014, IBAP was able to hire a Project Coordinator, a Forestry Technician, an Ecotourism Specialist, an Accountant and one Trainee. On that year, more advanced training was provided in GIS and Forestry Inventory. Furthermore, IBAP was able to provide support to 60 fisherwomen in PNTC to share best practices on sustainable fishing, hygiene and fish preparation.

The year of 2015 started with PNTC reaching RAMSAR site status on May 22nd. Park meeting evolved as expected with two community meetings being held in each park. The Central Oversight Unit organizes 90 surveillance incursions in PNTC and 24 in PNC with impressive results: 24 boats (pirogas) captured in PNTC and 7 in PNC. In 2015, 296 IBAP's technicians received formal training. All activities implemented by IBAP in Cacheu and Cantanhez can be accessed in IBAP's annual reports. Furthermore, patrolling activities were actively performed during the monitoring period.

Together, IBAP's efforts were responsible to reduce emissions totalling 335,603 tCO₂e between 2011 and 2016.

1.2 Sectoral Scope and Project Type

Scope 14. AFOLU: Reduced Emissions from Deforestation and Degradation (REDD)

Project Category: Activities that reduce emissions from unplanned deforestation (AUDD)

Grouped Project: The project is not a grouped project

1.3 Project Proponent

Organization name	Instituto da Biodiversidade e das Áreas Protegidas da República da Guiné-Bissau – IBAP
Contact person	Justino Biai
Title	General Director
Address	Av. Dom Settimio Arturro Ferrazzetta C.P. 70 Bissau, República da Guiné Bissau
Telephone	+245 20 71 06/7
Email	justino.biai@iucn.org

1.4 Other Entities Involved in the Project

Organization name	BioGuinea Foundation
Role in the project	Project implementation partner
Contact person	Fenosoa Andriamahenina
Title	Director
Address	2-6 Cannon Street London, England EC4M 6YH
Telephone	
Email	sebioguine@gmail.com

1.5 Project Start Date

31/March/2011

This date corresponds to the closure of the CBMP.

1.6 Project Crediting Period

The Project Crediting Period is 20 years and can be renewed at most four times.

Start Date: 31/March/2011 – End Date: 30/March/2031

Baseline must be revised every 10 years. Next baseline revision to be carried on 31st of December 2021.

1.7 Project Location

The project comprises two distinct areas in the Republic of Guinea-Bissau totaling 181,200 hectares of which 136,265 hectares are considered the Project Area. Cacheu Mangrove Forest National Park (PNTC) has 74,700 hectares, of which 54,807 comprises the Project Area, and was legally established by Decree 12/2002 to protect the most relevant patches of mangroves around the Cacheu River estuary in the northern part of Guinea-Bissau. Cantanhez Forest National Park (PNC) has 106,500 hectares, of which 81,458 comprises the Project Area, and was legally established by Decree 14/2011 to protect the remaining patches of primary sub-humid forest that form part of a larger area that extends to the south into Guinea Conakry.

PNTC is located at Latitude 12°18'38.37"N and Longitude 16°11'25.19"W, 111 km from Bissau. PNC is located at Latitude 11°16'29.85"N and Longitude 14°59'8.00"W, 275 km from Bissau. Both parks are accessible by car from Bissau. Figure 1 shows Guinea-Bissau location and Project location with the delimitation of the Project Area (PA), Leakage Belt (LK) and Reference Region (RRD). KML files of the project boundaries are provided to the VVB as part of this monitoring report.

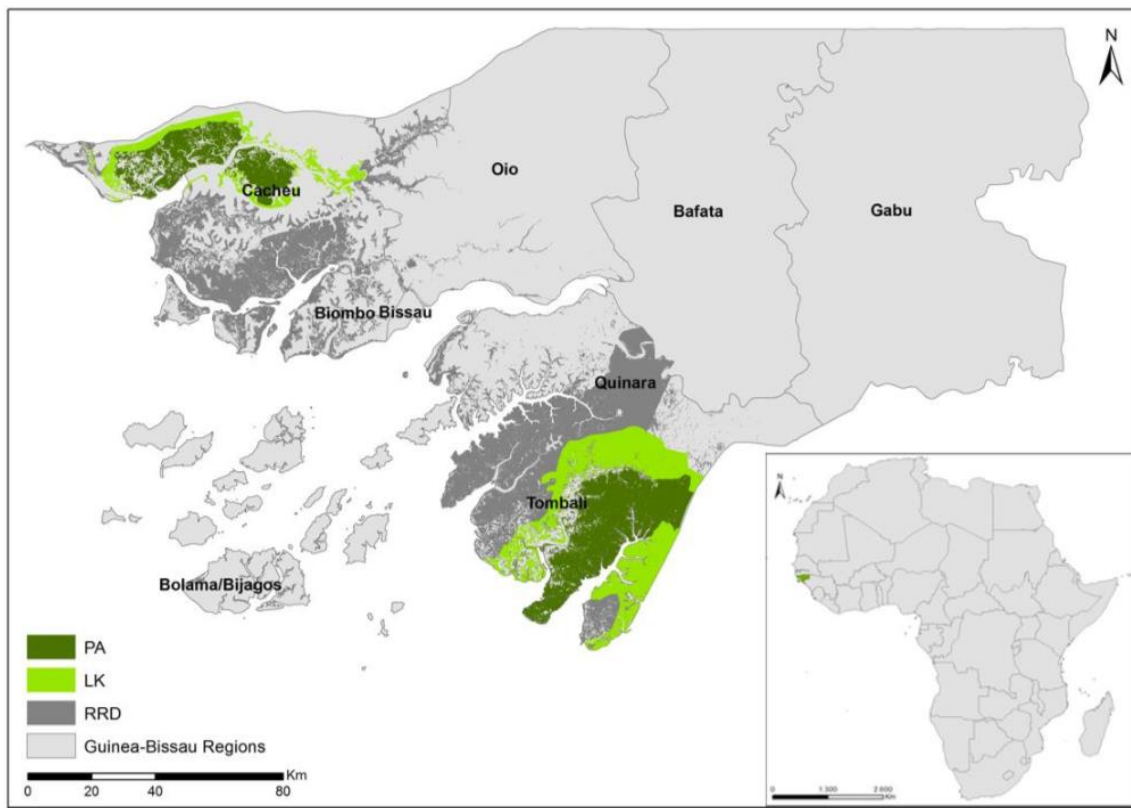


Figure 1. Guinea-Bissau location and Project location with the delimitation of the Project Area (PA), Leakage Belt (LK) and Reference Region (RRD).

1.8 Title and Reference of Methodology

Methodology / Module	ID	Version
REDD Methodology Framework.	REDD-MF (VM0007)	1.5
Methods for monitoring of greenhouse gas emissions and removals.	M-MON (VMD0015)	2.1
Tool for Demonstration and Assessment of Additionality in VCS AFOLU Project Activities.	T-ADD (VT0001)	3.0
AFOLU Non-Permanence Risk Tool.	T-BAR	4.0
Estimation of uncertainty for REDD project activities.	X-UNC (VMD0017)	2.1
Methods for stratification of the project area.	X-STR (VMD0016)	1.1
Estimation of baseline carbon stock changes and greenhouse gas emissions from unplanned deforestation.	BL-UP (VMD0007)	3.2
Estimation of emissions from activity shifting for avoided unplanned deforestation.	LK-ASU (VMD0010)	1.1
Estimation of carbon stocks in the above and belowground biomass in live tree and non-tree pools.	CP-AB (VMD0001)	1.1
Estimation of greenhouse gas emissions from biomass burning.	E-BPB (VMD0013)	1.1
CDM "Tool for testing significance of GHG emissions in A/R CDM Project Activities".	T-SIG	1.0

1.9 Other Programs

This project is eligible to create other forms of GHG-related environmental credits and participate in other GHG Programs, including Plan Vivo, Natural Forest Standard and VCS JNR. This project has not been registered and do not intend to be registered or generate other forms of GHG-related credits or GHG emissions reductions or removals claimed under this VCS audited project.

Other Forms of Environmental Credit: The project has not sought, planned or received another form of GHG-related environmental credit during this monitoring period.

Participation under Other GHG Programs: The project is not registered or seeking registration under any other GHG programs.

1.10 Sustainable Development

On March 25, 2015, the Government of Guinea-Bissau launched a new vision up to 2025 for its strategic and operational plan called “*Terra Ranka*”¹ (Fresh Start). The plan is a long-term sustainable development strategy composed of six pillars: (i) peace and governance, (ii) infrastructure, (iii) industrialization, (iv) urban development, (v) human development and (vi) biodiversity.

According to Terra Ranka: “*In 2025, Guinea-Bissau will be a society based on solidarity, respectful of biodiversity and well on the way to prosperity*”. Therefore, this project is aligned with Terra Ranka’s vision and objectives being a relevant demonstration of how Guinea-Bissau can protect its biodiversity.

More specifically, the biodiversity pillar seeks to “*sustainable manage ecosystems [...], better safeguard vulnerable resources, which, by implementing the National Protected Areas Strategy, will increase these zones from 13% to 26% of the country’s land mass over the coming years [...]*”. In other words, the national plan to biodiversity conservation rests in the expansion of the National System of Protected Areas (SNAP), in which PNTC and PNC are included.

Carbon finance plays a central role in IBAP’s and FBG’s strategy for SNAP given the lack of capacity of the country to finance conservation activities by itself. FBG’s long-term financial sustainability rests in the establishment of an endowment fund that will receive funding from REDD+, from Guinea-Bissau Government and from international donors. This REDD project is a pilot initiative able to demonstrate the impact of REDD and scale-up community-based conservation initiatives in the country. Therefore, this project is fully aligned with national priorities and strategies for sustainable development.

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

IBAP implemented a series of actions and conservation measures in Cacheu (PNTC) and Cantanhez (PNC) National Parks that allowed deforestation to be significantly reduced in the first monitoring period of the project. The backbone of the project’s implementation were governance and management activities undertaken throughout the first monitoring period. Other activities include Community Engagement, Political Action, Infrastructure Development and Financial Support. Below, a detailed list of year-by-year activities is presented. The detailed implementation status and activities undertaken in PNTC and PNC can be assessed at the IBAP’s Annual Reports.

¹ <http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=DCD/DAC/RD%282015%2915/RD2&docLanguage=En>

Table 1. Main activities undertaken in 2012 (Relatorio_IBAP_2012.pdf)

Year	Action	Type	Description
2012	Signature of FBG's Statute as a UK registered NGO	Governance	Formal establishment of FBG
2012	Human Resources Strengthening	Human Resources	Hire of Technical Assistance (MAVA / IUCN) and Local Technical Support (MONTE ACE) in PNTC.
2012	Civil Society Engagement	Governance	Partnerships for park management - NGO AD (PNC)
2012	Community Engagement	Engagement	Monthly meetings in PNTC with local fisherman (APESCA) to discuss the conservation of the area and sustainable fishing practices
2012	Park Management Activities with IUCN	Management	Shared wealth in PNTC, Marine Surveillance in PNTC, Ecotourism in protected areas
2012	RAMSAR Committee	Political	Establishment of a RAMSAR Committee in GB
2012	Training on RAMSAR Convention	Engagement	Technical workshops and training about the RAMSAR Convention, the value of ecosystem services and the importance of conservation practices
2012	Extension of SNAP project (UNDP)	Financial	Extension of the project to consolidate the National System of Protected Areas (SNAP)
2012	Sustainable Management of Forest Resources in Cacheu (MONTE ACE)	Financial	Start of MONTE ACE project that seeks to forest conservation in PNTC. Hire of Forestry Eng., Park Rangers and Reforestation Technicians
2012	Park Management Council - PNTC	Governance	Two meeting in July to discuss the Internal Regulations of the Park and Fishing Activities. In December (14-16) general meeting in PNTC.
2012	Control and Park Monitoring / Surveillance	Management	Initiation of surveillance activities in PNTC
2012	Agricultural Community Council (Bolanhas - PNTC)	Governance	Engagement of local rice producers to improve practices and reduce negative impacts in the forest (slash-and-burn)

Table 2. Main activities undertaken in 2013 (Relatorio_IBAP_2013.pdf)

Year	Action	Type	Description
2013	FBG Capitalization (GEF)	Financial	Seed money (US\$1.3MM) to capitalize the Foundation
2013	IBAP's Strategic Planning Revision	Governance	Initiation of the new strategic planning of IBAP
2013	Nominated the Director of PNTC	Management	Eng. Queba Quecuta

2013	Park Rangers in PNC	Human Resources	24 Park Rangers hired
2013	Ecotourism in Protected Areas (MAVA)	Financial	Support to develop ecotourism in the Protected Areas including PNC and PNTC
2013	Management of Natural Resources in PNTC (MAVA)	Financial	Support and training focusing on agriculture (bolanhas) and fishing
2013	Sustainable Management of Forest Resources in PNTC (MONTE ACE)	Financial Human Resources Infrastructure	Selection and training of 10 Park Rangers Physical improvements of PNTC HQ Reforestation of 4,8ha of Borassus aethiopum Construction of a 300sq meter forest nursery
2013	Park Management Meeting in PNTC	Management	2 Meetings, one local in 11-12/07 and one general in 14-16/12. Main topics included illegal deforestation of palm forests, kick-off of new projects, hire of park rangers
2013	Surveillance of Protected Areas	Management	LifeWeb project expanded, PNTC is one of the three initial parks with an established data base of park monitoring activities and results.
2013	Monitoring and Surveillance in PNTC	Management	24 missions along the year
2013	Training and Technical Workshops in PNTC	Human Resources	Park Rangers Formation, Reforestation Agents Formation, Electrical Fence (reduce human-animal conflict), Construction of Forest Nurseries.
2013	Community Development in PNTC	Governance	Support for the installation of Electrical Fences (hippo invading rice production fields) totaling 139,4ha; Improved Stoves in the southern communities of the park; Implementation of the Community Radio
2013	Fishery Resources Management	Management	4 scientific incursions in 2013, identifying 64 fish species
2013	Mangrove Forest Monitoring	Management	INEP work to collect field data to assess the mangrove ecosystem in PNTC

Table 3. Main activities undertaken in 2014 (Relatorio_IBAP_2014.pdf)

Year	Action	Type	Description
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2014	Ecotourism Diagnostic in PNTC and PNC	Financial	Promoted by the Tourism Secretariat, IUCN and IBAP as a basis to the development of a National Ecotourism Strategy. Included the human resource formation of ECOGUIDES and the improvement of infrastructures in the Protected Areas
2014	IBAP 2014-2020 Strategy	Governance	Launch of IBAP's Strategy between 18 and 19 of February. One core element of the strategy is the strengthening of the National System of Protected Areas and the Monitoring of Protected Area.
2014	FBG Capitalization	Financial	Seed Capital Support: Government of GB EUR1MM, EU and MAVA EUR1,3MM, GEF 5 USD 1,3MM, FFEM EUR 1MM and REDD USD 3,2MM
2014	MONTE ACE PNTC	Human Resources	Human Resources: 1 Project Coordinator, 1 Forestry Technician, 1 Ecotourism Specialist, 1 Trainee, 1 accountant
2014	Community Based Management	Management	Cooperation and collaboration with communities in PNTC as a mean to fill the financial gap. Active participation of locals to implement reforestation activities, included in Mangrove Forests
2014	GIS Training	Human Resources	13 IBAP technicians participated in GIS training
2014	Forestry Inventory	Human Resources	15 IBAP technicians participated in Forestry Inventory training
2014	Ecotourism	Human Resources	34 IBAP technicians participated in Ecotourism training. Focus on PNC, PNTC and PMNJVP
2014	Sustainable Fishing	Engagement	60 women in PNTC received support and training to improve their fishing practices, including conservation, hygiene and fish preparation
2014	Coastal Monitoring	Management	3 small boats (piroga) apprehended in Cacheu River.
2014	Patrolling	Management	6 chainsaws in PNC, 200 fishnets in PNC, 35 woodpiles in PNC and 23 in PNTC, 416 palms in PNTC, 3 fishing camps PNTC, 2 hunting camps in PNTC

2014	Central Oversight Unit	Management	In 2014 both PNC and PNTC reached they goals in internal and council meetings. In total, 2 meetings were organized in each park. In PNTC one directive that emerged from the meetings were to strengthen the engagement of the community on the introduction of other, more sustainable, agricultural practices in substitution of Cashew. In PNC the draft of the Internal Regulation was discussed and should be approved in 2015.
2014	Mett Score in Protected Areas	Management	The overall performance of IBAP's management in 2014 increase from 78,8% in 2013 to 79,8% in 2014
2014	Electric fences in rice fields	Management	Electric fences installed in 09 rice fields in PNTC, totaling 681,5 hectares, protecting the production of 1000 tons of rice and guaranteeing food security of 200 families
2014	Oyster Farming in PNTC	Financial	Support to the women association in PNTC to increase the production of oysters.
2014	Reforestation in PNTC	Management	From the forest nursery, PNTC was able to initiative a series of reforestation activities, including in mangrove forests

Table 4. Main activities undertaken in 2015 (Relatorio_IBAP_2015.pdf)

Year	Action	Type	Description
2015	"Terra Ranka"	Political	Strategic national Plan 2015-2025 focused on sustainable development of Guinea-Bissau and the protection of terrestrial and maritime biodiversity
2015	PNTC classification as RAMSAR site	Governance	On May 22nd, PNTC got status of RAMSAR site.
2015	Implemented Projects (MAVA, BCP-IDA/WB, GEF/UNDP, MONTE, MAVIA, IUCN, UE/UNDP, US Fish and Wildlife	Financial	Several international support programs and projects implemented in PNC and PNTC.
2015	Mett Score in Protected Areas	Management	PNC reached 60% in 2015, and PNTC 90% in 2015
2015	IBAP Staff Education	Human Resources	296 technicians were trained in 2015
2015	Central Oversight Unit	Management	In 2015 both PNC and PNTC reached they goals in internal and council meetings. In total, 2 meetings were organized in each park.

2015	Surveillance of Protected Areas	Management	PNTC had a target of executing 48 surveillance incursions, in total 90 incursions were performed. 24 small boats (pirogas) were captured. In PNC, 24 of 48 planned surveillance incursions were performed and 7 small boats (pirogas) were captured. Patrolling activities were also actively performed on both parks.
2015	Physical Rehabilitation	Governance	Rehabilitation of a primary school in PNTC
2015	Several community activities	Management	Continued activities with the community to strengthen conservation and restoration activities.

Leakage and Non-Permanence risk are monitored and managed since IBAP keeps constant presence in the Cacheu and Cantanhez. Leakage management are directly related to the implemented activities, in special the activities that provide alternative revenue streams (e.g. Oyster Farming, Sustainable Fishing and Ecotourism) and the activities that guarantee higher rice yields (e.g. Bolanha Restoration) and rice production (e.g. electrical fences to stop hipos from invading and destroying rice field). The policy of just hiring local population to work as guides and park rangers also guarantee employment, thus reducing pressure on natural resources, and a close relationship with the communities living inside and around the park. The main non-permanence risk is the inexistence of legal title of IBAP over the land it protects. In fact, IBAP exists to deal, continuously, with conservation in lands where people have been living and extracting their livelihoods in traditional ways. In other words, the non-permanence risk is not exclusive to the project but inherent to IBAP's operation making it the single most important issue to the effective operation of IBAP in Guinea-Bissau. Non-Permanence risk is guarantee by laws and decrees that give IBAP the power to manage and operate conservation areas. A clear evidence of such power is the increasing of equipment seizure, in special boats and outboard engines, and the application of fees. However, since population depends on natural resources and conflicts may arise, IBAP operates keeping continuous presence in the parks and by building, over more than a decade, trust-based relationships with communities. Over the monitoring period, grants from international donors also allowed IBAP to deliver positive impacts in the social and economic arena, for example, by building and retrofitting schools, building water wells, providing formal training and education to local communities, by dealing, in the Community Meeting,s with conflicts amongst community members. The aggregate of these actions reinforces that IBAP is the institution with legal and community power to control and manage land on Cacheu and Cantanhez.

2.2 Deviations

2.2.1 Methodology Deviations

One methodology deviation is relevant to this monitoring period:

1. The Section 6.2 of M-MON (version 2.1) requires that the parameter $A_{RRL, forest, t}$ be updated at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event. However, the parameter $A_{RRL, forest, t}$ has not been updated. The deviation does not negatively impact the conservativeness of the quantification of GHG emission reductions because the parameter $A_{RRL, forest, t}$ is not used, either directly or indirectly, in the quantification of GHG emission reductions, and does not need to be monitored until baseline re-assessment. Further, it relates only to the criteria and procedures for monitoring or measurement because it relates to measurement of baseline emissions, as carried out following the BL-UP module.
2. The project proponent requests a deviation in this monitoring period related to data collection by the PRA which is a methodology deviation of M-MON which states that “The PRA must be repeated every 2 years). IBAP was not able to perform an intermediary data collection (every 2 years) to monitor degradation potential. The deviation does not negatively impact the conservativeness of the quantification of GHG emission reduction because, as demonstrated in the latest PRA developed, the risk of degradation due to fuelwood collection is small because the local population uses other biomass, like cashew tree pruning and dead wood. There is no evidence that the lack of data in the requested frequency affects the conservativeness of the project negatively. Further, this deviation relates only to the criteria and procedures for monitoring or measurement because it relates to measurement of leakage emissions and project emissions, as carried out following the M-MON module.

2.2.2 Project Description Deviations

Three deviations are relevant to this monitoring period:

1. During the validation of the PD two allometric equations (Terrestrial Forest and Mangrove Forest) could not be validated due to lack of data. The project proponent successfully demonstrated that the applied equations were conservative and requested that the equations be validated prior to the first verification of the project. Therefore, additional data collection took place and a report was prepared to demonstrate the validity and conservativeness of the selected equations (Equations_report_23.01.2018.pdf). It is worth stressing that both equations applied in the PD were validated, thus, carbon stocks in live aboveground (AGB) and belowground biomass (BGB) remains unchanged for this monitoring period.

2. The project proponent requests a deviation in this monitoring period related to data collection by the PRA. IBAP was not able to perform an intermediary data collection (every 2 years) to monitor degradation potential. As demonstrated in the latest PRA developed, the risk of degradation due to fuelwood collection is small because the local population uses other biomass, like cashew tree pruning and dead wood. There is no evidence that the lack of data in the requested frequency affects the conservativeness of the project negatively.
3. During this first verification a map classification error was identified. The error caused rice fields ('Non-Forest Class') to be classified as savanna ('Forest Class') and wetlands ('Non-Forest Class') as mangroves ('Forest Class'). When assessing the problem, the identified root cause was the classification algorithm used to establish the Forest Cover Benchmark Map in the beginning of the monitoring period. In the attempt to keep the same procedures and methods the algorithm used during validation was reused during verification, propagating the misclassification. The project description deviation is needed because if only the 2016 map is corrected false deforestation will be quantified in the current monitoring period. To guarantee consistency and the conservativeness of the analysis both 2011 and 2016 maps were reclassified. The deviation does not impact the applicability of the methodology, additionality or the appropriateness of the baseline scenario since the main impact is the revision the project area (ha) and leakage belt (ha). Since there may be concerns about potential impacts in the methodology applicability, an update of the boundaries criteria was performed (Finding 2019.16.docx and Justification_PA_RRD_LK_Cacheu_Cantanhez_UPDATED.xlsx). The requirements for both boundaries are compliant. No significant changes could be identified in the update version in comparison with the version validated in the PD. This was, in fact, expected, since the revision can be considered very small as the Project Area was reduced in 3.71% and the Leakage Belt in 9.06%. New error matrixes were produced to validate the revised Forest Cover Benchmark Maps (2011 and 2016). All relevant information, SIG products and maps are made available to the VVB.
4. In the course of verification, it was identified a requirement in M-MON for calculating carbon stocks in aboveground non-tree vegetation in the post-deforestation land use stating that "*herbaceous non-tree vegetation is considered to be de minimis in all instances*". However, it was then noticed that BL-UP also requires that herbaceous non-tree vegetation should be considered *de minimis* in the quantification of carbon stocks in aboveground vegetation in the baseline. A deviation is requested since baseline aboveground non-tree vegetation carbon stocks were not considered *de minimis* during validation and has been adjusted in this first verification of the project. In other words, since post-deforestation land use is rice, an herbaceous non-tree

vegetation, post-deforestation carbon stocks was set to zero in the baseline scenario. This deviation does not impact the applicability of the methodology, additionality or appropriateness of the baseline scenarios. The project remains in compliance with the applied methodology with no negative impact to the conservativeness of the emission reduction estimate. In fact, the deviation is fully compliant with the methodology since REDD MF (VM0007 version 1.5) established on section 8.1.1 that for the quantification of baseline emissions “*the same procedure must be followed ex ante and ex post*” unless specific guidance is given in *ex-ante* calculation, which is not the case.

2.3 Grouped Project

Not Applicable

2.4 Safeguards

2.4.1 No Net Harm

Since 1990, Guinea-Bissau (GB) has put a great effort to adopt and implement best-practices for conservation of its biodiversity aligned with the concern of protecting local communities and their livelihoods. The establishment of IBAP and the National System of Protected Areas (SNAP) was a milestone in this pathway.

Conservation activities may conflict with interests and activities performed by local communities. Not surprisingly, all conservation activities in Guinea-Bissau are strongly rooted in the communities, their active participation, voice and cooperation. Conservation activities in GB are aligned with communities needs and no population relocation was undertaken in the establishment of SNAP. Therefore, aligning poverty reduction, sustained livelihood and biodiversity protection is a core element of the project.

The strategy undertaken by IBAP was the definition of Internal Regulations on each Park, that creates the norms and rules for land-use and conservation priorities. Both PNTC and PNC have approved Internal Regulations that were discussed and agreed with the local communities. Moreover, each park has a Park Management Council, a multi-stakeholder forum that includes representatives of the local communities. The council meets every semester and is a relevant instrument to guarantee that the local community is not been adversely impacted by conservation activities.

During the 2000's, IBAP piloted a microfinance instrument to expand its impact in the communities, supporting alternative revenue streams and improving general well-being. The REDD project will allow that communities be able to access cash transfers once again and is a relevant component of the benefit sharing mechanism thought by IBAP and BioGuinea Foundation. Whilst, in one hand, IBAP was not able to continue with the microfinance instrument due to lack of resources, it was

able, together with international donors, to implement projects at the local level that positively impacted the communities living in and around PNTC and PNC.

The yearly IBAP's Activity Reports are a rich registry of all activities and measures undertaken along the first monitoring period (2011-2016). Closely to the objective of this REDD Projects it is possible to list activities to: restore rice fields, reduce human-animal conflicts in agricultural areas, improve fishing practices and reduce impact from external agents (e.g maritime/coastal patrolling).

2.4.2 Local Stakeholder Consultation

The project is a pilot community-based initiative in two protected areas: PNTC and PNC. The participation of local stakeholders is in the core of the project and happens, informally, in a continued basis and formally, twice every year.

The main on-going and continued practice is the use of the radio. Radio is commonly used in the communities and can reach the most distant and isolate *tabancas* (households). The community radio shares information about the parks and active projects. The radio is also a relevant instrument to share knowledge about conservation and the protection of forests. For example, during the field work for forest inventory data collection and the PRA interviews, project members participated in radio programs explaining what was done, the relevance of the activities and what communities could expect. When the project team reached the sampled communities, the population was already aware of the work and able to collaborate. The radio also serves a social purpose of internal communication amongst communities.

Formally, local stakeholder consultation happens twice a year in the Park Management Council. Communities are informed about dates through radio and directly by local IBAP's staff team in the parks. It is relevant to stress that Park Rangers and other local staff are hired from the local communities, also increasing proximity and favoring information flow at the local level. The dates of the meeting between 2011 and 2016 are listed below.

Year	First Meeting	Second Meeting
2012	• PNTC: 7-8 August • PNC: Not Done	• PNTC: 14-16 December • PNC: Not Done
2013	• PNTC: 11-12 July • PNC: Not Done	• PNTC: 14-16 December • PNC: Not Done
2014	• PNTC: 11-12 May • PNC: 12-13 February	• PNTC: 4-5 December • PNC: 7-9 November
2015	• PNTC: 22-23 May • PNC: 22-24 March	• PNTC: 10-11 December • PNC: 26-28 November
2016	• PNTC: 26-27 September • PNC: 4-6 March	• PNTC: 08-09 December • PNC: 9-11 October

The meetings are documented using attendance lists (Listas de Presença) and meeting proceedings (Acta de Reunião). One meeting proceeding, registering the discussion and outcomes of PNC Management Plan, is being provided to the VVB. Mr Queba Quecuta is the Park Director in PNC and Mr. Fernando Biag is the Park Director in PNTC. All meetings proceedings and attendance lists are submitted to the General Director of IBAP and files maintained at IBAP's Headquarter in Bissau.

The Parks has a formal hearing and conflict resolution process, with the Park Director holding direct responsibility to manage conflicts and adjust activities to converge with local communities' expectations. Furthermore, communities actively collaborated with the approval of the Internal Regulations of PNC and PNTC. Internal Regulations are relevant instruments to align and built convergence between communities and the conservation objectives. For example, Internal Regulation protects the rights for cultural use of the forest (e.g. rituals) whilst also establishing priority conservation zones.

3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

Data / Parameter	CF
Data unit	tC t ⁻¹ d.m.
Description	Carbon fraction of dry matter
Source of data	IPCC 2006 Ch.4 Table 4.3
Value applied	Default value 0.47 t C t ⁻¹ d.m.
Justification of choice of data or description of measurement methods and procedures applied	IPCC is a peer-reviewed source widely used for GHG quantification.
Purpose of the data	• Calculation of baseline emissions • Calculation of project emissions • Calculation of leakage
Comments	Default values shall be updated whenever new guidelines are produced by the IPCC.

Data / Parameter	COMF _i
Data unit	Dimensionless
Description	Combustion factor for stratum i (vegetation type)
Source of data	Default values IPCC 2006 Ch.2 Table 2.6
Value applied	Closed Forest - 0.32 Open Forest - 0.45 Savanna - 0.72 Mangrove - 0.36
Justification of choice of data or description of measurement methods and procedures applied	IPCC is a peer-reviewed source widely used for GHG quantification. The choice of values applied to each stratum considers climatic and ecological classifications defined by IPCC. Table 2.6 presents values for Closed Forest, Open Forest and Savanna. For mangrove the classification of "all primary tropical forests" is used since no specific value is presented
Purpose of the data	• Calculation of project emissions

Comments	The combustion factor is a measure of the proportion of the fuel that is actually combusted, which varies as a function of the size and architecture of the fuel load, the moisture content of the fuel and the type of fire. Default values shall be updated whenever new guidelines are produced by the IPCC.
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Data / Parameter	G_{gi}
Data unit	$g\ kg^{-1}$ dry matter burnt
Description	Emission factor for stratum i for gas g
Source of data	Default values IPCC 2006 Ch.2 Table 2.5
Value applied	Closed Forest: $CH_4 - 6.8$ and $N_2O - 0.20$ Open Forest: $CH_4 - 6.80$ and $N_2O - 0.20$ Savanna: $CH_4 - 2.30$ and $N_2O - 0.21$ Mangrove: $CH_4 - 4.7$ and $N_2O - 0.26$
Justification of choice of data or description of measurement methods and procedures applied	IPCC is a peer-reviewed source widely used for GHG quantification. The choice of values applied to each stratum considers climatic and ecological classifications defined by IPCC. Table 2.5 presents values for Tropical Forest, used for Closed Forest and Open Forest, and Savanna. For mangrove the classification of “extra tropical forests” is used since no specific value is presented and the table recommends this category be used for all other forest type.
Purpose of the data	Calculation of project emissions
Comments	Default values shall be updated whenever new guidelines are produced by the IPCC.

Data / Parameter	D_j
Data unit	$t\ d.m.\ m^3$
Description	Basic wood density in $t\ d.m.\ m^3$ for species j
Source of data	Data is source from a combination of literature ranging from (a) national species-specific or group of species-specific, from CARBOVEG-GB, (b) species-specific or groups of species from neighboring countries with similar conditions, from Brown (1997),

	Nygard & Elfyng (2000) and Reyes et al. (1992), and (c) global species-specific or group of species-specific, from IPCC (2006) and the Global Wood Density Database. When known, species-specific wood density was applied. When the species was not known or wood density values were not published/available, an average wood density was calculated from the data collected under CARBOVEG-GB and applied (0.731 g cm^3)
Value applied	See Appendix 2 – Wood Density Information.
Justification of choice of data or description of measurement methods and procedures applied	Data sources comply with the requirements of M-MON and all values are referenced on Appendix 2 – Wood Density Information. When reference is made to CARBOVEG-GB, measurements were undertaken by IICT on three different periods: 2007, 2009 and 2012. The methods and procedures applied are the same described on section 4.3.4 and follow the protocols and requirements established by the modules CP-AB and X-STR.
Purpose of the data	• Calculation of baseline emissions • Calculation of project emissions • Calculation of leakage
Comments	Not applicable.

Data / Parameter	$f_{\text{palm}}(X,Y)$
Data unit	t d.m. tree ⁻¹
Description	Allometric equation for palm species linking measured tree variable(s) to aboveground biomass of living trees.
Source of data	Delaney, S. and Powell, M. (1999) 1999 Carbon-Offset Report for the Noel Kempff Climate Action Project, Bolivia. Report to the Nature Conservancy. Winrock International, Arlington, VA, USA. The reference is listed both in IPCC GPG-LULUCF (2003) and Pearson et al. (2005)
Value applied	$AGB_{\text{palm}} = 6.666 + 12.826 * H^{0.5} * \ln H$
Justification of choice of data or description of measurement methods and procedures applied	Delaney et al. (1999) complies with M-MON requirements being built on a sample of $n=30$ and a deviation was approved since $r^2 = 0.75$ but conservativeness was demonstrating by comparing Delaney et al. (1999) equation with other equations available in the literature. The equation is a allometric equation for mangroves requiring only one parameter (height). The equation is a (e) pan- tropical forest type-specific.

Purpose of the data	• Calculation of baseline emissions • Calculation of project emissions • Calculation of leakage
Comments	The deviation was approved and the equation validated based on a sample of 30 palms (<i>Elaeis guineensis</i>) in Guinea Bissau measured in February 2013.

Data / Parameter	$f_{\text{terrestrial_forest}}(X,Y)$
Data unit	t d.m. tree ⁻¹
Description	Allometric equation for terrestrial forest species linking measured tree variable(s) to aboveground biomass of living trees. This equation is used to estimate biomass of all forest tree species excluding palm trees and mangrove trees
Source of data	Chave et al. (2005). Tree allometry and improved estimation of carbon stocks and balance in tropical forests. <i>Oecologia</i> 145, 87-89.
Value applied	$AGB_{\text{terrestrial_forest}} = 0.112 * (\rho * DBH^2 * H)^{0.916}$
Justification of choice of data or description of measurement methods and procedures applied	The equation is a common allometric equation for dry forest requiring three parameters (DBH, wood density and height). The equation is a (e) pan-tropical forest type-specific. The equation complies with M-MON requirements, being built on a sample of n=404 and a $r^2 = 0.99$
Purpose of the data	• Calculation of baseline emissions • Calculation of project emissions • Calculation of leakage
Comments	A deviation was approved allowing the allometric equation to be validated after the project validation but prior to verification. A Corrective Action Plan (CAP) was prepared detailing the methods and procedures for the field data collection and demonstrating that the equation is conservative for ex-ante quantification. The data collection in terrestrial forest trees took place from November 20 to December 1 of 2017 spanning the two protected areas and the equations was successfully validated. For more details, please see the file Equations_Report_23.01.2018.pdf

Data / Parameter	$f_{\text{mangrove}} (X,Y)$
Data unit	t d.m. tree ⁻¹
Description	Allometric equation for mangrove species linking measured tree variable(s) to aboveground biomass of living trees.
Source of data	Chave et al. (2005). Tree allometry and improved estimation of carbon stocks and balance in tropical forests. <i>Oecologia</i> 145, 87-89.
Value applied	$AGB_{\text{mangrove}} = 0.168 * \rho * DBH^{2.47}$
Justification of choice of data or description of measurement methods and procedures applied	The equation is a common allometric equation for mangroves requiring only two parameters (DBH and wood density). The equation is a (e) pan-tropical forest type-specific. The equation complies with M-MON requirements being built on a sample of n=84 and $r^2 = 0.99$.
Purpose of the data	• Calculation of baseline emissions • Calculation of project emissions • Calculation of leakage
Comments	A deviation was approved allowing the allometric equation to be validated after the project validation but prior to verification. A Corrective Action Plan (CAP) was prepared detailing the methods and procedures for the field data collection and demonstrating that the equation is conservative for ex-ante quantification. A field campaign for data collection in mangroves took place from January 2 to January 17 of 2014. Due to the significant distances between parks and travel difficulties back then, a decision was made to focus sampling efforts during that field mission on the PNTC, which includes the most relevant patches of mangroves in GB. Additional individuals of mangroves trees were also measured in PNC between November 20 to December 1 of 2017 to increase the tree sample collected in 2014. For more details, please see the file <i>Equations_Report_23.01.2018.pdf</i>

Data / Parameter	R
Data unit	t root d.m. t ⁻¹ shoot d.m.
Description	Root to shoot ratio appropriate to species or forest type / biome applied as belowground biomass per unit area.
Source of data	Mokany et al. (2006) for tropical dry forest (IPCC 2006 Ch.4 Table 4.4)

	Komyiama et al. (2008) for mangrove
Value applied	For tropical dry forest: • if AGB < 20 t.ha⁻¹ R=0.56; • if AGB > 20 t.ha⁻¹ R=0.28 For mangrove forest R=0.46
Justification of choice of data or description of measurement methods and procedures applied	The data applied for terrestrial forests are (b) globally forest type specific or eco-region-specific sourced from IPCC 2006. IPCC is a peer-reviewed source widely used for GHG quantification. For mangroves, data reported in Komyiama et al. (2006) were averaged and resulted in an RSR value of 0.61. Conservatively, the half-width of the 95% confidence interval of these data was used to estimate the applied RSR (0.46).
Purpose of the data	• Calculation of baseline emissions • Calculation of project emissions • Calculation of leakage
Comments	Not applicable.

3.2 Data and Parameters Monitored

Data / Parameter	COLB
Data unit	tCO ₂ e ha ⁻¹
Description	Area weighted average aboveground tree carbon stock for forests available for unplanned deforestation outside the Leakage Belt
Source of data	Third National Communication on Climate Change in Guinea-Bissau (UNFCCC, 2018)
Description of measurement methods and procedures to be applied	Data from (i) aboveground tree carbon stock of forests outside the leakage belt and (ii) forest cover areas must be weight averaged (tCO ₂ e.ha ⁻¹).
Frequency of monitoring/recording	The area-weighted average must be recalculated when updated official data are published.
Value monitored	100.09
Monitoring equipment	Not applicable

QA/QC procedures to be applied	If field measurement is performed, standard QA/QC assurance procedures for forest inventory, including field data collection and data management shall be applied. All data registry must be backed up and stored in different sources (physical and digital) and medias (HDS, serves, internet cloud). See the Monitoring Plan for detailed QA/QC procedures.
Purpose of the data	• Calculation of leakage
Calculation method	Numbers derived from national data were used.
Comments	For ex-ante and ex-post GHG emissions reduction quantification, data from forest area and stratum carbon content is derived from the official governmental communication on Climate Change in Guinea-Bissau to the United National Framework Convention on Climate Change (UNFCCC). The latest version available is the Second National Communication (2011).

Data / Parameter	C _{LB}
Data unit	tCO ₂ e ha ⁻¹
Description	Area weighted average aboveground tree carbon stock for forests available for unplanned deforestation inside the Leakage Belt
Source of data	Derived from field work measurement (Carbon Stock) performed for the baseline establishment (Winrock/IICT 2012) and on remote sensing data collected during the monitoring period.
Description of measurement methods and procedures to be applied	• Methods and procedures: calculated from field measurement using modules CP-AB, BL-UP and X-STR. On each monitoring period forest cover changes must be quantified using map algebra and a new area weighted average aboveground carbon stock for forest inside the leakage belt recalculated. • Entity responsible for the measurement: IBAP • Accuracy: for the delineation of forest area (ha) the minimum map accuracy must be 90% for the classification of the forest/non-forest in the remote sensing imagery.
Frequency of monitoring/recording	Must be recalculated at each monitoring period.

Value monitored	97.50
Monitoring equipment	The following monitoring equipment's were used: • Diametric tape; • Hypsometer; • GPS; • Digital Camera; • Remote sensing data; • Computer, GIS software and spreadsheets.
QA/QC procedures to be applied	Standard QA/QC assurance procedures for forest inventory, including field data collection and data management shall be applied. All data registry must be backed up and stored in different sources (physical and digital) and medias (HDs, serves, internet cloud). See the Monitoring Plan for detailed QA/QC procedures. If map classification accuracy is less than 90% then the map is not acceptable for further analysis. More remote sensing data and ground truthing data will be needed to produce a product that reaches the 90% minimum mapping accuracy.
Purpose of the data	• Calculation of leakage
Calculation method	Calculated directly from field measurement and map algebra.
Comments	As forests in the leakage belt are deforested, the area-weighted average must be recalculated at each monitoring period.

Data / Parameter	MANFOR
Data unit	ha
Description	Total area of forest under active management nationally
Source of data	Official data, peer reviewed publication and other verifiable sources
Description of measurement methods and procedures to be applied	• Methods and procedures: identify available data on the total area of forest under active management from official data or peer-reviewed publication. • Entity responsible for the measurement: IBAP

	• Accuracy: subject to the quality of the data available, for example, protected area boundaries provided by the government
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs in a frequency of less than every 5 years examination must occur prior to any verification event
Value monitored	0
Monitoring equipment	Not applicable
QA/QC procedures to be applied	Broader evaluation must be carried out so the most up-to-date information is used.
Purpose of the data	• Calculation of leakage
Calculation method	Not applicable
Comments	Conservatively, MANFOR is considered zero, therefore, all national forest areas are considered available for deforestation displaced from the project area to outside the leakage belt.

Data / Parameter	PROP _{IMM}
Data unit	Proportion
Description	Estimated proportion of baseline deforestation caused by immigrating population
Source of data	PRA, peer-reviewed literature or official governmental data
Description of measurement methods and procedures to be applied	• Methods and procedures: identify and collect available data on the proportion of immigrants • Entity responsible for the measurement: IBAP • Accuracy: subject to the quality of the data available. When using a PRA, sampling must be carried on and around the project area and within 2 km from the leakage belt
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs in a frequency of less than every 5 years examination must occur prior to any verification event
Value monitored	0.013

Monitoring equipment	The following monitoring equipment's were used to perform the PRA: • Notebooks, field sheets, tablets; • GPS; • Digital Camera; • Spreadsheets.
QA/QC procedures to be applied	When the proportion of immigrants is calculated using a PRA all data must be documented and stored. The field team interviewing the communities must be properly trained.
Purpose of the data	• Calculation of leakage
Calculation method	Semi structured research applied to communities living inside and around the Project Area.
Comments	The sample area considered a 2km buffer from the Project Area (PA) and Leakage Belt (LK). The number of communities inside the sample area is 503 (177 in PNTC and 326 in PNC). As 10% of this number is higher than 30, the number of communities in the sample was defined as 30, according to the protocol: $N [1;30] = 0,1n = 0,1 \times 503 = 50,3 > 30 \rightarrow 30$ After that, the selection of the 30 target communities for the sample was obtained using a stratified random procedure. For more information see PRAreport_23.01.2018.pdf

Data / Parameter	PROP _{RES}
Data unit	Proportion
Description	Estimated proportion o baseline deforestation caused by population that has been resident for more than 5 years
Source of data	PRA, peer-reviewed literature or official governmental data
Description of measurement methods and procedures to be applied	• Methods and procedures: identify and collect available data on the proportion of immigrants • Entity responsible for the measurement: IBAP • Accuracy: subject to the quality of the data available. When using a PRA, sampling must be carried on and

	around the project area and within 2 km from the leakage belt
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs in a frequency of less than every 5 years examination must occur prior to any verification event
Value monitored	0.987
Monitoring equipment	The following monitoring equipment's were used to perform the PRA: • Notebooks, field sheets, tablets; • GPS; • Digital Camera; • Spreadsheets.
QA/QC procedures to be applied	When the proportion of residents is calculated using a PRA all data must be documented and stored. The field team interviewing the communities must be properly trained.
Purpose of the data	• Calculation of leakage
Calculation method	Semi structured research applied to communities living inside and around the Project Area
Comments	The sample area considered a 2km buffer from the Project Area (PA) and Leakage Belt (LK). The number of communities inside the sample area is 503 (177 in PNTC and 326 in PNC). As 10% of this number is higher than 30, the number of communities in the sample was defined as 30, according to the protocol: $N [1;30] = 0,1n = 0,1 \times 503 = 50,3 > 30 \rightarrow 30$ After that, the selection of the 30 target communities for the sample was obtained using a stratified random procedure. For more information see PRAreport_23.01.2018.pdf

Data / Parameter	PROTFOR
Data unit	ha
Description	Total area of fully protected forest nationally
Source of data	Official data, peer reviewed publication and other verifiable sources

Description of measurement methods and procedures to be applied	• Methods and procedures: identify available data on the total area of forest under active management from official data or peer-reviewed publication. In Guinea-Bissau the total area of forest under protection is equal to the area of the National System of Protected Areas (SNAP). • Entity responsible for the measurement: IBAP • Accuracy: subject to the quality of the data available, for example, protected area boundaries provided by the government
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs in a frequency of less than every 5 years examination must occur prior to any verification event
Value monitored	0
Monitoring equipment	Not applicable
QA/QC procedures to be applied	Broader evaluation must be carried so the must up-to-date information is used. A good cross check is the official information provided by the legal decrees that established each protected area
Purpose of the data	• Calculation of leakage
Calculation method	Not applicable
Comments	Conservatively, PROTFOR is considered zero, therefore, all national forest areas are considered available for deforestation displaced from the project area to outside the leakage belt.

Data / Parameter	TOTFOR
Data unit	ha
Description	Total available national forest area
Source of data	Second National Communication on Climate Change in Guinea Bissau (UNFCCC, 2011)
Description of measurement methods and procedures to be applied	Identify and collect available data on the total available national forest area

Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs in a frequency of less than every 5 years examination must occur prior to any verification event
Value monitored	2,683,290
Monitoring equipment	Not applicable.
QA/QC procedures to be applied	Broader evaluation must be carried so the must up-to-date information is used. If maps are produced and map accuracy is less than 90% then the map is not acceptable for further analysis. More remote sensing data and ground truthing data will be needed to produce a product that reaches the 90% minimum mapping accuracy.
Purpose of the data	• Calculation of leakage
Calculation method	Numbers derived from national data were used.
Comments	Not Applicable

Data / Parameter	ARRD,unplanned,hrp
Data unit	ha
Description	Total area deforested during the historical reference period in the RRD
Source of data	Remote sensing using Landsat imagery from 2002, 2007 and 2010 in combination with GPS data collected during ground truthing
Description of measurement methods and procedures to be applied	• Methods and procedures: mid-resolution satellite imagery, like Landsat, is the most commonly data source used for land cover classification and land cover change analysis in large areas. Pre-processed Landsat images are used in a mapping operation that follows a three-step approach: preprocessing, classification, and validation. The preprocessing included geometric corrections, radiometric calibration, and gap fill for the 2010 images. The gap fill methodology by Scaramuzza et al. (2004) was applied to the 2010 images affected by the malfunctioning of the Scan-line corrector mechanism and the relative radiometric calibration procedure by Phua et al. (2008) was applied prior to building the mosaic layers for the years analyzed. The classification and mapping followed the protocols established by the module BL-UP and

	XSTR. For detailed procedures see Sections 3.1, 4.3.1 and 4.3.2 of the PD (version 01.12). • Entity responsible for the measurement: IBAP • Accuracy: The minimum map accuracy must be 90% for the classification of forest/non-forest in the remote sensing imagery.
Frequency of monitoring/recording	Must be updated upon baseline revision, at least every ten years.
Value monitored	• Cacheu (2002-2010): 10,487 • Cantanhez (2002-2010): 21,213
Monitoring equipment	• Remote sensing data; • Computer, GIS software; • GPS; • Digital Camera; • Spreadsheets.
QA/QC procedures to be applied	If the classification accuracy is less than 90% then the maps is not acceptable for further analysis. More remote sensing data and ground truthing data will be needed to produce a product that reaches the 90% minimum mapping accuracy.
Purpose of the data	• Calculation of baseline emissions
Calculation method	For the current baseline, Landsat images date from 2002, 2007 and 2010 in periods between January and April were collected. Fieldwork for ground truthing took place on the dry season of 2010 and 2012, totaling 261 validation coordinates (125 in PNTC and 136 and PNC). The calculation method is based on map algebra using GIS software. All land cover transition is identified and the related transition areas calculated. A transition matrix is built to sum up all the conversion of forest areas (in ha) to non-forest areas (in ha). Detailed calculation methods are presented on Sections 3.1, 4.3.1 and 4.3.2 of the PD (version 01.12).
Comments	Monitored for the purpose of baseline revision.

Data / Parameter	Ai
Data unit	ha
Description	Area of stratum i
Source of data	Remote sensing imagery in combination with GPS data collected during ground truthing
Description of measurement methods and procedures to be applied	• Methods and procedures: mid-resolution satellite imagery, like Landsat, is the most commonly data source used for land cover classification and land cover change analysis in large areas. Pre-processed Landsat images are used in a mapping operation that follows a three-step approach: preprocessing, classification, and validation. The preprocessing included geometric corrections, radiometric calibration, and gap fill for the 2010 images. The gap fill methodology by Scaramuzza et al. (2004) was applied to the 2010 images affected by the malfunctioning of the Scan-line corrector mechanism and the relative radiometric calibration procedure by Phua et al. (2008) was applied prior to building the mosaic layers for the years analyzed. The classification and mapping followed the protocols established by the module BL-UP and XSTR. For detailed procedures see Sections 3.1, 4.3.1 and 4.3.2 of the PD (version 01.12). • Entity responsible for the measurement: IBAP • Accuracy: The minimum map accuracy must be 90% for the classification of forest/non-forest in the remote sensing imagery.
Frequency of monitoring/recording	Must be updated upon baseline revision, at least every ten years.
Value monitored	The adjusted values correcting misclassification bias in satellite based areal cover type estimates (Walsh and Burk, 1993) are: • Terrestrial Forest: 79,492 • Mangrove: 56,773
Monitoring equipment	• Remote sensing data; • Computer, GIS software; • GPS; • Digital Camera; • Spreadsheets.

QA/QC procedures to be applied	If the classification accuracy is less than 90% then the maps is not acceptable for further analysis. More remote sensing data and ground trothing data will be needed to produce a product that reaches the 90% minimum mapping accuracy.
Purpose of the data	• Calculation of project emissions
Calculation method	For the current baseline, Landsat images dated from 2002, 2007 and 2010 in periods between January and April were collected. Fieldwork for ground truthing took place on the dry season of 2010 and 2012, totaling 261 validation coordinates (125 in Cacheu and 136 and Cantanhez). The calculation method is based on wellknown GIS technics. Satelite imagery is classified using classification software (commercial or open source) and the classification is validated using ground thruthing data (GPS coordinates and observed land cover type) to comply with methodology accuracy requirements. Detailed calculation methos are presented on Sections 3.1, 4.3.1 and 4.3.2 of the PD (version 01.12).
Comments	For ex-ante it was assumed that strata remain constant for the baseline period.

Data / Parameter	Regional Forest Cover / Non-Forest Cover Benchmark Map
Data unit	Dimensionless
Description	Map showing the location of forest land within the RRD at the beginning of each project crediting period
Source of data	Remote sensing data in combination with GPS data collected during ground truthing
Description of measurement methods and procedures to be applied	•Methods and procedures: Landsat, or similar mid-resolution, images used in the mapping operation must follow a three-step approach: preprocessing, classification, and validation. The preprocessing includes geometric corrections and radiometric calibration. The classification and mapping must follow the protocols established by the module BL-UP and X-STR. The benchmark RRD Forest Cover map will be used as the

	baseline to the quantification of deforestation rates in the Reference Region. • Entity responsible for the measurement: IBAP • Accuracy: the minimum map accuracy must be 90% for the classification of the forest/non-forest in the remote sensing imagery.
Frequency of monitoring/recording	Update frequency at a minimum three times over the ten years leading up to baseline renewal (every 10 years).
Value monitored	Not applicable
Monitoring equipment	• Remote sensing data; • Computer, GIS software; • GPS; • Digital Camera; • Spreadsheets.
QA/QC procedures to be applied	If map classification accuracy is less than 90% then the map is not acceptable for further analysis. More remote sensing data and ground truthing data will be needed to produce a product that reaches the 90% minimum mapping accuracy.
Purpose of the data	• Calculation of baseline emissions
Calculation method	The classification and mapping must follow the protocols established by the module BL-UP and X-STR. For the current baseline, landsat images date from January 2010 until April 2010 were collected. Fieldwork for ground truthing took place on the dry season of 2010 and 2012, totaling 261 validation coordinates (125 in Cacheu and 136 in Cantanhez). The calculation method is based on well-known GIS techniques. Satellite imagery is classified using classification software (commercial or open source) and the classification is validated using ground truthing data (GPS coordinates and observed land cover type) to comply with methodology accuracy requirements.
Comments	Where forestland contains more than one forest class, the map was stratified into forest classes using module X-STR.

Data / Parameter	Project Forest Cover Benchmark Map
Data unit	Dimensionless
Description	Map showing the location of forestland within the Project Area at the beginning of each project crediting period.
Source of data	Remote sensing data in combination with GPS data collected during ground truthing
Description of measurement methods and procedures to be applied	• Methods and procedures: Landsat, or similar mid-resolution, images used in the mapping operation must follow a three-step approach: preprocessing, classification, and validation. The preprocessing includes geometric corrections and radiometric calibration. The classification and mapping must follow the protocols established by the module BL-UP and X-STR. The benchmark Project Area Forest Cover map will be used as the baseline for forest cover changes in the Project Area. • Entity responsible for the measurement: IBAP • Accuracy: the minimum map accuracy must be 90% for the classification of the forest/non-forest in the remote sensing imagery.
Frequency of monitoring/recording	Update frequency at a minimum three times over the ten years leading up to baseline renewal (every 10 years).
Value monitored	Not applicable
Monitoring equipment	• Remote sensing data; • Computer, GIS software; • GPS; • Digital Camera; • Spreadsheets.
QA/QC procedures to be applied	If map classification accuracy is less than 90% then the map is not acceptable for further analysis. More remote sensing data and ground truthing data will be needed to produce a product that reaches the 90% minimum mapping accuracy.
Purpose of the data	• Calculation of project emissions
Calculation method	The classification and mapping must follow the protocols established by the module BL-UP and X-STR. For the current baseline, landsat images date from January 2010 until April 2010 were collected. Fieldwork for ground

	truthing took place on the dry season of 2010 and 2012, totaling 261 validation coordinates (125 in Cacheu and 136 in Cantanhez). The calculation method is based on well-known GIS technics. Satellite imagery is classified using classification software (commercial or open source) and the classification is validated using ground truthing data (GPS coordinates and observed land cover type) to comply with methodology accuracy requirements.
Comments	Where forestland contains more than one forest class, the map must be stratified into forest classes using module X-STR.

Data / Parameter	Leakage Belt Forest Cover Benchmark Map
Data unit	Dimensionless
Description	Map showing the location of forestland within the Leakage Belt at the beginning of each project crediting period.
Source of data	Remote sensing data in combination with GPS data collected during ground truthing
Description of measurement methods and procedures to be applied	• Methods and procedures: Landsat, or similar mid-resolution, images used in the mapping operation must follow a three-step approach: preprocessing, classification, and validation. The preprocessing includes geometric corrections and radiometric calibration. The classification and mapping must follow the protocols established by the module BL-UP and X-STR. The benchmark Leakage Belt Forest Cover map will be used as the baseline for forest cover changes in the Leakage Belt. • Entity responsible for the measurement: IBAP • Accuracy: the minimum map accuracy must be 90% for the classification of the forest/non-forest in the remote sensing imagery.
Frequency of monitoring/recording	Update frequency at a minimum three times over the ten years leading up to baseline renewal (every 10 years).
Value monitored	Not applicable.
Monitoring equipment	• Remote sensing data; • Computer, GIS software;

	• GPS; • Digital Camera; • Spreadsheets.
QA/QC procedures to be applied	If map classification accuracy is less than 90% then the map is not acceptable for further analysis. More remote sensing data and ground truthing data will be needed to produce a product that reaches the 90% minimum mapping accuracy.
Purpose of the data	• Calculation of leakage emissions
Calculation method	The classification and mapping must follow the protocols established by the module BL-UP and X-STR. For the current baseline, landsat images date from January 2010 until April 2010 were collected. Fieldwork for ground truthing took place on the dry season of 2010 and 2012, totaling 261 validation coordinates (125 in Cacheu and 136 in Cantanhez). The calculation method is based on well-known GIS technics. Satellite imagery is classified using classification software (commercial or open source) and the classification is validated using ground truthing data (GPS coordinates and observed land cover type) to comply with methodology accuracy requirements.
Comments	Where forestland contains more than one forest class, the map must be stratified into forest classes using module X-STR

Data / Parameter	Project Forest Cover Monitoring Map
Data unit	Dimensionless
Description	Map showing the location of forestland within the project area at the beginning of each monitoring period. If, within the Project Area, some forestland is cleared the map must show the deforested areas at each monitoring event.
Source of data	Remote sensing data in combination with GPS data collected during ground truthing
Description of measurement methods and procedures to be applied	• Methods and procedures: Landsat, or similar mid-resolution, images used in the mapping operation must follow a three-step approach: preprocessing, classification and validation. The preprocessing includes geometric corrections and radiometric calibration. The classification

	and mapping must follow the protocols established by the module BL-UP and X-STR. The monitoring project area forest cover map will be compared to the benchmark project area forest cover map and land cover transitions areas from forest to non-forest in the project area quantified using map algebra • Entity responsible for the measurement: IBAP • Accuracy: the minimum map accuracy must be 90% for the classification of the forest/non-forest in the remote sensing imagery.
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value monitored	Not applicable
Monitoring equipment	• Remote sensing data; • Computer, GIS software; • GPS; • Digital Camera; • Spreadsheets.
QA/QC procedures to be applied	If map classification accuracy is less than 90% then the map is not acceptable for further analysis. More remote sensing data and ground truthing data will be needed to produce a product that reaches the 90% minimum mapping accuracy.
Purpose of the data	• Calculation of project emissions
Calculation method	Map algebra was used to calculate forest to non-forest transitions.
Comments	The map is presented on Figure 19 of the Forest Mapping Report (FMReport_11.11.2019.pdf). Landsat-8 OLI (Operational Land Imager) imagery for the dry season of 2016 was acquired through the USGS database (available at: http://earthexplorer.usgs.gov/). For more details see the Annexes of FMReport_11.11.2019.pdf.

Data / Parameter	Leakage Belt Forest Cover Monitoring Map
Data unit	Dimensionless

Description	Map showing the location of forestland within the Leakage Belt area at the beginning of each monitoring period.
Source of data	Remote sensing using in combination with GPS data collected during ground truthing.
Description of measurement methods and procedures to be applied	• Methods and procedures: Landsat, or similar mid-resolution, images used in the mapping operation must follow a three-step approach: preprocessing, classification, and validation. The preprocessing includes geometric corrections and radiometric calibration. The classification and mapping must follow the protocols established by the module BL-UP and X-STR. The monitoring leakage belt cover map will be compared to the benchmark leakage belt cover map and land cover transitions areas from forest to non-forest in the leakage belt quantified using map algebra • Entity responsible for the measurement: IBAP • Accuracy: the minimum map accuracy must be 90% for the classification of the forest/non-forest in the remote sensing imager
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value monitored	Not applicable.
Monitoring equipment	• Remote sensing data; • Computer, GIS software; • GPS; • Digital Camera; • Spreadsheets.
QA/QC procedures to be applied	If map classification accuracy is less than 90% then the map is not acceptable for further analysis. More remote sensing data and ground truthing data will be needed to produce a product that reaches the 90% minimum mapping accuracy.
Purpose of the data	• Calculation of leakage emissions
Calculation method	Map algebra was used to calculate forest to non-forest transitions.
Comments	The map is presented on Figure 20 of the Forest Mapping Report (FMReport_11.11.2019.pdf). Landsat-8 OLI

	(Operational Land Imager) imagery for the dry season of 2016 was acquired through the USGS database (available at: http://earthexplorer.usgs.gov/). For more details see the Annexes of FMReport_11.11.2019.pdf.
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Data / Parameter	Degradation PRA Results
Data unit	Dimensionless
Description	Degradation potential identified through the Participatory Rural Appraisal (PRA) determining if there is the potential for illegal extraction of trees to occur
Source of data	Interviews with the communities inside and surrounding the project area
Description of measurement methods and procedures to be applied	• Methods and procedures: the PRA consists of semistructured interviews / questionnaires. The PRA shall evaluate whether the following activities may be occurring in the project area: (i) harvesting of fuel wood, (ii) harvesting of wood for charcoal production and (iii) timber harvest. If $\geq 10\%$ of those interviewed/surveyed suggest that degradation may be occurring within the project boundary then the limited on the ground degradation survey shall be triggered. An additional output of the PRA shall be a depth of penetration of degradation pressure. A maximum distance shall be recorded for penetration into the forest from access points (such as roads, rivers, already cleared areas) for the purpose of harvesting fuel wood, charcoal and/or timber. It is likely that differing distances shall exist for each degradation pressure. If multiple pressures exist in the same stratum the deepest depth of penetration shall be used to define Adeg,i • Entity responsible for the measurement: IBAP • Accuracy: communities need to be sampled inside and on the surroundings of the project area and within 2 km of the boundaries of the Leakage Belt to avoid bias. Sampling must be randomly designed and at least 10% of communities shall be sampled. If 10% of communities are less than 10 communities then the sample size shall be set as 10 or 100% of the communities. If 10% is more than 10 communities then the sample size shall be set as 30.

Frequency of monitoring/recording	Degradation potential shall be assessed every two years
Value monitored	8.97%
Monitoring equipment	• GPS; • Field interview forms; • Spreadsheets.
QA/QC procedures to be applied	Communities locations shall be structured in a geo referenced database. If communities no longer exist or new settlements are established the database must be updated. All information collected on the field (i.e. questionnaires, spreadsheets) must be digitalized. Information must be recorded and backed-up digitally and physical copies stored at IBAP headquarters. Prior to PRA update the field team must be trained both on the interview method and on the questionnaire template.
Purpose of the data	• Calculation of project emissions
Calculation method	Semi-structured interviews with the communities to identify forest degradation potential.
Comments	As 8.82%<10%, the limited degradation survey was not executed. If a limited degradation survey was required, it would be necessary to know the depth of penetration of degradation pressure. For prevent this, in this field campaign, the team asked the population the maximum distance that they done to get wood.

Data / Parameter	Result of Limited Degradation Survey
Data unit	Dimensionless
Description	Rapid assessment to evaluate potential for degradation allowing the delineation of the areas that are potentially subjected to degradation.
Source of data	Field sampling
Description of measurement methods and procedures to be applied	• Methods and procedures: The area subjected to degradation shall be delineated based on an access buffer from all access points, such as roads and rivers or previously cleared areas, to the project area, with a width equal to the distance of degradation penetration. The area shall be sampled by surveying several transects of known

	length and width across the access-buffer area (equal in area to at least 1% of $A_{Deg,i}$) to check whether new tree stumps are evident or not. If there is little to no evidence that trees are being harvested then degradation can be assumed to be zero and no monitoring is needed. If degradation indications exist, systematic sampling must be conducted. • Entity responsible for the measurement: IBAP • Accuracy: T-SIG shall be used to establish significance.
Frequency of monitoring/recording	Must be repeated each time the PRA indicates a potential for degradation
Value monitored	Not applicable
Monitoring equipment	• Remote sensing data; • GPS; • Digital Camera; • Diametric tape; • Field sampling spreadsheets; • Computer, GIS software.
QA/QC procedures to be applied	All information collected on the field (i.e. questionnaires, spreadsheets, tree stump data) must be digitalized. Information must be recorded and backed-up digitally and physical copies stored at IBAP headquarters. Prior to PRA update the field team must be trained following a specific SOP detailing field and data collection methods. All maps produced delineating degradation areas must comply with the same error limit as established for other mapping activities in the monitoring plan (limit of 90%).
Purpose of the data	• Calculation of project emissions
Calculation method	The sampling plan must be designed using plots systematically placed over the buffer zone so that they sample at least 3% of the area of the buffer zone. The diameter of all tree stumps will be measured and conservatively assumed to be the same as the DBH.
Comments	According to PRA (Degradation PRA Results parameter), there is no potential for degradation. For more details, please see PRAreport_23.01.2018.pdf.

Data / Parameter	$A_{DefPA, i, u, t}$
Data unit	ha
Description	Area of recorded deforestation in the project area in stratum i converted to land use u at time t
Source of data	Remote sensing imagery
Description of measurement methods and procedures to be applied	• Methods and procedures: Landsat, or similar mid-resolution, images used in the mapping operation must follow a three-step approach: preprocessing, classification, and validation. The preprocessing includes geometric corrections and radiometric calibration. The classification and mapping must follow the protocols established by the module BL-UP and X-STR. The monitoring forest cover map will be compared to the benchmark forest cover map and land cover transitions areas from forest to non-forest in the project area quantified using map algebra • Entity responsible for the measurement: IBAP • Accuracy: the minimum map accuracy must be 90% for the classification of the forest/non-forest in the remote sensing imagery.
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value monitored	PNTC • Terrestrial Forest: 338 (67.6 ha.yr⁻¹) • Mangrove: 91 (18.2 ha.yr⁻¹) PNC • Terrestrial Forest: 1516 (303.2 ha.yr⁻¹) • Mangrove: 493 (98.6 ha.yr⁻¹)
Monitoring equipment	• Remote sensing data; • Computer, GIS software; • GPS; • Digital Camera; • Spreadsheets.
QA/QC procedures to be applied	All data sources and analytical procedures will be documented and archived. Accuracy of the classification must be assessed by comparing the classification with ground truthing samples.

Purpose of the data	• Calculation of project emissions
Calculation method	Map algebra was used to calculate forest to non-forest transitions.
Comments	The area for the two change classes of deforestation ("Terrestrial Forest" to "Non-Forest" and "Mangrove" to "Non-Forest") in the project area, between 2011 and 2016, was determined across deforestation maps built for this period. For more details, please see Table 17 and Figure 3 of the FMReport_11.11.2019.

Data / Parameter	$A_{DefLB, i, u, t}$
Data unit	ha
Description	Area of recorded deforestation in the leakage belt in stratum i converted to land use u at time t
Source of data	Remote sensing imagery
Description of measurement methods and procedures to be applied	• Methods and procedures: Landsat, or similar mid-resolution, images used in the mapping operation must follow a three-step approach: preprocessing, classification, and validation. The preprocessing includes geometric corrections and radiometric calibration. The classification and mapping must follow the protocols established by the module BL-UP and X-STR. The monitoring forest cover map will be compared to the benchmark forest cover map and land cover transitions areas from forest to non-forest in the leakage belt quantified using map algebra • Entity responsible for the measurement: IBAP • Accuracy: the minimum map accuracy must be 90% for the classification of the forest/non-forest in the remote sensing imagery.
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value monitored	PNTC • Terrestrial Forest: 536 (107.2 ha.yr⁻¹) • Mangrove: 158 (31.6 ha.yr⁻¹) PNC

	• Terrestrial Forest: 2098 (419.6 ha.yr⁻¹) • Mangrove: 917 (183.4 ha.yr⁻¹)
Monitoring equipment	• Remote sensing data; • Computer, GIS software; • GPS; • Digital Camera; • Spreadsheets.
QA/QC procedures to be applied	All data sources and analytical procedures will be documented and archived. Accuracy of the classification must be assessed by comparing the classification with ground truthing samples.
Purpose of the data	• Calculation of leakage
Calculation method	Map algebra was used to calculate forest to non-forest transitions.
Comments	The area for the two change classes of deforestation ("Terrestrial Forest" to "Non-Forest" and "Mangrove" to "Non-Forest") in the leakage belt, between 2011 and 2016, was determined across deforestation maps built for this period. For more details, please see Table 17 and Figure 3 of the FMReport_11.11.2019.

Data / Parameter	$A_{DegW, i}$
Data unit	ha
Description	Area potentially impacted by degradation processes in stratum i
Source of data	GIS delineation and ground truthing
Description of measurement methods and procedures to be applied	• Methods and procedures: the parameter is composed of a buffer from all access points, such as roads and rivers or previously cleared areas. The width of the buffer shall be determined by the depth of degradation penetration as defined as a PRA output. The sampling plan must be designed using plots systematically placed over the buffer zone so that they sample at least 3% of the area of the buffer zone. The diameter of all tree stumps will be measured and conservatively assumed to be the same as the DBH. • Entity responsible for the measurement: IBAP

	•Accuracy: degradation area delineation must be validated using ground truthing data according to the sampling plan
Frequency of monitoring/recording	Must be repeated each time the PRA indicates a potential for degradation.
Value monitored	Not Applicable
Monitoring equipment	• Remote sensing data; • Computer, GIS software; • GPS; • Digital Camera; • Spreadsheets.
QA/QC procedures to be applied	All data collected and analytical procedures will be documented and archived. Areas under degradation must be validated using ground truthing. The field team will be trained according to an appropriate SOP to identify and measure tree stumps.
Purpose of the data	• Calculation of project emissions
Calculation method	Map algebra will be used to calculate forest loss due to degradation.
Comments	According to PRA (Degradation PRA Results parameter), there is no potential for degradation. For more details, please see PRAreport_23.01.2018.pdf.

Data / Parameter	$A_{DistPA, q, i, t}$
Data unit	ha
Description	Area impacted by natural disturbances in the project stratum i converted to natural disturbance stratum q at time t
Source of data	Remote Sensing imagery combined with ground verification or GPS coordinates
Description of measurement methods and procedures to be applied	•Methods and procedures: where natural disturbance occur ex-post in the project area such as tectonic activity, extreme weather, pest, drought or fire that result in a degradation of forest carbon stock, the area disturbed shall be delineated. Using map algebra, the area impacted by natural disturbance is equal to the area that overlap

	between the delineated area of disturbance and the area of unplanned deforestation in the project area. • Entity responsible for the measurement: IBAP • Accuracy: degradation area delineation must be validated using ground truthing data of GPS coordinates. Emissions resulting from natural disturbances may be omitted if they are deemed de minimis through the use of the module TSIG
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value monitored	0
Monitoring equipment	• Remote sensing data; • Computer, GIS software; • GPS; • Digital Camera; • Spreadsheets.
QA/QC procedures to be applied	All data sources and analytical procedures will be documented and archived. Accuracy of the classification must be assessed by comparing the classification with ground truthing or GPS samples
Purpose of the data	• Calculation of project emissions
Calculation method	Map algebra to overlap the areas undergoing natural disturbance and the project area.
Comments	There is no evidence of natural disturbances during the monitoring period (2011-2016). For more details, please see Table 19 of the FMReport_11.11.2019.

Data / Parameter	AP _i
Data unit	ha
Description	Total area of degradation sample plots in stratum i
Source of data	Ground measurement
Description of measurement methods and procedures to be applied	• Methods and procedures: calculated by summing the area (slope corrected) of sample plots measures in the sample of $A_{Deg,W, i, t}$. • Entity responsible for the measurement: IBAP

	• Accuracy: total area must be slope corrected
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every five years examination occur prior to any verification event.
Value monitored	Not Applicable
Monitoring equipment	• Remote sensing data; • Computer, GIS software; • GPS; • Digital Camera; • Spreadsheets.
QA/QC procedures to be applied	Incident areas of potential degradation are confirmed and delineated in the field using GPS, sample plot dimensions are measured in the field on plot establishment.
Purpose of the data	• Calculation of project emissions
Calculation method	Calculated by summing the area (slope corrected) of sample plots measures in the sample of $A_{Deg,W,i,t}$.
Comments	There is no evidence of natural disturbances or burnings during the monitoring period (2011-2016). For more details, please see FMReport_11.11.2019.

Data / Parameter	$C_{DegW,i,t}$
Data unit	t CO ₂ e
Description	Biomass carbon of trees cut and removed through illegal logging and fuelwood and charcoal extraction degradation process from plots measured in stratum i at time t
Source of data	Field measurement
Description of measurement methods and procedures to be applied	• Methods and procedures: temporary circular sample plots will be allocated and measured in the area of potential logging. Diameter at cut height of stumps will be measured. Significance of GHG emissions shall be assessed using T-SIG. If emissions from degradation is deemed significant, biomass of trees cut and removed will be estimated from measured diameter (conservatively assuming that diameter at stump cut are equivalent to DBH) applying allometric equations from Chave et al. (2005) and Delayne (1999)

	• Entity responsible for the measurement: IBAP • Accuracy: the proposed approach to consider diameter at cut height equivalent to DBH assures the conservativeness of the parameter
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs in a frequency of less than every 5 years examination must occur prior to any verification event
Value monitored	Not Applicable
Monitoring equipment	• Diametric Tape; • GPS; • Digital Camera; • Spreadsheets.
QA/QC procedures to be applied	All data sources and analytical procedures will be estimated from diameter measurements of cut stumps in the documented and archived.
Purpose of the data	• Calculation of project emissions
Calculation method	Estimated from diameter measurements of cut stumps in the sample plots
Comments	There is no evidence of natural disturbances or burnings during the monitoring period (2011-2016). For more details, please see FMReport_11.11.2019.

Data / Parameter	$C_{AB,tree,i}$
Data unit	$tCO_2e\ ha^{-1}$
Description	Carbon Stock in aboveground biomass in trees in Cantanhez and Cacheu in stratum i
Source of data	Field Measurement (Winrock/IICT 2012) applied with allometric equation published in Chave et al. (2005) and Delaney (1999)
Description of measurement methods and procedures to be applied	• Methods and procedures: see Section 4.3.4 of the PD (version 01.12). • Entity responsible for the measurement: IBAP • Accuracy: see Section 4.3.4 of the PD (version 01.12).
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs in a frequency of less than every 5 years examination must occur prior to any verification event

Value monitored	PNTC • Open Forest: 132.88 • Savanna: 97.70 • Mangrove: 72.89 PNC • Closed Forest: 306.11 • Open Forest: 127.01 • Savanna: 101.43 • Mangrove: 100.45
Monitoring equipment	• Diametric Tape; • Hypsometer; • Remote sensing data; • Computer, GIS software; • GPS; • Digital Camera; • Spreadsheets
QA/QC procedures to be applied	Independent 3rd party audit of field data and procedures.
Purpose of the data	• Calculation of baseline emissions • Calculation of project emissions • Calculation of leakage
Calculation method	See Section 4.3.4 of the PD (version 01.12)
Comments	Not applicable

Data / Parameter	DBH _{tree, i}
Data unit	cm
Description	Diameter at breast height of a tree
Source of data	Field measurement
Description of measurement methods and procedures to be applied	•Methods and procedures: typically measured at 1.3 aboveground. Detail on methods and procedures are presented on Section 4.3.4 of the PD (version 01.12) •Entity responsible for the measurement: IBAP •Accuracy: procedures for accuracy assurance for forest inventory are detailed on section 4.3.4. of the PD (version 01.12)

Frequency of monitoring/recording	Monitoring must occur at least every ten years from baseline renewal.
Value monitored	Not Applicable
Monitoring equipment	• GPS; • Diametric tape; • Hypsometer.
QA/QC procedures to be applied	Independent 3rd party audit of field data and procedures. Field observation sheets will include DBH of each measured tree for evaluation of reasonableness of measurement based on feasible growth rate.
Purpose of the data	• Calculation of baseline emissions • Calculation of project emissions • Calculation of leakage
Calculation method	See Section 4.3.4 of the PD (version 01.12)
Comments	Data collected in the field campaigns of 2007, 2012, 2014, 2017.

Data / Parameter	H
Data unit	m
Description	Total height of tree
Source of data	Field measurement
Description of measurement methods and procedures to be applied	•Methods and procedures: height measure undertook using a hypsometer. Detail on methods and procedures are presented on Section 4.3.4 of the PD (version 01.12) •Entity responsible for the measurement: IBAP •Accuracy: procedures for accuracy assurance for forest inventory are detailed on section 4.3.4. of the PD (version 01.12)
Frequency of monitoring/recording	Monitoring must occur at least every ten years from baseline renewal.
Value monitored	Not applicable
Monitoring equipment	• GPS; • Hypsometer.
QA/QC procedures to be applied	Independent 3rd party audit of field data and procedures. Field observation sheets will include H of each measured

	tree for evaluation of reasonableness of measurement based on feasible growth rate.
Purpose of the data	• Calculation of baseline emissions • Calculation of project emissions • Calculation of leakage
Calculation method	See Section 4.3.4 of the PD (version 01.12)
Comments	Data collected in the field campaigns of 2007, 2012, 2014, 2017.

Data / Parameter	$C_{BB,tree,i}$
Data unit	$tCO_2e\ ha^{-1}$
Description	Carbon Stock in belowground biomass in trees in Cantanhez and Cacheu in stratum i
Source of data	Field Measurement (Winrock/IICT 2012) applied with root-to-shoot ratios
Description of measurement methods and procedures to be applied	• Methods and procedures: see Section 4.3.4 of the PD (version 01.12) • Entity responsible for the measurement: IBAP • Accuracy: see Section 4.3.4 of the PD (version 01.12)
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs in a frequency of less than every 5 years examination must occur prior to any verification event
Value monitored	PNTC • Open Forest: 35.23 • Savanna: 26.49 • Mangrove: 33.39 PNC • Closed Forest: 84.15 • Open Forest: 33.77 • Savanna: 28.18 • Mangrove: 46.01
Monitoring equipment	Not applicable
QA/QC procedures to be applied	Independent 3rd party audit of field data and procedures.
Purpose of the data	• Calculation of baseline emissions • Calculation of project emissions

	• Calculation of leakage
Calculation method	See Section 4.3.4 of the PD (version 01.12)
Comments	Not applicable

Data / Parameter	$C_{AB,tree,post,i}$
Data unit	tCO ₂ e ha ⁻¹
Description	Post-deforestation carbon stock in aboveground biomass in Cantanhez and Cacheu in stratum i
Source of data	Field data or literature data
Description of measurement methods and procedures to be applied	Since post-deforestation land use is the production of rice, a <i>herbaceous non-tree vegetation</i> , following BL-UP and M-MON the value applied is <i>de minimis</i> (zero).
Frequency of monitoring/recording	Every monitoring period.
Value monitored	0
Monitoring equipment	Monitoring equipment's are not applicable.
QA/QC procedures to be applied	Independent 3rd party audit and field verification.
Purpose of the data	• Calculation of baseline emissions • Calculation of project emissions • Calculation of leakage
Calculation method	Not Applicable
Comments	

Data / Parameter	$A_{burn, i, t}$
Data unit	ha
Description	Area burnt at time t (if any occurs)
Source of data	Remote sensing imagery
Description of measurement methods and procedures to be applied	• Methods and procedures: using GIS and Landsat imagery delineate area burnt at time t • Entity responsible for the measurement: IBAP • Accuracy: map accuracy must comply with methodology requirements (90% minimum)

Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs in a frequency of less than every 5 years examination must occur prior to any verification event
Value monitored	0
Monitoring equipment	• Remote sensing data; • Computer, GIS software; • GPS; • Digital Camera; • Spreadsheets.
QA/QC procedures to be applied	Incident areas of fire are confirmed and delineated in the field using GPS.
Purpose of the data	• Calculation of project emissions
Calculation method	Total burnt area is quantified using map algebra
Comments	There is no evidence of burnings during the monitoring period (2011-2016). For more details, please see FMReport_11.11.2019.

Data / Parameter	Asp
Data unit	ha
Description	Area of sample plots in ha
Source of data	Recording and archiving of number and size of sample plots
Description of measurement methods and procedures to be applied	• Methods and procedures: the project applies circular nested plots. The outer circle has 20 mts and the area is sloped adjusted in the field using a hypsometer. For details see Section 4.3.4. of the PD (version 01.12) • Entity responsible for the measurement: IBAP • Accuracy: the hypsometer shall be calibrated according to factory procedures before field campaigns.
Frequency of monitoring/recording	Monitoring must occur at least every ten years for baseline renewal.
Value monitored	0,13 ha (radius of 20 mts)
Monitoring equipment	• Remote sensing data; • Computer, GIS software; • Hypsometer;

	• GPS; • Digital Camera; • Spreadsheets.
QA/QC procedures to be applied	Personnel must be trained in the operation of hypsometers and how to correct for slope in the terrain. All data must be recorded and backup in multiple locations including physical copies and digital copies (HDs, servers, cloud)
Purpose of the data	• Calculation of baseline emissions
Calculation method	Plots are circular. Three circles are nested, the bigger with 20 mts, the intermediary with 14 mts and the internal with 4 mts. For details on calculation methods see Section 4.3.4 of the PD (version 01.12)
Comments	Initial above and belowground biomass stock estimates from the 2011 inventory are valid and treated as constant through 2021, after which they will be re-estimated from new field measurements.

Data / Parameter	N
Data unit	Dimensionless
Description	Number of sample points
Source of data	Recording and archiving of number of sample points
Description of measurement methods and procedures to be applied	• Methods and procedures: Plots are randomly selected over a 250x250 grid of points. For details see Section 4.3.4 of the PD (version 01.12) • Entity responsible for the measurement: IBAP • Accuracy: when overlaying the grid of points standard mapping procedures shall be observed to avoid distortion or misplacement of points.
Frequency of monitoring/recording	Monitoring must occur at least every ten years for baseline renewal.
Value monitored	259 plots
Monitoring equipment	• Remote sensing data; • Computer, GIS software; • GPS;

QA/QC procedures to be applied	Personnel must be trained in GIS and digital mapping operations. All data must be recorded and backup in multiple locations including physical copies and digital copies (HDs, servers, cloud)
Purpose of the data	• Calculation of baseline emissions
Calculation method	A 250 x 250 meter systematic grid of points with a random origin shall be created. The number of plots to be sampled in each stratum are determined based on three considerations: (1) the variability of biomass within a stratum (evaluated using previously collected data); (2), the estimated area covered by each stratum; and (3) the target precision level (set at 15%, 95% CI). Sample plots are then randomly selected for each stratum that were deforested and need to be revised over the grid. Selected plot coordinates shall be loaded into GPS equipment and later used in the field to reach the center of each plot. For details on calculation methods see Section 4.3.4 of the PD (version 01.12)
Comments	Not applicable

3.3 Monitoring Plan

The Community Based Avoided Deforestation Project in Guinea Bissau must monitor land cover changes and degradation activities before verifications in order to assess ex-post emission reduction. The main goal of this Monitoring Report is to present the data that will allow the verification of the deforestation and degradation within the Project Area and the Leakage Belt throughout time, regularly updating the emissions estimation as well as the generation of sufficient and timely information to evaluate the impact of the on the ground community measures to reduce pressure over the forest and make the necessary adjustments.

This Monitoring Report covers the parameters described in Section 3.2 and monitors the area of forest land converted to non-forest land and associates changes in carbon stocks, the area of forest land undergoing loss in carbon from degradation activities and associated changes in carbon stocks, the area of forest land undergoing loss in carbon stocks resulting from natural disturbances and associated changes in carbon stocks and the greenhouse gas emissions associated with project implementation.

The project monitoring and reporting process is IBAP's responsibility. IBAP is responsible for the conservation and management of forest-related biodiversity in Guinea-Bissau, and in the past

twelve years has recruited qualified staff and has grown into a fully functioning institution, coordinating the day-to-day management of more than 450,000ha of critical natural habitats. Figure 2 presents an overview of the monitoring process and defines the structure of IBAP's Monitoring Unit for the monitoring of this project.

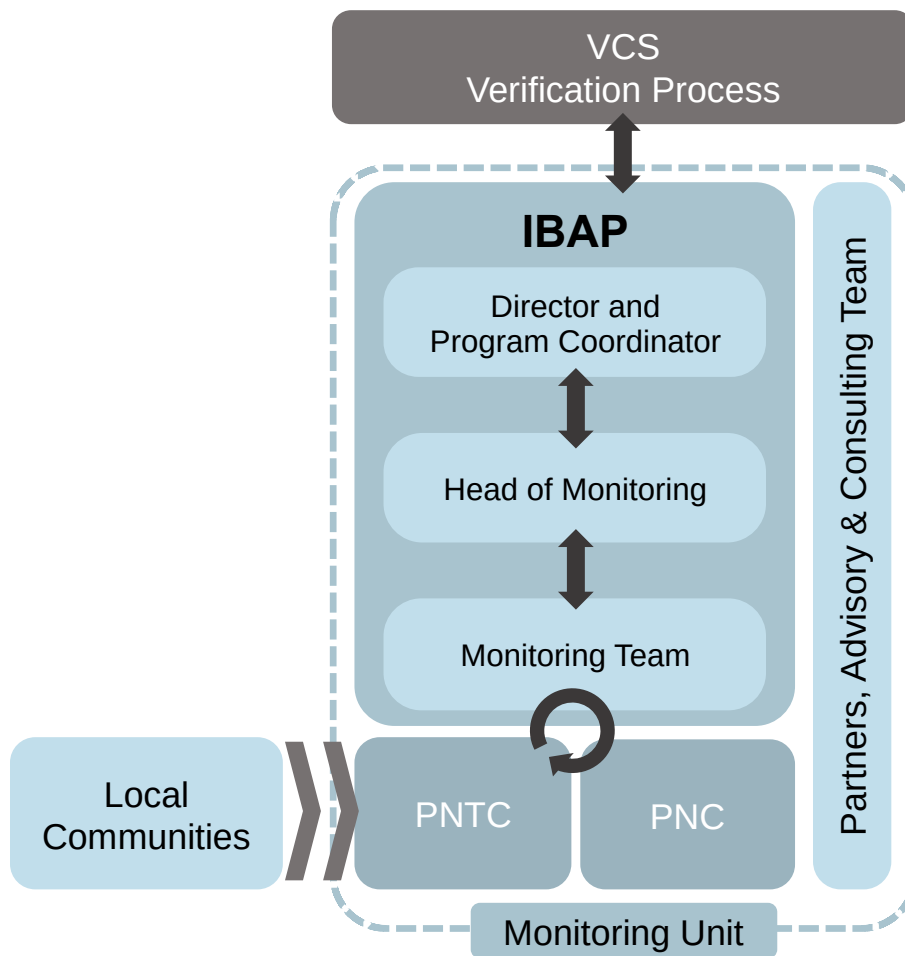


Figure 2. Overview of the monitoring process and structure.

The monitoring report was developed by a team composed of REDD specialists from WayCarbon, RSeT and ISA/Lisbon University coordinated by IBAP's Head of Monitoring (Leonildo Alves Cardoso, PhD) and discussed amongst all parts of the monitoring unit.

Specific groups of the monitoring team were responsible for specific tasks in this monitoring period, more specifically, (i) the Forest Cover Change Monitoring, (ii) the Participatory Rural Appraisal (PRA) Development and (iii) the Allometric Equation Validation for Terrestrial Forest and Mangrove

Forest. The figure below, presents an overview of the main monitoring tasks and the relationship between activities.

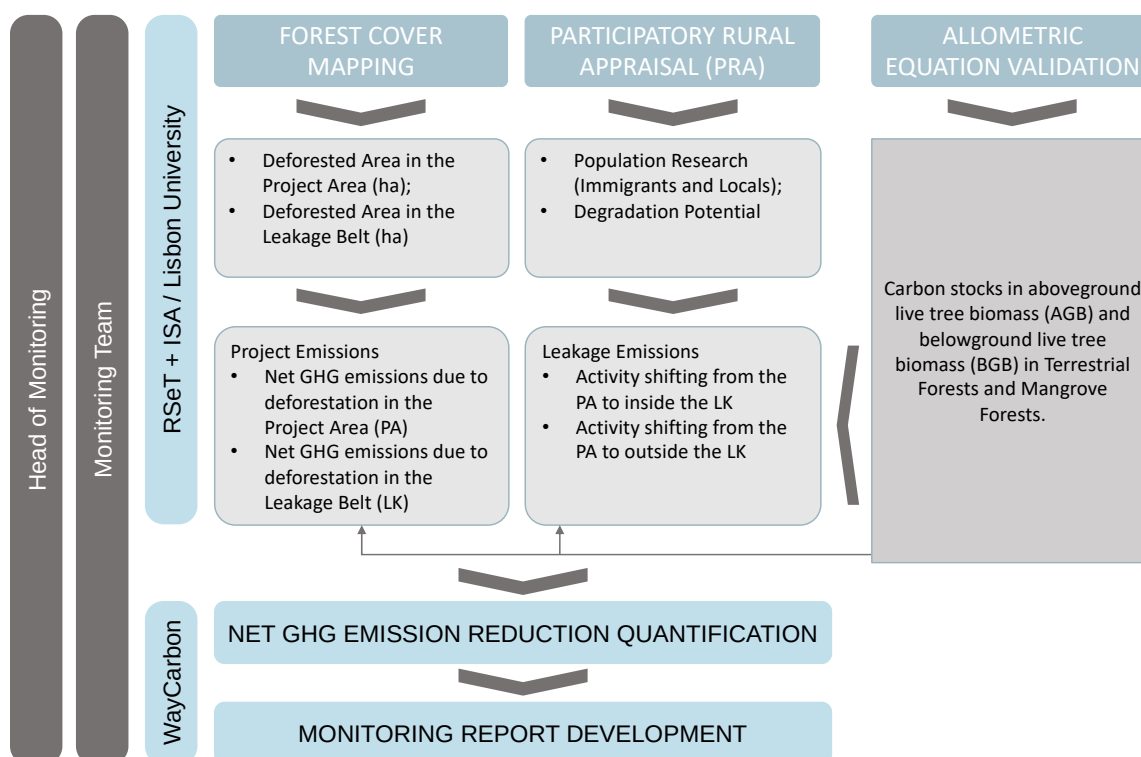


Figure 3. Main monitoring tasks, responsibilities and relationship of activities.

For each task, a main output was prepared detailing the applied methodology, sampling criteria, data collection and QC/QA procedures, together with relevant evidence and supporting material. The next table summarizes the documents provided to the VVB for the verification of emissions reductions between 2011 and 2016.

Table 5. Main monitoring documents of the REDD Project (2011-2016)

Task	Report	File ID
Forest Cover Mapping	Forest Mapping Report	FMReport_11.11.2019.pdf Finding_NIR-14.docx
Participatory Rural Appraisal (PRA)	Participatory Rural Appraisal Report	PRAreport_23.01.2018.pdf VCS_Monitoring_PRA_05.09.2019.xlsx
Allometric Equation Validation	Allometric Equation: Validation Report	Equations_Report_23.01.2018.pdf

Net GHG Emission Reduction Quantification	Not Applicable (Excel File)	MONITORING_GB-REDD_ER_20191111.xlsx WB2 – C assessment and emissions baseline v2.5 20191111.xlsx
Monitoring Report Development	Monitoring Report: Community Based Avoided Deforestation Project in Guinea-Bissau	Monitoring_REDD-GB_v03.0.pdf (<i>This File</i>)

All tasks had active participation of the IBAP's Monitoring Team both in the headquarters and on PNTC and PNC. Field work was used as an opportunity to provide training and share knowledge on GIS, Forestry Inventory and PRA methods.

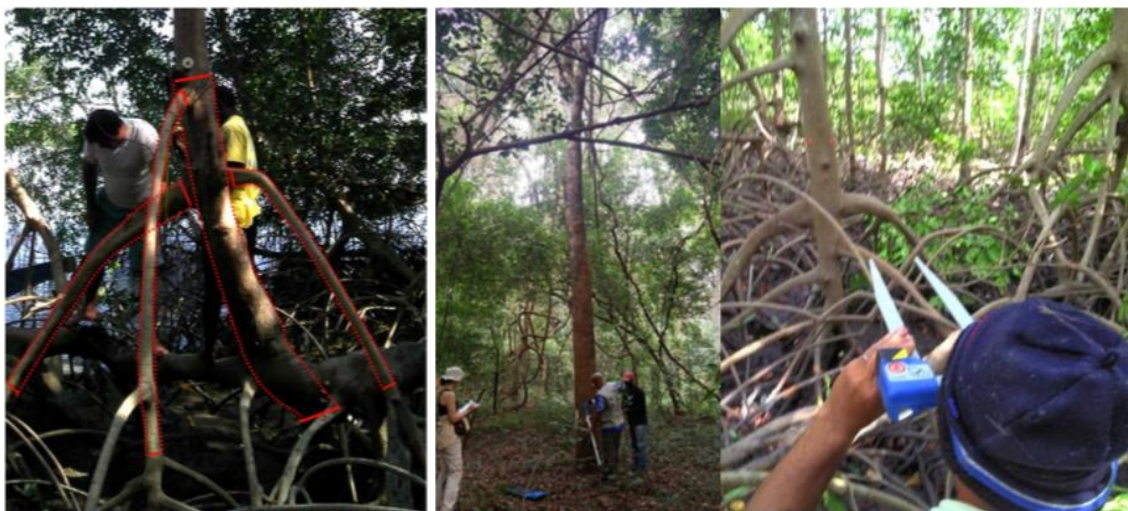


Figure 4. Field work performed by IBAP's Staff and International Consultants

The role of the Head of Monitoring is to oversight and guarantee that standard procedures and QA/QC procedures are being followed. The monitoring team reported in each of these components directly to the head of monitoring, receiving feedback in order to improve the quality of the data. The Head of Monitoring closely followed the final compilation of all data, ensuring data achieving, and the correct reporting. He is also responsible for setting up corrective or preventing actions to avoid non-conformities with the validated monitoring plan.

PARQUE: *Cachim* TABANCA: *Hala Balanta* DATA: *18/11/2017*

FOGÕES A INQUIRIR			POPULAÇÃO			RECOLHA DE MADEIRA*		
Fogão	Chefe de Fogão	Gênero	População Total	População Residente	População Imigrante	Abate Seletivo		Distância máxima percorrida para recolha (mts)
						Sim	Não	
F1	<i>Somes</i>	<i>H</i>	<i>3</i>	<i>3</i>	<i>0</i>		<i>X</i>	<i>1000</i>
F2	<i>Beze Hala</i>	<i>H</i>	<i>13</i>	<i>13</i>	<i>0</i>		<i>X</i>	<i>2500</i>
F3	<i>N'daga</i>	<i>H</i>	<i>25</i>	<i>25</i>	<i>0</i>		<i>X</i>	<i>10</i>
F4	<i>Orlando</i>	<i>H</i>	<i>25</i>	<i>25</i>	<i>0</i>		<i>X</i>	<i>5</i>
F5	<i>Teodoro</i>	<i>H</i>	<i>23</i>	<i>23</i>	<i>0</i>		<i>X</i>	<i>15</i>
F6	<i>Bali</i>	<i>H</i>	<i>109</i>	<i>2</i>	<i>2</i>		<i>X</i>	<i>1000</i>
F7	<i>Semi</i>	<i>F</i>	<i>6</i>	<i>6</i>	<i>0</i>		<i>X</i>	<i>5</i>
F8	<i>Sobressa</i>	<i>H</i>	<i>30</i>	<i>30</i>	<i>0</i>		<i>X</i>	<i>200</i>
F9								
F10								
F11								
F12								
F13								
F14								
F15								
F16								
F17								
F18								
F19								
F20								

* Abate seletivo (árvores cortadas): para lenha, para carvão ou madeira

Notas: *Tabanca sem chefe de tabanca*
mt foun, cunha do popul 9 em 2/3
mt baka's

X: 0370787
Y: 1354504

Figure 5. Example of field questionnaire applied during the PRA data collection. Standard procedures were prepared to train the monitoring team and guarantee the quality of the data

The forest monitoring is developed in a process of continuous improvement, which means that all activities performed by the monitoring team are registered in the formal report and revised by the Head of Monitoring. A process of internal audit was used to identify deviations or non-conformances. Internal audits were carried by more experienced international consultants that provided feedback and adjustments to the final report.

If material errors were identified and due action deemed necessary, correction action plans (CAPs) would have been developed and adjusted in the Monitoring Plan, including if a non-conformance is identified and the justification report fails to prove the conservativeness of the new method,

equipment or strategy. Standard Operational Procedures (SOPs) are developed and updated with the assistance of external carbon experts when necessary (e.g. PRA Data Collection) and are provided by the Head of Monitoring to the monitoring field team.

The monitoring unit had the support and guidance of external REDD experts. This advisory team includes carbon, forestry and remote sensing experts that have assisted with data entry, compilation of inventory results, and remote sensing work. The importance of these experts will gradually be diminished and become occasional as IBAP staff gains technical independence in all monitoring activities. Table 6 synthesizes the responsibilities of each group of the monitoring unit.

Table 6. Overview of the responsibilities of the monitoring team.

Group/Staff	Responsibility
Director / Program Coordinator	Managing the VCS verification process
	Revise monitoring reports from the head of monitoring and provide feedback
	Reporting
	Ensure engagement and support of external consultants and other members of the advisory board
Head of Monitoring	Compile data
	Data archiving
	Ensure consistency between the monitoring field team collecting data in the two parks
	Prepare monitoring reports
	Drafting SOPs
	Prepare CAPs when needed
	Selection of qualified staff for each specific activity to be performed by the monitoring field team (in collaboration with the Parks' Director)
	Identify training requirements
	Main liaison with the advisory board
	Liaison between the monitoring field team and the director and program coordinator
	Ensure that the quality control procedures are being implemented
	Plan and coordinate the Monitoring Field Team activities
Monitoring Field Team	Field data collection
	Data entry
	Data archiving
	Equipment maintenance and calibration
	Forest monitoring map production
	Prepare reports to the head of monitoring
External Experts	Provide technical and scientific support when needed and as required by the head of monitoring and IBAP's Director / Program coordinator
	Technical review or pre-verification of the data
	Technical review of monitoring reports and consistency with the monitoring plan

All data collected as part of the monitoring program was archived in both electronic and paper forms (when possible). To safeguard its security, copies of the data have been stored at IBAP's headquarters under the responsibility of the Head of Monitoring and at the offices of each Park (PNTC and PNC) under the supervision of the parks' directors. The archiving of the data was under the responsibility of the Head of Monitoring with the supervision of IBAP's director / program coordinator. The QA/QC protocol was supervised by the Head of Monitoring and includes:

- Collect data to validate the information produced with remote sensing;
- Ensure that the field team is trained, with biannual workshops, and discussion of SOPs;
- Register all field members and their specific responsibilities, and archive that information together with the data collected (metadata);
- Routine checks of the data sheets to ensure data integrity and correct labelling;
- Cross-check of the input data for transcription errors conducted by personnel not directly involved in inventory and data compilation steps;
- Total transparency of the worksheet to enable reproduction of the emission and uncertainty estimates;
- Revisit a sample of the measured plots to ensure the quality of the plot location (i.e. of the coordinates);
- Compare data from the GPS equipment with the coordinates in the field datasheet and in the excel workbook to identify and correct eventual transcription errors;
- Technical review or pre-verification of the data, and monitoring report will be conducted by the advisory board and IBAP's Director / Program coordinator.

The ex-post monitoring has two key aspects: (i) monitoring according to the Monitoring Plan and (ii) revising the baseline every 10 years. Carbon stocks shall be revisited every 10 years together with the baseline deforestation update in the reference region because agents, drivers and underlying causes of deforestation change dynamically.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

The baseline of the project was estimated *ex ante* (PD_REDD_v1_120.pdf) and validated by a VVB on the 20th of February of 2015 (VCS_WB-GB_ValidationReport_022015.pdf). It is monitored in a reference area (RRD) and used in both the *ex-ante* and *ex-post* estimation of net carbon stock changes and greenhouse gas (GHG) emission reduction. Following BL-UP, the boundaries for the project were established and historical deforestation evaluated during the historical reference period within the RRD. The simple historic baseline rate approach was applied.

4.1.1 Reference Region

The boundary of the reference region is the spatial delineation of the analytic domain from which information about regional rates and spatial patterns of deforestation were obtained. The reference region for projecting rate of deforestation (RRD) is representative of the general patterns of unplanned deforestation that are influencing the project area and its leakage belt. The reference region to quantify baseline emissions was validated and shall be updated on 31st of December of 2021. All procedures and methods are clearly presented in the validated PD.

Figure 1 (Section 1.7) depicts the boundaries of the RDD. The RDD was the only Reference Region defined since the configuration of deforestation in the Project Area is transition and the BL-UP requirement is achieved². The RDD does not need to be contiguous with and shall not encompass the Project Area (PA) or the Leakage Belt (LK), and its total area must be forested at the start of the historical reference period.

The area around Cacheu Park (PNTC) has the same ecological characteristic of those present within the Park, including the proportion of forest types observed in ancillary maps. The RDD includes forestlands spread along the administrative sectors of Cacheu, Caio and Cachungo. Wetlands of the region of Oio, along the margins of the rivers Cacheu and Mansoa, were also included to guarantee a similar proportion of mangrove and soil type.

The area around Cantanhez Park (PNC) includes most of the south western part of Guinea-Bissau (GB), which is the region with the most similar ecological and socio-economic conditions to those present in the Park. It includes the forests of the sectors of Buba, Empada and Catio and also those in the south of the administrative sector of Cacine. Additionally, the wetlands in the northern region of Quinara, along the margins of the Geba River, were also included in the RDD to ensure a similar proportion of mangroves.

Landsat image mosaics were prepared for 2002, 2007 and 2010. The original Landsat scenes, path/rows and acquisition dates of the images covering the relevant areas are shown in Table 7. For 2010, due to technical issues with the satellite sensor, primary scenes and fill scenes were used.

² Location analysis is not required where it can be shown that $\geq 25\%$ of the project geographic boundary is within 50m of land that has been anthropogenically deforested within the 10 years prior to the project start date.

Table 7. Landsat imagery from 2002, 2007 and 2010

Satellite	Sensor	Resolution		Coverage (km ²)	Acquisition date (DD-MM-YYYY)	Scene or point identifier	
		Spatial (m)	Spectral (μm)			Path	Row
Landsat	TM	28.5	0.45-2.35	32,000	02-04-2002	205	51
Landsat	TM	28.5	0.45-2.35	32,000	07-02-2007	205	51
Landsat	ETM+	28.5	0.45-2.35	32,000	11-04-2002	204	51
Landsat	TM	28.5	0.45-2.35	32,000	28-02-2007	204	51
Landsat	TM	28.5	0.45-2.35	32,000	11-04-2002	204	52
Landsat	TM	28.5	0.45-2.35	32,000	28-02-2007	204	52
Landsat	TM	28.5	0.45-2.35	32,000	04-04-2002	203	52
Landsat	TM	28.5	0.45-2.35	32,000	09-03-2007	203	52
Landsat	ETM+	30	0.45-2.35	32 000	02-01-2010	205	51
Landsat	ETM+	30	0.45-2.35	32 000	18-01-2010	205	51
Landsat	ETM+	30	0.45-2.35	32 000	19-02-2010	205	51
Landsat	ETM+	30	0.45-2.35	32 000	07-03-2010	205	51
Landsat	ETM+	30	0.45-2.35	32 000	23-03-2010	205	51
Landsat	ETM+	30	0.45-2.35	32 000	27-01-2010	204	51
Landsat	ETM+	30	0.45-2.35	32 000	12-02-2010	204	51
Landsat	ETM+	30	0.45-2.35	32 000	28-02-2010	204	51
Landsat	ETM+	30	0.45-2.35	32 000	16-03-2010	204	51
Landsat	ETM+	30	0.45-2.35	32 000	01-04-2010	204	51
Landsat	ETM+	30	0.45-2.35	32 000	27-01-2010	204	52
Landsat	ETM+	30	0.45-2.35	32 000	12-02-2010	204	52
Landsat	ETM+	30	0.45-2.35	32 000	28-02-2010	204	52
Landsat	ETM+	30	0.45-2.35	32 000	16-03-2010	204	52
Landsat	ETM+	30	0.45-2.35	32 000	01-04-2010	204	52
Landsat	ETM+	30	0.45-2.35	32 000	20-01-2010	203	52
Landsat	ETM+	30	0.45-2.35	32 000	09-03-2010	203	52

4.1.2 Mapping of Historical Land-Use and Land-Cover Change

To estimate the historical deforestation, the three land cover maps (2002, 2007, 2010) were combined to produce a single map with all possible transitions among the three land cover classes (terrestrial forest, mangrove, non-forest) and a single transition matrix was derived from the map

for calculation of the total deforestation from each forest class (terrestrial forest and mangrove) during the reference period 2002-2010 ($A_{RRD,unplanned,hrp}$). The tables showing the transition matrices obtained through map algebra operations with the landscape state at an initial time and the state of the same pixel at a later time are shown in Table 8 and Table 9.

Table 8. RRD PNTC – Land cover transition 2002 to 2010 | 3-class classification: terrestrial forest (TF), mangrove (M) and non-forest (NF)

2002	Dates		Area (ha)	% Total
	2007	2010		
TF	TF	TF	67,621	38.94
TF	TF	M	792	0.46
TF	TF	NF	2,149	1.24
TF	M	TF	1,603	0.92
TF	M	M	560	0.32
TF	M	NF	93	0.05
TF	NF	TF	5,921	3.41
TF	NF	M	239	0.14
TF	NF	NF	2,299	1.32
M	TF	TF	894	0.51
M	TF	M	2,734	1.57
M	TF	NF	215	0.12
M	M	TF	1,407	0.81
M	M	M	76,197	43.88
M	M	NF	1,745	1.01
M	NF	TF	596	0.34
M	NF	M	6,681	3.85
M	NF	NF	1,889	1.09
			173,634	100.00

Table 9. RRD PNC – Land cover transition 2002 to 2010 | 3-class classification: terrestrial forest (TF), mangrove (M) and non-forest (NF)

2002	Dates		Area (ha)	% Total
	2007	2010		
TF	TF	TF	121,840	63.32
TF	TF	M	2,496	1.30
TF	TF	NF	8,099	4.21
TF	M	TF	1,799	0.94
TF	M	M	1,700	0.88
TF	M	NF	466	0.24
TF	NF	TF	2,067	1.07
TF	NF	M	610	0.32
TF	NF	NF	4,069	2.11
M	TF	TF	809	0.42
M	TF	M	1,674	0.87
M	TF	NF	598	0.31
M	M	TF	1,139	0.59
M	M	M	39,773	20.67

M	M	NF	1,664	0.86
M	NF	TF	134	0.07
M	NF	M	1,421	0.74
M	NF	NF	2,075	1.08
			192,432	100.00

4.1.3 Map accuracy assessment

Map accuracy assessment was performed using an independent dataset the pixels were labelled according to the target classes, based on the observation of very-high resolution images available on Google Earth and on expert knowledge gained from several previous field campaigns. Overall accuracy of the 2010 Forest/Non-Forest map is 97.1%. The confusion matrix is shown in Table 10.

Table 10. Confusion matrix of the 2-class maps of forest/Non-Forest for 2011 of PA and LK (FMReport_11.11.2019.pdf)

		Predicted (# pixels)			Omission error (%)	Producer's accuracy (%)
		Forest	Non-forest	Total		
Observed (# pixels)	Forest	471	14	485	3.3	96.7
	Non-forest	0	0	0	7.5	92.5
	Total	471	14	485		
	Overall accuracy (%)	97,1				

4.1.4 Estimation of the annual areas of unplanned baseline deforestation

Simple historic approach was used to calculate the projected area of annual unplanned baseline deforestation in the RRD as follows:

$$A_{BSL,RRD,unplanned,t} = A_{RRD, unplanned, \hat{t}_{rp}} / T_{\hat{t}_{rp}}$$

Where:

$A_{BSL,RRD,unplanned,t}$ Projected area of unplanned baseline deforestation in the RRD in year t ; ha

$A_{RRD, unplanned, \hat{t}_{rp}}$ Total area deforested during the historical reference period in the RRD; ha

T_{rrp} *Duration of the historical reference period in years; yr*

t *1, 2, 3, ...t years elapsed since the projected start of the REDD project activity*

Net deforestation rate in the RRD was 0.62 for PNTC and 1.15 for PNC for the entire reference period. The modeled annual area of deforestation in the RRD ($A_{\text{BSL,RRD,unplanned},t}$) of each Project Area was calculated across the historical reference period. Table 11 shows the values of areas of unplanned baseline deforestation in the RRD in year t (ha) ($A_{\text{BSL,RRD,unplanned},t}$) for Cacheu (PNTC) and Cantanhez (PNC).

Table 11. Annual Area of Deforestation in the RRD (ha.yr⁻¹) in PNTC and PNC

RRD		Terrestrial Forest	Mangrove
PNTC	ha.yr ⁻¹	568	481
PNC	ha.yr ⁻¹	1,579	542

In the case of a transition configuration, location analysis is not required as long as it can be shown that $\geq 25\%$ of the project geographic boundary is within 50m of land that has been anthropogenically deforested within the 10 years prior to the project start date. Since the $>25\%$ criterion was met, location analysis is not required and thus was not be performed. The projected unplanned baseline deforestation in the project area was estimated as follows:

$$A_{\text{BSL,PA,unplanned},t} = A_{\text{BSL,RRD,unplanned},t} * P_{\text{PA}}$$

Where:

$A_{\text{BSL,PA,unplanned},t}$ *Projected area of unplanned baseline deforestation in the project area in year t ; ha*

$A_{\text{BSL,RRD,unplanned},t}$ *Projected area of unplanned baseline deforestation in the RRD in year t ; ha*

P_{PA} *Ratio of the project area to the total area of RRD; dimensionless*

t *1, 2, 3, ...t years elapsed since the projected start of the REDD project activity*

Similarly, the annual area of unplanned baseline deforestation in the leakage belt (Table 5) was estimated as follows:

$$A_{BSL,LK,unplanned,t} = A_{BSL,RRD,unplanned,t} * P_{LK}$$

Where:

$A_{BSL,LK,unplanned,t}$ *Projected area of unplanned baseline deforestation in the leakage belt in year t; ha*

$A_{BSL,RRD,unplanned,t}$ *Projected area of unplanned baseline deforestation in the RRD in year t; ha*

P_{LK} *Ratio of the area of the leakage belt to the total area of RRD; dimensionless*

t *1, 2, 3, ...t years elapsed since the projected start of the REDD project activity*

Table 12. Annual Area of Deforestation in the Project Area (ha.yr⁻¹) and Leakage Belt (ha.yr⁻¹)

		Project Area		Leakage Belt	
		Terrestrial Forest	Mangrove	Terrestrial Forest	Mangrove
PNTC	2012-2021	179	152	93	79
PNC	2012-2021	668	229	751	258

The total area of unplanned baseline deforestation in the Project Area and Leakage Belt were estimated as follows:

$$A_{BSL,PA,unplanned} = \sum_{t=1}^t A_{BSL,PA,unplanned}$$

$$A_{BSL,LK,unplanned} = \sum_{t=1}^t A_{BSL,LK,unplanned}$$

Where:

$A_{BSL,PA,unplanned}$ *Total area of unplanned baseline deforestation in the project area; ha*

$A_{BSL,LK,unplanned}$ *Projected area of unplanned baseline deforestation in the leakage belt; ha*

$A_{BSL,PA,unplanned,t}$	<i>Projected area of unplanned baseline deforestation in the project area in year t; ha</i>
$A_{BSL,LK,unplanned,t}$	<i>Projected area of unplanned baseline deforestation in the leakage belt in year t; ha</i>
t	<i>1, 2, 3, ...t years elapsed since the projected start of the REDD project activity</i>

4.1.5 Estimation of baseline carbon stocks and carbon stock changes

Estimation of carbon stock changes and GHG emissions followed BL-UP, CP-AB, X-STR and X-UNC. The maps in the following pages display the final delineation of strata in PNTC and PNC in 2011.



Figure 6. Baseline Land Cover Map | Parque Nacional dos Tarrafes de Cacheu (PNTC) 2011

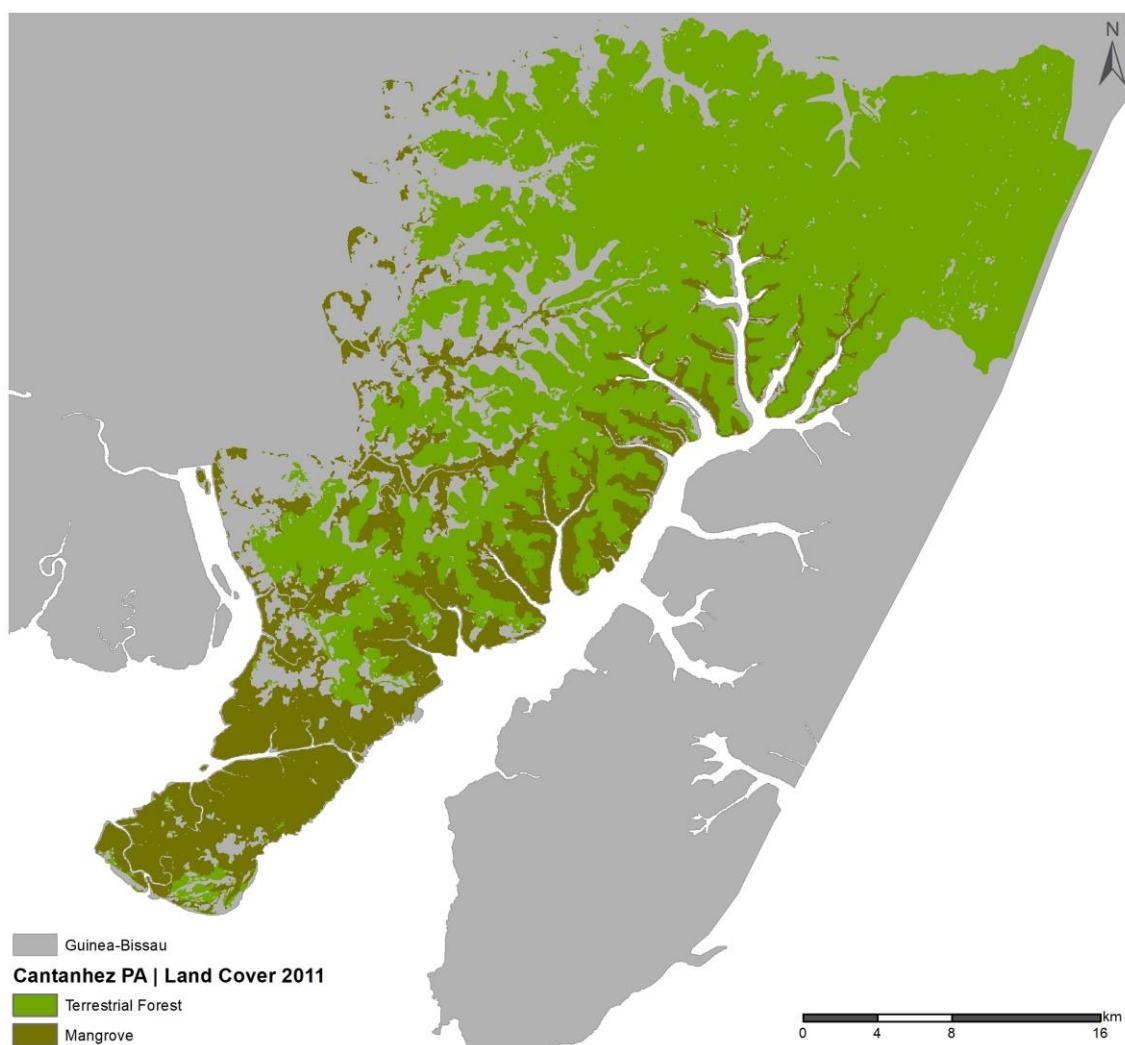


Figure 7. Baseline Land Cover Map | Parque Nacional do Cantanhez (PNC) 2011

The method chosen for sampling and estimation of carbon stocks in aboveground tree biomass is described in VMD0001 as "Option 1. Fixed Area Plots with Allometric Equation Method". A total of 259 plots were sampled for the carbon stock analysis based on data from the field missions. Of the 259 plots, 124 were measured in the PNTC, and 135 in PNC. Field measurements for the carbon stock assessment closely followed the requirements stated in the VM0007 and the carbon stock measurement protocols established in Pearson et al. (2007)³. Data analysis were also conducted

³ Pearson T R H, Brown S L and Birdsey R A 2007 Measurement guidelines for the sequestration of forest carbon Gen. Tech. Rep. NRS-18. Newtown Square, PA, US Department of Agriculture, Forest Service, Northern Research Station, p 42

according to the VMD0007 (BL-UP) module. All trees with DBH of ≥ 5 cm and a minimum height (H) of 1.3 m were measurement in the installed nested plots.

The project validated that the best fit for estimating above-ground biomass (AGB) of trees was the pantropical allometric equation formulated by Chave et al. (2005)⁴. Separate equations as a function of climate and primarily the mean monthly evapotranspiration and rainfall were developed by Chave et al. (2005), with these being for wet, moist, and dry forests. Given that forests in GB can be considered dry (Carreiras et al., 2012)⁵, the predictive model for dry forests in Chave et al. (2005) was used to estimate the AGB of each live forest tree in all strata (closed forest, open forest, and savanna). When known, species specific wood density was applied. When species was not known or wood density values were not published/available, an average wood density calculated from all other trees was applied.

As for mangroves, Chave et al. (2005) common allometric equation for mangroves requiring only two parameters (DBH and wood density) was used. Finally, the conservative allometric equation listed in both IPCC (2003) and Pearson et al. (2005) was used to estimate the biomass of palm trees. The carbon fraction (CF_j) used is the standard conversion factor of 0.47 (IPCC, 2006). Together, these equations were used to estimate the carbon stock in aboveground biomass for each individual tree with the equation:

$$C_{AB_{tree,sp,i}} = \sum_j^S \sum_{l=1}^{N_{j,sp,i}} f_j(X, Y \dots) \times CF_j$$

Where

$C_{AB_{tree,sp,i}}$	Carbon stock in aboveground biomass of trees in plot sp in stratum i; tC
CF_j	Carbon fraction of biomass for species group j; tC t ⁻¹ d.m; 0.47 (IPCC, 2006)
$f_j(X, Y \dots)$	Aboveground biomass of trees based on the above mentioned allometric equation for species group j based on measured tree variable(s); t.d.m.tree ⁻¹
i	1, 2, 3, ...M strata
j	1, 2, 3 ... S tree species

⁴ Chave, J., Andalo, C., Brown, S., Cairns, M.A., Chambers, J.Q., Eamus, D., Folster, H., Fromard, F., Higuchi, N., Kira, T., Lescure, J.-P., Nelson, B.W., Ogawa, H., Puig, H., Riéra, B. and Yamakura, T. (2005) *Tree allometry and improved estimation of carbon stocks and balance in tropical forests*. *Oecologia* 145, 87-89.

⁵ Carreiras, J. M. B., Vasconcelos, M. J., and Lucas, R. M. (2012) Understanding the Relationship between Aboveground Biomass and ALOS PALSAR Data in the Forests of Guinea-Bissau (West Africa). *Remote Sensing of Environment* 121, 426–442.

i 1, 2, 3, ... $N_{j,sp,i}$ sequence number of individual trees of species group j in sample plot sp in stratum i

Subsequently, the mean carbon stock in aboveground biomass is calculated for each stratum and converted to carbon dioxide equivalents, using the equation:

$$C_{AB_{tree,i}} = \sum_{sp=1}^{P_i} \frac{C_{AB_{tree,sp,i}}}{A_{sp,i}} \times \frac{44}{12}$$

Where:

$C_{AB_{tree,i}}$ Mean aboveground biomass carbon stock in stratum i ; $tCO_2-e \text{ ha}^{-1}$

$C_{AB_{tree,sp,i,t}}$ Aboveground biomass carbon stock of trees in sample plot sp of stratum i , tC

A_{spi} Area of sample plot sp in stratum i ; ha

sp 1, 2, 3, ... P_i sample plots in stratum i

i 1, 2, 3, ... M strata

44/12 Ratio of molecular weight of CO_2 to carbon, $tCO_2-e \text{ tC}^{-1}$

One should note that dividing the aboveground biomass carbon stock of trees in each sample plot ($C_{AB_{tree,sp,i,t}}$) by the area of that plot (A_{spi}) to extrapolate the estimate to the area of a full hectare is equivalent to multiplying the aboveground biomass carbon stock of trees in each sample plot ($C_{AB_{tree,sp,i,t}}$) by a scaling factor, i.e. calculating the proportion of an hectare (10,000 m^2) that is occupied by a given plot (or nest in this case) using a scaling factor. The scaling factor is calculated as follows:

$$Scaling_factor = \frac{10,000m^2}{Area_plot(m^2)}$$

The mean carbon stock in belowground tree biomass per unit area was estimated based on field measurements of aboveground parameters in sample plots. root-to-shoot ratios (RSR) were coupled with the allometric equations method used for estimation of aboveground biomass to

calculate belowground from aboveground biomass. Option 1 from VMD0001 “Fixed Area Plots with root-to-shoot ratio” was followed.

For forest trees the belowground biomass was estimated using a linear relationship between root biomass and shoot biomass reported by Mokany et al. (2006)⁶. The authors developed a RSR for many different types of vegetation and the relationship reported for tropical dry forest was chosen based on IPCC (1996). The relationship establishes that:

- if $AGB < 20 \text{ t.ha}^{-1}$, $BGB (\text{t.ha}^{-1}) = 0.56*AGB$; or
- if $AGB > 20 \text{ t.ha}^{-1}$, $BGB (\text{t.ha}^{-1}) = 0.28*AGB$

Below-ground biomass is of particular importance in mangroves because mangrove trees accumulate significant portion of its biomass in the roots (Komiyama et al., 2008)⁷. However, no RSR for African mangrove forests were found in the literature. To estimate BGB in mangroves, AGB and BGB data reported by Komiyama et al. (2008) (including data for Indonesia, Australia, Thailand, Panama, and Puerto Rico) was compiled and an average RSR of 0.61 was calculated across all available values. Conservatively the half-width of the 95% confidence interval of the data compiled was used to estimate BGB of mangroves (the mean AGB:BGB ratio minus the confidence interval value) resulting in an RSR of 0.46. For palm trees, since there is no dataset available or published that relate above to belowground biomass for palm trees, conservatively, belowground carbon stocks of palm trees were omitted.

To estimate the belowground tree biomass carbon stock for each plot the following equation was used:

$$C_{BB\text{tree},sp,i} = R \times C_{AB\text{tree},sp,i}$$

Where:

$C_{BB\text{tree},sp,i}$	<i>Belowground tree biomass carbon stock of trees in plot sp, in stratum i; tC</i>
$C_{AB\text{tree},sp,i,t}$	<i>Aboveground biomass carbon stock of trees in sample plot sp of stratum i , tC</i>
R	<i>Root-to-Shoot ratio; t root d.m. t⁻¹ shoot d.m</i>
i	<i>1, 2, 3, ...M strata</i>

⁶ Mokany K, Raison RJ, Prokushkine AS. 2006. Critical analysis of root:shoot ratios in terrestrial biomes. *Global Change Biology* 12:84–96.

⁷ Komiyama, A., J. E. Ong & S. Pongparn, 2008. Allometry, biomass, and productivity of mangrove forests: a review. *Aquatic Botany* 89: 128–137.

Subsequently, the mean belowground tree biomass carbon stock for each stratum was calculated and converted to carbon dioxide equivalents with the following equation:

$$C_{BB_{tree,i}} = \sum_{sp=1}^{P_i} \frac{C_{BB_{tree,sp,i}}}{A_{sp,i}} \times \frac{44}{12}$$

Where:

$C_{BB_{tree,i}}$	Mean belowground tree biomass carbon stock in stratum i ; $tCO_2\text{-e ha}^{-1}$
$C_{BB_{tree,sp,i}}$	Mean belowground tree biomass carbon stock of trees in sample plot sp of stratum i , tC
A_{spi}	Area of sample plot sp in stratum i ; ha
sp	1, 2, 3, ... P_i sample plots in stratum i
i	1, 2, 3, ... M strata
44/12	Ratio of molecular weight of CO_2 to carbon, $tCO_2\text{-e tC}^{-1}$

Similarly, to what was described for the expansion factor of the estimated aboveground biomass in a plot to the area of a full hectare, for belowground biomass the same method of using an expansion factor applies.

For the baseline, only aboveground ($C_{AB_{tree,i}}, tCO_2\text{-e ha}^{-1}$) and belowground ($C_{BB_{tree,i}}, tCO_2\text{-e ha}^{-1}$) biomass tree pools were quantified following the equations below:

$$\Delta C_{AB_{tree,i}} = C_{AB_{tree,bsl,i}} - C_{AB_{tree,post,i}}$$

$$\Delta C_{BB_{tree,bsl,i}} = C_{BB_{tree,BSL,i}} - C_{BB_{tree,post,i}}$$

Where:

$\Delta C_{AB_{tree,i}}$	Baseline carbon stock change in aboveground tree biomass in stratum i ; $tCO_2\text{-e ha}^{-1}$
$C_{AB_{tree,BSL,i}}$	Forest carbon stock in aboveground tree biomass in stratum i ; $tCO_2\text{-e ha}^{-1}$
$C_{AB_{tree,post,i}}$	Post-deforestation carbon stock in aboveground tree biomass in stratum i ; $tCO_2\text{-e ha}^{-1}$

$\Delta C_{BB_{tree},i}$ *Baseline carbon stock change in belowground tree biomass in stratum i ; tCO_2-e ha^{-1}*

$C_{BB_{tree},bsl,i}$ *Forest carbon stock in belowground tree biomass in stratum i ; tCO_2-e ha^{-1}*

$C_{AB_{tree},post,i}$ *Post-deforestation carbon stock in belowground tree biomass in stratum i ; tCO_2-e ha^{-1}*

The main agents of deforestation in GB are the local population, who clear land for subsistence agriculture. The main agricultural product is rice, which is planted in two different systems: dry land rice and wetland rice. Therefore, subsistence agriculture from both dry land and wetland is the only post-deforestation land-use mapped. Following M-MON (version 2.1) since the post-deforestation land-use is *herbaceous non-tree* vegetation carbon stock is considered to be *de minimis* in all instances.

$$C_{AB_post, i} = 0$$

Where:

$C_{AB_post, i}$ *Long-term average C stock of post deforestation land use i (tC ha^{-1})*

As previously mentioned, 125 forest plots were measured in PNTC and 136 in PNC. Applying the overall average forest stock per hectare to all strata would result in inaccurate estimates (GOF-GOLD, 2011)⁸. Therefore, dividing forest into homogeneous sub-classes (i.e., stratifying by forest type) may improve accuracy of carbon stock and carbon stock change estimates. Although the maps produced only stratify forest into terrestrial forest and mangrove, an additional stratification exercise was anticipated in the field work plan that preceded the collection of field data in all field campaigns. The pre-stratification of the project area into the following forest sub-classes contributed to avoiding post measurement stratification:

- Closed Forest
- Open Forest
- Savanna Woodland
- Mangrove

⁸ GOF-GOLD (2011). Reducing greenhouse gas emissions from deforestation and degradation in developing countries: a sourcebook of methods and procedure for monitoring, measuring and reporting. GOF-GOLD Report version COP17

VMD0017 uses the target precision of 15% (for a confidence interval of 95%). An estimate of the additional number of plots required to reduce uncertainty of carbon stocks and achieve the VMD0017 module precision target was performed prior to the fieldwork and additional data collection performed to guarantee compliance with the module requirement. Table 13 presents the average carbon stock per stratum in PNTC and PNC Project Areas.

Table 13. Average carbon stocks per stratum in the Project Area

Project Area	Stratum	Area (ha)	AGB carbon stock ($C_{AB_tree, i}$, $tCO_2-e.ha^{-1}$)	BGB carbon stock ($C_{BB_tree, i}$, $tCO_2-e.ha^{-1}$)
Cacheu	Terrestrial Forest	19,025	97.7	26.5
	Mangrove	35,782	72.9	33.4
Cantanhez	Terrestrial Forest	60,467	101.4	28.2
	Mangrove	20,991	100.5	46.0

The total forest area in Cacheu is 54,807 ha and in Cantanhez 81,458 ha. The sum of the baseline carbon stock changes was calculated under the business as usual at the end of the 10-year period by applying the estimated deforestation per year to the stratum with the lowest carbon stock for each project area and leakage belt using the equations below:

$$\Delta C_{TOT} = \sum_{t=1}^t \sum_{i=1}^M \Delta C_{BSL,i,t}$$

$$\Delta C_{BSL,i,t} = A_{unplanned,i,t} \times \Delta C_{AB_{tree,i}} + \sum_{t=10}^t A_{unplanned,i,t} \times \Delta C_{BB_{tree,i}} \times \frac{1}{10}$$

Where:

ΔC_{TOT} Sum of baseline carbon stock change in all pools up to time t ; tCO_2-e

$\Delta C_{BSL,i,t}$ Sum of baseline carbon stock change in all pools in stratum i at time t ; tCO_2-e

$A_{unplanned,i,t}$ Area of unplanned deforestation in forest stratum i at time t ; ha

$\Delta C_{ABtree,i}$ Baseline carbon stock change in aboveground tree biomass in stratum i ; tCO_2-e ha^{-1}

$\Delta C_{ABtree,i}$ Baseline carbon stock change in aboveground tree biomass in stratum i ; tCO_2-e ha^{-1}

$\Delta C_{BBtree,i}$ Baseline carbon stock change in belowground tree biomass in stratum i ; tCO_2-e ha^{-1}

i 1, 2, 3, ... M strata

t 1, 2, 3, ... t years elapsed since the projected start of the REDD project activity

As no location analysis was conducted, annual deforestation area is given directly by $A_{BSL,PA,t}$ for the Project Area and $A_{BSL,LK,t}$ for the Leakage Belt. The cumulative carbon stock change under the business as usual is shown on Table 14 (Project Area) and Table 17 (Leakage Belt).

Table 14. Cumulative Carbon Stock Changes in the BAU in the Project Area(tCO_2e)

$\Delta C_{BSLPA,i}$ (tCO_2-e)											
PA	Stratum	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
PNTC	Terrestrial Forest	17,978	36,431	55,358	74,760	94,636	114,987	135,813	157,113	178,887	201,136
	Mangrove	11,575	23,657	36,246	49,342	62,945	77,056	91,673	106,797	122,428	138,566
	ΔC_{TOT} (tCO_2e)	29,553	60,088	91,604	124,102	157,582	192,043	227,485	263,909	301,315	339,702
PNC	Terrestrial Forest	69,688	141,260	214,716	290,055	367,279	446,386	527,378	610,253	695,013	781,656
	Mangrove	24,105	49,266	75,483	102,755	131,083	160,468	190,908	222,403	254,955	288,562
	ΔC_{TOT} (tCO_2e)	93,793	190,526	290,198	392,810	498,362	606,854	718,285	832,657	949,968	1,070,218

Table 15. Cumulative Carbon Stock Changes in the BAU in the Leakage Belt(tCO₂e)

$\Delta C_{BSLLK,i}$ (tCO ₂ -e)											
PA	Stratum	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
PNTC	Terrestrial Forest	9,321	18,888	28,701	38,760	49,065	59,616	70,413	81,456	92,745	104,280
	Mangrove	6,001	12,265	18,792	25,582	32,634	39,950	47,528	55,369	63,473	71,840
	ΔC_{TOT} (tCO ₂ e)	15,322	31,153	47,493	64,341	81,699	99,566	117,941	136,825	156,218	176,121
PNC	Terrestrial Forest	78,317	158,750	241,301	325,969	412,755	501,657	592,677	685,814	781,068	878,439
	Mangrove	27,090	55,366	84,829	115,478	147,314	180,336	214,545	249,941	286,523	324,292
	ΔC_{TOT} (tCO ₂ e)	105,406	214,116	326,130	441,447	560,069	681,994	807,222	935,755	1,067,591	1,202,731

The net GHG emissions in the baseline was calculated considering no project emissions as follows:

$$\Delta C_{BSL,unplanned} = \Delta C_{BSL,PA,unplanned} + 0$$

$$\Delta C_{BSL,PA,unplanned} = \Delta C_{TOT,PA}$$

Where:

$\Delta C_{BSL,unplanned}$ Net greenhouse gas emissions in the baseline from unplanned deforestation; tCO₂-e

$\Delta C_{BSL,PA,unplanned}$ Net CO₂ emissions in the baseline from unplanned deforestation in the project area; tCO₂-e

$\Delta C_{TOT,PA}$ Sum of the baseline carbon stock change in all pools up to time *t* in the project area; tCO₂-e

Table 16. Net emissions reductions from avoiding unplanned deforestation in the baseline scenario.

	$\Delta C_{BSL,PA,unplanned}$ (tCO ₂ e)	GHG _{BLS,E} (tCO ₂ e)	$\Delta C_{BSL,unplanned}$ (tCO ₂ e)
PNTC	339,702	0	339,702
PNC	1,070,218	0	1,070,218

The next table shows the net emissions in the baseline from unplanned deforestation estimated as the sum at the end of the 10-year period.

Table 17. Net emissions in the Baseline Scenario (tCO₂e) – 2012 / 2021

		$\Delta C_{BSL,unplanned}$ (tCO ₂ e)				
		2012	2013	2014	2015	2016
PNTC	$\Delta C_{BSL,PA,unplanned}$ (tCO ₂ e)	29,553	60,088	91,604	124,102	157,582
	$\Delta C_{BSL,unplanned}$ (tCO ₂ e)	29,553	60,088	91,604	124,102	157,582
PNC	$\Delta C_{BSL,PA,unplanned}$ (tCO ₂ e)	93,793	190,526	290,198	392,810	498,362
	$\Delta C_{BSL,unplanned}$ (tCO ₂ e)	93,793	190,526	290,198	392,810	498,362

		$\Delta C_{BSL,unplanned}$ (tCO ₂ e)				
		2017	2018	2019	2020	2021
PNTC	$\Delta C_{BSL,PA,unplanned}$ (tCO ₂ e)	192,043	227,485	263,909	301,315	339,702
	$\Delta C_{BSL,unplanned}$ (tCO ₂ e)	192,043	227,485	263,909	301,315	339,702
PNC	$\Delta C_{BSL,PA,unplanned}$ (tCO ₂ e)	606,854	718,285	832,657	949,968	1,070,218
	$\Delta C_{BSL,unplanned}$ (tCO ₂ e)	606,854	718,285	832,657	949,968	1,070,218

4.2 Project Emissions

Net GHG emissions within the project area (ΔC_p) in the first monitoring period are calculated according to M-MON (v2.1) module. In the case of the proposed project activity three emissions sources were anticipated, potential net carbon stock changes as a result of (i) deforestation in the project area ($\Delta C_{P,DefPA,i,t}$), if the PRA indicates forest (ii) degradation is taking place in the project

area, such emissions must be calculated ($\Delta C_{P,DegW,i,t}$), and finally, net carbon stock changes due to (iii) natural disturbances⁹ ($\Delta C_{P,DistPA,i,t}$).

Carbon stock change from forest degradation ($\Delta C_{P,DegW,i,t}$) are accounted as zero. As demonstrated in the PRA¹⁰, carbon stock changes from wood extraction in the project area are considered insignificant. Similarly, carbon stock change from natural disturbances ($\Delta C_{P,DistPA,i,t}$) are accounted as zero. As demonstrated by the land cover and land use change mapping¹¹ prepared for the monitoring period, natural disturbances did not occur.

Carbon Dioxide (CO₂) emissions are fully accounted in the net carbon stock change. Other GHG gases like methane (CH₄) and nitrous oxide (N₂O) are not relevant because: IBAP activities do not include fire use ($E_{BiomassBurn,i,t}$) or nitrogen fertilization ($N_{2O,direct-N,i,t}$). Patrolling is done by the local communities on foot, therefore fossil fuel use is also not relevant ($E_{FC,i,t}$).

For the project area the net greenhouse gas emissions in the project case is equal to the sum of stock changes due to deforestation, degradation and natural disturbance:

$$\Delta C_P = \sum_{t=1}^{t^*} \sum_{i=1}^M (\Delta C_{P,DefPA,i,t} + \Delta C_{P,Deg,i,t} + \Delta C_{P,DistPA,i,t})$$

Where:

ΔC_P	Net greenhouse gas emissions within the project area under the project scenario; tCO ₂ e
$\Delta C_{P,DefPA,i,t}$	Net carbon stock change as a result of deforestation in the project area in the project case in stratum <i>i</i> at time <i>t</i> , tCO ₂ e
$\Delta C_{P,Deg,i,t}$	Net carbon stock changes as a result of degradation in the project area in the project case in stratum <i>i</i> at time <i>t</i> , tCO ₂ e ($\Delta C_{P,Deg,i,t} = 0$)
$\Delta C_{P,DistPA,i,t}$	Net carbon stock changes as a result of the natural disturbance in the project area in the project case in stratum <i>i</i> at time <i>t</i> , tCO ₂ e ($\Delta C_{P,DistPA,i,t} = 0$)
<i>i</i>	1,2,3... <i>M</i> strata (Closed Forest, Open Forest, Savanna, Mangrove)

⁹ According to the M-MON module such disturbances include tectonic activities, extreme weather, pest, drought or fire that result in a degradation of forest carbon stocks.

¹⁰ RSeT (2018) Participatory Rural Appraisal Report. Evidence file: PRAreport_23.01.2018.pdf

¹¹ ISA (2019) Forest Mapping Report. Instituto Superior de Agronomia – Lisbon University. Evidence file: FMReport_11.11.2019.pdf

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

For the leakage belt the net greenhouse gas emissions in the project case is equal to the sum of stock changes due to deforestation in the leakage belt:

$$\Delta C_{P, LB} = \sum_{t=1}^{t^*} \sum_{i=1}^M \Delta C_{P, DefLB, i, t}$$

Where:

$\Delta C_{P, LB}$ Net greenhouse gas emissions within the leakage belt under the project scenario; tCO_2e

$\Delta C_{P, DefLB, i, t}$ Net carbon stock change as a result of deforestation in the leakage belt in the project case in stratum i at time t , tCO_2e

i 1,2,3... M strata (Closed Forest, Open Forest, Savanna, Mangrove)

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

4.2.1 Net carbon changes due to deforestation

Landsat-8 OLI (operational Land Imager) imagery of the dry season of 2016 was acquired through USGS database. The satellite data was selected considering both the dates that were used to generate the 2011 classification and cloud cover in each available Landsat-8 scene, while trying to collect 2016 scenes with dates as close as possible to each other.

Table 18. Remote Sensing Data Acquired for the Monitoring

Satellite	Sensor	Acquisition date (YY-MM-DD)	Path	Row	Cloud Cover (%)
Landsat	OLI	2016-04-02	203	51	0,00
Landsat	OLI	2016-04-02	203	52	0,01
Landsat	OLI	2016-04-09	204	51	0,00
Landsat	OLI	2016-04-25	204	52	0,07
Landsat	OLI	2016-03-15	205	51	0,21

A detailed report was prepared (FMReport_11.11.2019.pdf) detailing methods and procedures and is attached to this monitoring report. The 3-class forest cover map of PNTC and PNC are presented on Figure 8 and Figure 9, respectively.

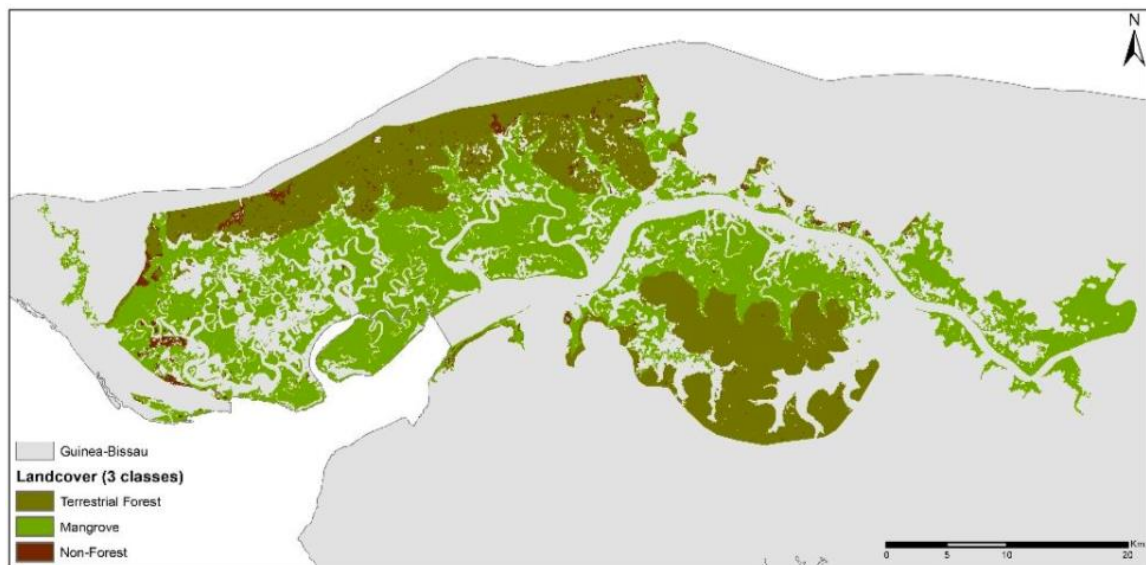


Figure 8. 3-class Forest Cover Map of PNTC PA and LK | 2011 - 2016

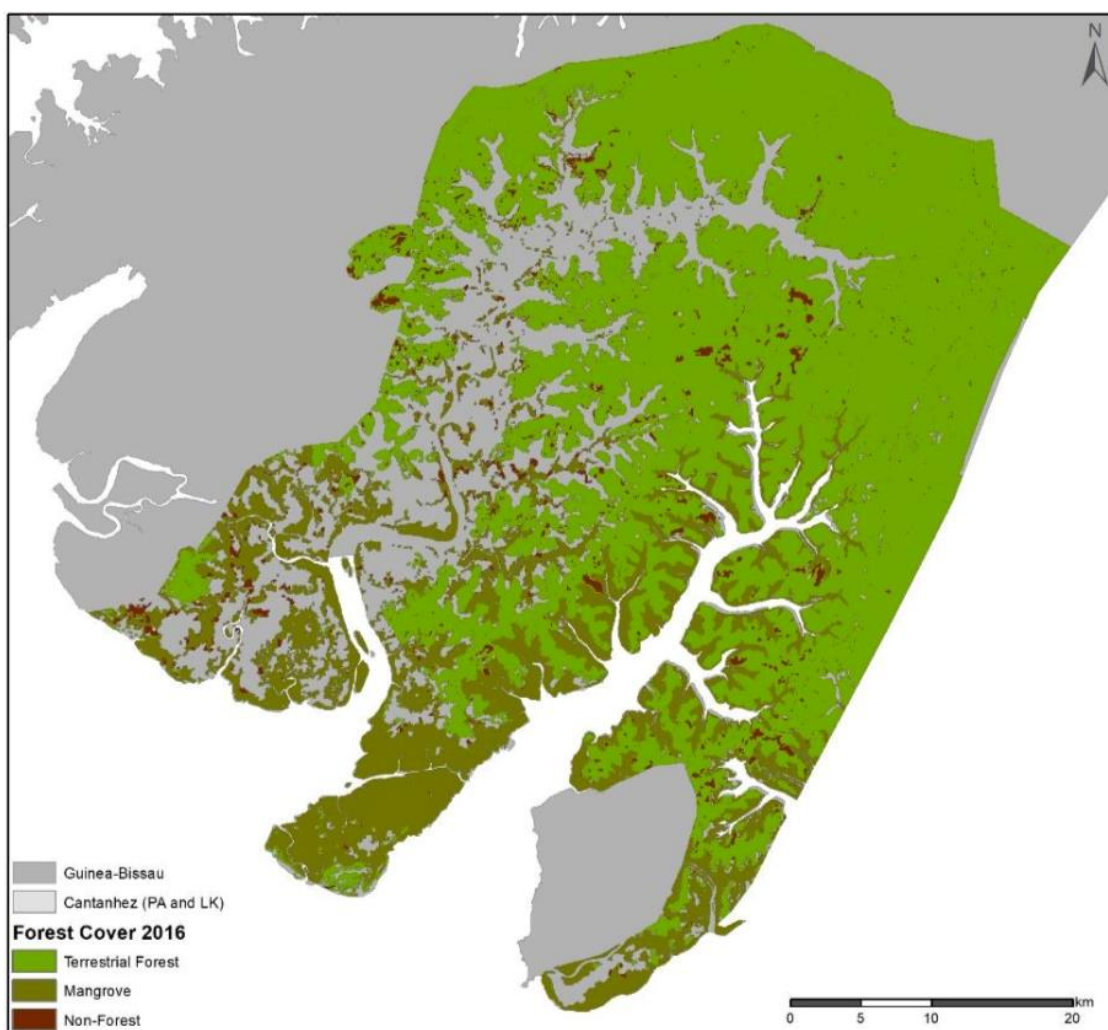


Figure 9. 3-class Forest Cover Map of PNC PA and LK | 2011 - 2016

The net carbon stock change as a result of deforestation is equal to the area deforested multiplied by the emission per unit area.

$$\Delta C_{P,DefPA,i,t} = \sum_{u=1}^U (A_{DefPA,u,i,t} * \Delta C_{pools,P,Def,u,i,t})$$

$$\Delta C_{P,DefLB,i,t} = \sum_{u=1}^U (A_{DefLB,u,i,t} * \Delta C_{pools,P,Def,u,i,t})$$

Where:

$\Delta C_{P,DefPA,i,t}$	Net carbon stock changes as a result of deforestation in the project case in the project area in stratum i at time t ; tCO ₂ e
$\Delta C_{P,DefLB,i,t}$	Net carbon stock change as a result of deforestation in the project case in the leakage belt in stratum i at time t , tCO ₂ e
$A_{DefPA,u,i,t}$	Area of recorded deforestation in the project area stratum i converted to land use u at time t ; ha
$A_{DefLB,u,i,t}$	Area of recorded deforestation in the leakage belt stratum i converted to land use u at time t ; ha
$\Delta C_{pools,P,Def,u,i,t}$	Net carbon stock change in all pools in the project case in land use u in stratum i at time t ; tCO ₂ e
u	1,2,3... U post-deforestation land uses
i	1,2,3... M strata (Closed Forest, Open Forest, Savanna, Mangrove)
t	1,2,3... t^* years elapsed since the start of the REDD project activity

The emission per unit area is equal to the difference between the stocks before and after deforestation minus any wood products created from timber extraction in the process of deforestation as shown in the next equation. It is conservative in the project case to assume no wood products are produced.

$$\Delta C_{pools,Def,u,i,t} = C_{BSL,i} - C_{P,post,u,i} - C_{WP,i}$$

Where:

$\Delta C_{pools,Def,u,i,t}$	Net carbon stock change in all pools as a result of deforestation in the project case in land use u in stratum i at time t ; tCO ₂ e
$C_{BSL,i}$	Carbon stock in all pools in the baseline case in stratum i , tCO ₂ e
$C_{P,post,u,i}$	Carbon stock in all pools in post-deforestation land use u in stratum i , tCO ₂ e
$C_{WP,i}$	Carbon stock sequestered in wood products from harvests in stratum i , tCO ₂ e
u	1,2,3... U post-deforestation land use

i 1,2,3... M strata (Closed Forest, Open Forest, Savanna, Mangrove)

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

Therefore, $\Delta C_{pools,P,Def,u,i,t}$ is equal to the carbon stock in the baseline case in the project area and leakage belt minus the post deforestation carbon stock. Instead of tracking annual emissions through burning and/or decomposition, the project employs the simplifying assumption that all carbon stocks are emitted in the year deforested.

For each post-deforestation land use (u) the project shall estimate the long-term carbon stock. Carbon stocks in the selected pools are the same used for the project baseline quantification, measured and estimated using the methods in the module CP-AB ($C_{ABtree,i}$ and $C_{BBtree,i}$). The calculation of carbon stocks in all pools in post-deforestation land use is performed according to the equation below.

$$C_{post,u,i} = C_{ABtree,i} + C_{BBtree,i}$$

Where:

$C_{post,u,i}$ Carbon stock in all pools in post-deforestation land use u in stratum i , $tCO_2e\ ha^{-1}$

$C_{ABtree,i}$ Carbon stock in aboveground tree biomass in stratum i , $tCO_2e\ ha^{-1}$

$C_{BBtree,i}$ Carbon stock in belowground tree biomass in stratum i , $tCO_2e\ ha^{-1}$

The next table summarizes the variables quantified during the monitoring period.

Table 19. Monitored parameters for deforestation in the PA and LK

Parameter	Unit	Value	Reference
$AC_{P,DegPA,i,t}$	tCO_2e	0.0	Participatory Rural Appraisal (PRA)
$AC_{P,DistPA,i,t}$	tCO_2e	0.0	Forest Mapping Report (FMReport_11.11.2019.pdf)

$A_{DefPA,u,i,t}$	ha	PNTC • Terrestrial Forest: 67.6 ha per year (338ha in the monitoring period) • Mangrove: 18.2 ha per year (91ha in the monitoring period) PNC • Terrestrial Forest: 303.2 ha per year (1516 ha in the monitoring period) • Mangrove: 98.6 ha per year (493ha in the monitoring period)	Forest Mapping Report (FMReport_11.11.2019.pdf) and Finding_NIR-14.docx
$A_{DefLB,u,i,t}$	ha	PNTC • Terrestrial Forest: 107 ha per year (536ha in the monitoring period) • Mangrove: 32 ha per year (158 ha in the monitoring period) PNC • Terrestrial Forest: 420 ha per year (2098 ha in the monitoring period) • Mangrove: 183 ha per year (917 ha in the monitoring period)	Forest Mapping Report (FMReport_11.11.2019.pdf) and Finding_NIR-14.docx
u	$tCO_2e\ ha^{-1}$	0	<i>Herbaceous Non-Tree Vegetation (Rice Fields) considered de minimis according to BL-UP and M-MON</i>
$C_{ABtree,i}$	$tCO_2e\ ha^{-1}$	PNTC • Terrestrial Forest: 97.70 • Mangrove: 72.89 PNC	Validated Project Document (PD)

		• Terrestrial Forest: 101.43 • Mangrove: 100.45	
$C_{BB_{tree},i}$	$tCO_2e\ ha^{-1}$	PNTC • Terrestrial Forest: 26.49 • Mangrove: 33.39 PNC • Terrestrial Forest: 28.18 • Mangrove: 46.01	Validated Project Document (PD)

4.3 Leakage

Leakage emissions accounted for are entirely from displacement of unplanned deforestation and were estimated applying the LK-ASU (v1.1) module. The rational for estimating carbon stock changes within the Leakage Belt under the baseline scenario is the same as used in the Project Area detail in Section 4.1, which include the same mapping processes, accuracy assessment, estimation of annual areas of baseline unplanned deforestation and estimation of carbon stock changes in the project case. Likewise, the rational for estimating carbon stock changes within the Leakage Belt under the project scenario is the same as used in the Project Area detailed in Section 4.2. Further, data collection was performed using a Participatory Rural Appraisal (PRA) methodology according to LK-ASU and M-MON requirements. The sample area considers a 2km buffer around the Project Area (PA) and Leakage Belt (LK) to the quantification of the Immigration Population and a 1km buffer around the PA to the assessment of degradation potential. The sample area and all the communities inside it are presented in the map below.

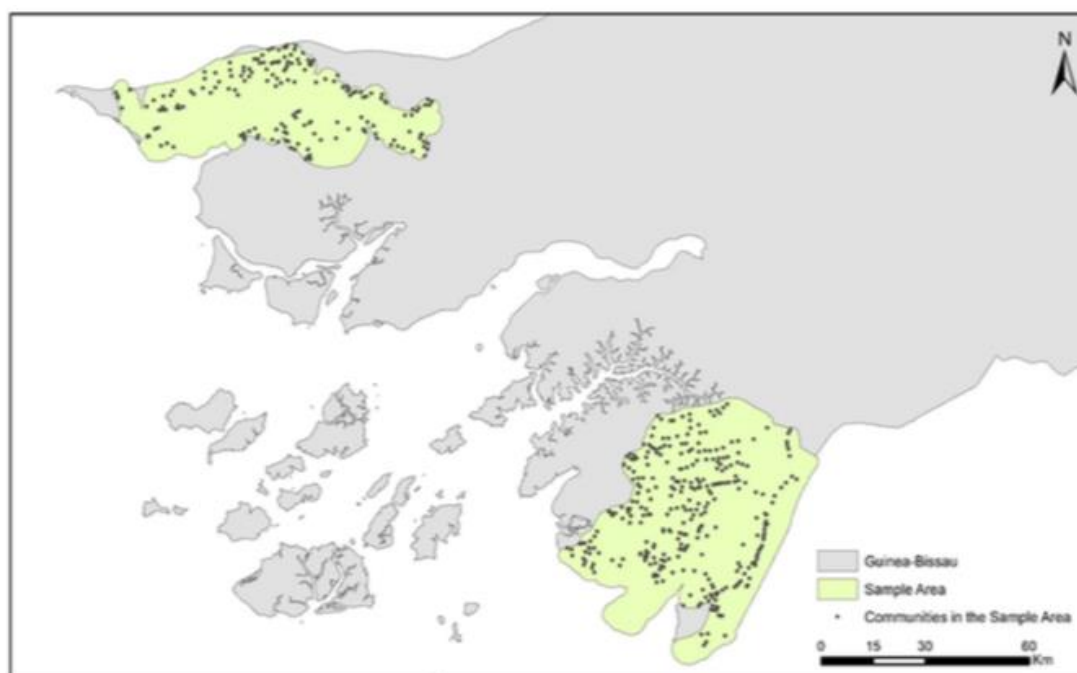


Figure 10. PRA sample area and its communities

The number of communities inside the 2km sample area is 503, with 177 in PNTC and 326 in PNC. Given the fact that 10% of the communities is more than 30 communities the sample size is set to 30. A stratified random sampling was then performed considering the size of each community (Table 20).

Table 20. PRA sampling size and stratification in PNTC and PNC

Stratification		PNTC			PNC		
		Communities	% of Total	Sample Size	Communities	% of Total	Sample Size
Communities	503	177	35%	11	326	65%	19
Very Small	<150 hab.	101	57%	6	193	59%	11
Small	151-300 hab.	42	24%	3	67	21%	4
Medium	301-600 hab.	24	14%	1	38	12%	2
Large	>601 hab.	10	6%	1	28	9%	2

Data collection in the selected communities took place from November 18 to November 23, 2017 in 11 communities of the PNTC area and from November 26 to December 3, 2017 in 19 communities of the PNC area. Figure 12 depicts the communities randomly selected for data collection. IBAP staff members (technical and park rangers) participated in the entire field campaign and were deeply involved in the survey. A total of 272 households were surveyed, with an average of 10 households per community.



Figure 11. Photographic registration of PRA work in Mata Balanta and Caiquene

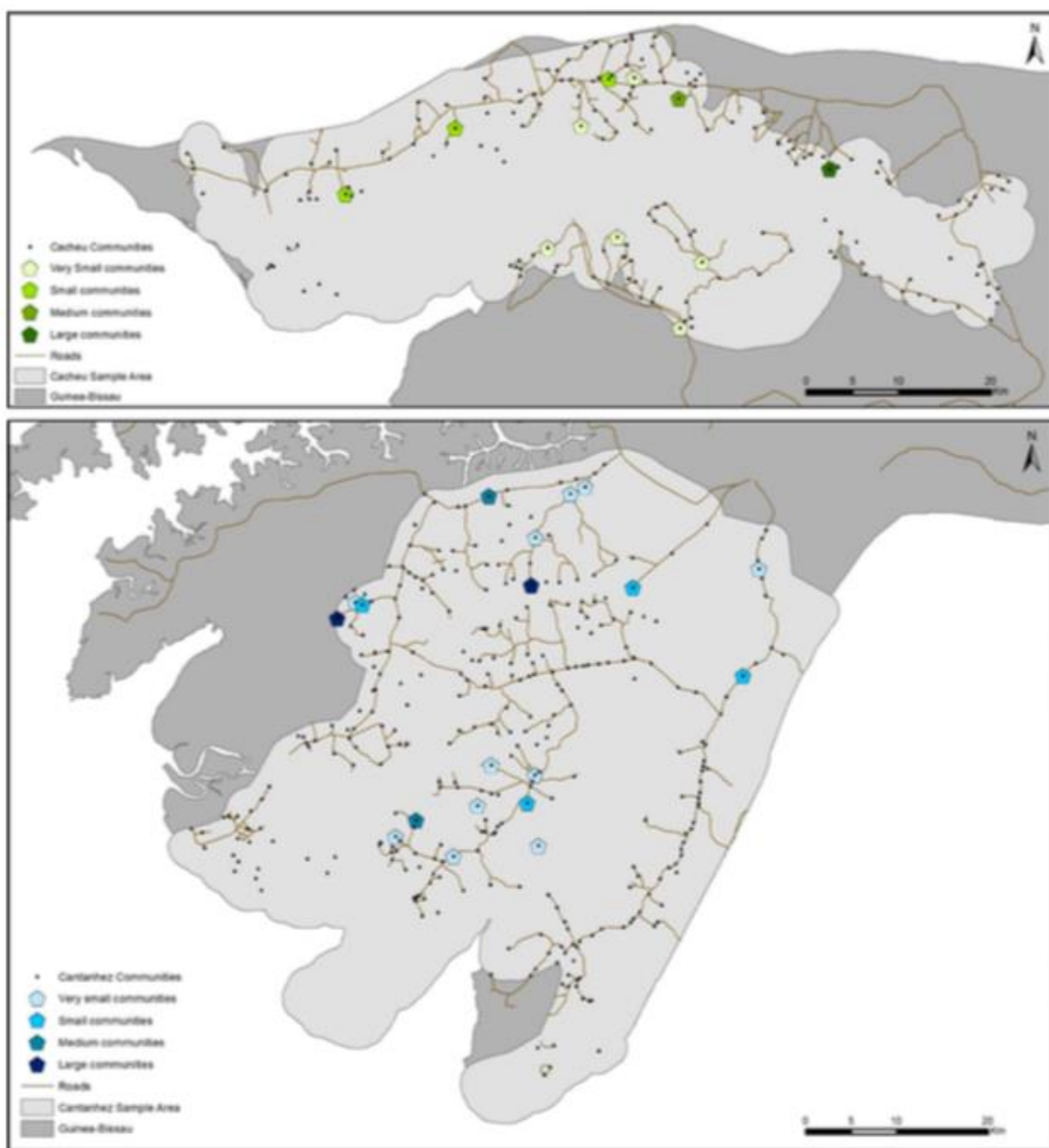


Figure 12. Communities randomly selected for data collection in the PRA (n=30)

Based on this broader 2km sample, the PRA demonstrates that, on average, women walk up to 919 meters to collect fuel wood. With that information a sample cut was made to consider only communities inside and around 1km buffer to the Project Area. This sample is used to assess degradation potential in the PA. The adjusted sample has 156 households and 14 declared in the PRA interview they collect live biomass as an energy source, therefore below the 10% threshold required to trigger on-the-ground de degradation survey (VCS_Monitoring_PRA_05.09.2019.xlsx).

The next table summarizes the results of the PRA. From the 3,020 individuals that participated in the survey, 98,68% have been resident in PNTC and PNC for more than 5 years. Consequently, only 1,32% of the population is considered immigrant according to LK-ASU criteria.

In addition, 8,97% of the communities inside and surrounding the project area reported selective logging activities for collection of firewood. Therefore, forest degradation was considered irrelevant and further degradation survey was not undertaken.

Table 21. Summary of the PRA results

Parameter	Description	PRA Value
PROP _{IMM}	Proportion of deforestation caused by immigrating population.	0.013
PROP _{RES}	Proportion of deforestation caused by population that has been resident for more than 5 years.	0.987
Degradation Survey	Degradation survey indicated that 8.97% of interviewed suggested that degradation may be occurring. LK-ASU states that the limited degradation survey is only necessary if >10% of interviewed indicated degradation potential.	0.000

The baseline carbon stock changes in the Leakage Belt (LK) are presented on Section 4.1, on Table 15.

Leakage emissions in the Leakage Belt (LK) is calculated as follows:

$$\Delta C_{LK-ASU-LB} = \Delta C_{P,LB} - \Delta C_{BSL,LK,unplanned}$$

Where:

$\Delta C_{LK-ASU-LB}$ Net CO₂ emissions due to unplanned deforestation displaced from the project area to the leakage belt; tCO₂e

$\Delta C_{P,LB}$ Net GHG emissions within the leakage belt in the project case; tCO₂e.

$\Delta C_{BSL,LK,unplanned}$ Net CO₂ emissions in the baseline form unplanned deforestation in the leakage belt; tCO₂e

The quantification follows the procedures and datasets presented in section 4.2 of this monitoring report to quantify $\Delta C_{P,DefLB,i,t}$. Leakage emission in the project case ($\Delta C_{P,LB}$) is equal to the area deforested in the Leakage Belt multiplied by the emission per unit area. The deforested area in Leakage Bel in the project case ($A_{DefLB,u,i,t}$) and the emissions per unit area ($C_{ABtree,i}$ and $C_{BBtree,i}$) are presented in Table 19. Table 22 details the yearly net GHG emissions within the LK in the project case in the first monitoring period.

Table 22. Net GHG emissions within the Leakage Belt in the project case

$\Delta C_{P,LB}$ (tCO ₂ -e)		2012	2013	2014	2015	2016
PNTC	Terrestrial Forest	13,312	26,625	39,937	53,250	66,562
	Mangrove	3,358	6,717	10,075	13,433	16,791
	$\Delta C_{P,LB}$ (tCO ₂ -e)	16,671	33,341	50,012	66,683	83,353
PNC	Terrestrial Forest	54,385	108,769	163,154	217,538	271,923
	Mangrove	26,861	53,723	80,584	107,446	134,307
	$\Delta C_{P,LB}$ (tCO ₂ -e)	81,246	162,492	243,738	324,984	406,230

Baseline GHG emissions from unplanned deforestation in the Leakage Belt is presented below. According to LK-ASU, if $\Delta C_{LK-ASU-LB}$ as calculated is ≤ 0 then $\Delta C_{LK-ASU-LB}$ shall be set equal to 0 (to prevent positive leakage). As can be seen, baseline emissions are greater than Leakage emissions in the project case, causing a cumulative total negative leakage emission in the monitoring period of -152,184tCO₂e. Therefore, $\Delta C_{LK-ASU-LB}$ is equal to 0.

Table 23. Net GHG emissions in the baseline from unplanned deforestation in the Leakage Belt

$\Delta C_{BSLLK,i}$ (tCO ₂ -e)											
PA	Stratum	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
PNTC	Terrestrial Forest	9,321	18,888	28,701	38,760	49,065	59,616	70,413	81,456	92,745	104,280
	Mangrove	6,001	12,265	18,792	25,582	32,634	39,950	47,528	55,369	63,473	71,840
	ΔC_{TOT} (tCO ₂ e)	15,322	31,153	47,493	64,341	81,699	99,566	117,941	136,825	156,218	176,121
PNC	Terrestrial Forest	78,317	158,750	241,301	325,969	412,755	501,657	592,677	685,814	781,068	878,439
	Mangrove	27,090	55,366	84,829	115,478	147,314	180,336	214,545	249,941	286,523	324,292
	ΔC_{TOT} (tCO ₂ e)	105,406	214,116	326,130	441,447	560,069	681,994	807,222	935,755	1,067,591	1,202,731

The quantification of unplanned deforestation displaced from the project area to outside the Leakage Belt considers immigrants prevented from migrating into and deforesting the project area. The available national forest area (TOTFOR) is calculated according to LK-ASU Module. TOTFOR is derived from the national forest cover provided officially in the Second National Communication on Climate Change in Guinea-Bissau (UNFCCC, 2011¹²).

The value applied is 2,683,290 ha. Conservatively, PROTFOR and MANFOR are considered zero, therefore, all national forest areas are considered available for deforestation displaced from the project area to outside the leakage belt.

Table 24. Forest area, per stratum, Guinea Bissau (2007) according to the Second National Communication on Climate Change (UNFCCC, 2011)

Forest Type		ha	Source
Terrestrial Forest	Closed Forest	147,865	Republic of Guinea-Bissau (2018). Third National Communication: Report to the United Nations Framework Convention on Climate Change. Republic of Guinea-Bissau.
	Open Forest	638,350	
	Savanna	1,582,289	
Wetlands	Mangrove	314,786	
TOTAL		2,683,290	

$$AVFOR = TOTFOR - PROTFOR - MANFOR$$

Where:

AVFOR *Total available national forest area for unplanned deforestation; ha*

TOTFOR *Total available national forest area; ha*

PROTFOR *Total area of fully protected forest nationally; ha*

MANFOR *Total area of forest under active management nationally; ha*

$$AVFOR = 2,683,290$$

Next, the ratio of the forested area in the Leakage Belt ($PROP_{LB}$) was calculated as a proportion of the total available national forest area.

¹² <http://unfccc.int/resource/docs/natc/gnbn2e.pdf>

$$PROP_{LB} = LBFOR / AVFOR$$

Where:

$PROP_{LB}$ Area of forest available in the Leakage Belt for unplanned deforestation as a proportion of the total national forest area available for unplanned deforestation; proportion

$LBFOR$ Total available forest area for unplanned deforestation in the Leakage Belt; ha (BL-UP: Leakage Belt Forest Cover Map)

$AVFOR$ Total available national forest area for unplanned deforestation; ha

Table 25. LBFOR value and source

Variable	Value	Source
$LBFOR$	119,958	FMReport_11.11.2019.pdf and Finding_NIR-14.docx

$$PROP_{LB} = 0.045$$

To stratify $AVFOR$, forest carbon stocks across the country and forest cover areas from the Second National Communication of Guinea-Bissau to UNFCCC (2011) were used. The document is the official¹³ communication of the Government of Guinea-Bissau to the United National Framework Convention on Climate Change regarding national GHG emissions, including those arising for land use and land cover change. The mean aboveground live tree carbon stock outside the leakage belt (C_{OLB}) was calculated based on official governmental data submitted to UNFCCC. Area weighted average AGB for open forest, closed forest, savannah and mangroves were used and C_{OLB} calculated according to the table below.

Table 26. Parameters used for C_{OLB} calculation and source

Forest Type		Average AGB (t/ha)	Carbon Fraction	tC/ha	Area (ha)	tCO ₂ /ha	Source
Terrestrial Forest	Closed Forest	186.26	0.47	88	147,865	321	Second National Communication on Climate Change in Guinea-Bissau (UNFCCC 2011)
	Open Forest	120.64	0.47	57	638,350	208	
	Savanna	27.68	0.47	13	1,582,289	48	

¹³ Available at <http://unfccc.int/resource/docs/natc/gnbnc2e.pdf>

Wetlands	Mangrove	23.82	0.47	11	314,786	41
Total Forest					2,683,290	100.09

$$C_{OLB} = 100.09$$

The mean aboveground live tree carbon stock inside the leakage belt (C_{LB}) was calculated based on field data, using area weighted average AGB for open forest, closed forest, savannah and mangroves. In doing so, the AGB value applied for closed forest (306.11 tCO₂/ha) is the one quantified in PNC since this is the only data available, as this stratum was not identified in PNTC. For all remaining stratum the average AGB were weighted considering the relative areas of each stratum in PNTC and PNC. Each value is calculated considering ((LB Area Stratum(i, Cacheu)* AGB tCO₂/ha(i, Cacheu)+ (LB Area Stratum(i, Cantanhez)* AGB tCO₂/ha(i, Cantanhez)))/ ((LB Area Stratum(i, Cacheu)+(LB Area Stratum(i, Cantanhez))).

Table 27. Parameters used for C_{LB} calculation and source

Forest Type		Area (ha)	tCO ₂ /ha	Source
Terrestrial Forest	Cacheu	14,484	97.70	MONITORING_GB_REDD_ER_20191111.xlsx
	Cantanhez	71,075	101.43	
MAngrove	Cacheu	13,931	72.89	
	Cantanhez	20,468	100.45	
Total Forest		119,958	97.50	

$$C_{LB} = 97.50$$

The proportional difference in carbon stocks between areas of forest available for unplanned deforestation both inside and outside de leakage belt ($PROP_{CS}$) is calculating using the equation below:

$$PROP_{CS} = C_{OLB} / C_{LB}$$

Where:

$PROP_{CS}$ The proportional difference in carbon stocks between areas of forest available for unplanned deforestation both inside and outside the leakage belt; proportion

C_{OLB} Area weighted average aboveground tree carbon stock for forest available for unplanned deforestation outside the leakage belt; tCO₂e.ha⁻¹

C_{LB} Area weighted average aboveground tree carbon stock for forest available for unplanned deforestation inside the leakage belt; tCO₂e.ha⁻¹

$$PROP_{CS} = 1.027$$

The proportional leakage for areas with immigrating populations are equal to the immigrating proportion multiplied by the proportion of available national forest area outside de Leakage Belt multiplied by the proportional difference in stocks between forests inside and outside the Leakage Belt and was calculated according to equation:

$$LK_{PROP} = PROP_{IMM} * (1 - PROP_{LB}) * PROP_{CS}$$

Where:

LK_{PROP}	<i>Proportional leakage for areas with immigrating population; proportion</i>
$PROP_{IMM}$	<i>Estimated proportion of baseline deforestation caused by immigrating population; proportion</i>
$PROP_{LB}$	<i>Area of forest available in the Leakage Belt for unplanned deforestation as a proportion of the total national forest area available for unplanned deforestation; proportion</i>
$PROP_{CS}$	<i>The proportional difference in carbon stocks between areas of forest available for unplanned deforestation both inside and outside the leakage belt; proportion</i>

$$LK_{PROP} = 0.012750$$

Ex post, deforestation in the Leakage Belt is measured, $\Delta C_{LK-ASU,OLB}$ is estimated as follows:

$$A_{LK-IMM,t} = PROP_{IMM} \times A_{BSL,PA,unplanned,t}$$

Where:

$A_{LK-IMM,t}$	Total area deforested by immigrant agents in the baseline and project scenario in year t (ha)
$PROP_{IMM}$	Proportion of area deforested by immigrant agents in the leakage belt and project area (proportion)
$A_{BSL,PA,unplanned,t}$	Projected area of unplanned baseline deforestation in the project area in year t (ha)
t	1, 2, 3 ... t^* time elapsed since the start of the project activity (year)

Table 28. Proportion of area deforested by immigrants in the baseline and project scenario.

		2012	2013	2014	2015	2016
Cacheu	A _{BSL, PA, unplanned,t}	331	331	331	331	331
Cantanhez	A _{BSL, PA, unplanned,t}	898	898	898	898	898
		1,229	1,229	1,229	1,229	1,229
	A _{LK-IMM,t}	15.977	15.977	15.977	15.977	15.977

Then, the area of deforested by immigrants in the project area and leakage belt under the project scenario is calculated as follows:

$$A_{LK-ACT-IMM,t} = PROP_{IMM} \times \left(\sum_{i=1}^M A_{DefPA,i,t} + A_{DefLB,i,t} \right)$$

Where:

$A_{LK-ACT-IMM,t}$	Area deforested by immigrant agents in the project area and leakage belt under the project scenario in year t (ha)
$PROP_{IMM}$	Proportion of area deforested by immigrant agents in the leakage belt and project area (proportion)
$A_{DefPA,i,t}$	Area of recorded deforestation in the project area in the project case in stratum i in year t (ha)
$A_{DefLB,i,t}$	Area of recorded deforestation in the leakage belt in the project case in stratum i in year t (ha)
i	1, 2, 3 ... M strata
t	1, 2, 3 ... t^* time elapsed since the start of the project activity (year)

Table 29. Proportion of area deforested by immigrants in the baseline and project scenario

		2012	2013	2014	2015	2016
Cacheu	$A_{Def, PA, i, t}$	86	86	86	86	86
	$A_{Def, LK, i, t}$	139	139	139	139	139
Cantanhez	$A_{Def, PA, i, t}$	402	402	402	402	402
	$A_{Def, LK, i, t}$	603	603	603	603	603
		1,229	1,229	1,229	1,229	1,229
	$A_{LK-IMM, t}$	15.982	15.982	15.982	15.982	15.982

The net leakage outside the Leakage Belt ($\Delta C_{LK-ASU, OLB}$) is calculated below:

$$A_{LK-OLB, t} = A_{LK-IMM, t} - A_{LK-ACT-IMM, t}$$

Where:

$A_{LK-OLB, t}$ Area deforested by immigrants outside the Leakage Belt and Project Area under the project scenario in year t (ha)

$A_{LK-IMM, t}$ Total area deforested by immigrant agents in the baseline and project scenario in year t (ha)

$A_{LK-ACT-IMM, t}$ Area deforested by immigrants in the Project Area and Leakage Belt under the project scenario in year t (ha)

t 1, 2, 3 ... t^* time elapsed since the start of the project activity (year)

$$A_{LK-OLB, t} = -0.01$$

According to LK-ASU, if $A_{LK-OLB, t}$ as calculated is ≤ 0 , leakage outside the Leakage Belt has not occurred.

4.4 Net GHG Emission Reductions and Removals

The total net greenhouse gas (GHG) emissions reductions of the REDD project activity are calculated as follows:

$$NER_{REDD} = \Delta C_{BSL-REDD} - \Delta C_{WPS-REDD} - \Delta C_{LK-REDD}$$

Where:

NER_{REDD} Total net GHG emission reductions of the REDD project activity up to year t^* ; tCO_2e

$\Delta C_{BSL-REDD}$ Net GHG emissions in the REDD baseline scenario up to year t^* ; tCO_2e

$\Delta C_{WPS-REDD}$ Net GHG emission in the REDD project scenario up to year t^* ; tCO_2e

$\Delta C_{LK-REDD}$ Net GHG emission due to leakage from the REDD project activity up to year t^* ; tCO_2e

The net greenhouse gas emissions under the baseline scenario ($\Delta C_{BSL-REDD}$) are the emissions in the baseline from unplanned deforestation ($\Delta C_{BSL,unplanned}$). Up to 2016, total baseline emissions totaled 655,944 tCO_2e . The net GHG emissions in the REDD project scenario ($\Delta C_{WPS-REDD}$) are the emission due to deforestation in the project scenario ($\Delta C_{P,DefPA,i,t}$). Up to 2016, total project emissions totaled 320,341 tCO_2e . Finally, as demonstrated on Section 4.3 Leakage Emissions ($\Delta C_{LK-REDD}$) in the monitoring period was equal to zero. Table 30 presents a summary of the results.

Table 30. Accumulated Net GHG Emissions Reduction Summary

	2012	2013	2014	2015	2016
$\Delta C_{BSL-REDD}$	123,346	250,614	381,802	516,912	655,944
$\Delta C_{WPS-REDD}$	64,068	128,136	192,205	256,273	320,341
$\Delta C_{LK-REDD}$	-	-	-	-	-
NER_{REDD} (tCO_2e)	59,278	122,477	189,598	260,640	335,603

Therefore, the estimated net GHG emissions reduction of the REDD project (NER_{REDD}) in the first monitoring period (2011-2016) totals 335,603 tCO_2e . Since *ex-post* monitoring does not include remeasurement of carbon pools of GHG sources, uncertainty analysis is already included in the baseline quantification and, therefore, set equal to zero (X-UNC).

Table 31. Estimated yearly net GHG emissions reduction or removals (tCO_2e)

Years	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
2012	123,346	64,068	0	59,278
2013	127,267	64,068	0	63,199
2014	131,189	64,068	0	67,121
2015	135,110	64,068	0	71,042
2016	139,031	64,068	0	74,963
Total	655,944	320,341	0	335,603

Risk Buffer

In AFOLU projects there is a stock permanence risk. In other words, a GHG reduction in a given year can be turned into an emission in case, for example, of fire or in the events of natural disturbance. To mitigate such risks, the VCS established that a crediting buffer must be established and a percentage of the VCU withhold considering an specific project risk. The number of credits to be held in the permanence risk buffer is determined as a percentage of the total carbon stock benefits. The percentage is calculated following the module T-BAR. The detailed risk report is presented on Appendix I according to the risk assessment for the first crediting period validated in 2015.

The VCS Buffer is equal to the net emissions in the baseline minus project emissions derived from fossil fuels use and fertilizers use multiplied by the risk factor resulting from T-BAR (see Appendix I). Leakage emissions do not factor into the buffer calculations. As discussed, the project does not expect emissions from fossil fuel use or fertilizer application; hence, the buffer equation was simplified as follows:

$$Buffer_{unplanned} = (\Delta C_{BSL,unplanned} - \Delta C_P) * Buffer\%$$

Where:

$Buffer_{unplanned}$	Buffer withholding for unplanned deforestation project areas; tCO ₂ e
$\Delta C_{BSL,unplanned}$	Net greenhouse gas emissions in the baseline from unplanned deforestation; tCO ₂ e
$\Delta C_{WPS-REDD}$	Net GHG emission in the REDD project scenario up to year t*; tCO ₂ e
$Buffer\%$	Buffer withholding percentage; %. Calculated according to T-BAR, for details see Appendix I.

According to the Risk Report, the project totals 6 points in the non-permanence risk analysis. Since the minimum risk scoring allowed is 10, a value of 10 was applied to the project (10% or 0.10). The next table details the calculation. It is important to notice, as said, that the buffer account does not consider leakage emissions.

Uncertainty analysis was conducted to provide conservative estimates of the total net GHG emission reduction according to module X-UNC version 2.1. Total uncertainty in the baseline scenario summed 13% for Cacheu and 9% for Cantanhez at the 95% confidence interval. According to the module, the allowable uncertainty under the REDD-MF methodology is +/- 15% of $C_{REDD,t}$ at the 95% confidence interval. Since the uncertainty level is attained no deduction is performed. The estimate number of Verified Carbon Units (VCUs) for the monitoring period $T=t_2-t_1$ is performed according to Equation 8 of REDD-MF.

$$VCU_t = (Adjusted_C_{REDD,t2} - Adjusted_C_{REDD,t1}) - Buffer_{TOTAL}$$

Where:

VCU_t Number of Verified Carbon Units at time $t=t_2-t_1$; VCU

$Adjusted_C_{REDD,t2}$ Cumulative total net GHG emissions reductions at time t_2 adjusted to account for uncertainty; tCO₂e

$Adjusted_C_{REDD,t1}$ Cumulative total net GHG emissions reductions at time t_1 adjusted to account for uncertainty; tCO₂e

$Buffer_{TOTAL}$ Total permanence risk buffer withholding; tCO₂e

The table below present the calculation performed for each year in the first monitoring period.

Years	$\Delta C_{BSL,Unplanned}$ (tCO ₂ e)	$\Delta C_{P,Unplanned}$ (tCO ₂ e)	Risk buffer	Deductions for AFOLU pooled buffer account	Net Total (tCO ₂ e)
2012	123,346	64,068	10%	5,928	53,350
2013	127,267	64,068	10%	6,320	56,879
2014	131,189	64,068	10%	6,712	60,409
2015	135,110	64,068	10%	7,104	63,938
2016	139,031	64,068	10%	7,496	67,467
Total	655,944	320,341	10%	33,560	302,043

APPENDIX 1: NON-PERMANENCE RISK REPORT

1 INTERNAL RISK

Project Management		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a)	Species planted (where applicable) associated with more than 25% of the stocks on which GHG credits have previously been issued are not native or proven to be adapted to the same or similar agro-ecological zone(s) in which the project is located. (Not applicable)	0
b)	On going enforcement to prevent encroachment by outside actors is required to protect more than 50% of stock Risk on which GHG credits have previously been issued. (Not applicable)	0
c)	Management team does not include individuals with significant experience in all skills necessary to successfully undertake all project activities (i.e., any area of required experience is not covered by at least one individual with at least 5 year's experience in the area). The project managed team holds two professionals with 10+ years of experience in conservation, park management, community engagement and agriculture. The CVs, in French, of Dr. Justino Biai and Leonildo Alves Cardoso clearly demonstrate the necessary experience to successfully manage the project.	0
d)	Management team does not maintain a presence in the country or is located more than a day of travel from the project site, considering all parcels or polygons in the project area. IBAP maintains and operates one office on each park included in the project activity (Cacheu and Cantanhez). On each office, there is a local team composed of, inter alia, a Park Director, Specialists and Park Guards. The presence is also supported by the continued engagement with the community and the participation of the local population on the park management committee.	0
e)	Mitigation: Management team includes individuals with significant experience in AFOLU project design and implementation, carbon accounting and reporting (e.g., individuals who have successfully managed projects through validation, verification and issuance of GHG credits) under the VCS Program or other approved GHG programs. (Not applicable)	0
f)	Mitigation: Adaptive management plan in place. (Not applicable)	0
Total Project Management (PM) [as applicable, (a + b + c + d + e + f)]		0
Total may be less than zero.		0

Financial Viability		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a)	Project cash flow breakeven point is greater than 10 years from the current risk assessment (Not applicable)	0
b)	Project cash flow breakeven point is between 7 and up to less than 10 years from the current risk assessment (Not applicable)	0
c)	Project cash flow breakeven point between 4 and up to less than 7 years from the current risk assessment (Not applicable)	0
d)	Project cash flow breakeven point is less than 4 years from the current risk assessment As demonstrated in the file RISK_REDD_20140622.xlsx (worksheet Cashflow_REDD) the project has a positive return on year 02, therefore breakeven point is less than 4 years. Park management costs are derived from Vreugdenhil (2007) (Vreugdenhil_2007_COST_IBAP.pdf). Other costs related to the VCS process, including validation, verification, levy and registries are based on public available information and on the current VVB contract with the project proponent. Revenues are calculated based on Ecosystem Marketplace (2012) on the state and trends of the voluntary carbon market. Finally, the cash flow arbitrarily establishes that 30% of the REDD revenues are channeled direct to the communities through the benefit sharing mechanism (FIAL).	0
e)	Project has secured less than 15% of funding needed to cover the total cash out before the project reaches breakeven (Not applicable)	0
f)	Project has secured 15% to less than 40% of funding needed to cover the total cash out required before the project reaches breakeven (Not applicable)	0
g)	Project has secured 40% to less than 80% of funding needed to cover the total cash out required before the project reaches breakeven (Not applicable)	0
h)	Project has secured 80% or more of funding needed to cover the total cash out before the project reaches breakeven IBAP is receiving support from the World Bank and the GEF. The VCS costs are being fully covered by this international support. For park management costs, GEF 5 is supporting IBAP with USD 2.95 million in a four-year grant to support the network of protected areas (SNAP). Further detail on the GEF 5 disbursement to the country can be found at http://qa-gef-wb.reisys.com/new-country-profile?countryCode=GW demonstrating that, in total, Guinea Bissau will receive USD 4,6 million, from which USD 1,5 million are focused on biodiversity and USD 2,0 million on Climate Change.	0

i)	Mitigation: Project has available as callable financial resources at least 50% of total cash out before project reaches breakeven. (Not applicable)	0
Total Financial Viability (FV) [as applicable, ((a, b, c or d) + (e, f, g or h) + i)] Total may not be less than zero.		0

Opportunity Cost		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a)	NPV from the most profitable alternative land use activity is expected to be at least 100% more than that associated with project activities; or where baseline activities are subsistence-driven, net positive community impacts are not demonstrated. (Not applicable)	0
b)	NPV from the most profitable alternative land use activity is expected to be between 50% and up to 100% more than from project activities (Not applicable)	0
c)	NPV from the most profitable alternative land use activity is expected to be between 20% and up to 50% more than from project activities (Not applicable)	0
d)	NPV from the most profitable alternative land use activity is expected to be between 20% more than and up to 20% less than from project activities; or where baseline activities are subsistence-driven, net positive community impacts are demonstrated. As demonstrated in the baseline assessment, the main deforestation driver is the small scale, subsistence-driven, traditional agricultural practices. In addition, the project provides net positive community impacts.	0
e)	NPV from project activities is expected to be between 20% and up to 50% more profitable than the most profitable alternative land use activity (Not applicable)	0
f)	NPV from project activities is expected to be at least 50% more profitable than the most profitable alternative land use activity (Not applicable)	0
g)	Mitigation: Project proponent is a non-profit organization (Not applicable)	0
h)	Mitigation: Project is protected by legally binding commitment to continue management practices that protect the credited carbon stocks over the length of the project crediting period (see project longevity) (Not applicable)	0
i)	Mitigation: Project is protected by legally binding commitment to continue management practices that protect the credited carbon stocks over at least 100 years (see project longevity) The parks are protected areas, legally established (Decrees 12/2000 and 14/2001). Further, both have Internal Regulations formally approved by the parks	-8

	management committee. Both the laws and internal regulations had been provided to SCS.	
Total Opportunity Cost (OC) [as applicable, (a, b, c, d, e or f) + (g or h)] Total may not be less than 0.		0

Project Longevity		
a)	Without legal agreement or requirement to continue the management practice (Not applicable)	0
b)	With legal agreement or requirement to continue the management practice The parks are protected areas, legally established (Decrees 12/2000 and 14/2001). Further, both have Internal Regulations formally approved by the parks management committee. Both the laws and internal regulations had been provided to SCS.	-20
Total Project Longevity (PL) May not be less than zero		0

Internal Risk	
Total Internal Risk (PM + FV + OC + PL) Total may not be less than zero.	0

2 EXTERNAL RISKS

Land and resource tenure		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a)	Ownership and resource access/use rights are held by same entity(s) (Not applicable)	0
b)	Ownership and resource access/use rights are held by different entity(s) (eg, land is government owned and the project proponent holds a lease or concession) The parks are public property; no private land rights exist in Guinea Bissau. Land belongs to the government and is managed by IBAP. Communities, by tradition, have rights over resources access and use. At community level, the elder defines resources share and access to standing forests. The Land Law clearly defines that ownership is not allowed but recognizes the consuetudinary rights of	2

	communities over land use and resource access. The land law and the protected area law demonstrating this situation had been provided to SCS.	
c)	In more than 5% of the project area, there exist disputes over land tenure or ownership (Not applicable)	0
d)	There exist disputes over access/use rights (or overlapping rights) Traditional culture establishes, for example, how land is passed in a family over the years, the role of male and female in the community and how sacred location are defined and protect. No disputes over access or overlapping rights exist.	0
e)	WRC projects unable to demonstrate that potential upstream and sea impacts that could undermine issued credits in the next 10 years are irrelevant or expected to be insignificant, or that there is a plan in place for effectively mitigating such impacts (Not applicable)	0
f)	Mitigation: Project area is protected by legally binding commitment (eg, a conservation easement or protected area) to continue management practices that protect carbon stocks over the length of the project crediting period The parks are protected areas, legally established (Decrees 12/2000 and 14/2001). Further, both have Internal Regulations formally approved by the parks management committee. Both the laws and internal regulations had been provided to SCS.	-2
g)	Mitigation: Where disputes over land tenure, ownership or access/use rights exist, documented evidence is provided that projects have implemented activities to resolve the disputes or clarify overlapping claims (Not applicable)	0
Total Land Tenure (LT) [as applicable, ((a or b) + c + d + e+ f)] Total may not be less than zero.		0

Community Engagement		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a)	Less than 50 percent of households living within the project area who are reliant on the project area, have been consulted	0
b)	Less than 20 percent of households living within 20 km of the project boundary outside the project area, and who are reliant on the project area, have been consulted For the establishment of the CBMP, IBAP performed a census that included households outside the Parks (Project Area) that could be impacted by the project. After understanding the potential impacts of protecting Cacheu and	5

	Cantanhez, FIAL, which was the micro project financial support instrument part of the CBMP, was extended to communities living outside Cacheu and Cantanhez. However, the project proponent cannot quantify the percentage of households consulted, therefore the most conservative value was selected.	
c)	Mitigation: The project generates net positive impacts on the social and economic wellbeing of the local communities who derive livelihoods from the project area The main project component to reduce deforestation relies on community engagement and support. The project will protect the standing forest by generating net positive impacts on the social and economic wellbeing of the local communities through technical support and training, efficiency gains in agricultural production, support to alternative income generation activities, and so forth. Moreover, the benefit sharing mechanism, similar to FIAL, will guarantee that micro projects relevant to communities are financed.	-5
Total Community Engagement (CE) [where applicable, (a+b+c)] Total may be less than zero.		0

Political Risk		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a)	Governance score of less than -0.79 The Worldwide Governance Indicator (WGI) was used to calculate the aggregate governance score between 2014 and 2018 (last 5 years). GB totaled a negative score of -1.17. The file POLITICAL-RISK_REDD_20191205.xlsx presents the detailed calculation of the index.	6
b)	Governance score of -0.79 to less than -0.32 (Not applicable)	0
c)	Governance score of -0.32 to less than 0.19 (Not applicable)	0
d)	Governance score of 0.19 to less than 0.82 (Not applicable)	0
e)	Governance score of 0.82 or higher (Not applicable)	0
f)	Mitigation: Country implementing REDD+ Readiness or other activities such as: a) The country is receiving REDD+ Readiness funding from the FCPF, UN-REDD or other bilateral or multilateral donors b) The country is participating in the CCBA/CARE REDD+ Social and Environmental Standards Initiative c) The jurisdiction in which the project is located is participating in the Governors' Climate and Forest Taskforce d) The country has an established national FSC or PEFC standards body	0

	e) The country has an established DNA under the CDM and has at least one registered CDM A/R project (Not applicable)	
Total Political (PC) [as applicable ((a, b, c, d or e) + f)] Total may not be less than zero.		6

External Risk	
Total External Risk (LT + CE + PC) Total may not be less than zero.	6

3 NATURAL RISKS

Natural Risk – Fire	
Significance	Insignificant
Likelihood	Unlikely – natural fire does not occur in the project area. No registration could be found on such natural risk event
Score (LS)	0 (Not applicable)
Mitigation	Not applicable

Natural Risk – Pest and Disease outbreaks	
Significance	Insignificant
Likelihood	Unlikely – the project proponent could not find registration of pest and diseases outbreaks in the project area.
Score (LS)	0 (Not applicable)
Mitigation	Not applicable

Natural Risk – Extreme Weather	
Significance	Insignificant
Likelihood	Unlikely – there are no records of extreme weather events in the project area
Score (LS)	0 (Not applicable)
Mitigation	Not applicable

Natural Risk – Geological Risks	
Significance	Insignificant – Guinea Bissau is not subject to geological events like earthquakes.
Likelihood	Unlikely – Guinea Bissau is not subject to geological events like earthquakes.
Score (LS)	0 (Not applicable)
Mitigation	Not applicable

Natural Risk – Other natural risk	
Significance	Not applicable
Likelihood	Not applicable
Score (LS)	Not applicable
Mitigation	Not applicable

Score for each natural risk applicable to the project (Determined by $(LS \times M)$)	
Fire (F) (Not applicable)	0
Pest and Disease Outbreaks (PD) (Not applicable)	0
Extreme Weather (W) (Not applicable)	0
Geological Risk (G) (Not applicable)	0
Other natural risk (ON) (Not applicable)	0
Total Natural Risk (as applicable, F + PD + W + G + ON)	0

Total Natural Risk (F + PD + W + G + ON)	0.00
Note: Total may not be less than zero If the Total Natural Risk is above 35 then the project fails the entire risk analysis	

4 OVERALL NON-PERMANENCE RISK RATING AND BUFFER DETERMINATION

4.1 Overall Risk Rating

Risk Category	Rating
a) Internal Risk	0
b) External Risk	6
c) Natural Risk	0
Overall Risk Rating (a + b + c)	10
Note: Overall risk rating shall be rounded up to the nearest whole percentage The minimum risk rating shall be 10, regardless of the risk rating calculated If the overall risk rating is over 60 then the project fails the entire risk analysis	

Since the risk score cannot be lower than 10 the project assigns a total score of 10 for the Non-Permanence Risk Rating.

4.2 Calculation of Total VCU

Years	Net GHG emission reductions or removals (tCO ₂ e)	Risk buffer	Deductions for AFOLU pooled buffer account	Net Total (tCO ₂ e)
2012	59,278	10%	5,928	53,350
2013	63,199	10%	6,320	56,879
2014	67,121	10%	6,712	60,409
2015	71,042	10%	7,104	63,938
2016	74,963	10%	7,496	67,467
Total	335,603	10%	33,560	302,043

APPENDIX 2: WOOD DENSITY INFORMATION

SPECIES CODE	SPECIES	COMMON NAMES	COMMON NAMES	FAMILY	WOOD DENSITY	SOURCE
Aca_mac	Acacia macrostachya Rchb. ex DC.	pau-de-ferida, pau-ferida	gáudê, tanda-sara (ff); bula-bali, bule, búrlé, quide, tchide (fu).	Legumino sae/ Mimosoideae	0.759	Nygard & Elfving 2000
Ada_dig	Adansonia digitata L.	Calabacera	lâtê (ba); uáto (bj); cabaceira, cabacera; baobab, pain de singe (o fruto) (fr); bôê (fu); bedom-hal, burungule-burúnque (mc); citô (md); bebâque, bedom-hal, brungal (mj); m'bêke (nl); burungule (pp); cabaceira, calabaceira (pt); kiri (ss).	Bombacaceae	0.32	
Afz_afr	Afzelia africana Sm. ex Pers.	pau-conta, pó-de-conta	biiguê, pega (ba); aru, oru (cs); lengue, lénguei (ff); lengueje, leoncô, luengue (fu); bignâni (mc); lencom-ô, linqué (md); becancha, becancla, congô, gongô (mj); butáua, butone (pp).	Legumino sae	0.655	EFGP
Alb_adi	Albizia adianthifolia (Schumach.) W.Wight	faróba-de-lala, farroba-de-lala	cobaga-ê, conecam, empantanca, unchâmpô (bj); untchaintchain (cb); caroubier (fr); catchena (fs); marnei, nêtemâe, néto-máio (fu); netô-farô (md); bianque (mj); masamp-thai (nl); alfarroba (pt); uasa-fiké (ss).	Legumino sae/ Mimosoideae	0.5956056	CARBOVEG
Alb_alt	Albizia altissima Hook.f.		nétéchango (fu).	Legumino sae/ Mimosoideae	0.52	Albizia spp. Brown97 / América
Alb_din	Albizia dinklagei (Harms) Harms	farroba-de-mato	nasce-fôre (ba); correrê (bj); bansabúle (bm); gaúde (ff); bubicaramba (fs); netechaguhol, sindjadjâlê, sindjalale (fu); masamp, masamp-tchill, masang-na (nl); ussúmbulo (pp); safatá, uasafore, (ss).	Legumino sae/ Mimosoideae	0.52	Albizia spp. Brown97 / Africa
Alb_fer	Albizia ferruginea (Guill. & Perr.) Benth.	faróba-de-lala, farroba-de-lala	untchampo (bj); furbirô (cs); marnei, nete-maio (fu); farranetô (md).	Legumino sae/ Mimosoideae	0.47	Brown97 / Africa
Alb_gla	Albizia glaberrima (Schumach. & Thonn.) Benth. var. glaberrima		uarmáma (fu); tangalamara (md).	Legumino sae/ Mimosoideae	0.52	Albizia spp. Brown97 / Africa

Alb_rho	Albizia rhombifolia Benth.		djêgo, nétè-cula (fu); d'jagu (md); quéquê-camacama (ss).	Legumino sae/ Mimosoide ae	0.52	Albizia spp. Brown97 / Africa
Alb_zyg	Albizia zygia (DC.) J.F.Macbr.	pó-de-raio	biaioga, buiaioga (bf); cobaga-ê (bj); bunike (fs); mabodadi, marroné, tali, taliba, uarmáua (fu); tangalamára (md); masamp, msamp-m'boko (nl); tombonka're (ss).	Legumino sae/ Mimosoide ae	0.46	Brown97 / Africa
Alc_cor	Alchornea cordifolia				0.731101955	Dens. Média CARBOVEG
All_afr	Allophylus africanus				0.45	Brown97 / Africa
Als_boo	Alstonia boonei De Wild.	tacára, tagara, tagarra	biangue, bianque, psoque, (ba); polôfuru (cs); banta-forodjé, bantera-fôrô, batanforo (fu); batacar (mc); iangué, ianké, ianque (nl)	Apocynac eae	0.33	A. congensis Brown97 / Africa
Als_con	Alstonia congensis Engl.	tacára, tagara, tagarra	djambé (ba); cudjêsse, quessum (bj); léguere (ff); bantam-foro (fu); betácarre (mc); bantam-forô (md); bidjêsse (mj); batáguar (pp); iangué, ianké, ianque (nl).	Apocynac eae	0.33	Brown97 / Africa
Ana_occ	Anacardium occidentale L.	Cadju	Ncadju (mj)	Anacardia ceae	0.431	GlobalWoodDensityDatabase
Ani_lau	Anisophyllea laurina R.Br. ex Sabine	miséria, pau-miséria, pó-de-miséria	mafel, máfêlê (ba); budjagálá (planta), mandjagálá (fruto) (bf); edoconhe (bj); kanse (fu); n'sunp, sénhê, unsununtu (nl); cantingui (ss); angueidja (td).	Rhizophoraceae	0.7308752	CARBOVEG
Ant_dja	Anthocleista djalensis A.Chev.		tagare (fu); bintié (mj).	Loganiaceae	0.5	A. keniensis Brown97 / Africa
Ant_mac	Anthonotha marcophila				0.78	Brown97 / Africa
Ant_mem	Antidesma membranaceum				0.731101955	Dens. Média CARBOVEG
Ant_pro	Anthocleista procera Lepr. ex Bureau	caboupa-matcho	kufá, cufê (ba); (ba); cadjangue, cadjanuê (bj); beidomodjô, tagare (fu); bintié (mj); papaeum-eme (pp); dissauri (ss).	Loganiaceae	0.5	A. keniensis Brown97 / Africa
Ant_sen	Anthostema senegalense A.Juss.	binhal, pó-de-binhal, pó-de-lete	p'tone (ba); cabate, cabete (bj); bulucune (fs); bufena, m'burô, umburo (fu); mante (nl); minhále, tagi (pp).	Euphorbiaceae	0.5546252	CARBOVEG
Ant_tox	Antiaris toxicaria subsp. welwitschii	língua-di-baca, pau-bicho, pau-de-bicho-amarelo, pó-	noii (bj); djauláe, nhenhe, tambatchilam, tchime (fu); tumbuiru (md); binam-ne, cóngorô,	Moraceae	0.37	Brown97 / Africa

	var. africana (Engl.) A. Chev.	de-bicho-branco, po-de-bitche, pó-de-lete	cóngôrô, (mj); bucanhe (pp); n'nhonhinhe (ss).			
Ant_ven	Antidesma venosum E.Mey. ex Tul.			Euphorbia ceae	0.731101955	Dens. Média CARBOVEG
Ant_vog	Anthocleista vogelii Planch.	acuapôpo, caboupa-matcho	cadjanué (bj); ugumba, undango (cb).	Loganiaceae	0.5	A. keniensis Brown97 / Africa
Aph_sen	Aphania senegalensis (A.Juss. ex Poir.) Radlk.	cerença, cerija, serinça	m'bôtcherê (ba); buiema (dj); bulebo (ff); culneldacu, mantchampôdje (fu); simbode-ô, simbondô (md); bute, n'pôrlô, obalei (pp).	Sapindaceae	0.731101955	Dens. Média CARBOVEG
Arv_desc	Árvore viva desconhecida				0.731101955	Dens. Média CARBOVEG
Arv_mort	Árvore morta em pé				0.328	Dens. Mínima das árvores vivas CARBOVEG
Avi_ger	Avicennia germinans (L.) L.	tarafe, tarrafê, tarrafe	béthá, ió, petá, péthsá (ba); bufendê (planta), m'pendê (população de plantas) (bf); cobaca, cudjuno (bj); behelm, úle (cb); cabêço, camangacú (ff); úle (mc); djibicum, tarafô, (md); pebadje, púle (mj); iófo, n'kim (nl); búle (pp); uofiri (ss).	Avicenniaceae	0.756	CARBOVEG
Bli_sap	Blighia sapida K.D.Koenig		m'butchiri (ba); otou (bj); cuiema (dj); féso (fu).	Sapindaceae	0.74	B. welwitschii Brown97 Africa
Bli_uni	Blighia unijugata Baker	osso-de-dari	bissabe (bf); democôri, sâtágá-preto (fu); firifora (md); m'but-balé, n'timlake (nl); belequesulé (ss).	Sapindaceae	0.74	B. welwitschii Brown97 Africa
Boi_mam		Boila mamba			0.731101955	Dens. Média CARBOVEG
Bom_cos	Bombax costatum Pellegr. & Vuillet	Polóm-fidalgo, polóm-fôro, sumauma	bumbum, buúforê (ba); brêgue (bf); djóia, djóê (ff); djóia, djóê, luncum (fu); belofa (mc); buncum-ô (md); djóia, belofa (mj); ulófo (pp).	Bombacaceae	0.4931059	CARBOVEG
Bor_aet	Borassus aethiopum Mart.	cibe	bace (ba); buár (bf); eudá (bj); dúbê, palmier-rônier, rônier (fc); dúbê (ff); cibedje (fu); cibô (md); n'bene, umbena (mj); buane, opane (pp).	Palmae	0.885	EFGP
Bri_mic	Bridelia micrantha (Hochst.) Baill.	bissáca	tagate (ba); bissai, bussacá (bf); endure, n'tongue, untágue, untongue (bj); utchak (cb); fudetchir (fs);	Euphorbiaceae	0.47	Brown97 / Africa

			bissoia, gúgri (fu); bissaiô, bissoia (md); m'bonhé, n'taque (nl); bissaque (pp); tolingué, tolingi (ss).			
Byr_bro	Byrsanthus brownii Guill.			Euphorbia ceae	0.73110195 5	Dens. Média CARBOVEG
Car_pro	Carapa procera DC.	cola- amargoso, cola- malegossa	caranhane (bj); punhe (bm); kola-malgos, pada- di-kola, siti-malgos (cs); bunhogone (dj); boculamape (fl); boncom-hadjie, gobi, mambodadje (fu); maló, boncom-ô (md); bépale, buaque, cóque (mj); bóco (pp).	Meliaceae	0.59	Brown97 / Africa
Cas_sie	Cassia sieberiana DC.	canafistra, canafistula, sambassinha ue	p'fonante (ba); bissindje, bussindja (bf); caquecequece (bj); sama-sidjam, samba- sindjandje samba- sinhangho, sambassinhanha, sambassinhamé, sandjoné, sanjoué (fu); sindjam-ô (md); bentape, n'tame, untame (mj); betame (pp).	Legumino sa/Caesal p.	0.72	Nygard & Elfving 2000
Cei_pen	Ceiba pentandra (L.) Gaertn.	Poilão, poilon, polóm	psáhê, pthaé, rumbum (ba), brêgue (bf); cob-bê, fromager (bj); bantanhe (ff, fu); pentene (mc); bantam-ô (md); pëntia (mj); m'bath (nl); metchene, n'tene, untene (pp).	Bombacac eae	0.26	Brown97 / Africa
Cit_sin	Citrus sinensis	Larandja	Plele (mj)		0.73110195 5	Dens. Média CARBOVEG
Col_cor	Cola cordifolia (Cav.) R.Br.	mandjanja, manjandja	m'bué (ba); budjanhi (bf); utuludjene (dj); tábá (fu); tabô (md).	Sterculiac eae	0.458	EFGP
Col_nit	Cola nitida				0.7	Cola sp. / Brown97 / Africa
Com_ade	Combretum adenogoni- um Steud. ex A.Rich.	Jambacatá	djambacatá (bf); djambacatam-ô (ff); bané, djambacatam (fu); djambacatam-quéo (md).	Combreta ceae	0.73110195 5	Dens. Média CARBOVEG
Com_c_g	Combretum collinum subsp. geitonophyll- um (Diels) Okafor		bierrequêtê (bf); djambacatá (fêmea) (fu); hiremoussôlo, madifô, (md).	Combreta ceae	0.73110195 5	Dens. Média CARBOVEG
Com_c_h	Combretum collinum subsp. hypopilinum (Diels) Okafor			Combreta ceae	0.73110195 5	Dens. Média CARBOVEG

Com_mic	Combretum micranthum			Combretaceae	0.736	Nygard & Elfving 2000
Com_nig	Combretum nigricans var. elliotii (Engl. & Diels) Aubrév.	pau-de-pilão	betne (ba); betne, bunro (bf); buidé, dodje-górè, úidè (fu); djambacatam-ô (md); atchelogon, tchelogom (td).	Combretaceae	0.957348	CARBOVEG
Com_sp	Combretum sp				0.731101955	Dens. Média CARBOVEG
Cor_pin	Cordyla pinnata (Lepr. ex A.Rich.) Milne-Redh.		psila (ba); dirqué, dóki, duco, dúki, dúquei, (fu); doto, dúnta, dutos, ulacomô-dutô (md).	Leguminales/ Mimosoidae	0.719	EFGP
Cra_lau	Craterispermum laurinum				0.731101955	Dens. Média CARBOVEG
Cro_feb	Crossopteryx febrifuga (Afzel. ex G.Don) Benth.		baradagamarama (bf); belim, colidjâncuma, (fu).	Rubiaceae	0.731101955	Dens. Média CARBOVEG
Dal_boe	Dalbergia boehmii Taub.		bierequété (bf); godjoli (fu); n'pessa, umpessa (mj); n'ticambague (nl); simoili (ss); ambrecome (td).	Leguminales/ Mimosoidae	0.731101955	Dens. Média CARBOVEG
Dan_oli	Daniellia oliveri (Rolfe) Hutch. & Dalziel	pau-incenso, pó-de-incenso	bóbe (ba); ucumbo (bj); si-bink (cs); santan, tchébè, tchéne (fr); tchéne (fu); santam-ô, santam-um, santangô (md); becúncaro, biécar (mj); boto, m'bétá (nl); rúngulo, untande (pp); kaméuri (ss).	Leguminales	0.536	EFGP
Dat_mic	Detarium microcarpum Guill. & Perr.	mamboli	códóde (bj); bôto, compoundôgô, pompôdôgô (fu); sárôco, sara-ôncô (md); m'betá, m'petch (nl); amule (td).	Leguminales	0.565	Nygard & Elfving 2000
Dat_sen	Detarium senegalense J.F.Gmel.	mambode	bobode (bf); cudoce (bj); boto, pó-pondogo, querenduta (fu); mabodô, sarôco (md); bumbuar (mj); bórrè (pp).	Leguminales	0.547	EFGP
Det_sp	Detarium sp				0.731101955	Dens. Média CARBOVEG
Dia_gui	Dialium guineense Willd.	beludo, pau-veludo, pó-de-veludo, veludo	m'boié, n'boi, umboi (ba); bufarô (bf); epádum (bj); uparan (fs); boiè-maio, cossirâe, mèco, moquê (fu); citó, cossitô, moquê (md); bebúi, bubúi (mj); m'bim, m'bimbe (nl); moquê (ss); atenguengelere (td).	Leguminales	0.698	EFGP
Dic_cin	Dichrostachys cinerea subsp.	fedida-branco, ferida-preto; fididi-preta,	biohé-mone, duê (ba); emudu (bj); sipiñan (cs); bulabêlê, bula-bété,	Leguminales	0.9196014	CARBOVEG

	platycarpa (Welw. ex W.Bull) Brenan & Brummitt var. platycarpa	pau-ferida, pó-de-fidida-preto	bulé, bule-baledje, bulu-caledje, búrlè, burlei, búrlè-lubode, burlé-lubodje, búrli (fu); n'gami-coió, n'gari-coió (md).	Mimosoideae		
Dio_ell	Diospyros elliotii (Hiern) F.White			Ebenaceae	1.03	Diospyrus sp. Reyes et al. 1992
Dio_fer	Diospyros ferrea (Willd.) Bakh.			Ebenaceae	1.03	Diospyrus sp. Reyes et al. 1992
Dio_heu	Diospyros heudelotii Hiern		ebangleba (bj); silabono (fu); cussito, malefu (md); jagôrtá, n'jangugurta, tchamburtá (nl); iatété, malefú, malevu (ss); culum (td).	Ebenaceae	0.9384003	CARBOVEG
Eke_cap	Ekebergia capensis				0.731101955	Dens. Média CARBOVEG
Ela_gui	Elaeis guineensis Jacq.	palmera	quem, ribe (ba); benintchi, bunintchi (bf); eárra, lara (bj); palmier-à-huile (fc); tuguêih (ff); tem-em-eih (fu); tem-ô (md); mintchame (mj); n'quemê (pp); palmeira de azeite, palmeira de óleo, palmeira dëndém (pt).	Palmae		
Ery_afr	Erythrophleum africanum (Welw. ex Benth.) Harms		corombel, gerombéle, pele, péli, querenduta (fu); cursonsum-ô, cussonsom (md).	Leguminales	1.02	Média de E. africanum em Brown97
Ery_sen	Erythrina senegalensis DC.	bissaca, pó-de-osso, pó-di-ossa, pó-di-onta	m'zisse (ba); burale, séléle (bf); cusserê (bj); pó-di-budogo (cs); arbre-coral, erythrine du Sénégal (fr); bondja, botchotchadje, bothola, mochôla, m'zisse (fu); dlim-ôdolim-ô (md); n'chaka-refat, n'tchakarfat (nl); bissansce (pp).	Leguminales/ Mimosoideae	0.31	Média de Erythrina sp. em Brown97
Ery_sig	Erythrina sigmoidea Hua		dolim-bá, dolimba (md).	Leguminales/ Mimosoideae	0.31	Média de Erythrina sp. em Brown97
Ery_sua	Erythrophleum suaveolens (Guill. & Perr.) Brenan	mancone, manconi	betomo, otone (ba); budatchai (fs); talidje, téli (fu); mănçone (cs); buirame (fl); betitche (mc); tálô (md); baier (=amarga), bentabe (mj); betitche (pp).	Leguminales	0.824	EFGP

EspDesc	Espécie viva desconhecida				0.731101955	Dens. Média CARBOVEG
Euc_lon	Euclina longiflora				0.731101955	Dens. Média CARBOVEG
Fai_alb	Faidherbia albida (Delile) A. Chev.	ferida-branco, pau-ferida, pó-de-ferida-branco	bioépi, djúè (ba); camude, camudé, camudo (bj); biongômo (bm); sipiñã, sipiñabrabu (cs); busseu-uliba (fl); cad (fr); bubirique (fs); borassanhe, buladanêlhe, bulé, búrlé-danédjo, marroné, (fu); betampale (mc); borassam, borassam-ô (md); butchampele (mj)	Legumino sae/ Mimosoideae	0.731101955	Dens. Média CARBOVEG
Fic_dic	Ficus dicranostyla Mildbr.		sur (ba); d'jambô, djambo-surei suredje, surei (fu); anak (td).	Moraceae	0.465	Média de Ficus sp. em Brown97
Fic_exa	Ficus exasperata Vahl	acarta-lixo, língua-di-baca, po-di-lixo, (cr)	noii (bj); uiássiáss (cb); karda (cs); nhinha (fu); bungadjé, n'cungre (uncungre) (mj); cuncgre, n'cuncgre, uncuncgre (pp).	Moraceae	0.465	Média de Ficus sp. em Brown97
Fic_glu	Ficus glumosa Delile	pau-de-leite	ságûê (ba); quequeiê (fu); sôtô (md).	Moraceae	0.465	Média de Ficus sp. em Brown97
Fic_ova	Ficus ovata			Moraceae	0.465	Média de Ficus sp. em Brown97
Fic_sp	Ficus sp				0.465	Média de Ficus sp. em Brown98
Fic_sur	Ficus sur Forssk.		blata, tumbli (ba); canhamá, catchocodo (bj); défay (cs); bucune (fs); tcheque, tchequedje (fu); buncuncul (mc); turô (md); cuncgre, cuncgre, n'cungre, uncungre (mj); tonkin-iá, tonquinha (nl); uncúngne (pp); anaque (td).	Moraceae	0.465	Média de Ficus sp. em Brown97
Fic_syc	Ficus sycomorus subsp. gnaphalocarpa (Miq.) C.C.Berg		chéque, tcheque (pl. tchequedje) (fu); cuncgre, n'cungre, uncungre (mj).	Moraceae	0.465	Média de Ficus sp. em Brown97
Fun_afr	Funtumia africana (Benth.) Stapf		ripetche (ba); budiquédo (fu).	Apocynaceae	0.4	Reyes et al. 1992
Gar_imp	Gardenia imperialis K.Schum.		tári-sútô (fu).	Rubiaceae	0.76	Gardenia sp. em Brown 97
Gar_ter_S	Gardenia ternifolia subsp. jovis-tonantis var. goetzei (Stapf &		brintintchi (ba); undágál (cb); bosseléole, djugale (fu); bireu (mc); n'dô (nl).	Rubiaceae	0.655	Nygard & Elfving 2000

	Hutch.) Verdc.					
Gar_ter_W	Gardenia ternifolia subsp. jovis- tonantis (Welw.) Verdc. var. jovis- tonantis		djugale (fu); n'dué (nl).	Rubiaceae	0.655	Nygard & Elfving 2000
Han_und	Hannoa undulata (Guill. & Perr.) Planch.		psône, psunn, tibdê (ba); tchuco (bj); colanzu, colonzo, quécui, quécui- djom, tivedê (fu); bren (mc); kéo-fôro (md).	Simarouba ceae	0.73110195 5	Dens. Média CARBOVEG
Har_mad	Harungana madagascari- ensis Lam.	canho, pó-di- fala	mintchéle, umpátê (ba); canho, uómnhé (bj); utéhia (cb); súngala (ff); chungalá, sungala (fu); sumbalá, uliéli, ulielô (md); binhanhaque (mj); acanjongra (td).	Euphorbia ceae	0.45	Reyes et al. 1992
Hei_par	Heisteria parvifolia				0.73110195 5	Dens. Média CARBOVEG
Hex_cri	Hexalobus crispiflorus A.Rich.			Annonace ae	0.48	Reyes et al. 1992
Hex_mon	Hexalobus monopetalus (A.Rich.) Engl. & Diels	mambumba	bacuré, boile, boili, canjé, tapircó (fu)	Annonace ae	0.827473	CARBOVEG
Hol_flo	Holarrhena floribunda (G.Don) T. Durand & Schinz	bribait, bripatche	rubitchi (ba); ete-éri (bj); machalô (fs); charra- quidjé, endama, rubitchi, tcharaquadje, tchoráqui (fu); bedufe, bedufi, bidufe (mc); tcharico (md); metchel (nl); kamaitê (ss).	Apocynac eae	0.73110195 5	Dens. Média CARBOVEG
Hun_umb	Hunteria umbellata (K.Schum.) Hallier f.	pó-di-pinti	báuri (fu); belace, belaha (mj); n'tchintchamp (nl); balé (ss).	Apocynac eae	0.926	CARBOVEG
Hym_aci	Hymenocard ia acida Tul. var. acida	Coronconde, coronconto	beninebahan, betenam (ba); coroncondô (bf); corocondé, oábi (bj); piloró (ff); bodi, caraconde, corocondé (fu); corocondô, cureucôndô (md); matikzé, n'tisé (nl); curencúnde, simóilé, simóieli (ss).	Euphorbia ceae	0.702	GlobalWoodDensit yDatabase
Hym_heu	Hymenocard ia heudelotii Planch. ex Müll.Arg.			Euphorbia ceae	0.73110195 5	Dens. Média CARBOVEG
Hym_lyr	Hymenocard ia lyrata Tul.		odinaco (bj).	Euphorbia ceae	0.73110195 5	Dens. Média CARBOVEG
Kee_sp	Keetia sp				0.73110195 5	Dens. Média CARBOVEG

Kha_sen	Khaya senegalensis (Desr.) A.Juss.	bissilão, bissilon	famé, iacume, tagmi, táminii (ba); bussilô (bf); unchômro, unchonro (bj); betenhête (dj); cáe (ff); acajou-du-Sénégal, caicédra (fr); cáe (fu); biaiêre (mc); djaló (md); béntia, bentiene, betone (mj); embale, utime (pp).	Meliaceae	0.608	EFGP
Lad_heu	Landolphia heudelotii				0.731101955	Dens. Média CARBOVEG
Lag_rac	Laguncularia racemosa				0.731101955	Dens. Média CARBOVEG
Lan_aci	Lannea acida A.Rich.	mantede	dôto (ba); ututene (fs); bembédja, bembem-hei, tchingole (fu); bémbo (md); betôlôdje (pp).	Anacard.	0.465	Nygard & Elfving 2000
Lan_nig	Lannea nigritana (Scott-Elliot) Keay	mantede	bembédje, bembem-hei, tchingole (fu); bémbo (md); betôlôdje (pp)	Anacard.	0.611	L. velutina CARBOVEG
Lan_sp	Lanea sp				0.731101955	Dens. Média CARBOVEG
Lan_vel	Lannea velutina A.Rich.	bembei, dembei, mantede	dôto (ba); bembédje, bembei, bembem-hei, tchingole (fu); bémbo (md); betôlôdje (pp)	Anacard.	0.611	CARBOVEG
Lec_cup	Lecaniodiscus cupanioides Planch. ex Benth.		sátaga (fu)	Sapindaceae	0.8556739	CARBOVEG
Lop_lan	Lophira lanceolata Tiegh. ex Keay	mené	p'fancha (ba); udoma (bj); malanga, marnenâe, p'bancar (ff); ledalbodeel, malanga, marnenâe, p'bancar (fu); mufó (pp); mené (ss).	Ochnaceae	0.706	EFGP
Mal_aln	Malacantha alnifolia (Baker) Pierre		ukissig (cb); lixa (cr); cafore (dj); nhada-haco, nhénhéô (fu); mafaléu (nl); lakó, lalaúri (ss).	Sapotaceae	0.6999394	CARBOVEG
Man_ind	Mangifera indica	mango	pamango (mj); manga, mangueira (pt)	Anacardiaceae	0.552	GlobalWoodDensityDatabase
Mar_tom	Markhamia tomentosa (Benth.) K.Schum. ex Engl.		boloitche (ba); n'álè (um-hálè) (fu).	Bignoniaceae	0.473	GlobalWoodDensityDatabase
Mil_reg	Milicia regia				0.439	EFGP
Mor_gem	Morinda geminata DC.	boloncodjibá-macho, bolongodjiba, bulungu-djubá	gunhe, n'dunquinhe, n'gume, ungume (ba); bulongodjibá (bf); obonodje (bj); bubalden (dj); n'garba, ungarba (ff); biloncontchebâe, bolonco-tchibá, dacuré, lhiamba, n'garba, uanda, wáda (fu); biloncondjebá, boloncom, boloncondjibá, goloneogita, simbom-ô, u	Rubiaceae	0.731101955	Dens. Média CARBOVEG

Mor_luc	Morinda lucida Benth.			Rubiaceae	0.731101955	Dens. Média CARBOVEG
Mor_sen	Morelia senegalensis A.Rich.			Rubiaceae	0.731101955	Dens. Média CARBOVEG
Neo_mac	Neocarya macrophylla (Sabine) Prance ex F.White	Mampatace-grande, tamankumba, tambacumba	n'bute (umbatú), n'djapô, téhè (ba); bufânga (bf); nórônóródó, nororodo, orodjô (bj); curabussuma (ff); bio, quíó (fruto) (fl); batè (fs); curanaco, nando, náudo (fu); menau, bénôbénô, bitague (mc); tambacumba (md); bénôbénô, bitague, menau (mj); mavé	Chirysobalanaceae	0.731101955	Dens. Média CARBOVEG
New_lae	Newbouldia laevis (P.Beauv.) Seem.	Manduco-defeticero	bugampal (bf); canhom, cassinconco (bj); mânduk-difuti-siru (cs); sucúndè (ff); fugumpa (fs); canhômburi (fu); becuape (mj); n'simkété, singèle (nl); angade-tcharre (td).	Bignoniaceae	0.731101955	Dens. Média CARBOVEG
Oxy_aby	Oxytenanthera abyssinica				0.731101955	Dens. Média CARBOVEG
Par_big	Parkia biglobosa (Jacq.) R.Br. ex G.Don	faroba, farôba, farrobe	gante, mehanaté (ba); biáie, buiái (bf); canhando (o fruto), em-bando, nândo, n'andu, unhando (árvore) (bj); poroba (cs); caroubier-africain, mimosa-poupre (fr); néré, netch, nètè (fu); olélè, ulélè (mc); nètè (md); ii (nl); olélè, ulélè (pp); néri (ss); a	Leguminosae/ Mimosoideae	0.533	EFGP
Par_exc	Parinari excelsa Sabine		meile, n'djano, pilé, undiano (ba); bussol, mantchoul (fruto) (bf); kankenom (fruto), nhêg-cuneme, uguene, ukenom (bj); mampatace, mampatás, mampataz (cr); cura (ff); bionai (fs); cura, curanaco (fu); minquela (mc); mampatá (md); bitchalam, n'tchalame (mj)	Chirysobalanaceae	0.604	EFGP
Per_lax	Pericopsis laxiflora (Benth. ex Baker) Meeuwen		cúlèculè, culi-culi; culucula (fu); baba, buba (mj).	Leguminosae/ Mimosoideae	0.94	Pericopsis sp. em Brown 97
Pho_rec	Phoenix reclinata Jacq.		sarábá, sérquê (ba); buadiá (bf); mandjaca (bj); bêlem (fu); bam-ò, corossedjambo, córóssó	Palmae		

			(md); bedjaca, m'jacai (mj); medjaca (pp).			
Pil_ret	Piliostigma reticulatum (DC.) Hochst.		pouúnquè (ba); canná, epamámbo (bj); bárqùè (fu); fará (md); n'toncre, untoncre (pp).	Legumino sae	0.641	Nygard & Elfving 2000
Pil_tho	Piliostigma thonningii (Schumach. & Thonn.) Milne-Redh.	fará, panu-di-kankora	boã, mansonca, mansanca, pouúnquè (ba); fará, bufará (bf); canna, epamámbo, epandando (bj); budandepe, bupande (fs); baiqué, bárqùè, barquedje, barqueiê, bongué, fará (fu); fará (md); impukui, m'bukui mukui (nl); n'tangré, n'toncre, untoncre (pp).	Legumino sae	0.7652155	CARBOVEG
Pre_his	Premna hispida				0.86	Premna sp. em Brown 97
Pro_afr	Prosopis africana (Guill. & Perr.) Taub.	pau-carvão, pó-carvão, pó-de-carbom, po-di-carvom	tentera (ba); buiengué, bussagan (bf); karbon, késeg-késeg (cs); tchelem (ff); tchalem-ai, tchela, tchelangadje, tchelem (fu); bal-tencali, culengô, culim-ô, djandjam-ô, quéssem-quéssem (md); djeiha, ogea (pp).	Legumino sae/ Mimosoide ae	0.847	EFGP
Pte_eri	Pterocarpus erinaceus Lam. ex Poir.	pau-sangue, pó-di-sangue	psilá, sila (ba); buana (bf); bane, bání, djêgo (fu); beléle (mc); kenê, quénò (md); beléle, beliadje, betéi, olei (mj); n'sila (nl); beliadje, betéi, ulei (pp).	Legumino sae/ Mimosoide ae	0.616	EFGP
Pte_san	Pterocarpus santalinoide s L'Hér. ex DC.	mangantem	déssa, dessáha, déxa (ba); antante, benganta (bf); ebontonton (bj); djégo (ff); djecudjecumádje, d'jega, d'jega, mangantum, (fu); nitichiba, n'tisebá, sibá (nl).	Legumino sae/ Mimosoide ae	0.44	Pterocarpus sp. em Brown 97
Pyc_ang	Pycnanthus angolensis				0.409	Dens. Média GlobalWoodDensityDatabase
Rap_pal	Raphia palma-pinus (Gaertn.) Hutch.	tara, tarra	darré (ba); ápél (singular), befén (plural) (cb); mãmbãmpa-tara (cs).	Palmae		
Rhi_har	Rhizophora harrisonii Leechm.			Rhizophoraceae	1	R. mangle em Brown 97
Rhi_man	Rhizophora mangle L.	tarafe, tarrafe	senhea, sóle (ba); bufendê (planta), m'pendê (população de plantas) (bf); sem-ah (bm); irangá, ubá (bj); fussossá (dj); cassolaco (fl); palétuvier-rouge (fr);	Rhizophoraceae	1	Brown 97

			mancô (md); pidjeu (mj); bugáha, ugáha (pp).			
Rhi_rac	Rhizophora racemosa G.Mey.	tarafe, tarrafe	cóbacá, codega, iranga, uba (bj);	Rhizophor aceae	1	R. mangle em Brown 97
Ric_heu	Ricinodendr on heudelotii (Baill.) Pierre ex Heckel subsp. heudelotii		bidjabbarrana (bf); n' tonte (nl); tonta (ss).	Euphorbia ceae	0.3649797	CARBOVEG
San_sen	Sansevierais senegambic a				0.73110195 5	Dens. Média CARBOVEG
Sar_lat	Sarcocephal us latifolius	tambacumba- di-santcho			0.73110195 5	Dens. Média CARBOVEG
Sch_arb	Schrebera arborea A.Chev.	pau-goiaba, po-de-goiaba	bugóiaba (planta), goiaba (fruto) (bf); maharra (bj); batirô (md).	Oleaceae	0.607	EFGP
Sor_jug	Sorindeia juglandifolia (A.Rich.) Planch. ex Oliv.		m'riul (ba); aionque (bj); balêbári (fruto), undêbári (planta) (cb); coxolourô, cupote-cuxolourô (fs); sandji- bombro (fu); lagari (mj); n'taluass, n'tchalúas, untchalbinass (nl); n'tata, untata (pp); ambilire (td).	Anacard.	0.73110195 5	Dens. Média CARBOVEG
Spo_mom	Spondias mombin L.	mandiple	p'sale, sale, samé (ba); budjábual (bf); negae, ogáe, ugai (bj); báfôssé (fruto), upôssé (planta) (cb); mandipul (cs); buijendendem (fs); prunes-mombin (fr); tchálè (fu); n'pela, umpela (mc); nincom-ô (md); pilme (mj); n'pilo, umpilo (pp)	Anacard.	0.5588044	CARBOVEG
Ste_tra	Sterculia tragacantha Lindl.	nassino, pau- corda, pó-de- cabaço	búê, umbufúre (ba); ereitô, éritú, freitô (bj); dácud, úcud (cb); barquelei, tabáe, tchapelêguê, tehapeleque (fu); bamé (mc); d'jubitabô, tabá, tabô (md); ibulbbecana, n'bama, umbana (mj); bamba (pp); mangéboré (ss); atakssulé (td).	Sterculiac eae	0.625	Média de Sterculia para África em Brown 97
Str_inn	Strychnos innocua Delile			Loganiace ae	0.73110195 5	Dens. Média CARBOVEG
Str_pus	Strombosia pustulata Oliv.	osso-de-dari	tinlake (nl).	Olacaceae	0.9079408	CARBOVEG
Syz_gui	Syzygium guineense (Willd.) DC. subsp. guineense	pó-branco	n'ocasso, nopêdê (bj); sotôno, trafidin-tera (cs); butote (dj); cadjô (ff); culelam-ô (md).	Myrtaceae	0.73110195 5	Dens. Média CARBOVEG

Ter_alb	<i>Terminalia albida</i> Scott-Elliot		cabuto (bj); furanfã (fs); sirafitom (md); n'tangunha (nl).	Combretaceae	0.9251145	CARBOVEG
Ter_avi	<i>Terminalia avicennioides</i> Guill. & Perr.		culume (fu); sirá-fitom, sirafitom (md).	Combretaceae	0.638	Nygard & Elfving 2000
Ter_lax	<i>Terminalia laxiflora</i> Engl. & Diels			Combretaceae	0.916	média de T. albida e T. macroptera CARBOVEG
Ter_mac	<i>Terminalia macroptera</i> Guill. & Perr.	karkone, macete, macite	fadi (ba); bulofôr (bf); djamba-catam (ff); bóde, bóí (fu); bolóbô (mc); hólô-fôro (md); betáli, betêlêdje, braqui, têtêje (mj); n'kone (nl); n'túlam, untulam (pp).	Combretaceae	0.9065019	CARBOVEG
Tre_afr	<i>Treculia africana</i> Decne. ex Trécul subsp. africana var. africana		bala, busaka, sobsob (cs); guilinte (ff); guibinte, mantchampudje (fu); mantchambô (md); becuáe (mj); bulóio (pp).	Moraceae	0.731101955	Dens. Média CARBOVEG
Tre_ori	<i>Trema orientalis</i> (L.) Blume		buanhônho (bf); nonha (bj); quere (fu).	Ulmaceae	0.3278344	CARBOVEG
Tri_eme	<i>Trichilia emetica</i> subsp. suberosa J.J.de Wilde	pó-cetona	búme, quécujon (fu); quécô (md)	Meliaceae	0.731101955	Dens. Média CARBOVEG
Tri_mon	<i>Trichilia monadelphica</i> (Thonn.) J.J. de Wilde		nequeno (bj).	Meliaceae	0.731101955	Dens. Média CARBOVEG
Tri_pri	<i>Trichilia prieuriana</i> A.Juss. subsp. prieuriana		cudaco, nequeno (bj); fulubudjone (dj); cudaco (fl); djambadjiom, quibiricarre (fu); benkar (nl); bugondjôle (pp).	Meliaceae	0.63	Brown 1997
Unknown	Unknown				0.731101955	Dens. Média CARBOVEG
Vit_don	<i>Vitex doniana</i> Sweet	cetona, cetona-pequeno, cetona-preta	múni, múri (ba); bugúa (planta), mangúa (fruto) (bf); n'bumbo, ubumbo, ubunvo (bj); bujinke (dj); prunier-noir (fr); búmé (fu); cutóbulo, cutubulô (md); bessápale, munsopane (mj); gúa (pp).	Labiatae	0.4	Brown 1997
Vit_fer	<i>Vitex ferruginea</i> Schumach. & Thonn.			Labiatae	0.731101955	Dens. Média CARBOVEG
Vit_mad	<i>Vitex madiensis</i> Oliv. subsp. madiensis	azeitona, azeitona-pequeno, cetona,	muni (ba); bugúa (planta), mangúa (fruto) (bf); bumé, bume-ainacobe (fu); intompinha, n'ssogorro	Labiatae	0.731101955	Dens. Média CARBOVEG

		cetona-pequena	(nl); kukukunkuri (ss); anhongore (td).			
Voa_afr	Voacanga africana Stapf ex Scott-Elliot		blacahai (ba); epopoquê (bj); pau-de-borracha (cr); m'pumbu (nl).	Apocynaceae	0.731101955	Dens. Média CARBOVEG
Voa_tho	Voacanga thouarsii Roem. & Schult.			Apocynaceae	0.731101955	Dens. Média CARBOVEG
Xer_stu	Xeroderris stuhlmannii (Taub.) Mendonça & E.C.Sousa	pó-de-sangue-branco	bandanei, bani-dânê, bani-dani, bani-dârê (fu); n'bóbó (nl).	Leguminosae/Mimosoideae	0.565	Nygard & Elfving 2000
Xim_ame	Ximenia americana L.	limon-do-mato, limon-di-sancho	agara (bj); udôngul, undemna-aguidig (cb); citronier-de-mer, prunier-de-mer (fr); tcheme, tjeme (fu); tufissa (md); mampã (nl); tufissa, tumbecrinhaque (ss).	Oleaceae	0.646	Nygard & Elfving 2000
Xyl_acu	Xylopia acutiflora (Dunal) A.Rich.		guilibete-bade (fu)	Annonaceae	0.731101955	Dens. Média CARBOVEG
Xyl_aet	Xylopia aethiopica (Dunal) A.Rich.	malagueta-da-guiné, malagueta-preta, malagueta-preto-de-guiné, malagueta-di-mato	sem-unte-pulhe, sentê (ba); eda, equêche, ocanhebo (bj); erauci (fs); guilé-balei, guilé-bê (fu); idóié-iginal (mc); canafiô, janafim-ô (md); brôbleque, irú (mj); séla (nl); djodjô, djó-gófe, iobogôfo (pp); calantú, calatú (ss)	Annonaceae	0.5	Brown 1997 Africa
Zan_lep	Zanthoxylum leprieurii Guill. & Perr.		mádjá, mantcha, mantchu (ba); eranha (bj); barquelem (fu).	Rutaceae	0.731101955	Dens. Média CARBOVEG