MONITORING REPORT "FORTALEZA ITUXI REDD PROJECT"

Document Prepared by Carbonext

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Project Title	*Fortaleza Ituxi REDD Project*
Version	*4.4*
Report ID	*3*
Date of Issue	*23-February-2023*
Project ID	*1654*
Monitoring Period	*01-January-2020 to 26-December-2021*
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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

Sustainable Forest Management is the main tool to guarantee the surveillance and integrity of the Project Area. The presence of workers in management activities is the first factor to prevent trespassing and deforestation of the Project Area, which is consolidated by a private surveillance contract.

The Forest Management Plan was initiated on 15/12/2013, which was defined as the Project Start Date. Equipment for Forest Management was placed in the Project Area and the first personnel to carry out preliminary studies for operations were present in this period: it is assumed that the presence of forest management personnel created a perception in deforestation agents that the Project Area was under increased surveillance by the Project Proponent.

In March 2019, the proponent's team received fire brigade training, thanks to which it was possible to protect carbon stocks from natural or criminal fires, such as the one that occurred in August 2021, which was promptly combated. Also in March 2019, training on sustainable cattle raising was carried out with employees of Fazenda Nossa Senhora das Cachoeiras do Ituxi and neighboring properties, with the aim of technical cooperation and environmental awareness. Such practices contribute to the development of livestock with less need for deforestation and less environmental impact.

In August 2020, an inventory of local biomass, flora and fauna was prepared, which allowed the project to acquire further first-hand knowledge on carbon stocks in the area, as well as biodiversity.

Surveillance to combat illegal deforestation and training on health, hygiene, safety, nutrition, and the environment are ongoing actions that contribute to the project's climate, biodiversity and community aspects.

The present Monitoring Report shows the results of Project activities for the period between 01/01/2020 and 26/12/2021.

Owing to project activities (i.e., forest surveillance), the project proponent was able to completely avoid deforestation by third-parties within the Project Area over the period verified.

Thus, the net total GHG emission reductions over this monitoring period are estimated at 176,038 tCO_2, which corresponds to an annual average of 88,019 tCO_2.

1.2 Sectoral Scope and Project Type

Sectoral Scope: 14 - Agriculture, Forestry, Land Use

Project Category: Avoided Unplanned Deforestation (AUD project activity)

This is not a grouped project.

1.3 Project Proponent

Organization name	Fazenda Nossa Senhora das Cachoeiras do Ituxi
Contact person	Ricardo Stoppe Júnior
Title	Project Proponent (Landowner)

Address	Estrada da Fazendinha, 5640 Centro, Carapicuíba – SP, Brazil
Telephone	55 (92) 3634-7521
Email	aamericardo@ig.com.br

1.4 Other Entities Involved in the Project

Organization name	Carbonext
Role in the Project	Technical advisory in project development
Contact person	Janaína Dallan & Luiz Fernando de Moura
Title	Project Designer
Address	Rua do Rocio, 220, cj 21 São Paulo, SP, Brazil www.carbonext.com.br
Telephone	11 3168-8521
Email	janaina@carbonext.com.br

1.5 Project Start Date

15/12/2013 is defined as the Project Start Date as it was when the Forest Management Plan was initiated. On the date equipment for Forest Management was first placed in the Project Area and the first employees arrived to commence preliminary studies. It is assumed that the presence of Forest Management personnel created a perception in deforestation agents that Project Area was under increased surveillance by the Project Proponent.

1.6 Project Crediting Period

Start date: 15/12/2013

End date: 14/12/2043

Project duration: 30 years

Date of the historical Reference Period: 15/12/2003 to 14/12/2013

1.7 Project Location

1) Name of the project area property: “Fazenda Nossa Senhora das Cachoeiras do Ituxi"

2) Map of the project area:

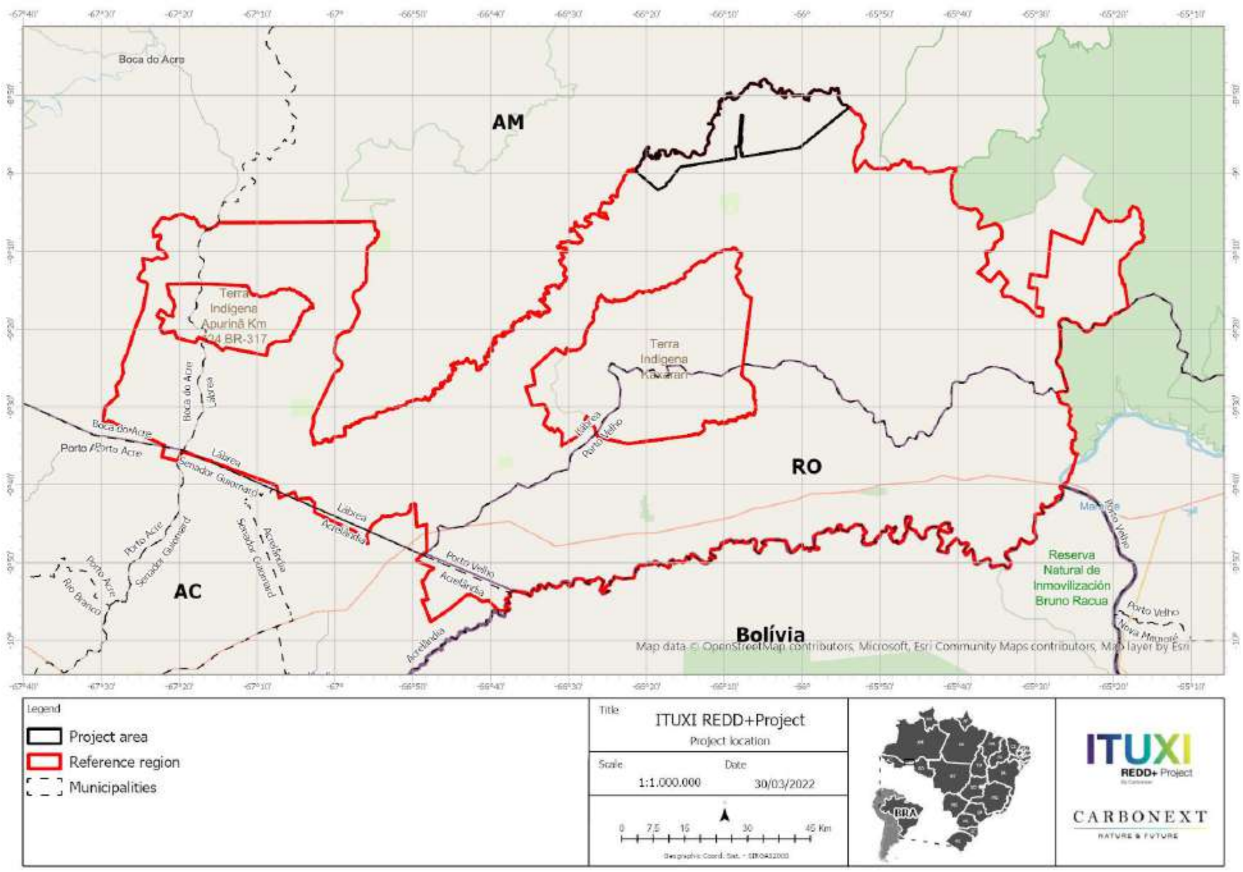

Figure 1 - Map of the project area.

3) Geodetic coordinates of the project area boundary:

Country: Brazil

State: Amazonas

Municipality: Lábrea

The "*Nossa Senhora das Cachoeiras do Ituxi*" farm has its geodetic coordinates officially registered in notary office. The Project Area corresponds to the portion of the property to the South of Ituxi River. The geodetic coordinates (coordinate system: South American Datum) of the Project Area boundary are as follows:

Table 1. The geodetic coordinates.

Vertice ID	LAT	LONG	Vertice ID	LAT	LONG	Vertice ID	LAT	LONG	Vertice ID	LAT	LONG
1	-8.85870	-65.89883	101	-8.95971	-66.29276	201	-8.84031	-66.16231	301	-8.82557	-66.02293
2	-8.94486	-66.00436	102	-8.96361	-66.28925	202	-8.83866	-66.16096	302	-8.82993	-66.02054
3	-8.96510	-66.12978	103	-8.96211	-66.28647	203	-8.83745	-66.15960	303	-8.83395	-66.01881
4	-8.96009	-66.13012	104	-8.96078	-66.28417	204	-8.83676	-66.15827	304	-8.83377	-66.01542
5	-8.95898	-66.12920	105	-8.95773	-66.28213	205	-8.83663	-66.15633	305	-8.83336	-66.01077
6	-8.95862	-66.12783	106	-8.95353	-66.28043	206	-8.83631	-66.15588	306	-8.83272	-66.00182
7	-8.95661	-66.12778	107	-8.94996	-66.27821	207	-8.83560	-66.15588	307	-8.83319	-65.99763
8	-8.95661	-66.12965	108	-8.94923	-66.27528	208	-8.83525	-66.15678	308	-8.83557	-65.99479
9	-8.93641	-66.12987	109	-8.95011	-66.27086	209	-8.83532	-66.15765	309	-8.83834	-65.99523
10	-8.92214	-66.12857	110	-8.95211	-66.26951	210	-8.83422	-66.15838	310	-8.84186	-65.99365
11	-8.92157	-66.13004	111	-8.95328	-66.27168	211	-8.83235	-66.16016	311	-8.84305	-65.98979
12	-8.89642	-66.12852	112	-8.95581	-66.27201	212	-8.83086	-66.16115	312	-8.84376	-65.98526
13	-8.89564	-66.12763	113	-8.95748	-66.26936	213	-8.83026	-66.16027	313	-8.84263	-65.98417
14	-8.89484	-66.12817	114	-8.95541	-66.26578	214	-8.82973	-66.15735	314	-8.83948	-65.98656
15	-8.87612	-66.12647	115	-8.95454	-66.26188	215	-8.82920	-66.15482	315	-8.83684	-65.98841
16	-8.87603	-66.13021	116	-8.95817	-66.25617	216	-8.82787	-66.15462	316	-8.83495	-65.98253
17	-8.94287	-66.13554	117	-8.96286	-66.25116	217	-8.82689	-66.15375	317	-8.82970	-65.98172
18	-8.94287	-66.14259	118	-8.96562	-66.24551	218	-8.82687	-66.15321	318	-8.83050	-65.98476
19	-8.96630	-66.14091	119	-8.96648	-66.23923	219	-8.82771	-66.15250	319	-8.82655	-65.98091
20	-8.96712	-66.14159	120	-8.96020	-66.23723	220	-8.83360	-66.14990	320	-8.82889	-65.98091
21	-8.98645	-66.26031	121	-8.95333	-66.23317	221	-8.83455	-66.14885	321	-8.82889	-65.97929

Vertice ID	LAT	LONG	Vertice ID	LAT	LONG	Vertice ID	LAT	LONG	Vertice ID	LAT	LONG
22	-9.02290	-66.28971	122	-8.95326	-66.23004	222	-8.83455	-66.15067	322	-8.82646	-65.97929
23	-9.02452	-66.29005	123	-8.95905	-66.22328	223	-8.83535	-66.15067	323	-8.82499	-65.97908
24	-9.03580	-66.30837	124	-8.96116	-66.21814	224	-8.83535	-66.15310	324	-8.82300	-65.97660
25	-8.99533	-66.35602	125	-8.95912	-66.21186	225	-8.83455	-66.15310	325	-8.82121	-65.97265
26	-8.98885	-66.35403	126	-8.95723	-66.20776	226	-8.83455	-66.15391	326	-8.82296	-65.96938
27	-8.98435	-66.34964	127	-8.95185	-66.20746	227	-8.83616	-66.15391	327	-8.82227	-65.96337
28	-8.98035	-66.34581	128	-8.95078	-66.20652	228	-8.83616	-66.15472	328	-8.82297	-65.95649
29	-8,97511	-66,34528	129	-8.95134	-66.20473	229	-8.83697	-66.15472	329	-8.82586	-65.95374
30	-8.97098	-66.34257	130	-8.95027	-66.20576	230	-8.83697	-66.15391	330	-8.82784	-65.94739
31	-8.96776	-66.33893	131	-8.95091	-66.20742	231	-8.83778	-66.15391	331	-8.83055	-65.94274
32	-8.96527	-66.33750	132	-8.94812	-66.20737	232	-8.83778	-66.15229	332	-8.83012	-65.94048
33	-8.95918	-66.33810	133	-8.94393	-66.20610	233	-8.83697	-66.15229	333	-8.82340	-65.93945
34	-8.95454	-66.33705	134	-8.94141	-66.20407	234	-8.83697	-66.15148	334	-8.81787	-65.93665
35	-8.94886	-66.33483	135	-8.93825	-66.20124	235	-8.83616	-66.15148	335	-8.82058	-65.93360
36	-8.94597	-66.33306	136	-8.93506	-66.19901	236	-8.83616	-66.15067	336	-8.82291	-65.92872
37	-8.94422	-66.33045	137	-8.92952	-66.20085	237	-8.84021	-66.15067	337	-8.81931	-65.92672
38	-8.94484	-66.32816	138	-8.92558	-66.20097	238	-8.84021	-66.14986	338	-8.81834	-65.92451
39	-8.94661	-66.32870	139	-8.92204	-66.20036	239	-8.84182	-66.14986	339	-8.81970	-65.92289
40	-8.94848	-66.33084	140	-8.91817	-66.19843	240	-8.84182	-66.14744	340	-8.82302	-65.92280
41	-8.94953	-66.33228	141	-8.91360	-66.19630	241	-8.84263	-66.14744	341	-8.82645	-65.92067
42	-8.94958	-66.33283	142	-8.90894	-66.19396	242	-8.84263	-66.14663	342	-8.83348	-65.92239
43	-8.95000	-66.33308	143	-8.90521	-66.19067	243	-8.84344	-66.14663	343	-8.84097	-65.92049

Vertice ID	LAT	LONG
44	-8.95077	-66.33311
45	-8.95112	-66.33286
46	-8.95130	-66.33219
47	-8.95400	-66.33011
48	-8.95500	-66.32987
49	-8.95575	-66.33013
50	-8.95751	-66.33234
51	-8.95851	-66.33267
52	-8.95974	-66.33241
53	-8.96099	-66.33147
54	-8.96186	-66.33012
55	-8.96201	-66.32817
56	-8.96162	-66.32627
57	-8.96111	-66.32435
58	-8.96099	-66.32313
59	-8.96139	-66.32237
60	-8.96237	-66.32163
61	-8.96331	-66.32140
62	-8.96448	-66.32188
63	-8.96486	-66.32246
64	-8.96504	-66.32449
65	-8.96549	-66.32468

Vertice ID	LAT	LONG
144	-8.90120	-66.18951
145	-8.89822	-66.19000
146	-8.89557	-66.19038
147	-8.89455	-66.19161
148	-8.89477	-66.19360
149	-8.89453	-66.19643
150	-8.89426	-66.20004
151	-8.89387	-66.20062
152	-8.89340	-66.20057
153	-8.89311	-66.19949
154	-8.89319	-66.19691
155	-8.89238	-66.19498
156	-8.88931	-66.19319
157	-8.88603	-66.19187
158	-8.88337	-66.19065
159	-8.88023	-66.18839
160	-8.87675	-66.18701
161	-8.87505	-66.18517
162	-8.87378	-66.18445
163	-8.87395	-66.18335
164	-8.87455	-66.18256
165	-8.87461	-66.18080

Vertice ID	LAT	LONG
244	-8.84344	-66.14501
245	-8.84263	-66.14501
246	-8.84263	-66.14420
247	-8.84101	-66.14420
248	-8.84101	-66.14339
249	-8.84182	-66.14339
250	-8.84182	-66.14259
251	-8.84031	-66.14259
252	-8.84039	-66.14088
253	-8.84007	-66.13933
254	-8.83898	-66.13794
255	-8.83603	-66.13625
256	-8.82910	-66.13055
257	-8.82411	-66.12538
258	-8.81944	-66.12222
259	-8.81788	-66.12084
260	-8.81674	-66.11727
261	-8.81413	-66.11558
262	-8.81069	-66.11416
263	-8.80848	-66.11231
264	-8.80794	-66.10929
265	-8.80845	-66.10265

Vertice ID	LAT	LONG
344	-8.84711	-65.91670
345	-8.85210	-65.91306
346	-8.85360	-65.90891
347	-8.85376	-65.90506
348	-8.85723	-65.90144

Vertice ID	LAT	LONG	Vertice ID	LAT	LONG	Vertice ID	LAT	LONG	Vertice ID	LAT	LONG
66	-8,96661	-66,32401	166	-8.87400	-66.17891	266	-8.80997	-66.09515			
67	-8.96869	-66.32171	167	-8.87376	-66.17550	267	-8.81066	-66.09231			
68	-8,96491	-66,31536	168	-8.87293	-66.17741	268	-8.81459	-66.08915			
69	-8.96042	-66.31238	169	-8.87209	-66.17987	269	-8.81512	-66.08693			
70	-8.95842	-66.31276	170	-8.86703	-66.18044	270	-8.81209	-66.08744			
71	-8.95765	-66.31215	171	-8.86256	-66.17912	271	-8.80961	-66.08918			
72	-8.95762	-66.31146	172	-8.86014	-66.17812	272	-8.80676	-66.09042			
73	-8.95898	-66.31041	173	-8.86024	-66.17614	273	-8.80429	-66.08920			
74	-8.96033	-66.30936	174	-8.86126	-66.17458	274	-8.80013	-66.08440			
75	-8.96107	-66.30770	175	-8.85957	-66.17553	275	-8.79814	-66.08069			
76	-8.96141	-66.30672	176	-8.85811	-66.17731	276	-8.79983	-66.07764			
77	-8.96268	-66.30759	177	-8.85658	-66.17793	277	-8.80363	-66.07518			
78	-8.96252	-66.30907	178	-8.85482	-66.17686	278	-8.80696	-66.07225			
79	-8.96196	-66.31036	179	-8.85413	-66.17631	279	-8.80901	-66.06685			
80	-8.96249	-66.31194	180	-8.85467	-66.17503	280	-8.81059	-66.06458			
81	-8.96731	-66.31268	181	-8.85463	-66.17487	281	-8.81363	-66.06428			
82	-8.96873	-66.31247	182	-8.85292	-66.17593	282	-8.81876	-66.06417			
83	-8.96895	-66.31172	183	-8.85132	-66.17693	283	-8.82167	-66.06079			
84	-8.96721	-66.31192	184	-8.84906	-66.17785	284	-8.82567	-66.05632			
85	-8.96534	-66.31150	185	-8.84804	-66.17818	285	-8.82885	-66.05177			
86	-8.96368	-66.31135	186	-8.84688	-66.17772	286	-8.82796	-66.04999			
87	-8.96279	-66.31091	187	-8.84614	-66.17668	287	-8.82172	-66.04789			

Vertice ID	LAT	LONG
88	-8.96339	-66.30927
89	-8.96502	-66.30680
90	-8.96871	-66.30742
91	-8.96592	-66.30597
92	-8.96405	-66.30547
93	-8.96295	-66.30428
94	-8.96193	-66.30321
95	-8.96046	-66.30300
96	-8.95908	-66.30343
97	-8.95822	-66.30488
98	-8.95217	-66.30715
99	-8.95142	-66.30701
100	-8.95144	-66.29345

Vertice ID	LAT	LONG
188	-8.84628	-66.17582
189	-8.84705	-66.17455
190	-8.84699	-66.17399
191	-8.84581	-66.17372
192	-8.84573	-66.17262
193	-8.84442	-66.17226
194	-8.84288	-66.17253
195	-8.84165	-66.17281
196	-8.84110	-66.17256
197	-8.84066	-66.17161
198	-8.84193	-66.16608
199	-8.84147	-66.16461
200	-8.84143	-66.16344

Vertice ID	LAT	LONG
288	-8.81859	-66.04391
289	-8.81866	-66.04217
290	-8.82419	-66.04187
291	-8.83012	-66.04289
292	-8.83326	-66.04302
293	-8.83709	-66.03816
294	-8.83870	-66.03559
295	-8.83495	-66.03448
296	-8.83015	-66.03555
297	-8.82747	-66.03603
298	-8.82660	-66.03552
299	-8.82255	-66.02905
300	-8.82249	-66.02658

Vertice ID	LAT	LONG

3) Total size of the project area: 46,159 ha

4) Details of ownership: Private land: Landowner: Ricardo Stoppe Junior

The entire Project Area is under the control of the project proponent at the time of verification.

a) According to the rural property documentation and project design, it is demonstrated that the project will not encroach uninvited on private property, community property, or government property. It is also demonstrated that project activities do not lead to involuntary removal or relocation of Property Rights Holders from their lands or territories and does not force them to relocate activities important to their culture or livelihood.

b) No property rights are affected by this project activity.

c) No restitution or compensation is owed to any parties, given that no other lands have been or will be affected by this project in terms of land tenure and property rights.

1.8 Title and Reference of Methodology

Approved VCS Methodology VM0015 "Methodology for Avoided Unplanned Deforestation", Version 1.1, 3 December 2012. At: https://verra.org/methodology/vm0015-methodology-for-avoided-unplanned-deforestation-v1-1/ (last visited in 27/01/2022)

VT0001 "Tool for the demonstration and assessment of additionality in VCS agriculture, forestry and other land use (AFOLU) project activities", Version 3.0, 1 February 2012. At: https://verra.org/methodology/vt0001-tool-for-the-demonstration-and-assessment-of-additionality-in-vcs-agriculture-forestry-and-other-land-use-afolu-project-activities-v3-0/ (last visited in 27/01/2022)

AFOLU "Non-Permanence Risk Tool", VCS Version 4, 19 September 2019, v4.0. At: https://verra.org/project/vcs-program/rules-and-requirements/ (last visited in 27/01/2022)

CDM – Executive Board "Tool for testing significance of GHG emissions in A/R CDM project activities (Version 01)" EB 31. At: https://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-04-v1.pdf (last visited in 25/01/2022)

1.9 Participation under other GHG Programs

Not applicable: the project is not engaged in other emissions trading programs and the host country has no binding limits on GHG emissions.

The project neither has nor intends to generate any other form of GHG-related environmental credit for GHG emission reductions or removals claimed under the VCS Program. The VCS Program has a central project database, which lists each approved project. The VCS Project Database is the central storehouse of information on all projects validated to VCS criteria and all Verified Carbon Units issued under the program. Every VCU can be tracked from issuance to retirement in the database, allowing buyers to ensure every credit is real, additional, permanent, independently verified, uniquely numbered and fully traceable online. This project has not been registered in any other credited activity, and no VCUs have been assigned to the project area so far. Thus, any possibility of double counting of credits is eliminated.

The project has not been registered, and it is not seeking registration under any other GHG programs.

This project has not been rejected under any other GHG program.

1.10 Other Forms of Credit

Not applicable: the project is not involved in other Emission Trading Programs, other Binding Limits or other Forms of Environmental Credit.

1.11 Sustainable Development Contributions

The MacroZEE/AL (Macrozoneamento Ecológico-Econômico da Amazônia Legal; Ecological and Economic Macro-zoning of Amazon) of the Brazilian Ministry of Environment, which encompasses the Project Area established the strategic zone for "Containment of the expansion fronts with protected areas and alternative uses"[1]. The MacroZEE/AL aims to define strategic indications of occupation and use of land on a sustainable basis to guide, at the regional scale, the development and spatial distribution of public development policies, territorial and environmental planning, as well as the decisions of private agents. Due to its shield function for the heart forest protection, this territorial unit deserves strengthening policies. In this context, the FORTALEZA ITUXI REDD PROJECT converges with the strategies set up by the MacroZEE/AL of the Brazilian Ministry of Environment.

Due to the increase in deforestation across the Legal Amazon, the Action Plan for the Prevention and Control of Deforestation in the Legal Amazon (PPCDAm; Plano de Ação para a Prevenção e Controle do Desmatamento na Amazônia Legal) came into effect, starting ongoing actions to mitigate and to reduce deforestation. PRODES[2] indicates that in 2021 Lábrea municipality had the fourth highest municipal deforestation rate in Brazil, and that the 2021 rate made an unprecedented jump to 4.52%, up from 3.65% in 2020. In this context, the Fortaleza Ituxi REDD Project continues to be highly relevant in the context of PPCDAm premises, as it has been since the project start.

At the international level, Brazil made it official at COP 26, in November 2021, that the country's goal is to zero deforestation by 2028, to increase to 50% the goal of reducing greenhouse gas emissions by 2030, and to reduce by 30% its methane emissions in the atmosphere[3]. At this COP, the Glasgow Climate Pact was signed, which reinforced the parties' commitments to keep global heating below the 1.5°C

[1] (MMA 2010) P.114: https://www.amazonia.cnptia.embrapa.br/publicacoes_estados/Amazonia%20Legal/MacroZEE-AML.pdf
[2] http://terrabrasilis.dpi.inpe.br/app/dashboard/deforestation/biomes/legal_amazon/increments
[3] https://portal.fgv.br/artigos/quem-e-brasil-cop-26

limit.[4] Another important decision taken was the authorization of the global carbon market, which means that countries will be able to exchange carbon credits among themselves, favouring Brazil given that it houses the vast majority of the Amazon rainforest.[5] To attain these goals, an essential component will be to ally government and private initiatives, such as that proposed within the present project.

The Fortaleza Ituxi REDD Project project therefore represents significant potential to assist the Federal and State administrations to attain these goals and leverage pilot REDD projects at the municipal level, ensuring priority for the municipalities facing a critical deforestation threat, as in the case in Lábrea and Porto Velho's districts of Nova Califórnia and Extrema. This is particularly true if taken in the context of Ituxi being the first of three projects in the region by the same owner/ proponent:

Since the beginning of the project, deforestation avoided by the project is estimated at 2,681.8 hectares. Moreover, the Project Proponent has recruited 15 neighbouring properties to take part in a new REDD Project, totaling 99,035.20 hectares of protected forest in Lábrea. This is the Unitor REDD+ project, which is currently being validated by VERRA.

he SDGs - Sustainable Development Goals are a campaign of the UN, the United Nations Organization, to promote positive changes in the world of the future. The SDGs seek to promote urgent measures to guarantee the 17 goals proposed in this sustainable agenda of the UN by conserving natural resources, combating climate change, and adopting more sustainable production and consumption practices. The SDGs are central to Brazil's 2030 Agenda and poverty can be the main mission for all internal or external initiatives, programs, projects and activities, including REDD+ projects.

The Ituxi REDD+ Project is aligned with Brazil's commitments to the UN Sustainable Development Goals (SDGs)[6]. Progress is being made towards meeting the targets of the following SDGs, aimed to be met by 2030: (1) No poverty; (13) climate action and (15) life on land ecosystems. Table 2 below shows the quantifiable contributions of the project to specific targets and indicators of the Sustainable Development Goals (SDGs) over the present monitoring period. Details of the actions are described in 3*.1 Project Activity Implementation Status* and further evidence was presented at audit.

[4] https://idesam.org/opiniao/cop26-entre-erros-e-acertos/
[5] https://idesam.org/opiniao/cop26-entre-erros-e-acertos/
[6] https://odsbrasil.gov.br/

Table 3 - Sustainable Development Contributions.

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	1.1	Total official development assistance grants from all donors that focus on poverty reduction as a share of the recipient country's gross national income	Implemented activities to increase	Action to encourage donations from local entrepreneurs for the most vulnerable families with the distribution of 508 food kits with a total invested amount of R$253,030.00[7].	Total amount of investments in actions for communities and/or socially vulnerable residents of R$253,030.00.
2)	13.0	Tonnes of greenhouse gas emissions avoided or removed	Implemented activities to increase	This project has prevented the release of 193,376 tCO_2 into the atmosphere during the monitoring period (MR3)	Prevent the release of 1,570,705 tCO_2 tonnes of carbon into the atmosphere.
3)	15.1	Forest area as a proportion of total land area	Implemented activities to increase	Avoiding deforestation of 243.3[8] hectares for MR3	Avoiding deforestation of 2,719.7 hectares (MR1: 1,992.3 ha; MR2: 484.2 ha; MR3: 243.3 ha)[9].

[7] Source: Average of R$478.05 and R$518.21 from the nearby locations of Aracajú and Salvador https://www.dieese.org.br/analisecestabasica/2021/202112cestabasica.pdf

[8] As described in Sections 3.2.2 Project Description Deviation and 5.4 Net GHG Emission Reductions and Removals, the value of deforestation projection in 2021 was updated, reducing 3.90 ha. For this monitoring period (01/01/2020 to 26/12/2021), the final value of avoided deforestation is 239.4 ha.

[9] As described in Sections 3.2.2 Project Description Deviation and 5.4 Net GHG Emission Reductions and Removals, the deforestation projections were updated, reducing by 38.00 ha since start date. .

4)		Progress towards Sustainable Forest Management		No contribution within the present MR	The Project is predicted to carry out 7,636.6 ha of Sustainable Forest Management within its project lifetime.

2 SAFEGUARDS

2.2 No Net Harm

The project activities do not cause any potential negative offsite stakeholder impacts. The project does not result in net negative impacts on the wellbeing of other stakeholder groups.

In order to mitigate any negative impact and understand the needs of the community, a communication channel has been established for stakeholders to express their concerns and to solve potential conflicts and grievances that may arise during the project. This aspect is fully explained under item *4.3 Monitoring Plan.* In this context, community needs are heard through conversations during meetings and lectures, where the property secretary and spokeswoman Ganete Eloi asks direct questions or asks community members to write in if they feel more comfortable. In addition, the Project Proponent has a direct communication channel via WhatsApp with all stakeholders in the region.

Monitoring activities of the working conditions (internal audits for health and safety assessments, nutritional aspects, personal care and hygiene, etc.) are being carried out on a bimonthly basis, as described under 3.1. All situations and occupations that may arise through the implementation of the project and that pose a risk to the safety of the workers will be thoroughly evaluated.

2.3 Local Stakeholder Consultation

The process of identifying and involving local stakeholders is as described in item 5.3 Local Stakeholder Consultation of the Project Description. The main actions and procedures related to ongoing public consultation are presented below.

Table 4 - Public Consultation Activities.

Ongoing public consultation activities	Date
Health and Security internal audits	May/2020
Advice on nutritional aspects	November/2020
Advice on nutritional aspects and Health internal audits	April/2021

Ongoing public consultation activities	Date
Health internal audits and Advice on personal care and hygiene	July/2021
Visit to the traditional community of Boca do Querequete	October/2021
Health internal audits and Advice on personal care and hygiene	November/2021
Institutional Public Consultation	February/2022*

*This activity took place after the monitoring period, however, it was included in this MR as it presented the main results between 2020 and 2021 to Institutional Stakeholders.

Local Stakeholders

According to database surveys and the structure of activities foreseen in the project, the following list of stakeholders has been established, with the respective distances between PA:

- Lábrea City Hall (237 km)
- Porto Velho City Hall (districts of Nova Califórnia and Extrema) (249 km)
- Municipal Secretariat of Education of Lábrea (237 km)
- Municipal Secretariat of Education of Porto Velho (districts of Nova Califórnia and Extrema) (90 km)
- SEMA - AM (Amazonas State Secretariat of Environment) (940 km)
- Extractive Reserve (RESEX) of “Ituxi” (40 km)
- National Forest (FLONA) of “Iquiri” (1 km)
- National Park (PARNA) of “Mapinguari” (50 km)
- Community leaders of Kaxarari Indigenous Land (80 km)
- IFAM (Federal Institute of Science and Technology; Campus Lábrea) (237 km)

The Conservation Units and Indigenous Territories closest to the project, according to the list of stakeholders, are shown in the Figure below.

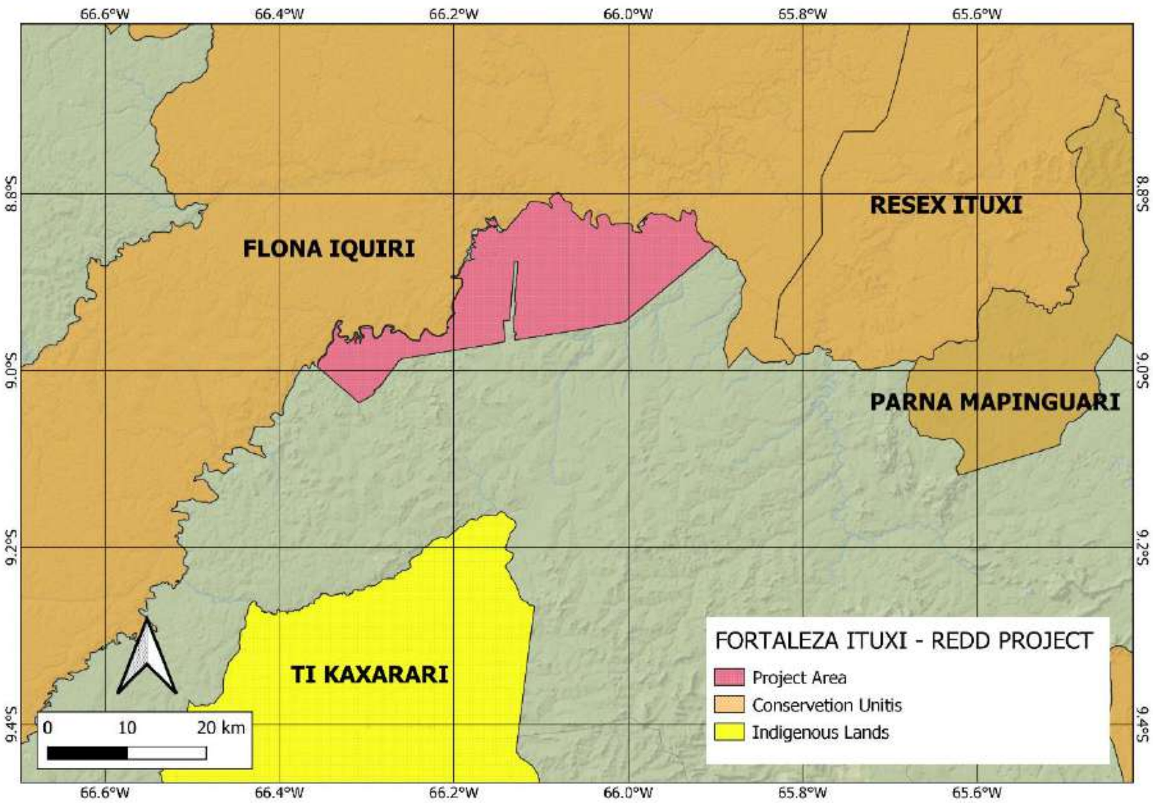

Figure 2 - Closest conservation units and indigenous lands.

The full project documentation was made accessible to Communities and Other Stakeholders at the beginning of the project.

The ongoing communication with local stakeholders is conducted with the provision of an updated executive summary of the status of the project in Portuguese, presenting the details of the activities already carried out, the benefits obtained and the expected objectives.

Contact is made by telephone and e-mail, where the proponent makes himself available to present more details and receive suggestions, as well as proposals for partnerships.

No complaints or suggestions were presented by these stakeholders during the present monitoring period.

The "*Nossa Senhora das Cachoeiras do Rio Ituxi*" property was impacted by the creation of a federal Conservation Unit (Floresta Nacional; National Forest) to the north of the Iquiri River. The project proponent and landowner started a legal process to recover the rights of land use, and succeeded, the documentation relating to which was presented at audit. Nevertheless, the proponent has decided to keep this area out of the project scope, for the present.

In response to the Local Stakeholder Consultation, ICMBio (Instituto Chico Mendes de Conservação da Biodiversidade) voiced concerns about the location of the project activity, as a portion of the property overlaps with the Iquiri National Forest (FLONA), while the VCS Project Area does not. The project proponent provided explanations regarding the project, as well as the full project documentation for consultation. On this occasion, the project proponent elucidated that the Project Area is located outside the FLONA area, and no negative impact is expected to occur in relation to the activities of this federal Conservation Unit.

The project proponent presented the main project results obtained up to the present monitoring period to ICMBio, however no response was from the Institute was received.

The public comment period was held in 2019 for the validation of the project. The comments and responses are available in the Project Description Section *5.4 Public Comments*.

Traditional communities

As identified in the Project Description, wild harvesting communities interact with the Project Area. These communities have been identified and an initial socioeconomic questionnaire applied, in order to identify best means to involve and integrate this population with the project. These actions are foreseen to occur in the next monitoring period.

In October 2021, a visit to the traditional community of Boca do Querequete was carried out in order to identify possible activities of community benefit to which the project can contribute. The community was not identified as a stakeholder in the Project Description due to distance, however, we are prospecting for possible benefits from the project. The community is located approximately 166 km of river distance, which corresponds to about eleven hours away by boat from the Project Area, however they are the nearest community eligible to be benefited, and be benefitted, by the project.

Figure 3 - Community of Boca do Querequete.

Employees and neighbours

The Project Proponent actively works to raise awareness and involve employees and neighbours, through meetings and training. The employees live within the Project Area and the neighbors are from the farms surrounding the area. On these occasions, the main needs of these stakeholders are raised in order to guide efforts to improve the quality of life and coexistence. A good relationship helps to improve these stakeholders' commitment to combating deforestation.

Figure 4 - Meeting with employees and neighbors.

Communication channel

A communication channel has been established with the project communities and other stakeholders to better explain the project activities and to respond to stakeholders' questions and concerns related to the project.

Any complaint received by the proponent in person, by phone, email, or mobile apps, among other channels, are dealt with in accordance with the procedures set out in the Project Description.

The process for receiving, hearing, responding to and resolving grievances are to be performed within a reasonable time period. It is expected that each grievance is responded to within a period of 7 days, including proposing and/or taking corrective actions. This feedback and grievance redress procedure has three stages:

First: the Project Proponent shall attempt to amicably resolve all Grievances, and provide a written response to the grievances in a manner that is culturally appropriate. (Action must be taken in 7 days).

Second: any grievances that are not resolved by amicable negotiations shall be referred to mediation by a neutral third party. (Action must be taken in 30 days)

Third: any grievances that are not resolved through mediation shall be referred either to a) arbitration, to the extent allowed by the laws of the relevant jurisdiction or b) competent courts in the relevant jurisdiction, without prejudice to a party's ability to submit the grievance to an appropriate legal body of the responsible jurisdiction (the time to complete this stage is dependent on jurisdiction deadlines).

Within this monitoring period, no grievance was received by the project proponent.

2.4 AFOLU-Specific Safeguards

The project proponent maintains continuous contact with neighbouring landowners in order to encourage them to avoid deforestation and implement sustainable practices.

One of the results was the creation of the Unitor REDD+ Project during the monitoring period, currently in the final approval phases by VERRA, which aims to protect approximately 100,000 hectares of forests in the Reference Region of Fortaleza Ituxi Project.

When the Project Description was prepared, there was a dispute with the Brazilian government over the use rights to part of the Ituxi property, due to its partial overlap with a Conservation Unit. The situation was considered as a possible non-permanence risk, therefore this part of the property was not included in the Project Area.

In December 2021, the Brazilian court decided to return all rights of use to the proponent, performing its activities in accordance with environmental legislation, according to the documentation made available at audit.

In addition to the continuous contact with neighbouring landowners and with ICMBio, the project proponent communicated with other stakeholders to present the main results and to request contributions, as presented in section *2.3*. There were no responses that could constitute conflicts or negative impacts.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

Deforestation prevention

The start of the implementation of Forest Management Plan is regarded as the first operation of the present Project Activity. Equipment for Forest Management was placed in the Project Area and the first activities for preliminary operational studies were performed as of 15/12/2013. The presence of Forest Management workers is the first factor to combat trespassing inside the Project Area. Coupled with Sustainable Forest Management, the project activity contracted[10] a private individual, who resides in the PA, to conduct surveillance and further invasions into the Project Area. However, as explained in item *5.2 Project Emissions,* during the present monitoring period, no timber harvesting occurred within the context of the project's Forest Management Plan.

In November 2020, a new surveillance post was implemented in the project area with the aim of improving the structure for employees to carry out activities in remote areas.

Figure 5. New surveillance post built in November 2020.

[10] File "Contrato Prestação de Serviço" available for audit.

The project proponent implemented training sessions to farm collaborators on environmental awareness and keeps a trained fire brigade team. Furthermore, the project proponent also made efforts to disseminate the project activity to neighbouring landowners and their collaborators, as shown in item *2.2 Local Stakeholder Consultation.*

Across the entire monitoring period covered by this report, project staff has guaranteed the surveillance of the project area borders and supervised the activities within the property. Surveillance is carried out by land, river and air. Any illegal deforestation activity or fire outbreak is recorded for immediate action to be taken. Employees take photographs and record geographic coordinates for easy identification.

Table 5 - Surveillance activities during the monitoring period.

Surveillance activities	Date
Air monitoring	October/2020
Air monitoring	November/2020
Ground monitoring	June/2021
Air monitoring	August/2021
River monitoring	September/2021
Air monitoring	September/2021
Air monitoring	October/2021
River monitoring	November/2021

Figure 6 - Surveillance conduced by river and air in 2021.

Ituxi's Adaptative Management Plan is in place, having the aim of reducing risks of fire and related trespassing. In 2019, 6 workers were trained within the "Fire Brigade Training Course". This activity is scheduled to occur every 5 years, according to the Monitoring Plan (see section *4.3 of Project Descrition*).

In September 2021, a fire from a neighbouring property reached a forested area within the Fazenda Nossa Senhora das Cachoeiras do Ituxi property. The fire brigade was called, and immediately applied firebreaking techniques, with the thinning of vegetation around the fire and application of water with anti-fire pump equipment.

The fire was contained without causing significant damage to the vegetation of the Fazenda Nossa Senhora das Cachoeiras do Ituxi.

Figure 7 - Action of the fire brigade in August 2021

Communities

According to the work proposal described in in item "*1.8 Description of the Project Activity*" of the Project Description document, for this monitoring period - 01/01/2020 to 12/26/2021, corresponding to the eighth and ninth year of the project - the following social activities were planned: Health internal audits; Security internal audits; Advice on nutritional aspects; Advice on personal care and hygiene; Monitoring the attendance in schools; and Dissemination of forest conservation practices. Of these, all except for the items "Monitoring the attendance in schools" and "Dissemination of forest conservation practices" were completed according to the expected schedule. The justification for this is described below.

The item "Monitoring the attendance in schools" planned in the Project Description document was not completed, for this monitoring period, because there are no children residing permanently within the Project Area. According to Ganete Eloi, most of the young people stay in the communities only during the vacation period and are therefore temporary. Given this current scenario and that no changes are expected, the project proponent is considering the logistical replanning of this activity. These changes will be reported in the next Monitoring Report.

The activities related to "Dissemination of forest conservation practices" planned in the Project Description document for community and biodiversity (described below), were not carried out for this monitoring period due to the critical situation of the pandemic in Brazil, especially in the northern region of the country. Given the high rates of cases and mortality from COVID-19 in the state of Amazonas, the project proponent suspended the hiring of specialists as well as transport of staff to carry out the activities related to the activity. Thus, during this period, activities in the health area were prioritized, as shown in the table below and the figures at the end of this section. With the stabilization of this national and global problem, the activities corresponding to this parameter are planned for the year 2022, and the results will be presented in the next Monitoring Report.

The table below presents a description for each of the activities carried out, as well as the number of participants and related indicators. More information on the activities can also be seen in item "*1.11 Sustainable Development Contributions*" of this document”.

Table 6 - Description of the social activities carried out during the monitoring period.

Parameter	Activity Description	Date	Frequency	Nº participants
Health and Security internal audits	Talk explaining about personal hygiene, STIs and venomous animals, and healthy eating	17/05/2020	Bimonthly	14
Advice on nutritional aspects	Workshop on nutrition and home gardening	10/11/2020	Bimonthly	20
Advice on nutritional aspects and Health internal audits	Talk explaining about personal hygiene, STIs and venomous animals, and healthy eating	02/04/2021	Bimonthly	18
Health internal audits and Advice on personal care and hygiene	Talk about COVID, STIs and venomous animals, and healthy habits	08/07/2021	Bimonthly	26
Health internal audits and Advice on personal care and hygiene	Lecture explaining about Pink October and Blue November (information about breast and prostate cancer)	01/11/2021	Bimonthly	36

Biodiversity

A Biomass, Fauna and Biodiversity Inventory was conducted in August 2020 by a private company hired by the Project Proponent. According to the survey, the project provides protection for an estimated 250 species of birds, 10 species of amphibians, 16 species of reptiles, and 40 species of mammals identified in the region, including species with some level of extinction threat. Examples are the jaguar (*Pantera onca*), the giant otter (*Pteronura brasiliensis*), the giant anteater (*Myrmecophaga tridactyla*) and the giant armadillo (*Priodontes maximus*).

The table below presents all the species and taxa identified by the biodiversity inventory in the PA under some level of threat. The classification considers the categories of extinction threat according to the lists of the International Union for Conservation of Nature (IUCN 2020) and the Red Book of the Brazilian Fauna Threatened with Extinction (ICMBio 2018).

Table 7 – Project Area species with respective levels of extinction threat.

Taxon	Popular name	Level of threat	
		IUCN	MMA
Podocnemididae Cope, 1888			
Podocnemis unifilis Troschel, 1848	tracajá	VU	NT
Ramphastidae Vigors, 1825			
Ramphastos vitellinus Lichtenstein, 1823	Channel-billed Toucan	VU	-
Psittacidae Rafinesque, 1815			
Pionites leucogaster (Kuhl, 1820)	Green-thighed Parrot	EN	-
Felidae Fischer von Waldheim, 1817			
Panthera onca (Linnaeus, 1758)	Jaguar	NT	VU
Puma concolor (Linnaeus, 1771)	Puma	LC	VU
Puma yagouaroundi (Geoffroy, 1803)	Jaguarundi	LC	VU
Mustelidae Fischer von Waldheim, 1817			
Pteronura brasiliensis (Gmelin, 1788)	Giant Otter	EN	VU
Dasypodidae Gray, 1821			
Priodontes maximus (Kerr, 1792)	Giant Armadillo	VU	VU
Myrmecophagidae Gray, 1825			
Myrmecophaga tridactyla Linnaeus, 1758	Giant Anteater	VU	VU
Tapiridae Gray, 1821			
Tapirus terrestris (Linnaeus, 1758)	Lowland Tapir	VU	VU
Cervidae Goldfuss, 1820			
Ozotoceros bezoarticus (Linnaeus, 1758)	Pampas Deer	NT	VU
Tayassuidae Palmer, 1897			
Tayassu pecari (Link, 1795)	White-lipped Peccary	VU	VU
Iniidae Gray, 1846			
Inia geoffrensis (de Blainville, 1817)	Amazon River Dolphin	EN	EN

Atelidae Gray, 1825			
Lagothrix cana (E. Geoffroy, 1812)	Common Woolly Monkey	VU	EN
Ateles chamek (Humboldt, 1812)	Black-faced Black Spider Monkey	EN	VU

For the Survey on High Conservation Areas, High Conservation Values (HCVs) were defined according to the "General Guide to Identifying High Conservation Values"[11] relating to the region's biodiversity and communities. The definitions of HCVs consider a classified biological, ecological, social or cultural value of exceptional or critical importance, which can be classified into different categories.

Regarding the biodiversity factor, HCV 1 and HCV 3 were identified as critical points for this project. HCV 1 describes levels of biodiversity, including endemic species and rare, threatened or endangered species, while HCV 3 covers rare, threatened or endangered ecosystems, habitats or refugia. As to the communities' factor, HCV 5 was identified in the vicinity of the Project Area, relating to forest wild-harvesting activities. This indicator refers to places and resources that are fundamental to the basic needs of traditional communities, such as livelihoods, health and nutrition. Beyond, the selection of HCV 6, related to cultural values of special cultural, spiritual, archaeological or historical significance to the traditional culture of local communities considered historical monuments within the ITUXI Fortal Farm that are known and visited by local people.

The following table shows the HCVs defined for the ITUXI REDD+ Project, displaying their respective qualitative attributes and focal points for this project. Following it are some photographic records of the social and biodiversity activities carried out during this monitoring period.

[11] https://hcvnetwork.org/wp-content/uploads/2021/12/HCVCommonGuide_portuguese_IFL2018.pdf

High Conservation Value	Qualifying Attribute	Focal Area
HCV 1: Species diversity	The Amazon Forest ecosystems comprise the largest and richest forest in the world in terms of biodiversity[12]. In the Amazon Rainforest it is estimated that 183 species of animals are threatened with extinction, 122 of which are endemic to this biome[13]. According to the biodiversity inventory carried out in the REDD ITUXI project area, among the 316 registered species 12 have been classified to some degree of threat, beyond groups endemic to the hydromorphic basin.	It is necessary to conserve and protect in totality the current vegetation in the project area (46.159,68 ha) and maintaining constant monitoring to protect it from illegal exploration and degradation.
HCV 2: Ecosystems and mosaics at the landscape level and Intact Forest Landscapes	The closest conservation units to the Project Area are the National Forest (FLONA) of "Iquiri" (limit with the project), the Extractive Reserve (RESEX) of "Ituxi" (10km), and the National Park (PARNA) of Mapinguari" (30km). The presence of a protected area most often alerts to potential HCVs, as they harbour significant concentrations of biodiversity values[14]. According to the Flona de Iquiri Management Plan[15], 122 mammal species, 454 bird species, 170 amphibian species, 179 reptile species, and 494 fish species are observed within the area, with the presence of threatened, endemic and endangered species.	The conservation of areas near protected areas, especially for the Iquiri FLONA, can contribute to the maintenance of the biodiversity of these sites.
HCV 5: Community Needs	As better described in the item 2.3 Local Stakeholder Consultation, the project area has traditional communities thatbenefit directly from the basic survival resources in the area and close to the Project Area, as well as communities that benefit from wild harvesting, such as the as the "Boca do Querequete Communitie". In the harvest season, the members of this community harvest chestnuts from within the ITUXI area for commercialization as a source of income. In addition, the residents of the project area harvest chestnuts and açai for their own consumption.	The protection of the project area directly impacts the quality of life and the basic needs of local communities in terms of livelihood, health, nutrition, water, among others.

[12] https://www.scielo.br/j/po/a/pKpnpz8VRnLhRtfPCdZd5Ds/?format=pdf&lang=pt
[13] http://cienciaecultura.bvs.br/pdf/cic/v70n1/v70n1a15.pdf
[14] https://hcvnetwork.org/wp-content/uploads/2021/12/HCVCommonGuide_portuguese_IFL2018.pdf
[15] https://www.icmbio.gov.br/portal/images/stories/plano-de-manejo/plano_manejo_flona_do_iquiri.pdf

HVC 6: Cultural Values	The region of Fazenda Fortaleza has a number of monuments such as a ship, train parts, and graves dating back to 1905. Residents of the region and even families from surrounding towns visit the site, especially the tombs because of the stories of cultural and spiritual values.	Protecting elements that are part of the culture and beliefs of the residents of the ITUXI Farm region contributes to the preservation of history, as well as the well-being and values of the communities involved.

Figure 8 - Health, Security, Nutritional, Personal Care and Hygiene Advising – April/2020.

Figure 9 - Health and Security Audits – April/2020

Figure 10 - Fauna Inventory - August/2020.

Figure 11 - Home garden course - November/2020.

Figure 12 - Donation of basic food kits for communities – March 2021

Figure 13 - Health habits, COVID-19 and venomous animals advising – July/2021.

Figure 14 - Prevention of prostate and breast cancer advice – November/2021.

3.1.1.1 Activities planned for the next monitoring period

For the next monitoring report, we are reviewing the schedule of activities that no longer make sense for the community and also carrying out a survey of the demands that have arisen. This way, the welfare of the community and the workers will be improved.

Below is a table with the actions that are already organized and/or being developed, which will be better described and highlighted in the next monitoring report.

Table 8 - Description of the social activities planned for the next monitoring period

Activity	Description
Training on forest management	Training on "what are environmental conservation areas and their importance for the environment"
	Training on "Impacts of fire and illegal deforestation"
	Training on "Recycling and environmental problems caused by garbage"
	Training on "Importance of biodiversity; impacts of hunting and fishing of endangered animals"
Training on sustainable cattle raising	Sustainable cattle ranching training for workers within and surrounding the Project Area for residents and neighbours
Dissemination of forest conservation practices	Training on Sustainable Forest Management
Internal health audits	Training on "Personal Hygiene"
	Training on "Healthy Eating"
Internal security audits	The themes of these activities are being developed

3.2 Deviations

3.2.1 Methodology Deviations

As described in the Project Document there is a methodology deviation relating to the use of biomass data. This deviation is maintained in the present monitoring report. The PD citation is as follows:

The use of secondary biomass data for estimation of avoided emissions is permitted by the methodology VM0015. However, this methodology mentions the use of biomass inventory data obtained for less than 10 years. As a methodology deviation, the project proponent used biomass inventory data older than 10 years. This deviation might be justified by the fact that forest biomass in the Amazon Biome is increasing, as stated in scientific literature[16] [17], which implies more conservative data (i.e. lower biomass estimates) in older inventories, compared with newer inventories. The project proponent opted for using the scientific study made by Cummings et al. (2002), which was considered as a reliable source of information by the validation audit team, whose data have been derived from multiple inventory parcels, installed in the forest class similar to that observed in the Project Area. The proponent is adopting a methodological deviation to use these forest inventory data, justifying that the authors sampled areas very near the Project Area, inside the forest type that represents the vegetation inside the Project Area, which was

[16] Baker, T.R. et al. (2004). Increasing biomass in Amazonian forest plots. Phil. Trans. R. Soc. Lond. B (2004) 359, 353-365. DOI 10.1098/rstb.2003.1422

[17] Phillips, O.L. et al. (1998). Changes in the Carbon Balance of Tropical Forests: Evidence from Long-Term Plots. SCIENCE VOL 282 16, 439-442.

published 11 years prior to the project start date. In this case, it can be assumed that the methodological deviation corresponds to 1 year, given that, according to VM0015, data should be published from 2003 (10 years before the project start date), to be eligible in conformity with the methodology without deviations. Thus, considering that 6 parcels were taken from inventory measurements made by Cummings et al. (2002) (which are the closest to the Project Area as shown by coordinates, in addition to represent the same type of vegetation), the proponent used the standard deviation among these parcels, for determining the 90% confidence interval, for uncertainty analysis.

3.2.2 Project Description Deviations

3.2.2.1 Project Area Boundary Improvement

Through analysis of Landsat 8 satellite imagery from July 17, 2013, a number of minor adjustments to the area of the PA identified in the PD were made. In summary, these were: rocky outcrops (327.8 ha), the property's headquarters (5.7 ha), the borders of the river (16.75 ha), and the frontiers of the Ramal do Boi road (82.1 ha).

Rocky outcrops which had previously been classified as Project Area, totaling 327.8 ha, were identified. These areas were detected as *non-forest* in the present Monitoring Report and removed from the total Project Area. The image and the polygons of the outcrops were provided to the auditors as evidence.

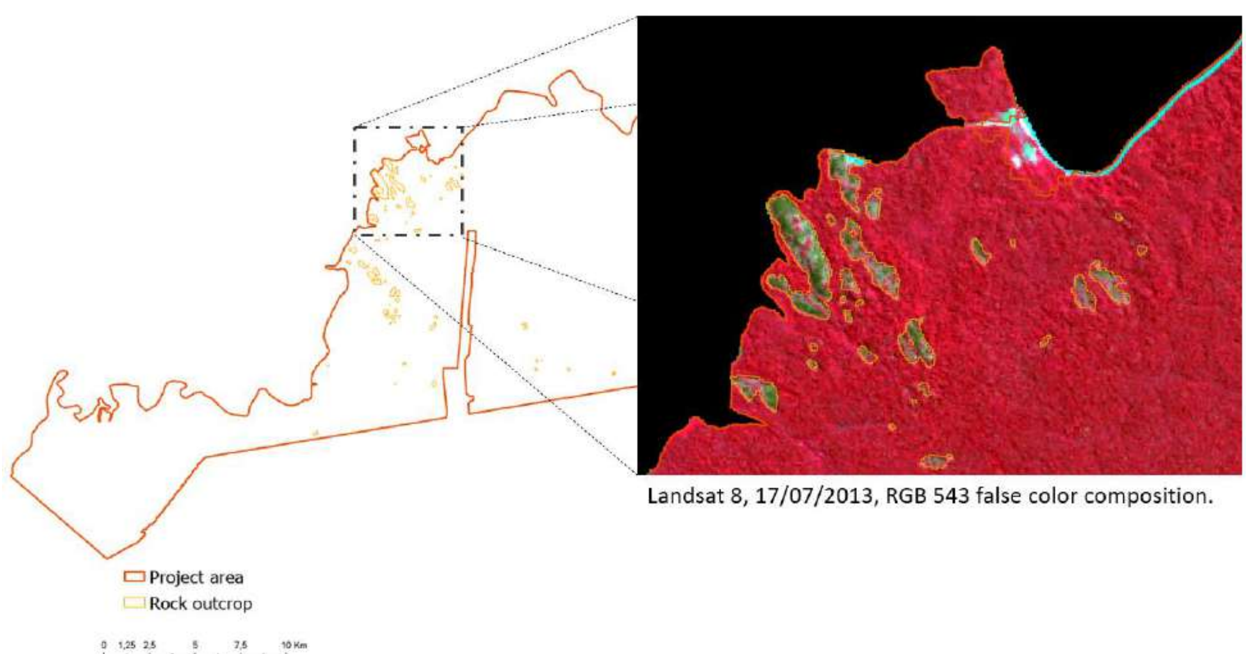

Figure 15 - Occurrence of quarries (rock outcrops) encompassed as Project Area.

Secondly, there was a misunderstanding regarding areas deforested before the start date in the region of the Ramal do Boi road. As can be seen in the same Landsat 8 image from July 17, 2013, the PA boundary encompassed areas that had no forest cover. This error occurred due to a layer projection issue, so the files are being updated with the relocation of the Project Area boundaries so that it does not include non-forested areas. This reallocation resulted in a reduction of 82.1 ha of Project Area.

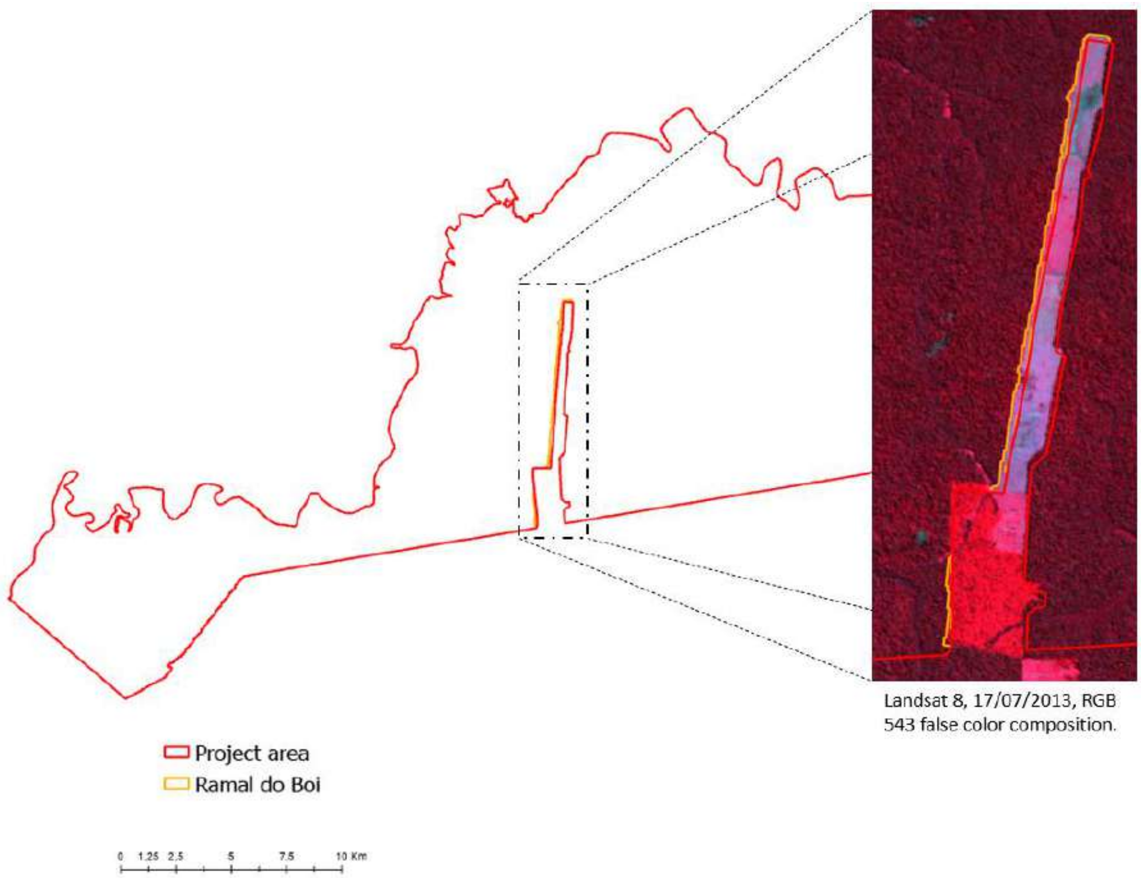

Figure 16 - Areas deforested before the start date in the region along the Ramal do Boi.

Thirdly, an error identified in the delimitation of the Project Area concerns areas deforested before the start date in the region of the property headquarters. As can be seen via the same Landsat 8 image from July 17, 2013, the Project Area boundary encompassed areas that had no forest cover and that were detected as deforestation in this MR, but were subsequently removed from PA, totaling 5.7 ha.

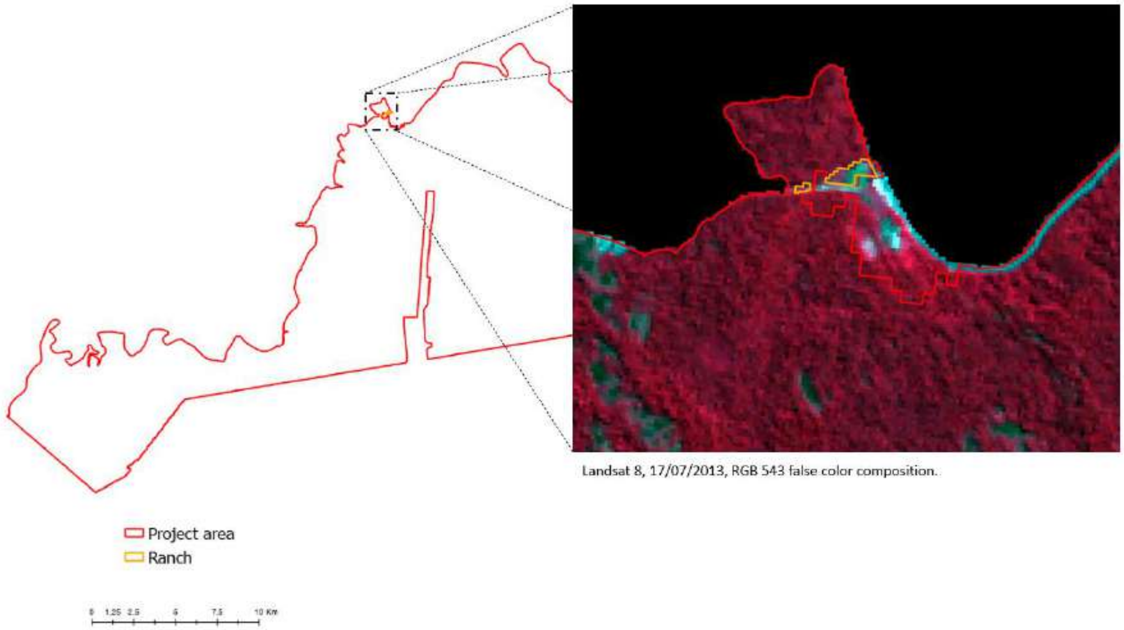

Figure 17 - Boundary of the Project Area with areas that had no forest cover.

Finally, another error identified in the delimitation of the Project Area concerns areas overlapping Ituxi River, as can be seen via the same Landsat 8 image from July 17, 2013. These areas were removed from the Project Area, totaling 16.75 ha.

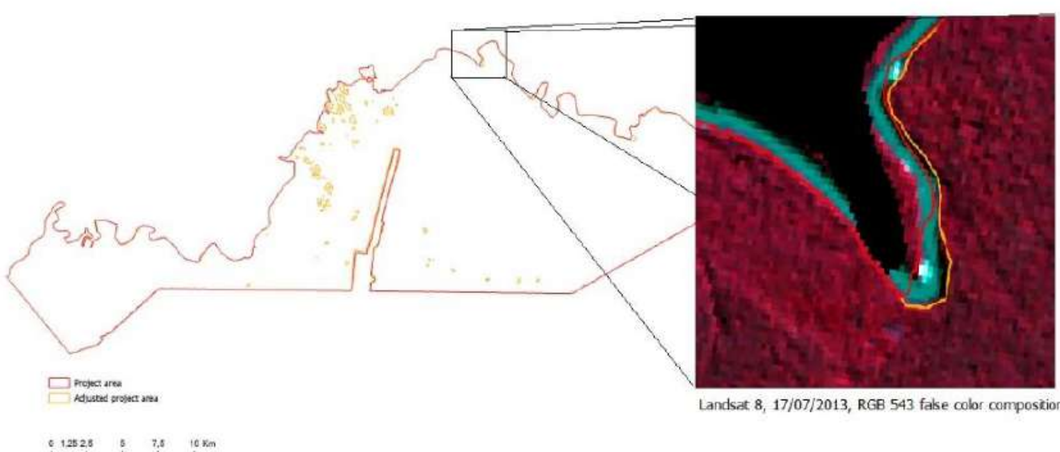

Figure 18 - Boundary of the Project Area with areas overlapping Ituxi River.

Through the procedure described above, the Project Area was redefined in size from 46.592,06 hectares to 46.159,68 hectares, a reduction of 0.93% of original area.

With these adjustments in Project Area, the allocated ('initial') annual deforestation projection was revised to quantify possible baseline losses arising from boundaries corrections in the rocky outcrop areas, Ituxi River and the farm's headquarters.

Table 9 - Deforestation projection overlapping non-forest area[18]

Year	Rocky outcrops (ha)	Property's headquarter (ha)	Borders of the River (ha)	Total (ha)
2014	21.5	3.41	1.39	26.3
2015	1.3	0.0	0.0	1.3
2017	3.4	0.0	0.1	3.5
2019	2.9	0.0	0.1	3.0
2021	2.7	0.0	1.2	3.9
Total	**38.0**			

3.2.2.2 Root to shoot ratio adjustment

An error in the root to shoot ratio value was identified. Table 2 (root to shoot ratio) on page 140 of the VM0015 methodology presents a value of 0.24 for Tropical Rainforest (>125 t.ha-1), identifying table 4.4 of the IPCC GL AFOLU. Meanwhile, Table 4.4 on page 4.49 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4. Agriculture, Forestry and Other Land Use gives a value of 0.37 for this vegetation category. Up until Monitoring Report 2, the average of these values (0.31) was used. However, it is now considered that this is an error and from this monitoring period the correct value will be use: 0.37. Thus, *Cbb* values were adjusted from 176 to 213 tCO_{2-e}/ha.

[18] Hectare numbers utilized in the "Net GHG reductions and VCU" tab of the GHG reductions calculation spreadsheet

The differences in calculation in the first and second verification compared to the current verification are clarified below, emphasizing that the differences between the two calculation methodologies are still very close. The differences between the previous Monitoring Reports and the current Monitoring Report are described as follows:

Table 10 - The differences between the previous Monitoring Reports and the current Monitoring Report.

Changes in Current Verification Period	Values applied in First Verification	Values applied in Second Verification	Values applied in Current Verification
Biomass data	Aboveground biomass: *Cab*: 575 $tCO_{2\text{-}e}$/ha Belowground biomass: *Cbb*: 174 $tCO_{2\text{-}e}$/ha	Aboveground biomass: *Cab*: 577* $tCO_{2\text{-}e}$/ha Belowground biomass: *Cbb*: 176 $tCO_{2\text{-}e}$/ha	Aboveground biomass: *Cab*: 575 $tCO_{2\text{-}e}$/ha Belowground biomass: *Cbb*: 213 $tCO_{2\text{-}e}$/ha
Correction of leakage due to abnormal increase in deforestation	Total net increase in emissions due to leakage: 29,438 $tCO_{2\text{-}e}$/ha No correction applied.	Total net increase in emissions due to leakage: 0 $tCO_{2\text{-}e}$/ha As explained in MR2, a 3.9 factor was applied on ex post deforestation in the Leakage Belt, as a correction for conjunctural unusual increase in deforestation in Lábrea, which has also affected the Leakage Belt area and cannot be attributed to this Project Activity.	Total net increase in emissions due to leakage: 0 $tCO_{2\text{-}e}$/ha As explained in sections 3.2.1 and 5.3, an 8.13 factor was applied on ex post deforestation in the Leakage Belt, as a correction for conjunctural unusual increase in deforestation in Lábrea, which has also affected the Leakage Belt area and cannot be attributed to this Project Activity.
Current amount of timber harvested	Total carbon stock decrease due to planned logging activities: 36,751 $tCO_{2\text{-}e}$	Total carbon stock decrease due to planned logging activities: 187,705 $tCO_{2\text{-}e}$	Total carbon stock decrease due to planned logging activities: 0 $tCO_{2\text{-}e}$

** Correction related to the Aboveground biomass parameter used on second verification is being applied on this current verification in Section 5.5.*

3.2.2.3 Carbon stock in Biodiversity parameters to be monitored

The Project Description presented the biomass stock as an indicator of biodiversity parameters to be monitored, in table 41 of section 4.3.4 Initial plan for selecting community and biodiversity variables to be monitored. However, no literature references were found directly relating carbon stocks with biodiversity parameters. Therefore, this indicator is being excluded from the project as of this Monitoring Report.

This Project Description deviation does not impact the applicability of the methodology or validity of the baseline scenario, given the justifications presented in 3.2.1 above, which are, in summary: greater conservativeness of older inventories; large sample set of the inventory used, located very close to the Project Area; and the same forest type.

3.3 Grouped Projects

This is not a grouped project.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	CF
Data unit	tC/tdm
Description	Default value of carbon fraction in biomass
Source of data	Values from the literature (e.g., IPCC 2003. Good practice guidance for land use, land-use change and forestry. Kanagawa: IGES, 2003. Available at: <http://www.ipccnggip.iges.or.jp/public/gpglulucf/gpglulucf.html>)
Value applied	*0.5*
Justification of choice of data or description of measurement methods and procedures applied	The default value was used for conservativeness purposes.
Purpose of Data	Calculation of GHG emissions

Comments	If new and more accurate carbon fraction data become available, these can be used to estimate the net anthropogenic GHG emission reduction of the subsequent fixed baseline period.

Data / Parameter	44/12
Data unit	Dimensionless
Description	Carbon mass to CO_{2e} mass conversion factor
Source of data	From scientific literature: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 AFOLU
Value applied	*44/12*
Justification of choice of data or description of measurement methods and procedures applied	Conversion from C to CO_2 based on molecular weights
Purpose of Data	Calculation of GHG emissions
Comments	IPCC standard value.

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; note that as defined here, root to shoot ratio is applied as belowground biomass per unit area: aboveground biomass per unit area (not on a per stem basis).
Source of data	From scientific literature: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 AFOLU, V. 4, Ch. 4, AFOLU, pg. 4.49, Table 4-4.
Value applied	*0.37*
Justification of choice of data or description of measurement methods and procedures applied	Local values are not available, and the IPCC and VM0015 factors are conservative values.
Purpose of Data	Calculation of GHG emissions.
Comments	IPCC standard value.

Data / Parameter	BEF
Data unit	Dimensionless
Description	Biomass Expansion Factor
Source of data	According to “Brown, S., A. J. R. Gillespie, and A. E. Lugo, 1989. Biomass estimation methods for tropical forests with applications to forest inventory data. Forest Science, 35:881- 902”. (Table 4; pg. 890; minimum value deducted from lowest limit.: 1.743 - 0.083 = 1.66)
Value applied	*1.66*
Justification of choice of data or description of measurement methods and procedures applied	BEF was applied for conversion of merchantable volume to total aboveground tree biomass.
Purpose of Data	Calculation of GHG emissions
Comments	N/A

Data / Parameter	Cabicl
Data unit	tCO_2/ha
Description	Average carbon stock per hectare in the aboveground biomass pool of initial forest class icl
Source of data	Average of public literature data from the project region. Further details are provided in “1.10 Conditions Prior to Project Initiation” of the VCS-PD.
Value applied	*575*
Justification of choice of data or description of measurement methods and procedures applied	0.37 root-shoot ratio (R) was applied, according to "2006 IPCC Guidelines for National Greenhouse Gas Inventories," V. 4, Ch. 4, AFOLU, pg. 4.49, Table 4-4. 1.66 The Biomass Expansion Factor (BEF) was applied to convert marketable volume to total aboveground tree biomass, according to "Brown, S., A. J. R. Gillespie, and A. E. Lugo, 1989. Biomass estimation methods for tropical forests with applications to forest inventory data. Forest Science, 35:881- 902." (Table 4; pg. 890; minimum value deducted from the lower limit: 1.743 - 0.083 = 1.66)

	0.589 t/m^3 wood density was applied, according to Nogueira (2008).
Purpose of Data	Calculation of baseline emissions
Comments	Literature studies used for this assessment, as well as respective calculations, are available for consultation by the audit team

Data / Parameter	Cbb_{icl}
Data unit	tCO_2/ha
Description	Average carbon stock per hectare in the belowground biomass pool of initial forest class icl
Source of data	Average of public literature data from the project region. Further details are provided in "1.10 Conditions Prior to Project Initiation" of the VCS-PD.
Value applied	*213*
Justification of choice of data or description of measurement methods and procedures applied	0.37 root-shoot ratio (R) was applied, according to "2006 IPCC Guidelines for National Greenhouse Gas Inventories," V. 4, Ch. 4, AFOLU, pg. 4.49, Table 4-4 0.589 t/m^3 wood density was applied, according to Nogueira (2008).
Purpose of Data	Calculation of baseline emissions
Comments	Files related to the local biomass assessment are available for consultation by the audit team.

Data / Parameter	Cab_{fcl}
Data unit	tCO_2/ha
Description	Average carbon stock per hectare in the aboveground biomass pool of post-deforestation class fcl
Source of data	Weighted average (by area obtained in Terra Class database): 2006 IPCC Guidelines for National Greenhouse Gas Inventories, V. 4, Chapter 6: Grassland, pg. 6.27, Table 6.4 (for Pasture: 76.1% of area) 2006 IPCC Guidelines for National Greenhouse Gas Inventories,

	V. 4, Chapter 4: Forest Land, pg. 4.63, Table 4.12 (for Pasture with regeneration: 23.9% of area)
Value applied	Baseline: 15.6 Project emissions: 7.1
Justification of choice of data or description of measurement methods and procedures applied	Conservative default value from IPCC, to estimate post-deforestation land use carbon stock.
Purpose of Data	Calculation of baseline emissions
Comments	Conservative average to be used in calculations, based on uncertainties in source values.

Data / Parameter	Cbb_{fcl}
Data unit	tCO_2/ha
Description	Average carbon stock per hectare in the belowground biomass pool of post-deforestation class fcl
Source of data	Weighted average (by area obtained in Terra Class database): 2006 IPCC Guidelines for National Greenhouse Gas Inventories, V. 4, Chapter 6: Grassland, pg. 6.27, Table 6.4 (for Pasture: 76.1% of area) 2006 IPCC Guidelines for National Greenhouse Gas Inventories, V. 4, Chapter 4: Forest Land, pg. 4.63, Table 4.12 (for Pasturewith regeneration: 23.9% of area)
Value applied	Baseline: 25.0 Project emissions: 11.3
Justification of choice of data or description of measurement methods and procedures applied	Conservative default value from IPCC, to estimate post-deforestation land use carbon stock.
Purpose of Data	Calculation of baseline emissions
Comments	Conservative average to be used in calculations, based on uncertainties in source values.

Data / Parameter	EI

Data unit	N/A
Description	Ex ante estimated effectiveness index
Source of data	Local assessment
Value applied	*0.9*
Justification of choice of data or description of measurement methods and procedures applied	The project design team conservatively considers that surveillance activities are able to attain 90% of effectiveness in avoiding unplanned deforestation inside the Project Area.
Purpose of Data	Calculation of project emissions
Comments	This value is an ex-ante estimate. Accurate and actual values will be monitored and reported in verification periods.

Data / Parameter	DLF
Data unit	N/A
Description	Displacement Leakage Factor
Source of data	Local assessment
Value applied	*0.05*
Justification of choice of data or description of measurement methods and procedures applied	If deforestation agents do not participate in leakage prevention activities and project activities, the Displacement Factor shall be 100%. Where leakage prevention activities are implemented the factor shall be equal to the proportion of the baseline agents estimated to be given the opportunity to participate in leakage prevention activities and project activities. The project design team estimates that 100% of potential deforestation agents in the Reference Region will be given the opportunity to participate in leakage prevention activities. Thus, the “Displacement Leakage Factor” (DLF) is conservatively considered as 0.05.
Purpose of Data	Calculation of leakage
Comments	This value is an ex-ante estimate. Accurate and actual values will be monitored and reported in verification periods.

Data / Parameter	Deforestation

Data unit	ha
Description	Maps of forest cover areas converted into non-forest areas
Source of data	Landsat 8 optical imagery for supervisioned land use classification and Sentinel 1 SAR imagery, for visual interpretation of land use change.
Value applied	Yearly variable: deforestation values are presented for the Reference Region, Leakage Belt and Project Area (projections) in the VCS-PD
Justification of choice of data or description of measurement methods and procedures applied	The project area is located within a region that is subject to a monitoring program that is approved or sanctioned by the national government (PRODES). The data generated by such program is used in this project. PRODES data are applicable for use in this project, according to the criteria listed below (Methodology VM0015): i) PRODES monitoring occurs in the entire project area andleakage belt. ii) PRODES monitoring occurs in the entire reference region andcovers the beginning, middle and end of the fixed baseline period. iii) PRODES monitors conversion of forest land to non-forest land. Monitoring occurred during the entire fixed baseline period.
Purpose of Data	Calculation of baseline emissions
Comments	N/A

4.2 Data and Parameters Monitored

Data / Parameter	ACPAt
Data unit	ha
Description	Annual area within the Project Area affected by catastrophic events at year t
Source of data	- Remote sensing data and GIS, Supervisor reports

Description of measurement methods and procedures to be applied	The following sources were monitored: - INMET (Instituto Nacional de Meteorologia) http://www.inmet.gov.br/portal/index.php?r=home/page&page=rede_estacoeshttp://www.inmet.gov.br/portal/index.php?r=home/page&page=rede_estacoeshttp://www.inmet.gov.br/portal/index.php?r=home/page&page=rede_estacoes - Periodic reports from area supervisor INPE (INPE. Instituto Nacional de Pesquisas Espaciais. Home — Programa Queimadas (inpe.br)
Frequency of monitoring/recording	At each time a catastrophic event occurs
Value monitored	0
Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. Image acquisitionis performed during the period of low incidence of clouds and rainfall in the region, within July and September. 2) Images undergo geometric correction by means of geo-referencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation of radar image is performed. Evaluation of classification accuracy is performed by analyzing the overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be 90%.
Purpose of the data	Calculation of project emissions
Calculation method	Remote sensing and GIS
Comments	N/A

Data / Parameter	ABSLLKt

Data unit	ha
Description	Annual area of deforestation within the leakage belt at year t
Source of data	Remote sensing data and GIS
Description of measurement methods and procedures to be applied	Deforestation in the leakage belt area was considered activity displacement leakage. Activity data for the leakage belt area will be determined using the same methods applied to monitoring deforestation activity data in the project area.
Frequency of monitoring/recording	Annually
Value monitored	*2020: ex-post recorded: 9,875.7 ha. Actual leakage: 0 ha* *2021: ex-post recorded: 7,893.9 ha. Actual leakage: 0 ha*
Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. Image acquisitionis performed during the period of low incidence of clouds and rainfall in the region, within July and September. 2) Images undergo geometric correction by means of geo-referencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation of radar image is performed. Evaluation of classification accuracy is performed by analyzingthe overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be 90%.
Purpose of the data	Calculation of leakage emissions
Calculation method	Analysis of satellite images and maps
Comments	Where strong evidence can be collected that deforestation in the leakage belt is attributable to deforestation agents that are not linked to the project area, the detected deforestation will not be attributed to the project activity, thus not considered leakage. In the current verification period, as explained in “2.3.1 Methodology Deviations” of this report, an adjustment has been made considering the Brazilian conjuncture of increased

	deforestation rates, which cannot be attributed to this project activity.

Data / Parameter	ABSLPAt
Data unit	ha
Description	Annual area of deforestation in the project area at year t
Source of data	Remote sensing data and GIS
Description of measurement methods and procedures to be applied	Forest cover change due to deforestation is monitored through periodic assessment of classified satellite imagery covering the project area.
Frequency of monitoring/recording	Annually
Value monitored	*2020: 43.8 ha.* *2021: 26.5 ha.*
Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. Image acquisitionis performed during the period of low incidence of clouds and rainfall in the region, within July and September. 2) Images undergo geometric correction by means of geo-referencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation of radar image is performed. 4) Evaluation of classification accuracy is performed by analyzingthe overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be 90%.
Purpose of the data	Calculation of project emissions
Calculation method	Analysis of satellite images and maps
Comments	N/A

Data / Parameter	ΔCADLKt
Data unit	tCO_{2e}
Description	Total decrease in carbon stocks due to displaced deforestation at year t
Source of data	Remote sensing data and GIS
Description of measurement methods and procedures to be applied	Deforestation in the leakage belt area was considered activity displacement leakage. Activity data for the leakage belt area was determined using the same methods applied to monitoring deforestation activity data in the project area.
Frequency of monitoring/recording	Annually
Value monitored	*2020: 0 tCO_{2e}* *2021: 0 tCO_{2e}*
Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. Image acquisitionis performed during the period of low incidence of clouds and rainfall in the region, within July and September. 2) Images undergo geometric correction by means of geo-referencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation ofradar image is performed. Evaluation of classification accuracy is performed by analyzing the overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be 90%.
Purpose of the data	Calculation of leakage emissions
Calculation method	Emissions from deforestation are estimated by multiplying the detected area of forest loss by the average forest carbon stock per unit area.
Comments	N/A

Data / Parameter	ΔCPLdPAt
Data unit	tCO_{2e}
Description	Total decrease in carbon stock due to all planned activities at year t in the project area
Source of data	Documents, remote sensing and GIS
Description of measurement methods and procedures to be applied	The planned activities in the project area that result in carbon stock decrease would be subject to monitoring, if significant.
Frequency of monitoring/recording	Annually
Value monitored	*2020: 0 tCO_{2e}* *2021: 0 tCO_{2e}*
Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. Image acquisitionis performed during the period of low incidence of clouds and rainfall in the region, within July and September. 2) Images undergo geometric correction by means of geo-referencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation of radar image is performed. 4) Evaluation of classification accuracy is performed by analyzingthe overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be 90%.
Purpose of the data	Calculation of project emissions
Calculation method	Emissions from deforestation are estimated by multiplying the detected area of forest loss by the average forest carbon stockper unit area.
Comments	N/A

Data / Parameter	ΔCPSLKt
Data unit	tCO_{2e}
Description	Total annual carbon stock change in leakage management areas in the project case
Source of data	- Activities report related to leakage prevention measures. - Field assessment. - Remote sensing and GIS.
Description of measurement methods and procedures to be applied	The planned activities in leakage management areas that result in carbon stock decrease would be subject to monitoring, if significant.
Frequency of monitoring/recording	Annually
Value monitored	0
Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. Image acquisitionis performed during the period of low incidence of clouds and rainfall in the region, within July and September. 2) Images undergo geometric correction by means of geo-referencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation of radar image is performed. 4) Evaluation of classification accuracy is performed by analyzingthe overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be 90%.
Purpose of the data	Calculation of leakage
Calculation method	Emissions from deforestation are estimated by multiplying the detected area of forest loss by the average forest carbon stockper unit area.
Comments	N/A

Data / Parameter	ΔCUDdPAt
Data unit	tCO_{2e}
Description	Total actual carbon stock change due to unavoided unplanned deforestation at year t in the project area
Source of data	Remote sensing and GIS
Description of measurement methods and procedures to be applied	Forest cover change due to unplanned deforestation is monitored through periodic assessment of classified satellite imagery covering the project area.
Frequency of monitoring/recording	Annually
Value monitored	*2020: 32,365 tCo_2e* *2021: 19,611 tCo_2e*
Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. Image acquisition is performed during the period of low incidence of clouds and rainfall in the region, within July and September. 2) Images undergo geometric correction by means of georeferencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation of radar image is performed. 4) Evaluation of classification accuracy is performed by analyzing the overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be 90%.

Purpose of the data	Calculation of project emissions
Calculation method	Emissions from deforestation are estimated by multiplying the detected area of forest loss by the average forest carbon stock per unit area.
Comments	N/A

Data / Parameter	$EBBPSPA_t$
Data unit	*tCO_2e*
Description	Sum of (or total) actual non-CO_2 emissions from forest fire at year t in the project area
Source of data	- Remote sensing data and GIS; - Supervisor reports.
Description of measurement methods and procedures to be applied	If forest fires occur, these non-CO_2 emissions are subject to monitoring and accounting, when significant.
Frequency of monitoring/recording	Areas burnt are monitored every 5 years or if verification occurs on a frequency of less than every 5 years, examination will occur prior to any verification event.
Value monitored	*2020: 1,408 tCO_{2-e}* *2021: 853 tCO_{2-e}*
Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. Image acquisitionis performed during the period of low incidence of clouds and rainfall in the region, within July and September. 2) Images undergo geometric correction by means of geo-referencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation of radar image is performed. 4) Evaluation of classification accuracy is performed by

	analyzingthe overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be 90%.
Purpose of the data	Calculation of project emissions
Calculation method	Analysis of satellite images and maps to determine the incidence of deforestation and multiplying it by the respective emission factors.
Comments	If forest fires occur, these non-CO_2 emissions will be subject to monitoring and accounting, when significant.

Data / Parameter	EADLKt
Data unit	*tCO_2e*
Description	Total ex post increase in GHG emissions due to displaced forest fires at year t
Source of data	Remote sensing data and GIS
Description of measurement methods and procedures to be applied	When significant, GHG emissions due displaced forest fires are monitored.
Frequency of monitoring/recording	Annually
Value monitored	*2020: 0 tCO_2e* *2021: 0 tCO_2e*
Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. Image acquisitionis performed during the period of low incidence of clouds and rainfall in the region, within July and September. 2) Images undergo geometric correction by means of geo-referencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation of radar image is performed.

	Evaluation of classification accuracy is performed by analyzingthe overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be 90%.
Purpose of the data	Calculation of leakage
Calculation method	Analysis of satellite images and maps to determine the incidence of deforestation and multiplying it by the respective emission factors.
Comments	Where strong evidence can be collected that forest fires in the leakage belt is attributable to deforestation agents that are not linked to the project area, the detected deforestation will not be attributed to the project activity, thus not considered leakage.

Data / Parameter	RFt
Data unit	%
Description	Risk factor used to calculate VCS buffer credits
Source of data	- VCS Non-Permanence Risk Report (v3.1), - Remote sensing data and GIS, - Supervisor report. Literature data.
Description of measurement methods and procedures to be applied	All sources of data from the VCS Non-Permanence Risk Report were used to measure the various risk factors.
Frequency of monitoring/recording	Annually
Value monitored	10
Monitoring equipment	VCS-approved AFOLU Non-Permanence Risk Tool
QA/QC procedures to be applied	Literature data from reputed sources will be used and critically checked. When possible, the average of two or more sources will be used.
Purpose of the data	Calculation of buffer credits

Calculation method	All the risk factors described in the VCS Non-Permanence Risk Report were assessed.
Comments	N/A

Data / Parameter	Deforestation in the project area and leakage belt
Data unit	ha
Description	Forest cover areas converted into non-forest areas inside the Project Area and Leakage Belt
Source of data	Calculated through remote sensing images
Description of measurement methods and procedures to be applied	The monitoring of the forest cover in the Project Area and Leakage Belt was done through satellite image analysis. When data from the PRODES system are not available, the forestcover monitoring will be carried out by automatic classification and visual interpretation of images from other optical sensors or SAR (radar) data.
Frequency of monitoring/recording	Annually
Value monitored	Project Area: *2020: 43.8 ha* *2021: 26.5 ha* Leakage Belt: *2020: 80,263.89 ha; corrected value: 9,875.67 ha* *2021: 64,156.81 ha; corrected value: 7,893.85 ha*
Monitoring equipment	Remote sensing images digital processing program, geographic information systems
QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. Image acquisitionis performed during the period of low incidence of clouds and rainfall in the region, within July and September. 2) Images undergo geometric correction by means of geo-referencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation of radar image is performed.

	Evaluation of classification accuracy is performed by analyzingthe overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be 90%.
Purpose of the data	Calculation of project emissions
Calculation method	Calculation of leakage emissions
Comments	Analysis of satellite images and maps Corrected values as detailed in Section 5.3

Data / Parameter	ΔCabBSLLKt
Data unit	*tCO_2e*
Description	Total carbon stock changes in the leakage belt area
Source of data	Calculated
Description of measurement methods and procedures to be applied	• Leakage prevention activities were listed; • A map showing areas of intervention and type of interventionwere prepared; • Areas where leakage prevention activities impact carbon stockwere identified; • Non-forest classes existing within these areas in the baselinecase were identified; • Conservative literature carbon stocks estimates were used; • Carbon stock changes in the leakage management areas underthe project scenario were reported using table 30b of the VM0015; • Net carbon stock changes that the leakage prevention measures cause during the project crediting period were calculated; • Results of the calculations are reported in table 30.c of the VM0015.
Frequency of monitoring/recording	To be determined depending on the activity
Value monitored	*2020: 0 tCO_2e* *2021: 0 tCO_2e*

Monitoring equipment	Remote sensing images digital processing program, geographic information systems
QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. Image acquisition is performed during the period of low incidence of clouds and rainfall in the region, within July and September. 2) Images undergo geometric correction by means of geo-referencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation of radar image is performed. 4) Evaluation of classification accuracy is performed by analyzing the overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be 90%.
Purpose of the data	Calculation of leakage
Calculation method	Analysis of satellite images and maps to determine deforestation in Leakage Belt and multiplying it by the carbon stocks previously set.
Comments	N/A

4.3 Monitoring Plan

4.3.1 General information

4.3.1.1 Organizational Structure and Monitoring Team

Carbonext will perform the monitoring of carbon stocks from deforestation rates and greenhouse gas emissions produced or avoided during the REDD project, so it has a specialized and experienced REDD team. This includes social experts, who have the necessary skills to involve the community and stakeholders, ensuring community participation, activity design and socio-economic indicator monitoring.

The main stakeholders in this Project are Ituxi Farm Workers and neighbors: the communication channel between the interested parties and the project proponent is the farm secretary and spokeswoman Ganete Eloi da Silva, hired by Dr. Ricardo. As the Project Region has low complexity in terms of social context, Ganete is the only local person in charge to communicate problems, demands and conflicts to the landowner, and is responsible for the administrative and management side of the on-site activities.

Given the above, the organizational structure below is very simple, where the Project Proponent (Ricardo Stoppe) and the Project Designer (Carbonext) work together and exist a communication channel direct between site Manager Ganete Eloi and the technical developer team. The technical team is responsible for planning the activities and providing the guidance, while the site Manager is responsible for executing the project's actions and collective their respective items of evidence.

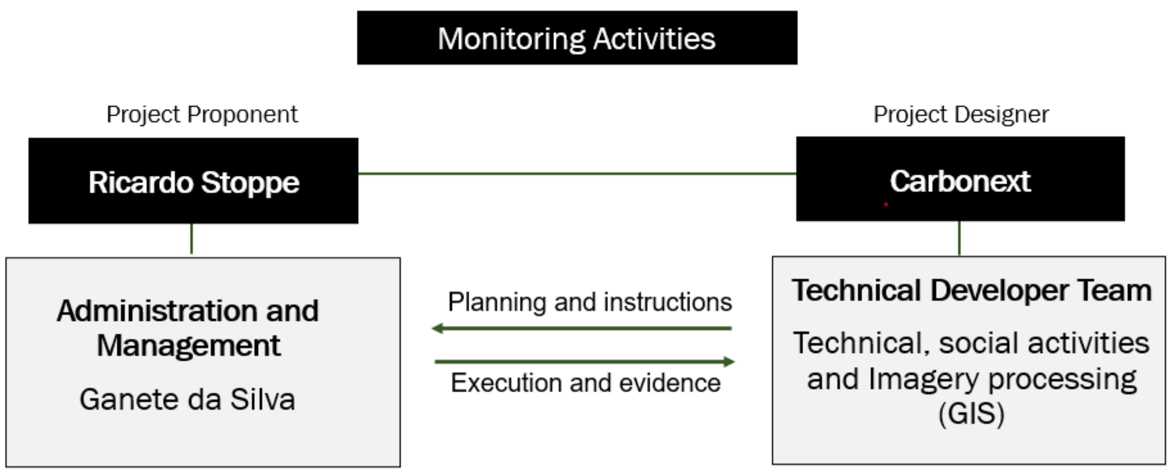

Figure 19. Organizational structure

Below, is a summary of Carbonext personnel's main responsibilities and tasks relating to monitoring activities, to be carried out for the ITUXI REDD+ Project over the present monitoring period.

Table 11 - Carbonext personnel responsible for the ITUXI REDD+ Project for this monitoring period

Name and Position	Responsibilities and competencies
Janaina Dallan Carbonext CEO	Degree in Forestry Engineering from Luiz de Queiroz College of Agriculture (ESALQ) and a Master's in environmental business She has been working with the carbon market since 2001 on projects around the world and, as CEO of Carbonext, she is directly involved in coordinating the development and implementation of carbon credit projects. Throughout her career, she has managed UNFCCC CDM (Clean Development Mechanisms) projects through several international companies such as Golder Associates, Global Energy Partners, Orbeo / Societé Generale, One Carbon and Ecofys. She is currently a member of the United Nations Framework Convention on Climate Change (UNFCCC), in which she has been a member of the Registration and Issuance Team (RIT) since 2013, she is president of the Brazil Alliance for Nature-Based Solutions and is a member of the experts for the Taskforce for Scaling Voluntary Carbon Markets (TSVCM).
Luiz Moura Technical Director	Forestry Engineer by Luiz de Queiroz College of Agriculture (ESALQ) the M.Sc. and Ph.D. in Wood technology from the Université Laval (Quebec, Canada). He is responsible to coordinate the technical group at Carbonext, working with projects for the Carbon Markets including Forestry projects Dr. de Moura had participation in the preparation of "Energia Verde Carbonization Project - Mitigation of Methane Emissions in the Charcoal Production of Grupo Queiroz Galvão, Maranhão, Brazil", registered on March 21, 2011. Dr. de Moura has also participation as project designer in Florestal Santa Maria REDD Projet, Fortaleza Ituxi REDD project, UNITOR REDD project and Evergreen REDD project.
David Swallow Technical REDD+ Coordinator	Degree in Anthropology from the University of Edinburgh and an MSc in Ecology, Evolution and Conservation from Imperial College London. Experience with forest carbon, certified supply chains and impact investing, with ten years of experience developing carbon projects and social aspects of REDD+ in the Brazilian market.
Ághata Artusi REDD+ Analyst	Bachelor in Biological Sciences (URI) and Master student in Biodiversity Conservation and Sustainable Development (IPÊ/ESCAS) Experience in forestry, socio-environmental and ecological research development. Worked with Brazilian biodiversity monitoring, forest inventories and currently has a conservationist focus on REDD Projects and carbon stock.
Débora Santos REDD+ Analyst	Environmental Manager from the University of São Paulo (USP) and master's in business Sustainability from the Federal University of São Carlos (UFSCAR). Experience with Geographic Information Systems (GIS) in national and international urban registry projects and with Greenhouse Gas (GHG) emissions inventories.
Vinicio Sugui REDD+ Analyst	Environmental Engineer (FOC) and M.Sc. in Urban and Industrial Environment (UFPR). MBA in ESG and Impact student Twelve years' experience in environmental projects and programs; environmental management; sustainability; air pollution emissions; climate change; environmental construction control; environmental licensing processes.

Thiago Sozinho Social Analyst for REDD+	Degree in Forestry Engineering from Amazonia Federal Rural University and a Master's in forestry economy in Paraná Federal University He has ten years' work experience on in the following areas: protected areas, environment, carbon markets, community relations, research, geotechnologies, customer success, project management, BI and Data Science.
Rafael Martins GIS Coordinator	Bachelors' in Biological Science; MBA in Database Administration; GIS Professional, Spatial Analyst and Spatial Data Processing ESRI certified; CTT+ certified Eighteen years of experience in developing GIS systems, processes and solutions for conservation projects, land use and land cover management, forest management and forest integrity monitoring.

For this Monitoring Report, the monitoring activities carried out through GIS tools were carried out internally by Carbonext. The mechanisms adopted in previous MRs continue as before but were executed by the internal team. Further, Carbonext implemented a deforestation alert system called MonitoraCarbon, which detects probable changes in land-use, validates and sends alerts for monitoring agents to confirm and take appropriate actions. The system has been available as of 03/2022.

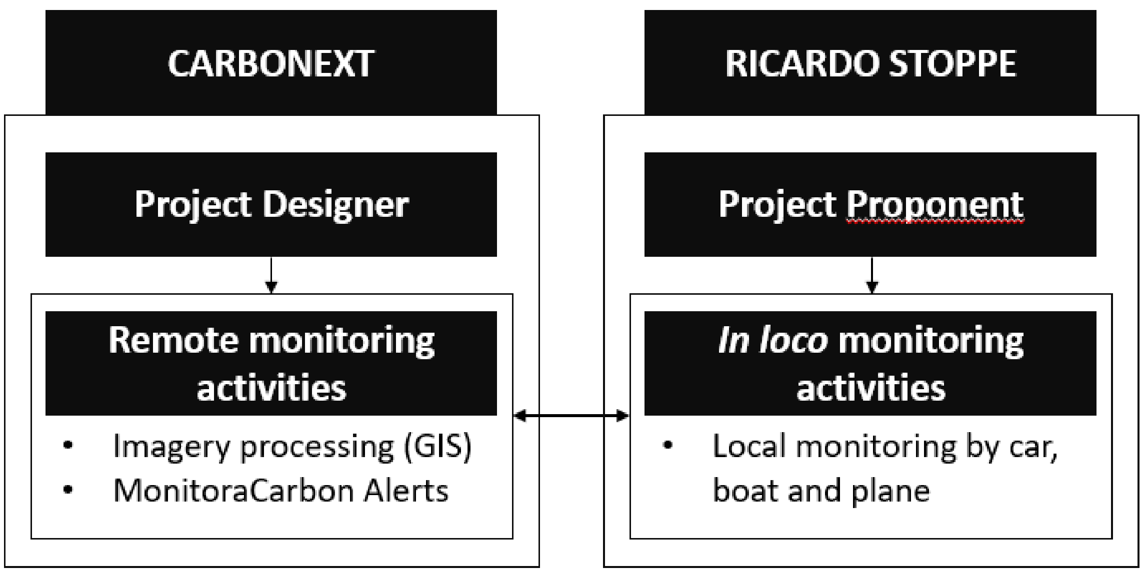

Figure 20 - General organizational structure of deforestation monitoring.

4.3.1.2 Monitoring of land-use and land-cover change within the project area and Leakage Belt

a) Technical description of the monitoring tasks.

Monitoring of land-use and land-cover change within the Project Area and Leakage Belt were carried out through analysis of satellite imagery covering the whole Reference Region, over the entire monitoring period. Satellite analysis of land-uses was based on primary information due to the unavailability of PRODES Digital data (INPE, 2014). Imagery processing referred mainly to the classes "Forest Land" and "Non-Forest Land".

b) Data to be collected.

The categories of change that will be subject to MRV-A (monitoring, reporting, verification and accounting) are “Area of forest land converted to non-forest land”, “Area of forest land undergoing carbon stock decrease” and “Area of forest land undergoing carbon stock increase”.

In this context, the deforestation that occurred within the period from 01/01/2020 to 23/07/2021 was mapped through automatic supervised optical multispectral image classification. The first step was to generate a mosaic of images of Landsat 8 Operational Land Imager (OLI) dated July 23, 2021 with the least amount of clouds possible for the period. The composition chosen was False Colour, combining the R5 G4 B3 bands to highlight the vegetation through band 5, near infrared. With the aid of high-resolution imagery (WMS imagery services such as ESRI basemaps and Planet), LU/LC samples were collected for forest, non-forest and water, throughout the entire RR. As well as the multispectral optical image, an NDVI (Normalized Difference Vegetation Index) image was created through the algebra of bands (B5-B4)/(B5+B4), where band 4 is RED and band 5 is INFRARED to feed the classifier with one more variable and potentiate the separation of the forest class from any other non-forest class.

The conclusion of the deforestation measurements for the monitoring period from 23/07/2021 up to 26/12/2021 was conducted through visual interpretation of the SAR radar (Synthetic Aperture Radar), operating band C (between 8 and 4 GHz or 3.8 - 7.5 cm), dual polarization VV and VH, 20 meter spatial resolution, from the Sentinel 1 satellite (European Space Agency). This strategy was necessary in order to map deforestation over a period when the clouds predominate and block the use of optical images to classify land-use. Microwave remote sensors such as Sentinel 1 (C-band) are widely adopted for this type of mapping because they can penetrate clouds [19] and can amplify the time series frequency of land-use dynamics mapping.

These images are available on the Google Earth Engine (GEE) platform, already with some pre-processing such as thermal noise removal, border blending, radiometric calibration, and orthorectification. In the orthorectification step, the data are converted to backscatter coefficient (σ°), measured in decibels (dB),

[19] Kellndorfer et al. 2014, Mitchell et al. 2017

using the Shuttle Radar Topography Mission (SRTM) digital elevation model (DSM) of 30-meter spatial resolution. The coefficients are then set to the 1st and 99th percentile to preserve the dynamic range from outliers and quantile values to 16 bits. These steps followed implementation of the Sentinel Application Platform (SNAP) toolbox, the image processing software made by the Sentinel constellation, freely available from ESA [20].

c) Overview of procedures.

The classification of the Landsat 8 optical image was done using the Random Forest algorithm [21], in the Google Earth Engine environment. Samples for training the Randon Forest classifier were divided into two blocks, with 30% for training and evaluation of the classifier; and 70% for use in the classification process. The classifier was run with 100 decision trees.

The initial result of the classification was treated in a GIS environment (ArcGIS), in order to reduce residuals and errors of the classifier. Pixel filters such as Majority (ArcGIS) was applied twice to reduce the so-called "salt and pepper effect" of the classification, identifying isolated pixels and recategorizing it according to the majority value of its eight neighbours. In addition, a visual inspection of the classification product overlaid on the image was performed with the objective of correcting main errors of the classifier via visual interpretation and vector scanning.

Although the collection of radar images available at GEE does not have the speckle filter application, very common in data processing of this type, we found that the identification and mapping of the deforestation increment would be more satisfactory through visual interpretation and scanning over the VV and VH polarization products, composed in RGB for visualization in a GIS environment. C-band data, in comparative studies with optical images, present satisfactory performance in the visual recognition of features associated with deforestation [22], especially clear cutting.

The mapping of deforestation through visual interpretation, was carried out through the following steps:

i. **Target identification**: non-forest areas;
ii. **Training:** deforestation areas observed in optical satellite images, of equal or better resolution. are overlaid to identify patterns of hue, texture/roughness, shape, and location of the deforestation feature on the radar image;

[20] Google Earth Engine. Sentinel-1 algorithms. 2018. Disponível em: Acesso em: 17 de agosto de 2018
[21] Breiman, L. 2001, 'Random Forests', Machine Learning, vol. 45, pp. 5–32. https://doi.org/10.1023/A:1010933404324
[22] Haarpaintner, J.; Almeida-Filho, R.; Shimabukuro, Y. E.; Malnes, E.; Lauknes, I. Comparasion of Envisat ASAR deforestation monitoring in Amazonia with Landsat-TM and Alos Palsar imagens. Anais Simpósio Brasileiro de Sensoriamento Remoto, 2009. Natal. p 5857-5864.

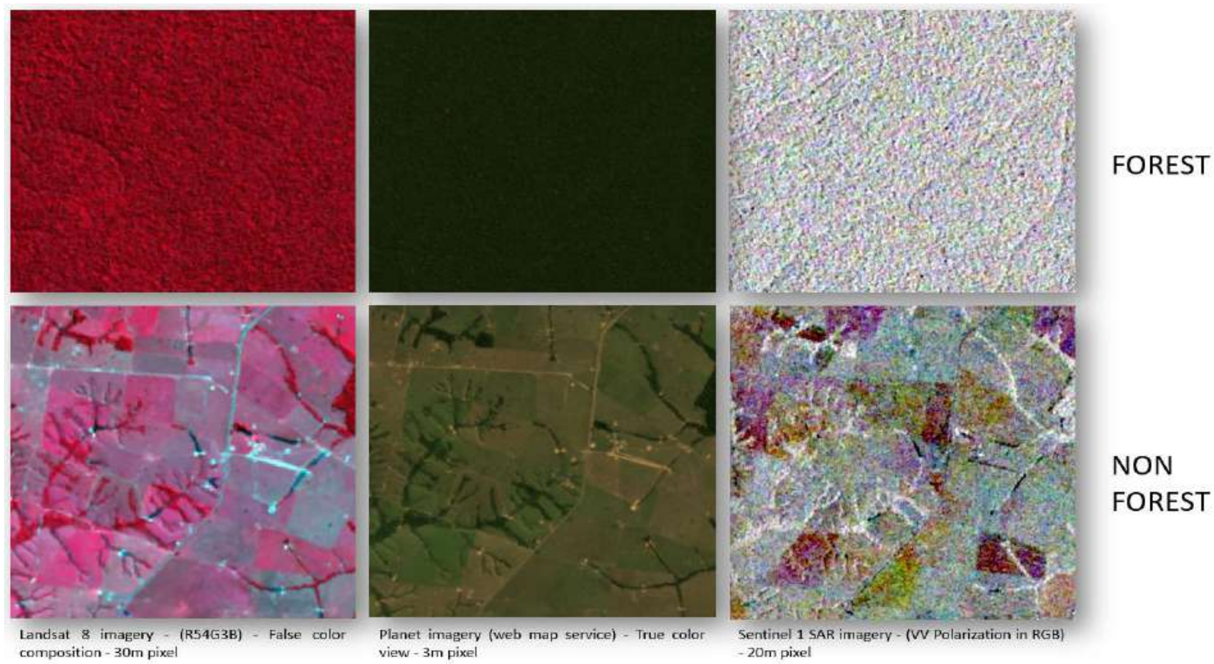

Figure 21 - Land use sampling frame for photointerpretation and deforestation measurement.

i. **Photointerpretation:** identification and vectorization on the radar image of deforestation areas omitted by clouds on the optical image, using as mask all the deforestation mapped in the previous MRs.

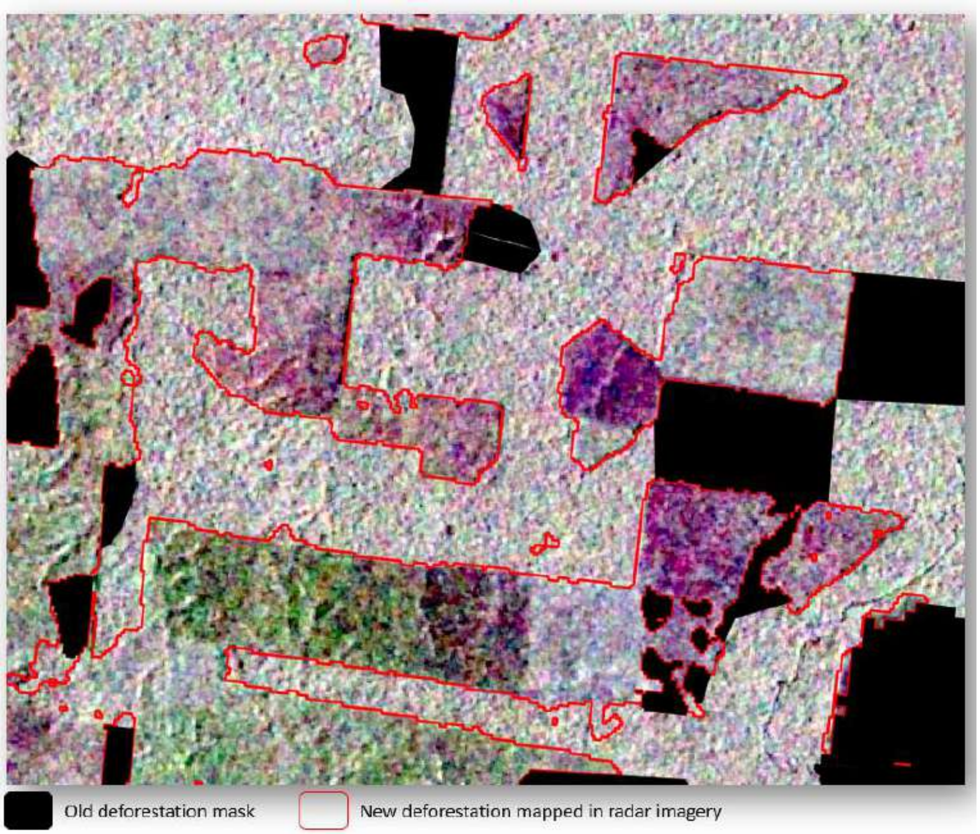

Figure 22 - Final product of the deforestation classification on radar imagery.

d) Quality control and quality assurance procedures.

The validation of land-use data used for modeling of land-use is performed using a confusion matrix, in order to calculate the overall index of success by period and by class. Three specific classes will be used: forest, deforestation and hydrography.

The analysis of the accuracy of the Landsat 8 image classification was performed by means of the confusion matrix, overall accuracy and Kappa index. The sampling was stratified, proportional by area, based on a total of 264 points randomly distributed across the RR by using the *Create Random Points* tool on ArcGIS. The reference data used in this step were the classified image itself and web service maps from ESRI and Planet, higher spatial resolution than the output image.

Table 12 - Confusion Matrix and Kappa Accuracy Assessment – Landsat 8 imagery

		REFERENCE				
CLASSIFIED		Hydrography	Forest	Deforestation	Total	User Accuracy
	Hydrography	10	0	0	10	100%
	Forest	0	147	4	151	97.35%
	Deforest	0	7	96	103	93.20%
	Total	10	154	100	264	**Kappa**
	Prod. Accuracy	100%	95.45%	96%		**91.94%**

The overall classification accuracy for all land use and land cover classes was 91.94% in the reference region, higher than the 90% suggested by the VM0015 methodology. The specific accuracy for the Forest and Non-forest classes were 97.35 and 93.20%, respectively.

Accuracy analysis of the radar image classification was performed by means of the confusion matrix, overall accuracy and Kappa index. The sampling was of the stratified type, proportional to area, based on a total of 107 points randomly distributed among deforestation polygons and remaining forest areas, excluding masked areas, through the *Create Random Points* tool on ArcGIS.

Table 13 - Confusion Matrix and Kappa Accuracy Assessment – SAR (radar) imagery.

		REFERENCE			
CLASSIFIED		Forest	Deforestation	*Total*	*User Accuracy*
	Forest	96	1	*97*	*98.96%*
	Deforest	0	10	*10*	*100.00%*
	Total	*96*	*11*	*107*	***Kappa***
	Prod. Accuracy	*100.00%*	*91%*		**94.72%**

The overall accuracy of the classification of all land-use and land cover classes was 94.72% in the Reference Region, higher than the 90% suggested by the VM0015 methodology. The specific accuracy for the Forest and Deforestation classes were 100 and 91%, respectively.

e) Data archiving.

All maps and records generated during project implementation will be kept on file and made available to VCS verifiers at verification for inspection as evidence of the AUD project activity's implementation.

All documents and records will be kept in a secure retrievable manner for at least two years after the end of the project crediting period.

4.3.2 Forest Fires

The CPTEC/INPE database[23]. was used to assess forest fire occurrence in the region for years 2017 – 2021. Fire incidence in the years mentioned are presented in the figure below.

No fire outbreaks were identified through the database in the Project Area for the present monitoring period. To this extent, there were also no carbon stock losses by fire taken into account. As presented in section 3.1 Implementation Status of the Project Activity, a fire started in August 2021, however, there were no consequences in terms of deforestation.

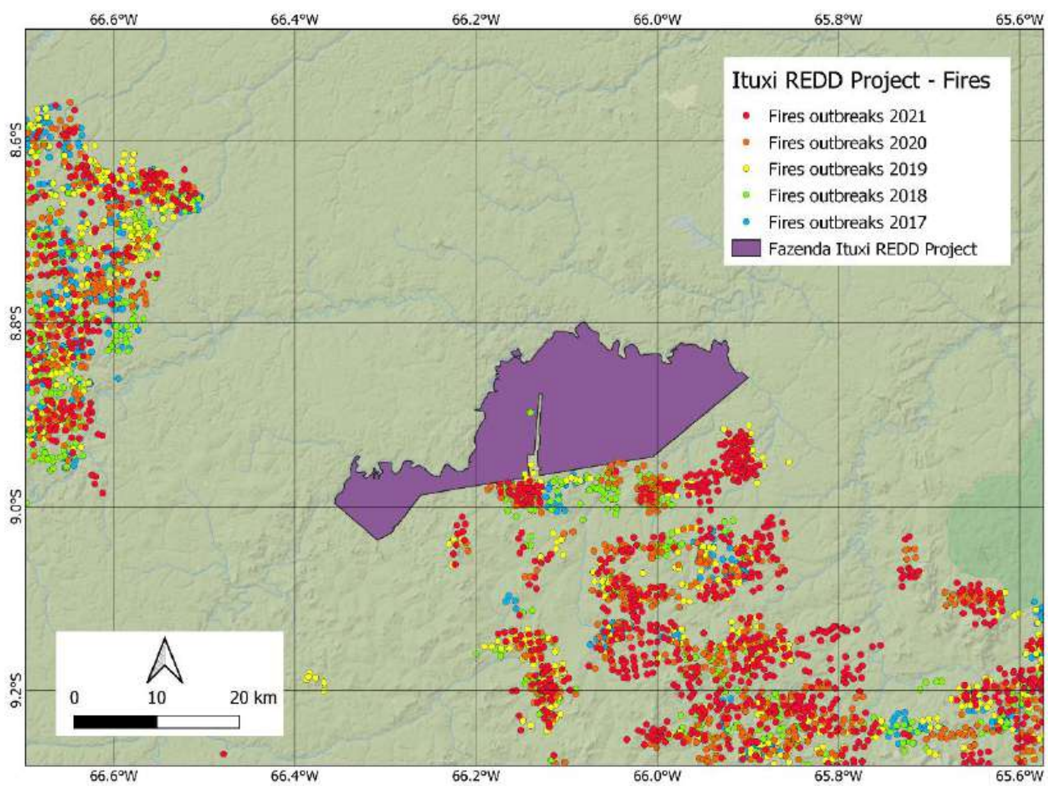

Figure 23 - Fire outbreak between 2017 and 2021.

[23] Source: http://queimadas.dgi.inpe.br/queimadas/bdqueimadas#exportar (last visited on 04/02/2021).

4.3.3 Non-Permanence Risk

The Risk factor used to calculate VCS buffer credits was updated in this monitoring period, as shown in the non-permanence risk report.

Monitoring this parameter involved the following updates:

- Financial analyses performed as part of the Unitor REDD project permitted greater precision in the relationship between the project's NPV and the NPV of the most profitable land use.
- Contract between the project developer (Carbonext) and the project proprietors is defined as a legally binding commitment protecting the project area.
- Brazilian court decision returning the right of use to the proponent of part of the property (not included in the project area).
- Project activities generated net positive impacts on the social and economic well-being and mitigated risk related to communities.
- Fire Brigade training and active firefighting in the MR period constitutes mitigation of fires risks.

4.3.4 Monitoring of leakage

a) technical description of the monitoring tasks.

The sources of leakage identified as significant in the ex-ante assessment are subject to monitoring, specifically:

- Decrease in carbon stocks and increase in GHG emissions associated with leakage prevention activities;
- Decrease in carbon stocks and increase in GHG emissions in due to activity displacement leakage.

This Project Activity does not involve decrease in carbon stocks and increase in GHG emissions associated with leakage prevention activities. As described in section 3.3.1 of the VCS-PD: leakage prevention activities do not involve any carbon stock reduction due to deforestation or additional emissions caused by increased grazing activities. For this reason, only the decrease in carbon stocks and increase in GHG emissions in due to activity displacement leakage will be monitored.

b) Data to be collected.

Deforestation above baseline levels in the leakage belt will be considered activity displacement leakage. The result of the ex-post estimates of carbon stock changes were reported using the same table formats used in the ex-ante assessment of changes in baseline carbon stocks in the leakage belt (Tables 22.c.1; 22.c.2 and 22.c.6)

Where strong evidence can be collected that deforestation in the leakage belt is attributable to deforestation agents that are not linked to the Project Area, the deforestation detected is not be attributed to the Project Activity and considered leakage. The operational entity verifying the monitoring data will determine whether the documentation provided by the project proponent represents sufficient evidence to consider the deforestation detected as not attributable to the Project activity and therefore not leakage.

To estimate the increase in GHG emissions due to forest fires in the leakage belt area, 100% of forest clearing is assumed to be done by burning the forest. The values of the parameters used to estimate emissions will be the same as those used to estimate forest fires in the baseline (table 23), except for the initial carbon stocks (Cab, Cdw), which will be those of the initial forest classes burned in the area of the Leakage Belt.

We reported the results of the estimates using the same table formats used in the ex-ante assessment of baseline GHG emissions from forest fires in the project area (Tables 23 and 24).

The results of all ex-post estimates of leakage are summarized using the same table format used for the ex-ante assessment (Table 35)

Item "*c) Summary of data collection procedures*" and "*d) Quality control and quality assurance procedures*" were previously described above in section "*4.3.1.2 Monitoring of land-use and land-cover change within the Project Area and Leakage Belt*."

e) Data archiving.

All maps and records generated during project implementation will be retained and made available to VCS verifiers at verification for inspection to demonstrate that GHG emissions reductions.

4.3.5 Ex post calculation of net anthropogenic GHG emission reduction

a) Technical description of the monitoring tasks.

The process of ex-post calculations of anthropogenic GHG net emission reductions was similar to the ex-ante calculations, with the only difference being that the ex-post estimate of carbon stock changes and GHGs should be used in the case of the project and the leakage scenario. The results were presented using Table 36 of the approved methodology VM0015 version 1.1, along with spatial data (deforestation maps made available).

b) Data to be collected.

Report the ex-post estimate of net anthropogenic GHG emissions and the calculation of verified GHG emissions Carbon Units (VCUt, and VBCt) using the same Table 36 of VM0015 format used for the ex-ante assessment.

c) Overview of data collection procedures.

Data collection procedures are the same as described in previous steps. This step involves compilation of data from previous procedures to calculate ex post net anthropogenic GHG emission reduction.

d) Quality control and quality assurance procedures.

A map showing cumulative areas credited within the project area shall be updated and presented to VCS verifiers at each verification event. The cumulative area cannot generate additional VCUs in future periods.

e) Data archiving.

All maps, records, and reports generated during project implementation will be retained and archived in digital format and will be kept securely for at least two years after the end of the project credit period.

The original (raster) and processed (vector) digital data of satellite images, coordinates, technical maps, along with field photographs are stored, and the maps of annual deforested areas, satellite images, and reports are made available to the verification body at each verification event.

f) Organization and responsibilities of the parties involved in all the above.

All satellite imagery assessments will be performed by CARBONEXT who is responsible for reporting and data archiving in accordance with VM0015 and for providing assistance during verification audits. The Project Proponent is co-responsible for data archiving.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

Please note that the present section 5 is accompanied by a calculation spreadsheet[24], attached as a separate file, for the purposes of illustration of the calculation methodology.

The accumulated baseline deforestation projected to occur within the Project Area was estimated as 5,391.6 hectares over the 30-year project lifetime. The estimated average annual rate of deforestation in the Project Area is therefore 179.7 hectares.

Table 14 - Annual areas of baseline deforestation in the Project Area (Table 9.b of VM0015).

Year	Project year	Total - PA	
		annual $ABSLPA_t$ ha	Cummulative ABSLPA ha
2013	0	-	0.0
2014	1	1,748.3	1,748.3
2015	2	244.0	1,992.3
2016	3	-	1,992.3
2017	4	242.3	2,234.6
2018	5	-	2,234.6
2019	6	241.9	2,476.4
2020	7	-	2,476.4
2021[25]	8	246.7	2,723.1
2022	9	-	2,723.1
2023	10	238.7	2,961.8
2024	11	-	2,961.8
2025	12	237.5	3,199.3
2026	13	-	3,199.3
2027	14	238.9	3,438.2
2028	15	-	3,438.2
2029	16	225.7	3,663.8
2030	17	-	3,663.8
2031	18	224.4	3,888.3
2032	19	-	3,888.3
2033	20	219.8	4,108.1
2034	21	-	4,108.1

[24] Excel file name: "VM0015_CALCULATION_v4_MR3_4_19_11_2022"

[25] N.B. The value of 246.7 is the baseline deforestation for entire year of 2021. However, for this monitoring period (up to 26 Dec 2021), the value is 243.3 ha"

Year	Project year	Total - PA	
		annual ABSLPA$_t$ ha	Cummulative ABSLPA ha
2035	22	217.4	4,325.5
2036	23	-	4,325.5
2037	24	220.7	4,546.2
2038	25	-	4,546.2
2039	26	212.0	4,758.2
2040	27	-	4,758.2
2041	28	214.0	4,972.2
2042	29	-	4,972.2
2043	30	419.4	5,391.6
TOTAL		5,391.6	

Table 15 - Annual areas of baseline deforestation in the Leakage Belt (Table 9.c of VM0015).

Year	Project year	Total - LK	
		annual $ABSLLK_t$ ha	cummulative ABSLLK ha
2013	0	0.0	0.0
2014	1	9,824.5	9,824.5
2015	2	9,550.7	19,375.2
2016	3	10,816.8	30,192.0
2017	4	8,854.7	39,046.7
2018	5	10,414.4	49,461.1
2019	6	8,464.0	57,925.1
2020	7	10,012.1	67,937.2
2021	8	8,358.8	76,296.0
2022	9	11,309.6	87,605.6
2023	10	7,678.3	95,283.9
2024	11	8,632.8	103,916.7
2025	12	7,620.2	111,536.9
2026	13	8,142.8	119,679.7
2027	14	7,435.6	127,115.3
2028	15	7,759.2	134,874.5
2029	16	7,194.7	142,069.2
2030	17	9,005.5	151,074.7
2031	18	6,466.6	157,541.3
2032	19	6,958.6	164,499.9
2033	20	6,291.9	170,791.8
2034	21	6,668.8	177,460.6
2035	22	6,039.0	183,499.6
2036	23	6,427.9	189,927.5
2037	24	5,778.2	195,705.7
2038	25	7,492.6	203,198.3
2039	26	5,144.3	208,342.6
2040	27	5,857.8	214,200.4
2041	28	8,801.2	223,001.6
2042	29	1,792.8	224,794.4
2043	30	4,774.6	229,569.0
TOTAL		**229,569.0**	

According to MMA[26] data, the Project Area's forest cover corresponds to has 100% Open Ombrophylous Forest (Submontane open ombrophylous forest – As). The following table shows the annual estimates of deforestation within the Project Area, obtained by means of modelling.

[26] http://redd.mma.gov.br/images/FREL/RR_LULUCF_Mudana-de-Uso-e-Floresta.pdf

Table 16 - Annual areas deforested per forest class icl within the Project Area in the baseline case (baseline activity data per forest class) (Table 11.b of VM0015).

	ID_{icl} >	1	Total baseline deforestation in the project area	
	Name >	Submontane open ombrophilous forest (As)		
Year	Project year *t*	ha	annual $ABSLPA_t$ ha	cummulative ABSLPA ha
2013	0	0.0	0.0	0.0
2014	1	1,748.3	1,748.3	1,748.3
2015	2	244.0	244.0	1,992.3
2016	3	0.0	0.0	1,992.3
2017	4	242.3	242.3	2,234.6
2018	5	0.0	0.0	2,234.6
2019	6	241.9	241.9	2,476.4
2020	7	0.0	0.0	2,476.4
2021	8	246.7	246.7	2,723.1
2022	9	0.0	0.0	2,723.1
2023	10	238.7	238.7	2,961.8
2024	11	0.0	0.0	2,961.8
2025	12	237.5	237.5	3,199.3
2026	13	0.0	0.0	3,199.3
2027	14	238.9	238.9	3,438.2
2028	15	0.0	0.0	3,438.2
2029	16	225.7	225.7	3,663.8
2030	17	0.0	0.0	3,663.8
2031	18	224.4	224.4	3,888.3
2032	19	0.0	0.0	3,888.3
2033	20	219.8	219.8	4,108.1
2034	21	0.0	0.0	4,108.1
2035	22	217.4	217.4	4,325.5
2036	23	0.0	0.0	4,325.5
2037	24	220.7	220.7	4,546.2
2038	25	0.0	0.0	4,546.2
2039	26	212.0	212.0	4,758.2
2040	27	0.0	0.0	4,758.2
2041	28	214.0	214.0	4,972.2
2042	29	0.0	0.0	4,972.2
2043	30	419.4	419.4	5,391.6
TOTAL			5,391.6	

The following table shows the annual estimates of deforestation within the Leakage Belt, obtained by means of modelling.

Table 17 - Annual areas deforested per forest class icl within the Leakage Belt area in the baseline case (baseline activity data per forest class) (Table 11.c of VM0015).

	ID_{icl} >	1	Total baseline deforestation in the leakage belt	
	Name >	Submontane open ombrophilous forest (As)		
Year	Project year *t*	ha	annual $ABSLLK_t$ ha	cummulative ABSLLK ha
2013	0	0.0	0.0	0.0
2014	1	9,824.5	9,824.5	9,824.5
2015	2	9,550.7	9,550.7	19,375.2
2016	3	10,816.8	10,816.8	30,192.0
2017	4	8,854.7	8,854.7	39,046.7
2018	5	10,414.4	10,414.4	49,461.1
2019	6	8,464.0	8,464.0	57,925.1
2020	7	10,012.1	10,012.1	67,937.2
2021	8	8,358.8	8,358.8	76,296.0
2022	9	11,309.6	11,309.6	87,605.6
2023	10	7,678.3	7,678.3	95,283.9
2024	11	8,632.8	8,632.8	8,632.8
2025	12	7,620.2	7,620.2	111,536.9
2026	13	8,142.8	8,142.8	119,679.7
2027	14	7,435.6	7,435.6	127,115.3
2028	15	7,759.2	7,759.2	134,874.5
2029	16	7,194.7	7,194.7	142,069.2
2030	17	9,005.5	9,005.5	151,074.7
2031	18	6,466.6	6,466.6	157,541.3
2032	19	6,958.6	6,958.6	164,499.9
2033	20	6,291.9	6,291.9	170,791.8
2034	21	6,668.8	6,668.8	177,460.6
2035	22	6,039.0	6,039.0	183,499.6
2036	23	6,427.9	6,427.9	189,927.5
2037	24	5,778.2	5,778.2	195,705.7
2038	25	7,492.6	7,492.6	203,198.3
2039	26	5,144.3	5,144.3	208,342.6
2040	27	5,857.8	5,857.8	214,200.4
2041	28	8,801.2	8,801.2	223,001.6
2042	29	1,792.8	1,792.8	224,794.4
2043	30	4,774.6	4,774.6	229,569.0
TOTAL			**229,569.0**	

To project the LU/LC classes that will replace forests in the baseline case, Method 1 “Historical LU/LC-change” has been chosen, since historical LU/LC-changes are assumed to be representative for future trends. Hence, post-deforestation land-uses are allocated to the projected areas of annual deforestation in same proportions as those observed on lands deforested during the historical reference period in the Reference Region.

As described in "1.10 Conditions Prior to Project Initiation" of the VCS-PD, pasture accounts for virtually all the deforested land occupation in the project region. Thus, the post deforestation class is considered as "pasture".

The following table shows the annual estimates of deforestation within the Project Area, obtained by means of modelling.

Table 18 - Annual areas deforested in each zone within the Project Area in the baseline case (baseline activity data zone) (Table 13.b of VM0015).

	ID_z >	1	Total baseline deforestation in the project area	
	Name >	Pasture		
Year	Project year *t*	ha	annual $ABSLPA_t$ ha	cummulative ABSLPA ha
2013	0	0.0	0.0	0.0
2014	1	1,748.3	1,748.3	1,748.3
2015	2	244.0	244.0	1,992.3
2016	3	0.0	0.0	1,992.3
2017	4	242.3	242.3	2,234.6
2018	5	0.0	0.0	2,234.6
2019	6	241.9	241.9	2,476.4
2020	7	0.0	0.0	2,476.4
2021	8	246.7	246.7	2,723.1
2022	9	0.0	0.0	2,723.1
2023	10	238.7	238.7	2,961.8
2024	11	0.0	0.0	2,961.8
2025	12	237.5	237.5	3,199.3
2026	13	0.0	0.0	3,199.3
2027	14	238.9	238.9	3,438.2
2028	15	0.0	0.0	3,438.2
2029	16	225.7	225.7	3,663.8
2030	17	0.0	0.0	3,663.8
2031	18	224.4	224.4	3,888.3
2032	19	0.0	0.0	3,888.3
2033	20	219.8	219.8	4,108.1
2034	21	0.0	0.0	4,108.1
2035	22	217.4	217.4	4,325.5
2036	23	0.0	0.0	4,325.5
2037	24	220.7	220.7	4,546.2
2038	25	0.0	0.0	4,546.2
2039	26	212.0	212.0	4,758.2
2040	27	0.0	0.0	4,758.2
2041	28	214.0	214.0	4,972.2
2042	29	0.0	0.0	4,972.2
2043	30	419.4	419.4	5,391.6
TOTAL			5,391.6	

The following table shows the annual estimates of deforestation within the Leakage Belt, obtained by means of modelling.

Table 19 - Annual areas deforested in each zone within the Leakage Belt in the baseline case (baseline activity data per zone) (Table 13.c of VM0015)

	ID_z >	1	Total baseline deforestation in the leakage belt	
	Name >	Pasture		
Year	Project year *t*	ha	annual $ABSLLK_t$ ha	cummulative ABSLLK ha
2013	0	0.0	0.0	0.0
2014	1	9,824.5	9,824.5	9,824.5
2015	2	9,550.7	9,550.7	19,375.2
2016	3	10,816.8	10,816.8	30,192.0
2017	4	8,854.7	8,854.7	39,046.7
2018	5	10,414.4	10,414.4	49,461.1
2019	6	8,464.0	8,464.0	57,925.1
2020	7	10,012.1	10,012.1	67,937.2
2021	8	8,358.8	8,358.8	76,296.0
2022	9	11,309.6	11,309.6	87,605.6
2023	10	7,678.3	7,678.3	95,283.9
2024	11	8,632.8	8,632.8	8,632.8
2025	12	7,620.2	7,620.2	111,536.9
2026	13	8,142.8	8,142.8	119,679.7
2027	14	7,435.6	7,435.6	127,115.3
2028	15	7,759.2	7,759.2	134,874.5
2029	16	7,194.7	7,194.7	142,069.2
2030	17	9,005.5	9,005.5	151,074.7
2031	18	6,466.6	6,466.6	157,541.3
2032	19	6,958.6	6,958.6	164,499.9
2033	20	6,291.9	6,291.9	170,791.8
2034	21	6,668.8	6,668.8	177,460.6
2035	22	6,039.0	6,039.0	183,499.6
2036	23	6,427.9	6,427.9	189,927.5
2037	24	5,778.2	5,778.2	195,705.7
2038	25	7,492.6	7,492.6	203,198.3
2039	26	5,144.3	5,144.3	208,342.6
2040	27	5,857.8	5,857.8	214,200.4
2041	28	8,801.2	8,801.2	223,001.6
2042	29	1,792.8	1,792.8	224,794.4
2043	30	4,774.6	4,774.6	229,569.0
TOTAL			229,569.0	

The carbon stock change factors shown below have been calculated based on VM0015 premises and using Method 2, as activity data are available for categories.

Table 20 - Carbon stock change factors for land-use change categories (ct or ctz) (Method 2) (Table 20.c of VM0015).

Year after deforestation		ΔCabctz,t	ΔCbbctz,t	ΔCwpctz,t long-lived
1	2013	-575.48	-18.85	0.0
2	2014	1.56	-18.85	0.0
3	2015	1.56	-18.85	0.0
4	2016	1.56	-18.85	0.0
5	2017	1.56	-18.85	0.0
6	2018	1.56	-18.85	0.0
7	2019	1.56	-18.85	0.0
8	2020	1.56	-18.85	0.0
9	2021	1.56	-18.85	0.0
10	2022	1.56	-18.85	0.0
11	2023	0.0	0.00	0.0
12	2024	0.0	0.00	0.0
13	2025	0.0	0.00	0.0
14	2026	0.0	0.00	0.0
15	2027	0.0	0.00	0.0
16	2028	0.0	0.00	0.0
17	2029	0.0	0.00	0.0
18	2030	0.0	0.00	0.0
19	2031	0.0	0.00	0.0
20	2032	0.0	0.00	0.0
21	2033	0.0	0.00	0.0
22	2034	0.0	0.00	0.0
23	2035	0.0	0.00	0.0
24	2036	0.0	0.00	0.0
25	2037	0.0	0.00	0.0
26	2038	0.0	0.00	0.0
27	2039	0.0	0.00	0.0
28	2040	0.0	0.00	0.0
29	2041	0.0	0.00	0.0
30	2042	0.0	0.00	0.0
31	2043	0.0	0.00	0.0

The following tables show the calculation of baseline carbon stock changes in above-ground biomass, below-ground biomass, and wood products in the Project Area, using the carbon stock change factors presented in Table 20.c of VM0015.

Table 21 - Baseline carbon stock change in the above-ground biomass in the Project Area (Table 22.b.1 of VM0015)

Year	Project year t	Activity data per category x Carbon stock change factor for above-ground biomass in the project area		Total baseline carbon stock change in the project area	
		Forest / Pasture		annual	cumulative
		$ABSLPA_{ct,t}$	$\Delta Cab_{ct,t}$	$\Delta CabBSLPA_t$	$\Delta CabBSLPA$
		ha	$tCO_2\text{-e ha}^{-1}$	$tCO_2\text{-e}$	$tCO_2\text{-e}$
2013	0	0.0	0.0	0.0	0.0
2014	1	1,748.3	-575	-1,006,076	-1,006,076
2015	2	244.0	-69	-137,684	-1,143,760
2016	3	0.0	2	3,114	-1,140,646
2017	4	242.3	-61	-136,330	-1,276,976
2018	5	0.0	2	3,492	-1,273,484
2019	6	241.9	-55	-135,698	-1,409,182
2020	7	0.0	1.6	3,870	3,870
2021	8	246.7	-50.7	-138,076	-134,206
2022	9	0.0	2	6,232	-127,974
2023	10	238.7	-45	-133,855	-261,830
2024	11	0.0	1	1,140	-260,690
2025	12	237.5	-113	-135,940	-396,630
2026	13	0.0	1	1,130	-395,500
2027	14	238.9	-113	-136,328	-531,829
2028	15	0.0	1	1,503	-530,325
2029	16	225.7	-108	-128,359	-658,684
2030	17	0.0	2	1,856	-656,828
2031	18	224.4	-110	-127,678	-784,507
2032	19	0.0	2	1,821	-782,685
2033	20	219.8	-109	-125,047	-907,733
2034	21	0.0	2	1,792	-905,941
2035	22	217.4	-110	-123,700	-1,029,641
2036	23	0.0	2	1,760	-1,027,881
2037	24	220.7	-113	-125,621	-1,153,502
2038	25	0.0	2	1,732	-1,151,770
2039	26	212.0	-110	-120,633	-1,272,403
2040	27	0.0	2	1,710	-1,270,693
2041	28	214.0	-112	-121,775	-1,392,468
2042	29	0.0	2	1,694	-1,390,774
2043	30	419.4	-187	-240,016	-1,630,790

Table 22 - Baseline carbon stock change in the below-ground biomass in the Project Area (Table 22.b.2 of VM0015).

Year	Project year t	Activity data per category x Carbon stock change factor for below-ground biomass in the project area		Total baseline carbon stock change in the project area	
		Forest / Forest		annual	cumulative
		$BBSLPA_{ct,t}$	$\Delta Cbb_{ct,t}$	$\Delta CbbBSLPA_t$	$\Delta CbbBSLPA$
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2013	0	0.0	0.0	0.0	0.0
2014	1	1,748.3	-18.85	-32,963	-32,963
2015	2	244.0	-18.85	-37,564	-70,526
2016	3	0.0	-18.85	-37,564	-108,090
2017	4	242.3	-18.85	-42,132	-150,222
2018	5	0.0	-18.85	-42,132	-192,354
2019	6	241.9	-18.85	-46,693	-239,047
2020	7	0.0	-18.85	-46,693	-46,693
2021	8	246.7	-18.85	-51,343	-98,036
2022	9	0.0	-18.85	-51,343	-149,379
2023	10	238.7	-18.85	-55,844	-205,223
2024	11	0.0	-18.85	-22,881	-228,104
2025	12	237.5	-18.85	-22,759	-250,863
2026	13	0.0	-18.85	-22,759	-273,622
2027	14	238.9	-18.85	-22,694	-296,315
2028	15	0.0	-18.85	-22,694	-319,009
2029	16	225.7	-18.85	-22,388	-341,397
2030	17	0.0	-18.85	-22,388	-363,786
2031	18	224.4	-18.85	-21,969	-385,755
2032	19	0.0	-18.85	-21,969	-407,723
2033	20	219.8	-18.85	-21,613	-429,337
2034	21	0.0	-18.85	-21,613	-450,950
2035	22	217.4	-18.85	-21,234	-472,183
2036	23	0.0	-18.85	-21,234	-493,417
2037	24	220.7	-18.85	-20,891	-514,308
2038	25	0.0	-18.85	-20,891	-535,200
2039	26	212.0	-18.85	-20,634	-555,834
2040	27	0.0	-18.85	-20,634	-576,468
2041	28	214.0	-18.85	-20,437	-596,905
2042	29	0.0	-18.85	-20,437	-617,342
2043	30	419.4	-18.85	-24,201	-641,543

Table 23 - Baseline carbon stock change in the wood products in the (Table 22.b.6 of VM0015).

Year	Project year t	Activity data per category x Carbon stock change factor for wood products biomass in the project area		Project Area Total baseline carbon stock change in the project area	
		Forest / Forest		annual	cumulative
		$WPSLPA_{ct,t}$	$\Delta Cwp_{ct,t}$	$\Delta CwpBSLPA_t$	$\Delta CwpBSLPA$
		ha	$tCO_2\text{-e ha}^{-1}$	$tCO_2\text{-e}$	$tCO_2\text{-e}$
2013	0	0.0	0.00	0.0	0.0
2014	1	1,748.3	0.00	0.0	0.0
2015	2	244.0	0.00	0.0	0.0
2016	3	0.0	0.00	0.0	0.0
2017	4	242.3	0.00	0.0	0.0
2018	5	0.0	0.00	0.0	0.0
2019	6	241.9	0.00	0.0	0.0
2020	7	0.0	0.00	0.0	0.0
2021	8	246.7	0.00	0.0	0.0
2022	9	0.0	0.00	0.0	0.0
2023	10	238.7	0.00	0.0	0.0
2024	11	0.0	0.00	0.0	0.0
2025	12	237.5	0.00	0.0	0.0
2026	13	0.0	0.00	0.0	0.0
2027	14	238.9	0.00	0.0	0.0
2028	15	0.0	0.00	0.0	0.0
2029	16	225.7	0.00	0.0	0.0
2030	17	0.0	0.00	0.0	0.0
2031	18	224.4	0.00	0.0	0.0
2032	19	0.0	0.00	0.0	0.0
2033	20	219.8	0.00	0.0	0.0
2034	21	0.0	0.00	0.0	0.0
2035	22	217.4	0.00	0.0	0.0
2036	23	0.0	0.00	0.0	0.0
2037	24	220.7	0.00	0.0	0.0
2038	25	0.0	0.00	0.0	0.0
2039	26	212.0	0.00	0.0	0.0
2040	27	0.0	0.00	0.0	0.0
2041	28	214.0	0.00	0.0	0.0
2042	29	0.0	0.00	0.0	0.0
2043	30	419.4	0.00	0.0	0.0

The following tables show the calculation of baseline carbon stock changes in above-ground biomass, below-ground biomass, and wood products in the Leakage Belt, using the carbon stock change factors presented in Table 20.c of VM0015.

Table 24 - Baseline carbon stock change in the above-ground biomass in the Leakage Belt area (Table 22.c.1 of VM0015).

Year	Project year t	Activity data per category x Carbon stock change factor for above-ground biomass in the leakage belt		Total baseline carbon stock change in the leakage belt	
		Forest / Pasture		annual	cumulative
		$ABSLLK_{ct,t}$	$\Delta Cab_{ct,t}$	$\Delta CabBSLLK_t$	$\Delta CabBSLLK$
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2013	0	0.0	0.0	0.0	0.0
2014	1	9,825	-575	-5,653,788	-5,653,788
2015	2	9,551	-283	-5,480,845	-11,134,633
2016	3	10,817	-205	-6,194,528	-17,329,160
2017	4	8,855	-129	-5,048,481	-22,377,641
2018	5	10,414	-120	-5,932,211	-28,309,852
2019	6	8,464	-83	-4,793,526	-33,103,379
2020	7	10,012	-83	-5,671,192	-38,774,571
2021	8	8,359	-62	-4,704,109	-43,478,680
2022	9	11,310	-73	-6,389,160	-49,867,840
2023	10	7,678	-45	-4,281,758	-54,149,598
2024	11	8,633	-51	-4,834,404	-58,984,002
2025	12	7,620	-46	-4,253,112	-63,237,114
2026	13	8,143	-51	-4,558,851	-67,795,965
2027	14	7,436	-47	-4,152,987	-71,948,952
2028	15	7,759	-51	-4,343,867	-76,292,820
2029	16	7,195	-48	-4,020,112	-80,312,932
2030	17	9,006	-61	-5,066,588	-85,379,520
2031	18	6,467	-44	-3,604,501	-88,984,021
2032	19	6,959	-51	-3,895,204	-92,879,225
2033	20	6,292	-47	-3,512,659	-96,391,884
2034	21	6,669	-51	-3,733,215	-100,125,099
2035	22	6,039	-47	-3,372,267	-103,497,366
2036	23	6,428	-51	-3,599,358	-107,096,723
2037	24	5,778	-47	-3,227,046	-110,323,769
2038	25	7,493	-62	-4,216,738	-114,540,507
2039	26	5,144	-43	-2,864,882	-117,405,389
2040	27	5,858	-52	-3,281,519	-120,686,908
2041	28	8,801	-76	-4,976,327	-125,663,235
2042	29	1,793	-16	-940,280	-126,603,515
2043	30	4,775	-45	-2,663,267	-129,266,782

Table 25 - Baseline carbon stock change in the below-ground biomass in the Leakage Belt area (Table 22.c.2 of VM0015).

Year	Project year t	Activity data per category x Carbon stock change factor for below-ground biomass in the leakage belt		Total baseline carbon stock change in the leakage belt	
		Forest / Pasture		annual	cumulative
		$BBSLLK_{ct,t}$	$\Delta Cbb_{ct,t}$	$\Delta CbbBSLLK_t$	$\Delta CbbBSLLK$
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2013	0	0.0	0.0	0.0	0.0
2014	1	9,825	-18.85	-185,240	-185,240
2015	2	9,551	-18.85	-365,317	-550,557
2016	3	10,817	-18.85	-569,265	-1,119,822
2017	4	8,855	-18.85	-736,219	-1,856,041
2018	5	10,414	-18.85	-932,581	-2,788,622
2019	6	8,464	-18.85	-1,092,168	-3,880,790
2020	7	10,012	-18.85	-1,280,944	-5,161,734
2021	8	8,359	-18.85	-1,438,548	-6,600,282
2022	9	11,310	-18.85	-1,651,788	-8,252,071
2023	10	7,678	-18.85	-1,796,561	-10,048,632
2024	11	8,633	-18.85	-1,774,091	-11,822,723
2025	12	7,620	-18.85	-1,737,692	-13,560,416
2026	13	8,143	-18.85	-1,687,274	-15,247,690
2027	14	7,436	-18.85	-1,660,517	-16,908,207
2028	15	7,759	-18.85	-1,610,454	-18,518,662
2029	16	7,195	-18.85	-1,586,522	-20,105,183
2030	17	9,006	-18.85	-1,567,542	-21,672,726
2031	18	6,467	-18.85	-1,531,865	-23,204,591
2032	19	6,959	-18.85	-1,449,828	-24,654,419
2033	20	6,292	-18.85	-1,423,688	-26,078,107
2034	21	6,669	-18.85	-1,386,657	-27,464,764
2035	22	6,039	-18.85	-1,356,844	-28,821,608
2036	23	6,428	-18.85	-1,324,510	-30,146,117
2037	24	5,778	-18.85	-1,293,260	-31,439,377
2038	25	7,493	-18.85	-1,288,233	-32,727,609
2039	26	5,144	-18.85	-1,249,573	-33,977,182
2040	27	5,858	-18.85	-1,190,224	-35,167,406
2041	28	8,801	-18.85	-1,234,242	-36,401,648
2042	29	1,793	-18.85	-1,136,842	-37,538,490
2043	30	4,775	-18.85	-1,108,233	-38,646,723

Table 26 - Baseline carbon stock change in the wood products in the Leakage Belt area (Table 22.c.6 of VM0015).

Year	Project year t	Activity data per category x Carbon stock change factor for wood products biomass in the leakage belt area		Total baseline carbon stock change in the leakage belt area	
		Forest / Pasture		annual	cumulative
		$WPSLLK_{ct,t}$	$\Delta Cwp_{ct,t}$	$\Delta CwpBSLLK_t$	$\Delta CwpBSLLK$
		ha	$tCO_2\text{-e ha}^{-1}$	$tCO_2\text{-e}$	$tCO_2\text{-e}$
2013	0	0,0	0.00	0.0	0.0
2014	1	9,824.5	0.00	0.0	0.0
2015	2	9,550.7	0.00	0.0	0.0
2016	3	10,816.8	0.00	0.0	0.0
2017	4	8,854.7	0.00	0.0	0.0
2018	5	10,414.4	0.00	0.0	0.0
2019	6	8,464.0	0.00	0.0	0.0
2020	7	10,012.1	0.00	0.0	0.0
2021	8	8,358.8	0.00	0.0	0.0
2022	9	11,309.6	0.00	0.0	0.0
2023	10	7,678.3	0.00	0.0	0.0
2024	11	8,632.8	0.00	0.0	0.0
2025	12	7,620.2	0.00	0.0	0.0
2026	13	8,142.8	0.00	0.0	0.0
2027	14	7,435.6	0.00	0.0	0.0
2028	15	7,759.2	0.00	0.0	0.0
2029	16	7,194.7	0.00	0.0	0.0
2030	17	9,005.5	0.00	0.0	0.0
2031	18	6,466.6	0.00	0.0	0.0
2032	19	6,958.6	0.00	0.0	0.0
2033	20	6,291.9	0.00	0.0	0.0
2034	21	6,668.8	0.00	0.0	0.0
2035	22	6,039.0	0.00	0.0	0.0
2036	23	6,427.9	0.00	0.0	0.0
2037	24	5,778.2	0.00	0.0	0.0
2038	25	7,492.6	0.00	0.0	0.0
2039	26	5,144.3	0.00	0.0	0.0
2040	27	5,857.8	0.00	0.0	0.0
2041	28	8,801.2	0.00	0.0	0.0
2042	29	1,792.8	0.00	0.0	0.0
2043	30	4,774.6	0.00	0.0	0.0

Conversion of forest to non-forest involving fires is a source of emissions of non-CO_2 gases (CH_4 and N_2O). Sufficient data on such forest fires are available from the historical reference period and the project proponent considers that these emissions are an important component of the baseline. Thus, CH_4 emissions from biomass burning were estimated.

The effect of fire on carbon emissions is counted in the estimation of carbon stock changes; therefore, CO_2 emissions from forest fires were ignored to avoid double counting.

To estimate non-CO_2 emissions from forest fires, the average percentage of the deforested area in which fire was used, the average proportion of mass burnt in each carbon pool (Pburnt,p), and the average combustion efficiency of each pool (CEp) were estimated. These average percentage values were estimated for each forest class (*icl*) and are assumed to remain the same in the future.

Based on revised IPCC 1996 GL LULUCF, GHG emissions from biomass burning were estimated as follows.

$$EBBtot_{icl,t} = EBBN2O_{id,t} + EBBCH4_{id,t}$$

Where:

$EBBtot_{icl,t}$: Total GHG emission from biomass burning in forest class icl at year t; tCO_2-e ha_{-1}

$EBBN_2O_{icl,t}$:N_2O emission from biomass burning in forest class icl at year t; tCO_2-e ha_{-1}

$EBBCH_{4icl,t}$:CH_4 emission from biomass burning in forest class icl at year t; tCO_2-e ha_{-1}

$$EBBN2O_{id,t} = EBBCO2_{id,t} * 12/44 * NCR*ER_{N2O}*44/28*GWP_{N2O}$$

$$EBBCH4_{id,t} = EBBCO2_{id,t} * 12/44 * ER_{CH4}*16/12*GWP_{CH4}$$

Where:

$EBBCO_2icl,t$ *Per hectare CO_2 emission from biomass burning in slash and burn in forest class icl at year t; tCO_2-e ha-1*

$EBBN_2Oicl,t$ *Per hectare N_2O emission from biomass burning in slash and burn in forest class icl at year t; tCO_2-e ha-1*

$EBBCH_4icl,t$ *Per hectare CH_4 emission from biomass burning in slash and burn in forest class icl at year t; tCO_2-e ha-1*

NCR *Nitrogen to Carbon Ratio (IPCC default value = 0.01); dimensionless*

ERN_2O *Emission ratio for N_2O (IPCC default value = 0.007)*

$ERCH_4$ *Emission ratio for CH_4 (IPCC default value = 0.012)*

$GWPN_2O$: Global Warming Potential for N_2O (IPCC default value = 310 for the first commitment period)

$GWPCH_4$: Global Warming Potential for CH_4 (IPCC default value = 21 for the first commitment period)

$$EBBCO2_{icl,t} = Fburnt_{icl} * \sum_{p=1}^{P} (C_{p,icl,t} * Pburnt_{p.icl} * CE_{p,icl})$$

Where:

$EBBCO_2icl,t$ 1	*Per hectare CO_2 emission from biomass burning in the forest class icl at year t; tCO_2-e ha-*
Fburnticl	*Proportion of forest area burned during the historical reference period in the forest class icl; %*
Cp,icl,t	*Average carbon stock per hectare in the carbon pool p burnt in the forest class icl at year t; tCO_2-e ha-1*
Pburntp,icl	*Average proportion of mass burnt in the carbon pool p in the forest class icl; %*
CEp,icl	*Average combustion efficiency of the carbon pool p in the forest class icl; dimensionless*
P	*Carbon pool that could burn (above-ground biomass, dead wood, litter)*
icl	*1, 2, 3, …icl (pre-deforestation) forest classes*
t	*1, 2, 3 … t, a year of the proposed project crediting period; dimensionless*

The IPCC default combustion efficiency of 0.5 was used. The Nitrogen to Carbon Ratio (NCR) of 0.01 was used.

Table 27 - Parameters used to calculate non-CO_2 emissions from forest fires (Table 23 of VM0015).

Initial Forest Class		Parameters								
		$Fburnt_{icl}$	Cab	$Pburnt_{ab,icl}$	$CEab,icl$	$ECO_2\text{-}ab$	$EBBCO_2\text{-}tot$	$EBBN_2O_{icl}$	$EBBCH_{4icl}$	$EBBtot_{icl}$
IDcl	Name	N/A	$tCO_2e\ ha^{-1}$	N/A	N/A	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$
1	Submontane open ombrophilous forest (As)	1.0	575	0.86	0.5	247	247	1.97	30.2	32.2

Table 28 - Baseline non-CO_2 emissions from forest fires in the Project Area (Table 24 of VM0015).

Year	Project year t	Emissions of non-CO2 gasses from baseline forest fires		Total baseline non-CO2 emissions from forest fires in the project area	
		IDicl = 1		annual	cumulative
		$ABSLPA_{icl,t}$	$EBBBSLtot_{icl}$	$EBBBSLPA_t$	EBBBSLPA
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2013	0	0.0	32.30	0.0	0.0
2014	1	1,748.3	32.30	56,464	56,464
2015	2	244.0	32.30	7,881	64,344
2016	3	0.0	32.30	0.0	64,344
2017	4	242.3	32.30	7,826	72,170
2018	5	0.0	32.30	0.0	72,170
2019	6	241.9	32.30	7,812	79,982
2020	7	0.0	32.30	0.0	79,982
2021	8	246.7	32.30	7,966	87,948
2022	9	0.0	32.30	0.0	87,948
2023	10	238.7	32.30	7,709	95,657
2024	11	0.0	32.30	0.0	95,657
2025	12	237.5	32.30	7,672	103,329
2026	13	0.0	32.30	0.0	103,329
2027	14	238.9	32.30	7,715	111,043
2028	15	0.0	32.30	0.0	111,043
2029	16	225.7	32.30	7,288	118,331
2030	17	0.0	32.30	0.0	118,331
2031	18	224.4	32.30	7,248	125,580
2032	19	0.0	32.30	0.0	125,580
2033	20	219.8	32.30	7,099	132,679
2034	21	0.0	32.30	0.0	132,679
2035	22	217.4	32.30	7,022	139,701
2036	23	0.0	32.30	0.0	139,701
2037	24	220.7	32.30	7,128	146,829
2038	25	0.0	32.30	0.0	146,829
2039	26	212.0	32.30	6,848	153,677
2040	27	0.0	32.30	0.0	153,677
2041	28	214.0	32.30	6,911	160,587
2042	29	0.0	32.30	0.0	160,587
2043	30	419.4	32.30	13,546	174,133

Ex ante estimation of actual carbon stock changes

These carbon stock changes are due to the following:

- Planned activities within the project area.
- Unplanned deforestation that cannot be avoided.

Carbon stock changes due to possible future catastrophic events cannot be predicted and were therefore excluded from the ex-ante assessment.

Certain discrete areas of forest within the project area will be subject to project activities that will change the carbon stocks of these areas compared to the baseline. In this Project Activity, such activities are related to planned timber logging.

According to the Sustainable Forest Management Plan, the annual area of wood-controlled logging is 1,831.74 hectares. Given that the total management area is 24,295.89 hectares, it was assumed ex-ante that logging activities would be carried out over 13 years, followed by 14 years of fallow period. The table below shows the yearly ex-ante estimates of carbon stock decrease due to planned logging activities in the Project Area.

The increase following planned logging activities in the Project Area has also been estimated ex-ante, using secondary data by WEST et al. (2014)[27], which points to an annual increase of 3.03 tCO_2 per hectare per year due to post-logging regeneration of vegetation.

[27] West et al. 2014. Forest Ecology and Management 314 (2014) 59–63.

Table 29 - Ex-ante estimated actual carbon stock decrease due to planned logging activities in the Project Area (Table 25.b of VM0015).

Year	Project year t	Areas of planned logging activities x Carbon stock change (decrease) in the project area		Total carbon stock decrease due to planned logging activities	
		IDcl = 1		annual	cumulative
		$APLPA_{icl,t}$	$\Delta Ctot_{icl,t}$	$\Delta CPLdPA_t$	$\Delta CPLdPA$
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2013	0	0.0	47.24	0.0	0.0
2014	1	1,831.7	47.24	86,538	86,538
2015	2	1,831.7	47.24	86,538	173,075
2016	3	1,831.7	47.24	86,538	259,613
2017	4	1,831.7	47.24	86,538	346,150
2018	5	1,831.7	47.24	86,538	432,688
2019	6	1,831.7	47.24	86,538	519,225
2020	7	1,831.7	47.24	86,538	605,763
2021	8	1,831.7	47.24	86,538	692,300
2022	9	1,831.7	47.24	86,538	778,838
2023	10	1,831.7	47.24	86,538	865,375
2024	11	1,831.7	47.24	86,538	951,913
2025	12	1,831.7	47.24	86,538	1,038,450
2026	13	1,831.7	47.24	86,538	1,124,988
2027	14	0.0	47.24	0.0	1,124,988
2028	15	0.0	47.24	0.0	1,124,988
2029	16	0.0	47.24	0.0	1,124,988
2030	17	0.0	47.24	0.0	1,124,988
2031	18	0.0	47.24	0.0	1,124,988
2032	19	0.0	47.24	0.0	1,124,988
2033	20	0.0	47.24	0.0	1,124,988
2034	21	0.0	47.24	0.0	1,124,988
2035	22	0.0	47.24	0.0	1,124,988
2036	23	0.0	47.24	0.0	1,124,988
2037	24	0.0	47.24	0.0	1,124,988
2038	25	0.0	47.24	0.0	1,124,988
2039	26	0.0	47.24	0.0	1,124,988
2040	27	0.0	47.24	0.0	1,124,988
2041	28	1,831.7	47.24	86,538	1,211,525
2042	29	1,831.7	47.24	86,538	1,298,063
2043	30	1,831.7	47.24	86,538	1,384,600

Table 30 - Ex ante estimated carbon stock increase following planned logging activities in the Project Area (Table 26.b of VM0015).

Year	Project year t	Areas of planned logging activities x Carbon stock change (increase up to maximum long-term average) in the project area		Total carbon stock increase due to planned logging activities	
		IDcl = 1		annual	cumulative
		$APLPA_{icl,t}$	$\Delta Ctot_{icl,t}$	$\Delta CPLiPA_t$	$\Delta CPLiPA$
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2013	0	0.0	0.0	0.0	0.0
2014	1	1,831.7	3.03	5,541	5,541
2015	2	1,831.7	6.05	11,082	16,623
2016	3	1,831.7	9.08	16,623	33,246
2017	4	1,831.7	12.10	22,164	55,410
2018	5	1,831.7	15.13	27,705	83,115
2019	6	1,831.7	18.15	33,246	116,361
2020	7	1,831.7	21.18	38,787	155,148
2021	8	1,831.7	24.20	44,328	199,476
2022	9	1,831.7	27.23	49,869	249,345
2023	10	1,831.7	30.25	55,410	304,755
2024	11	1,831.7	33.28	60,951	365,707
2025	12	1,831.7	36.30	66,492	432,199
2026	13	1,831.7	39.33	72,033	504,232
2027	14	1,831.7	42.35	77,574	581,806
2028	15	1,831.7	45.38	83,115	664,921
2029	16	1,831.7	48.40	88,656	753,577
2030	17	1,831.7	51.43	94,197	847,774
2031	18	1,831.7	54.45	99,738	947,512
2032	19	1,831.7	57.48	105,279	1,052,792
2033	20	1,831.7	60.50	110,820	1,163,612
2034	21	1,831.7	63.53	116,361	1,279,973
2035	22	1,831.7	66.55	121,902	1,401,875
2036	23	1,831.7	69.58	127,443	1,529,318
2037	24	1,831.7	72.60	132,984	1,662,302
2038	25	1,831.7	75.63	138,525	1,800,828
2039	26	1,831.7	78.65	144,066	1,944,894
2040	27	1,831.7	81.68	149,607	2,094,501
2041	28	1,831.7	81.68	149,607	2,244,108
2042	29	1,831.7	81.68	149,607	2,393,715
2043	30	1,831.7	81.68	149,607	2,543,323

Some unplanned deforestation may happen in the project area despite the AUD project activity. The level at which deforestation will actually be reduced in the project case depends on the effectiveness of the proposed activities, which cannot be measured ex-ante.

To allow ex ante projections to be made, the project proponent conservatively estimated an Effectiveness Index (EI) of 0.90.

$$\Delta CUDdPA_t = \Delta CBSL_t * (1 - EI)$$

Where:

ΔCUDdPAt — *Total ex ante actual carbon stock change due to unavoided unplanned deforestation at year t in the project area; tCO_2-e*

ΔCBSLt — *Total baseline carbon stock change at year t in the project area; tCO_2-e*

EI — *Ex ante estimated Effectiveness Index; %*

t — *1, 2, 3 … t, a year of the proposed project crediting period; dimensionless*

Table 31 - Ex ante estimated net carbon stock change in the Project Area under the project scenario (Table 27 of VM0015).

Year	Project year t	Total carbon stock decrease due to planned logging activities		Total carbon stock increase due to planned logging activities		Total carbon stock decrease due to unavoided unplanned deforestation		Total carbon stock change in the project case	
		annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
		$\Delta CPLdPA_t$	$\Delta CPLdPA$	$\Delta CPLiPA_t$	$\Delta CPLiPA$	$\Delta CUDdPA_t$	$\Delta CUDdPA$	$\Delta CPSPA_t$	$\Delta CPSPA$
		tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2013	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2014	1	86,538	86,538	5,541	5,541	-103,624	-103,624	-184,621	-184,621
2015	2	86,538	173,075	11,082	16,623	-15,723	-119,348	-91,179	-275,800
2016	3	86,538	259,613	16,623	33,246	-1,437	-120,784	-71,351	-347,151
2017	4	86,538	346,150	22,164	55,410	-15,799	-136,583	-80,172	-427,323
2018	5	86,538	432,688	27,705	83,115	-1,611	-138,194	-60,444	-487,767
2019	6	86,538	519,225	33,246	116,361	-15,948	-154,142	-69,239	-557,006
2020	7	86,538	605,763	38,787	155,148	-1,786	-155,928	-49,536	-606,542
2021	8	86,538	692,300	44,328	199,476	-16,406	-172,334	-58,615	-665,157
2022	9	86,538	778,838	49,869	249,345	-1,963	-174,297	-38,632	-703,789
2023	10	86,538	865,375	55,410	304,755	-16,111	-190,408	-47,238	-751,028
2024	11	86,538	951,913	60,951	365,707	-2,136	-192,543	-27,722	-778,750
2025	12	86,538	1,038,450	66,492	432,199	-14,955	-207,498	-35,000	-813,750
2026	13	86,538	1,124,988	72,033	504,232	-870	-208,369	-15,375	-829,125
2027	14	0.0	1,124,988	77,574	581,806	-15,028	-223,397	62,546	-766,579
2028	15	0.0	1,124,988	83,115	664,921	-868	-224,265	82,247	-684,331
2029	16	0.0	1,124,988	88,656	753,577	-14,243	-238,508	74,413	-609,919
2030	17	0.0	1,124,988	94,197	847,774	-856	-239,364	93,341	-516,578
2031	18	0.0	1,124,988	99,738	947,512	-14,158	-253,523	85,580	-430,998
2032	19	0.0	1,124,988	105,279	1,052,792	-840	-254,363	104,439	-326,559
2033	20	0.0	1,124,988	110,820	1,163,612	-13,869	-268,232	96,951	-229,608
2034	21	0.0	1,124,988	116,361	1,279,973	-827	-269,058	115,535	-114,073
2035	22	0.0	1,124,988	121,902	1,401,875	-13,714	-282,772	108,188	-5,885
2036	23	0.0	1,124,988	127,443	1,529,318	-812	-283,584	126,631	120,746
2037	24	0.0	1,124,988	132,984	1,662,302	-13,894	-297,478	119,091	239,837
2038	25	0.0	1,124,988	138,525	1,800,828	-799	-298,277	137,726	377,563
2039	26	0.0	1,124,988	144,066	1,944,894	-13,366	-311,643	130,700	508,263
2040	27	0.0	1,124,988	149,607	2,094,501	-789	-312,432	148,818	657,082
2041	28	86,538	1,211,525	149,607	2,244,108	-13,472	-325,903	49,598	706,680

Year	Project year t	Total carbon stock decrease due to planned logging activities		Total carbon stock increase due to planned logging activities		Total carbon stock decrease due to unavoided unplanned deforestation		Total carbon stock change in the project case	
		annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
		$\Delta CPLdPA_t$	$\Delta CPLdPA$	$\Delta CPLiPA_t$	$\Delta CPLiPA$	$\Delta CUDdPA_t$	$\Delta CUDdPA$	$\Delta CPSPA_t$	$\Delta CPSPA$
		tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2042	29	86,538	1,298,063	149,607	2,393,715	-782	-326,685	62,288	768,968
2043	30	86,538	1,384,600	149,607	2,543,323	-25,642	-352,327	37,428	806,395

Ex ante estimation of actual non-CO_2 emissions from forest fires

Where forest fires have been included in the baseline scenario, non-CO_2 emissions from biomass burning must be included in the project scenario. This is done by multiplying the baseline emissions by the factor (1 – *EI*).

$$EBBPSPA_t = EBBBSPA_t^* (1 - EI)$$

$$EBBPSPA_t = EBBBSPA_t^* (1 - EI)$$

Where:

EBBPSPAt	*Total ex ante actual non-CO_2 emissions from forest fire due to unavoided unplanned deforestation at year t in the project area; tCO_2-e*
EBBBSPAt T	*Total non-CO_2 emissions from forest fire at year t in the project area; tCO_2-e*
EI	*Ex ante estimated Effectiveness Index; %*
t	*1, 2, 3 … t, a year of the proposed project crediting period; dimensionless*

Table 32 - Total ex ante estimated actual emissions of non-CO_2 gases due to forest fires in the Project Area (Table 28 of VM0015).

Year	Project year t	Total ex ante estimated actual non-CO_2 emissions from forest fires in the Project area	
		annual	cumulative
		$EBBPSPA_t$	EBBPSPA
		tCO_2-e	tCO_2-e
2013	0	0.0	0.0
2014	1	4,365	4,365
2015	2	609	4,974
2016	3	0.0	4,974
2017	4	605	5,579
2018	5	0.0	5,579
2019	6	604	6,183
2020	7	0.0	6,183
2021	8	616	6,799
2022	9	0.0	6,799
2023	10	596	7,395
2024	11	0.0	7,395
2025	12	593	7,988
2026	13	0.0	7,988
2027	14	596	8,584
2028	15	0.0	8,584
2029	16	563	9,147
2030	17	0.0	9,147
2031	18	560	9,708
2032	19	0.0	9,708
2033	20	549	10,256
2034	21	0.0	10,256
2035	22	543	10,799
2036	23	0.0	10,799
2037	24	551	11,350
2038	25	0.0	11,350
2039	26	529	11,880
2040	27	0.0	11,880
2041	28	534	12,414
2042	29	0.0	12,414
2043	30	1,047	13,461

Table 33 - Total ex ante estimated actual net carbon stock changes and emissions of non-CO_2 gases in the Project Area (Table 29 of VM0015).

Year	Project year t	Total ex ante carbon stock decrease due to planned activities		Total ex ante carbon stock increase due to planned activities		Total ex ante carbon stock decrease due to unavoided unplanned deforestation		Total ex ante net carbon stock change		Total ex ante estimated actual non-CO2 emissions from forest fires in the project area	
		annual $\Delta CPAdPA_t$ tCO_2-e	cumulative $\Delta CPAdPA$ tCO_2-e	annual $\Delta CPAiPA_t$ tCO_2-e	cumulative $\Delta CPAiPA$ tCO_2-e	annual $\Delta CUDdPA_t$ tCO_2-e	cumulative $\Delta CUDdPA$ tCO_2-e	annual $\Delta CPSPA_t$ tCO_2-e	cumulative $\Delta CPSPA$ tCO_2-e	annual $EBBPSPA_t$ tCO_2-e	cumulative $EBBPSPA$ tCO_2-e
2013	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2014	1	86,538	86,538	5,541	5,541	-103,624	-103,624	-184,621	-184,621	4,365	4,365
2015	2	86,538	173,075	11,082	16,623	-15,723	-119,348	-91,179	-275,800	609	4,974
2016	3	86,538	259,613	16,623	33,246	-1,437	-120,784	-71,351	-347,151	0.0	4,974
2017	4	86,538	346,150	22,164	55,410	-15,799	-136,583	-80,172	-427,323	605	5,579
2018	5	86,538	432,688	27,705	83,115	-1,611	-138,194	-60,444	-487,767	0.0	5,579
2019	6	86,538	519,225	33,246	116,361	-15,948	-154,142	-69,239	-557,006	604	6,183
2020	7	86,538	605,763	38,787	155,148	-1,786	-155,928	-49,536	-606,542	0.0	6,183
2021	8	86,538	692,300	44,328	199,476	-16,406	-172,334	-58,615	-665,157	616	6,799
2022	9	86,538	778,838	49,869	249,345	-1,963	-174,297	-38,632	-703,789	0.0	6,799
2023	10	86,538	865,375	55,410	304,755	-16,111	-190,408	-47,238	-751,028	596	7,395
2024	11	86,538	951,913	60,951	365,707	-2,136	-192,543	-27,722	-778,750	0.0	7,395
2025	12	86,538	1,038,450	66,492	432,199	-14,955	-207,498	-35,000	-813,750	593	7,988
2026	13	86,538	1,124,988	72,033	504,232	-870	-208,369	-15,375	-829,125	0.0	7,988
2027	14	0.0	1,124,988	77,574	581,806	-15,028	-223,397	62,546	-766,579	596	8,584
2028	15	0.0	1,124,988	83,115	664,921	-868	-224,265	82,247	-684,331	0.0	8,584
2029	16	0.0	1,124,988	88,656	753,577	-14,243	-238,508	74,413	-609,919	563	9,147
2030	17	0.0	1,124,988	94,197	847,774	-856	-239,364	93,341	-516,578	0.0	9,147
2031	18	0.0	1,124,988	99,738	947,512	-14,158	-253,523	85,580	-430,998	560	9,708
2032	19	0.0	1,124,988	105,279	1,052,792	-840	-254,363	104,439	-326,559	0.0	9,708
2033	20	0.0	1,124,988	110,820	1,163,612	-13,869	-268,232	96,951	-229,608	549	10,256
2034	21	0.0	1,124,988	116,361	1,279,973	-827	-269,058	115,535	-114,073	0.0	10,256
2035	22	0.0	1,124,988	121,902	1,401,875	-13,714	-282,772	108,188	-5,885	543	10,799
2036	23	0.0	1,124,988	127,443	1,529,318	-812	-283,584	126,631	120,746	0.0	10,799
2037	24	0.0	1,124,988	132,984	1,662,302	-13,894	-297,478	119,091	239,837	551	11,350
2038	25	0.0	1,124,988	138,525	1,800,828	-799	-298,277	137,726	377,563	0.0	11,350

Year	Project year t	Total ex ante carbon stock decrease due to planned activities		Total ex ante carbon stock increase due to planned activities		Total ex ante carbon stock decrease due to unavoided unplanned deforestation		Total ex ante net carbon stock change		Total ex ante estimated actual non-CO2 emissions from forest fires in the project area	
		annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
		$\Delta CPAdPA_t$	$\Delta CPAdPA$	$\Delta CPAiPA_t$	$\Delta CPAiPA$	$\Delta CUDdPA_t$	$\Delta CUDdPA$	$\Delta CPSPA_t$	$\Delta CPSPA$	$EBBPSPA_t$	$EBBPSPA$
		tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2039	26	0.0	1,124,988	144,066	1,944,894	-13,366	-311,643	130,700	508,263	529	11,880
2040	27	0.0	1,124,988	149,607	2,094,501	-789	-312,432	148,818	657,082	0.0	11,880
2041	28	86,538	1,211,525	149,607	2,244,108	-13,472	-325,903	49,598	706,680	534	12,414
2042	29	86,538	1,298,063	149,607	2,393,715	-782	-326,685	62,288	768,968	0.0	12,414
2043	30	86,538	1,384,600	149,607	2,543,323	-25,642	-352,327	37,428	806,395	1,047	13,461

Leakage

Activities that will cause deforestation within the project area in the baseline case could be displaced outside the project boundary due to the implementation of the AUD project activity. If carbon stocks in the Leakage Belt area will decrease more during project implementation than projected in the baseline case, this will be an indication that leakage due to displacement of baseline activities has occurred. Leakage due to activity displacement can thus be estimated by ex post monitoring of deforestation in the leakage belt and comparing ex post observed deforestation with ex ante projected baseline deforestation.

Ex ante activity displacement leakage can only be guessed based on the anticipated combined effectiveness of the proposed leakage prevention measures and project activities. This shall be done by multiplying the estimated baseline carbon stock changes for the project area by a "Displacement Leakage Factor" (DLF) representing the percent of deforestation expected to be displaced outside the project boundary.

If deforestation agents do not participate in leakage prevention activities and project activities, the displacement Factor shall be 100%. Where leakage prevention activities are implemented, the factor shall be equal to the proportion of the baseline agents estimated to be given the opportunity to participate in leakage prevention activities and project activities.

It is expected that 100% of potential deforestation agents in the Reference Region will be given the opportunity to participate in leakage prevention activities. Thus, the "Displacement Leakage Factor" (DLF) is conservatively considered as 0.05.

If emissions from forest fires have been included in the baseline, the ex-ante emissions from forest fires due to activity displacement leakage will be calculated by multiplying baseline forest fire emissions in the project area by the same DLF used to estimate the decrease in carbon stocks.

Table 34 - Ex ante estimated leakage due to activity displacement (Table 34 of VM0015).

Year	Project year t	Total ex ante estimated decrease in carbon stocks due to displaced deforestation		Total ex ante estimated increase in GHG emissions due to displaced forest fires	
		annual	cumulative	annual	cumulative
		$\Delta CADLK_t$	$\Delta CADLK$	$EADLK_t$	$EADLK$
		tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2013	0	0.0	0.0	0.0	0.0
2014	1	-51,812	-51,812	2,182	2,182
2015	2	-7,862	-59,674	305	2,487
2016	3	-718	-60,392	0.0	2,487
2017	4	-7,899	-68,292	302	2,789
2018	5	-806	-69,097	0.0	2,789
2019	6	-7,974	-77,071	302	3,091
2020	7	-893	-77,964	0.0	3,091
2021	8	-8,203	-86,167	308	3,399
2022	9	-982	-87,149	0.0	3,399
2023	10	-8,055	-95,204	298	3,697
2024	11	-1,068	-96,272	0.0	3,697
2025	12	-7,477	-103,749	297	3,994
2026	13	-435	-104,184	0.0	3,994
2027	14	-7,514	-111,698	298	4,292
2028	15	-434	-112,132	0.0	4,292
2029	16	-7,122	-119,254	282	4,574
2030	17	-428	-119,682	0.0	4,574
2031	18	-7,079	-126,761	280	4,854
2032	19	-420	-127,181	0.0	4,854
2033	20	-6,934	-134,116	274	5,128
2034	21	-413	-134,529	0.0	5,128
2035	22	-6,857	-141,386	271	5,400
2036	23	-406	-141,792	0.0	5,400
2037	24	-6,947	-148,739	276	5,675
2038	25	-399	-149,138	0.0	5,675
2039	26	-6,683	-155,821	265	5,940
2040	27	-395	-156,216	0.0	5,940
2041	28	-6,736	-162,952	267	6,207
2042	29	-391	-163,343	0.0	6,207
2043	30	-12,821	-176,163	524	6,730

Table 35 - Ex ante estimated total leakage (Table 35 of VM0015).

Year	Project year t	Total ex ante increase in GHG emissions due to displaced forest fires		Total ex ante decrease in carbon stocks due to displaced deforestation		Total net carbon stock change due to leakage		Total net increase in emissions due to leakage	
		annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
		$EADLK_t$	EADLK	$\Delta CADLK_t$	$\Delta CADLK$	ΔCLK_t	ΔCLK	ELK_t	ELK
		tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2013	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2014	1	2,182	2,182	-51,812	-51,812	-51,812	-51,812	2,182	2,182
2015	2	305	2,487	-7,862	-59,674	-7,862	-59,674	305	2,487
2016	3	0.0	2,487	-718	-60,392	-718	-60,392	0.0	2,487
2017	4	302	2,789	-7,899	-68,292	-7,899	-68,292	302	2,789
2018	5	0.0	2,789	-806	-69,097	-806	-69,097	0.0	2,789
2019	6	302	3,091	-7,974	-77,071	-7,974	-77,071	302	3,091
2020	7	0.0	3,091	-893	-77,964	-893	-77,964	0.0	3,091
2021	8	308	3,399	-8,203	-86,167	-8,203	-86,167	308	3,399
2022	9	0.0	3,399	-982	-87,149	-982	-87,149	0.0	3,399
2023	10	298	3,697	-8,055	-95,204	-8,055	-95,204	298	3,697
2024	11	0.0	3,697	-1,068	-96,272	-1,068	-96,272	0.0	3,697
2025	12	297	3,994	-7,477	-103,749	-7,477	-103,749	297	3,994
2026	13	0.0	3,994	-435	-104,184	-435	-104,184	0.0	3,994
2027	14	298	4,292	-7,514	-111,698	-7,514	-111,698	298	4,292
2028	15	0.0	4,292	-434	-112,132	-434	-112,132	0.0	4,292
2029	16	282	4,574	-7,122	-119,254	-7,122	-119,254	282	4,574
2030	17	0.0	4,574	-428	-119,682	-428	-119,682	0.0	4,574
2031	18	280	4,854	-7,079	-126,761	-7,079	-126,761	280	4,854
2032	19	0.0	4,854	-420	-127,181	-420	-127,181	0.0	4,854
2033	20	274	5,128	-6,934	-134,116	-6,934	-134,116	274	5,128
2034	21	0.0	5,128	-413	-134,529	-413	-134,529	0.0	5,128
2035	22	271	5,400	-6,857	-141,386	-6,857	-141,386	271	5,400
2036	23	0.0	5,400	-406	-141,792	-406	-141,792	0.0	5,400
2037	24	276	5,675	-6,947	-148,739	-6,947	-148,739	276	5,675
2038	25	0.0	5,675	-399	-149,138	-399	-149,138	0.0	5,675
2039	26	265	5,940	-6,683	-155,821	-6,683	-155,821	265	5,940
2040	27	0.0	5,940	-395	-156,216	-395	-156,216	0.0	5,940
2041	28	267	6,207	-6,736	-162,952	-6,736	-162,952	267	6,207

Year	Project year t	Total ex ante increase in GHG emissions due to displaced forest fires		Total ex ante decrease in carbon stocks due to displaced deforestation		Total net carbon stock change due to leakage		Total net increase in emissions due to leakage	
		annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
		$EADLK_t$	EADLK	$\Delta CADLK_t$	ΔCADLK	ΔCLK_t	ΔCLK	ELK_t	ELK
		tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2042	29	0.0	6,207	-391	-163,343	-391	-163,343	0.0	6,207
2043	30	524	6,730	-12,821	-176,163	-12,821	-176,163	524	6,730

Net GHG Emission Reductions and Removals

The determination of which GHG emissions by sources, decreases in carbon pools, and leakage emissions are significant for this Project Activity has been carried out using the "Tool for testing significance of GHG emissions in A/R CDM project activities (Version 01)". According to the tool, GHG emissions by sources, decreases in carbon pools and leakage emissions are all considered significant, as their sums represent more than 5% of net emission reductions.

Calculation of ex-ante estimation of total net GHG emissions reductions

The net anthropogenic GHG emission reduction of the proposed AUD project activity is calculated

as follows:

$$REDD_t = (CBSLPA_t + EBBBSLPA_t) - (CPSPA_t + EBBPSPA_t) - (CLK_t + ELK_t)$$

Where:

$REDD_t$	Ex ante estimated net anthropogenic greenhouse gas emission reduction attributable to the AUD project activity at year *t*; tCO_2e
$CBSLPA_t$	Sum of baseline carbon stock changes in the project area at year *t*; tCO_2e

Note: The absolute values of $CBSLPA_t$ shall be used in equation above.

$EBBBSLPA_t$	Sum of baseline emissions from biomass burning in the project area at year *t*; tCO_2e
$CPSPA_t$	Sum of ex ante estimated actual carbon stock changes in the project area at year *t*; tCO_2e

Note: If $CPSPA_t$ represents a net increase in carbon stocks, a negative sign before the absolute value of $CPSPA_t$ shall be used. If $CPSPA_t$ represents a net decrease, the positive sign shall be used.

$EBBPSPA_t$	Sum of (ex-ante estimated) actual emissions from biomass burning in the project area at year t; tCO_2e
CLK_t	Sum of ex ante estimated leakage net carbon stock changes at year t; tCO_2e

Note: If the cumulative sum of CLK_t within a fixed baseline period is > 0, CLK_t shall be set to zero.

ELK_t	Sum of ex ante estimated leakage emissions at year t; tCO_2e
t	1, 2, 3 … t, a year of the proposed project crediting period; dimensionless

Calculation of ex-ante Verified Carbon Units (VCUs)

The number of Verified Carbon Units (VCUs) to be generated through the proposed AUD project activity at year t is calculated as follows:

VCUt = REDDt – VBCt

VBCt = (CBSLPAt - CPSPAt) * RFt

Where:

VCUt	*Number of Verified Carbon Units that can be traded at time t; t CO_2-e*
REDDt	*Ex-ante estimated net anthropogenic greenhouse gas emission reduction attributable to the AUD project activity at year t; tCO_2-e ha-1*
VBCt	*Number of Buffer Credits deposited in the VCS Buffer at time t; t CO_2-e*
CBSLPAt	*Sum of baseline carbon stock changes in the project area at year t; tCO_2e*
CPSPAt	*Sum of ex ante estimated actual carbon stock changes in the project area at year t; tCO_2-e ha-1*
RFt	*Risk factor used to calculate VCS buffer credits; %*

Note: RFt is a risk factor to be determined using the latest version of the VCS-approved AFOLU Non-Permanence Risk Tool.

t	*1, 2, 3 … t, a year of the proposed project crediting period; dimensionless*

Table 36 - Ex ante estimated net anthropogenic GHG emission reductions (ΔREDDt) and Verified Carbon Units (VCUt).

Years	Estimated baseline emissions (tCO2e)	Estimated project emissions (tCO2e)	Estimated leakage emissions (tCO2e)	Estimated net GHG emission reductions (tCO2e)
2013	0.0	0.0	0.0	0.0
2014	1,079,891	188,986	53,995	836,911
2015	163,324	91,788	8,166	63,370
2016	14,365	71,351	718	-57,704
2017	164,040	80,777	8,202	75,060
2018	16,112	60,444	806	-45,137
2019	165,515	69,843	8,276	87,396
2020	17,856	49,536	893	-32,573
2021	170,218	59,231	8,511	102,476
2022	19,635	38,632	982	-19,979
2023	167,067	47,834	8,353	110,880
2024	21,356	27,722	1,068	-7,434
2025	155,478	35,593	7,774	112,111
2026	8,704	15,375	435	-7,106
2027	156,247	-61,949	7,812	210,384
2028	8,679	-82,247	434	90,492
2029	148,068	-73,849	7,403	214,514
2030	8,562	-93,341	428	101,475
2031	147,186	-85,020	7,359	224,846
2032	8,401	-104,439	420	112,420
2033	144,178	-96,402	7,209	233,371
2034	8,265	-115,535	413	123,387
2035	142,565	-107,646	7,128	243,083
2036	8,120	-126,631	406	134,345
2037	144,446	-118,540	7,222	255,764
2038	7,989	-137,726	399	145,316
2039	138,954	-130,171	6,948	262,177
2040	7,891	-148,818	395	156,315
2041	140,060	-49,064	7,003	182,121
2042	7,816	-62,288	391	69,713
2043	266,891	-36,381	13,345	289,927
TOTAL	**3,657,879**	**-792,935**	**182,894**	**4,267,919**

5.2 Project Emissions

As stated in the VCS-PD as an activity to be performed after the first carbon credit sales, a local biomass inventory has been carried out in the Project Area (ex-ante estimations had been made with secondary data). Files related to the local biomass assessment are available for consultation by the audit team.

Table 37 - Ex post carbon stock per hectare of initial forest classes icl existing in the project area and leakage belt (Table 15a of VM0015)

Year	Project year t	Initial forest class *icl* Name: Submontane open ombrophilous forest (As) ID $_{icl}$ 1 Average carbon stock per hectare ± 90% CI											
		Cab $_{icl}$		Cbb $_{icl}$		Cwp $_{icl}$ short lived		Cwp $_{icl}$ medium lived		Cwp $_{icl}$ long lived		Ctot $_{icl}$	
		C *stock*	± 90% CI	C *stock*	± 90% CI	C *stock*	± 90% CI	C *stock*	± 90% CI	C *stock*	± 90% CI	C *stock*	± 90% CI
		t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}
2013	0												
2014	1		555		205		0		0		25		735
2015	2	575		213		0		0		30		758	
...	...		595		220		0		0		35		780
2043	30												

The 90% Confidence Intervals have been used to define if the most suitable choice would be the average or the inferior limit of intervals, to mitigate uncertainties in estimates, as shown in table below. In the present case, the averages of above and below-ground biomass have been taken for calculation; while the superior limit of the interval has been taken for the calculations related to the wood products carbon pool, for conservativeness purposes and mitigation of uncertainties.

Table 38 - Ex post carbon stock per hectare of initial forest classes icl existing in the project area and leakage belt (the selection of carbon pools is subject to the latest VCS requirements) (Table 15b of VM0015)

Year	Project year t	Initial forest class *icl* Name: Submontane open ombrophilous forest (As) ID $_{icl}$ 1 Average carbon stock per hectare ± 90% CI											
		Cab $_{icl}$		Cbb $_{icl}$		Cwp $_{icl}$						Ctot $_{icl}$	
						short lived		*medium lived*		*long lived*			
		C *stock*	C *stock change*	C *stock*	C *stock change*	C *stock*	C *stock change*	C *stock*	C *stock change*	C *stock*	C *stock change*	C *stock*	C *stock change*
		t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}
2013	0												
2014	1												
2015	2	575	0	213	0	0	0	0	0	35	5	753	-5
...	...												
2043	30												

The same reasoning is applicable to post-deforestation classes, for which the superior limit of the interval has been taken in the case of above-ground biomass, while the superior limit has been chosen for below-ground biomass, for conservativeness purposes and mitigation of uncertainties.

Table 39 - Ex post carbon stock per hectare of final classes fcl existing in the project area and Leakage Belt (Table 16 of VM0015).

Year	Project year t	Post deforestation class *fcl* Name: Pasture ID $_{fcl}$ 1 Average carbon stock per hectare ± 90% CI											
		Cab $_{fcl}$		Cbb $_{fcl}$		Cwp $_{fcl}$						Ctot $_{fcl}$	
						short lived		*medium lived*		*long lived*			
		average stock	± 90% CI	*average stock*	± 90% CI	*average stock*	± 90% CI	*average stock*	± 90% CI	*average stock*	± 90% CI	*average stock*	± 90% CI
		t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}
2013	0												
2014	1		7.10		11.34		0		0		0		18.4
2015	2	11.37		18.15		0		0		0		29.52	
...	...		15.63		24.96		0		0		0		40.6
2043	30												
Average		11.37		18.15		0		0		0		29.52	
Average to be used in calculations		15.6		25.0		0		0		0		40.6	

Certain discrete areas of forest within the project area will have been subject to project activities that changed the carbon stocks of these areas compared to the baseline. In this Project Activity, such activities are related to planned timber logging.

The relevant documentation was provided by the project proponent: the exploration permit from the National System for the Control of the Origin of Forest Products (Sinaflor), and the exploitation permit from the Instituto de Proteção Ambiental do Amazonas (IPAAM). Both documents authorize as of June 14, 2021, the management of the area of 4,012.26 ha with a total volume of 94,626.77 m^3 of timber. The Project Proponent, even with the authorization and logging permit, has not carried out logging within the period monitored in this MR. The validity of this permit and authorization expires on March 29, 2023.

Regarding table 40 (26.b) below, the carbon stock increase relates to years since 2013 in which planned logging was carried out. Specifically, these were 2014, 2017 and 2018, which are fully presented in the calculation spreadsheet and were verified in previous MRs.

Table 41 - Ex post carbon stock decrease due to planned logging activities (Table 25b of VM0015).

Year	Project year t	Areas of planned logging activities x Carbon stock change (decrease) in the		Total carbon stock decrease due to planned logging activities	
		IDcl = 1		annual	cumulative
		$APLPA_{icl,t}$	$\Delta Ctot_{icl,t}$	$\Delta CPLdPA_t$	$\Delta CPLdPA$
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2020	7	0.0	47.24	0.0	0.0
2021*	8	0.0	47.24	0.0	0.0

*Until December 26.

Table 42 - Ex post estimated carbon stock increase following planned logging activities in the project area (Table 26.b of VM0015).

Year	Project year t	Areas of planned logging activities x Carbon stock change (increase up to maximum long-term average)		Total carbon stock increase due to planned logging activities	
		IDcl = 1		annual	cumulative
		$APLPA_{icl,t}$	$\Delta Ctot_{icl,t}$	$\Delta CPLiPA_t$	$\Delta CPLiPA$
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2020	7	0.0	3.03	14,372	14,372
2021*	8	0.0	3.03	14,175	28,547

*Until December 26.

The measures and actions against deforestation were partially ineffective in not avoiding the deforestation of 70.3 ha within the Project Area. The deforestation within the Project Area, in this monitoring period, is due to the opening of roads that were created up to the management yards for the transport and work with timber. As described in section 4.3, deforestation within the PA is not linked to the fires observed over the period.

Table 43 - Ex post carbon stock decrease due to unavoided unplanned deforestation in the project area

Year	Project year t	Areas of unavoided unplanned deforestation in the project area		Total carbon stock decrease due to unavoided unplanned deforestation	
		IDcl = 1		annual	cumulative
		$AUDdPA_t$	$\Delta Ctot_{icl,t}$	$\Delta CUDdPA_t$	$\Delta CUDdPA_t$
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2020	0	43.8	739.77	32,365	32,365
2021*	1	26.5	739.77	19,611	51,976

*Until December 26.

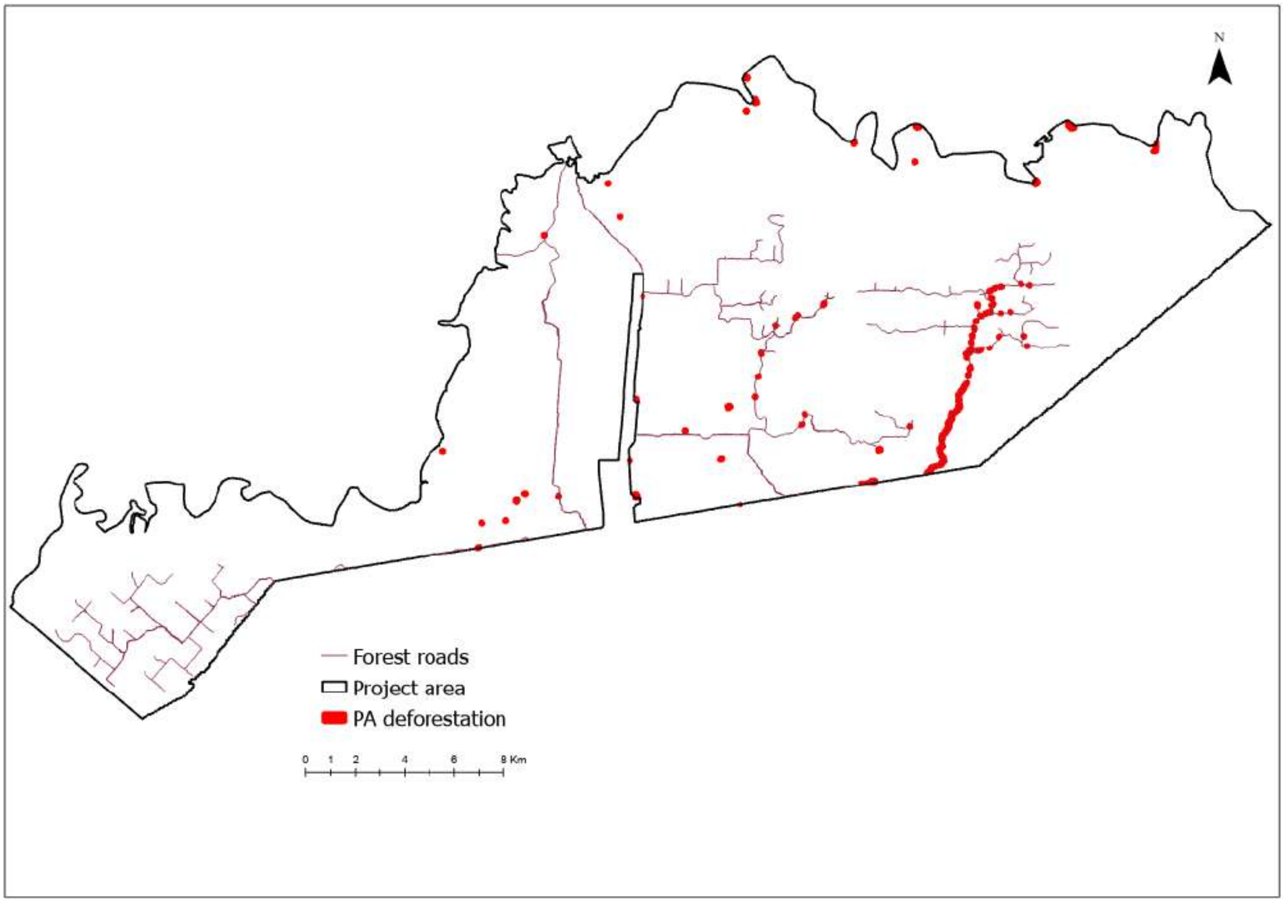

Figure 24 - Deforestation inside the PA.

Thus, the ex post total net carbon stock change within the Project Area is expressed in table below:

Table 44 - Ex post total net carbon stock change in the Project Area (Table 27 of VM0015).

Year	Project year t	Total carbon stock decrease due to planned logging activities		Total carbon stock increase due to planned logging activities		Total carbon stock decrease due to unavoided unplanned deforestation		Total carbon stock change in the project case	
		annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
		$\Delta CPLdPA_t$	$\Delta CPLdPA$	$\Delta CPLiPA_t$	$\Delta CPLiPA$	$\Delta CUDdPA_t$	$\Delta CUDdPA$	$\Delta CPSPA_t$	$\Delta CPSPA$
		tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2020	7	0.0	0.0	14,372	14,372	32,365	32,365	17,993	17,993
2021*	8	0.0	0.0	14,175	28,547	19,611	51,976	5,436	23,429

*Until December 26.

The ex post actual net changes in carbon stocks and emissions in the Project Area are presented in the table below:

Table 45 - Total ex post estimated actual net changes in carbon stocks and emissions of GHG gases in the Project Area (Table 29 of VM0015)

Year	Project year t	Total ex post carbon stock decrease due to planned activities		Total ex post carbon stock increase due to planned activities		Total ex post carbon stock decrease due to unavoided unplanned deforestation		Total ex post net carbon stock change		Total ex post estimated actual non-CO2 emissions from forest fires in the project area	
		annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
		$\Delta CPAdPA_t$	$\Delta CPAdPA$	$\Delta CPAiPA_t$	$\Delta CPAiPA$	$\Delta CUDdPA_t$	$\Delta CUDdPA$	$\Delta CPSPA_t$	$\Delta CPSPA$	$EBBPSPA_t$	$EBBPSPA$
		tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2020	7	0.0	0.0	14,372	52,834	32,365	32,365	17,993	17,993	1,408	1,408
2021*	8	0.0	0.0	14,175	67,009	19,611	51,976	5,436	23,429	853	2,261

*Until December 26.

5.3 Leakage

5.3.1.1 Increasing deforestation rates in the Reference Region and the Leakage Belt

Recent years have abnormal increases in deforestation rates in the project Reference Region and Leakage Belt Areas, much higher than those initially foreseen in the validated Project Description. This deforestation rate scenario is harmful to project viability, as Leakage estimates would be much higher than projected avoided deforestation inside the Project Area. The justification for non-attribution of this spike to project deforestation agents is presented below.

As demonstrated in MR2, the average deforestation rate in Reference Region from 2008 to 2013 was estimated at 4,035 hectares, while it has jumped to 14,715 hectares from 2013 to 2016 (i.e. a 265% increase). Updating this information, comparing with the period between 2014 and 2021, the average annual deforestation increased to 20,706 hectares, that is, 413% higher. Deforestation verified in the Reference Region in the period of this MR (01/01/2020 to 12/26/2021) was especially higher than expected in the baseline, being 8.13 times greater. Deforestation increased from approximately 30 thousand hectares in 2019 to 80 thousand hectares in 2020. (Figure 15).

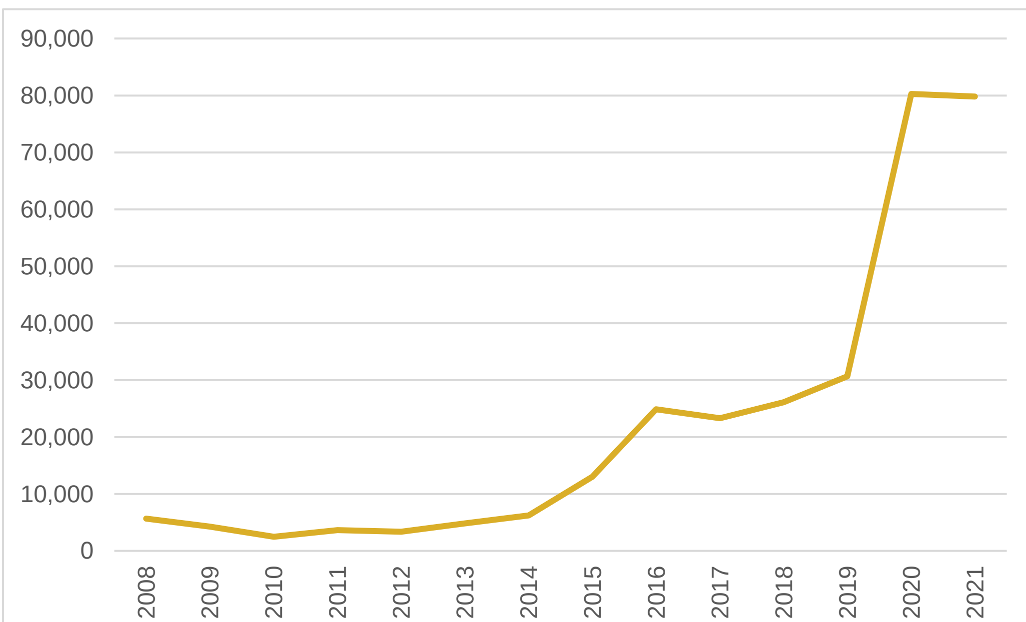

Figure 25 - Historic deforestation in Reference Region from 2008 to 2021.

.

The main factors for this boom in deforestation as of 2020 are as follows:

Trends in Brazilian legislation: there are several indications of slackening of environmental legislation in recent years, mainly in the Bolsonaro government framework, with emphasis on the following subfactors:

Greater ease of obtaining "forest clearing authorizations": An example of this can be observed in the state of Goiás, which reported a 1,100% increase in the number of permits for deforestation in 2020[28]. The new environmental licensing in Goiás, plus technologies that facilitate the inspection work of the Secretariat of Environment and Sustainable Development (Semad), in addition to effort in the analysis of applications, are responsible for increasing the number s of deforestation permits in the State. According to data from Semad's Environmental Licensing Superintendency, there was a 673% increase of area deforested: 6.5 km 2 in 2019, to 43.8 km² in 2020. Thus, as occurred in the State of Goiás, the facilitation of the issuance of authorization for the removal of native vegetation can occur at any time in the Amazon Biome. Indeed, attempts at further facilitation have been sought recently (in 2020), as indicated in the next topic.

Granting of tacit (or automatic) environmental licensing, in case of delay of the environmental agency: The controversial automatic release of environmental permits and permits by completion of term, that is, after a period stipulated for the government agency to respond (120 days) was voted for on 04/29/2020, by a virtual plenary. Provisional Measure 915 originally referred to the so called "Economic Freedom Law" edited by the government, but ended up bringing, within the texts, changes that directly affect the rite of environmental licensing throughout the country. The change could lead to the automatic authorization of forest suppression in the Amazon and Atlantic Forest enforced by delay, and without analysis of the environmental agency. This means that, once the 120-day period is expired the request would be automatically granted with a "tacit license"[29]. Fortunately, environmentalists have revised the Provisional Measure 915, to prevent deforestation licensing from being subject to expiration of term[30].

Relaxing legislation for timber exports: As reported by Reuters, over 2019 Brazil exported "thousands of cargoes of wood from an Amazonian port without authorization from the federal environmental agency, increasing the risk that they have been extracted from illegally deforested land". The rule change, which scraps IBAMA's authorization for most timber exports came after five cargoes of wood arrived in US and European ports without these mandatory documents. Foreign authorities contacted Brazil to ask about the

[28] https://www.meioambiente.go.gov.br/noticias/2089-emiss%C3%A3o-de-licen%C3%A7as-para-supress%C3%A3o-de-vegeta%C3%A7%C3%A3o-tem-aumento-de-1-100-in-a-year-in-goi%C3%A1s.html
[29] https://www.correiobraziliense.com.br/app/noticia/brasil/2020/04/29/interna-brasil,849652/camara-pode-aprovar-hoje-licenciamento-ambiental-automatico.shtml
[30] https://epbr.com.br/ambientalistas-alteram-mp-915-para-prevent-licensing-environmental-by-course-of-time/

missing authorizations, with the head of Ibama in Pará then retroactively granting the authorizations. The problem, however, is much more widespread than just the se five shipments. In Pará state, more than half of the roughly 3,000 officially registered shipments in the past year, containing an estimated 54,000 m^3 of wood that left one port was not officially authorized. Companies had requested authorizations from IBAMA for those shipments but exported them before the agency had time to respond. Furthermore, many shipments were exported without seeking IBAMA 's approval. Shipments went to the US, the Netherlands, France, Germany, Belgium, and possibly other countries. Before the rules changed, IBAMA was required to authorize all wood exports before they leave port. Even so, most shipments continued to require the proper paperwork to be given the green light, however only a few would be randomly selected for physical inspection[31]. Arbitrarily, the president of IBAMA ensured that all future unauthorized exports of wood, previously classified as illegal, became legal: he took advantage of the lack of attention of the press to the topic during Carnival, at the end of February 2020, to quietly revoke a 2011 IBAMA policy that required an authorization from the agency before forest products could receive export licenses. From that date on such permits would be required only for endangered tree species or in other special circumstances. Given the repeal, the floodgates were opened for large shipments of illegal timber from the Brazilian Amazon to go abroad[32]. It was also revealed that in February 2020, loggers from Pará asked IBAMA to effect that rule change: the companies wanted to sell wood abroad presenting only the Document of Forest Origin (DFO, "DOF Documento de Origem Florestal" in Portuguese), made by the companies themselves and that originally only served to allow the transport of the goods to the port. This change was immediately accepted by the president of Ibama[33].

Legislation favoring landgrabbers: An analysis conducted by IPAM (Environmental Research Institute of the Amazon) showed that 35% of deforestation in the Amazon between August 2018 and July 2019 was recorded in non designated areas without information. Regarding land regularization, environ mental NGOs warn about two ongoing projects. While Bill 510/21 was being presented in the Senate, the vote on Bill 2633/20[34] was being considered in the House of Representatives. Both derive from the original text of Provisional Measure 910, known as "MP da Grilagem" (Landgrabbers' Provisional Measure), which proposes to change the law to favor large occupants of recently invaded public lands. Bill 510/21 once again changes the deadline for public land invasions to be legalized (from 2011 to 2014) and allow s large areas (up to 2,500 hectares) to be processed without the need for inspection. Indeed, given that land-grabs of undesignated public lands are responsible for more than 1/3 of the deforestation in the country, it is to

[31] https://www.businesslive.co.za/bd/world/americas/2020-03-04-brazil-may-be-exporting-illegally-deforested-wood/
[32] https://brasil.mongabay.com/2020/04/ao-afrouxar-leis-de-exportacao-brasil-permite-saida-de-madeira-ilegal-da-amazonia/
[33] https://g1.globo.com/natureza/noticia/2020/11/17/documentos-mostram-que-ibama-facilitou-exportacao-de-madeira-extraida-ilegalmente.ghtml
[34] https://ipam.org.br/35-do-desmatamento-na-amazonia-e-grilagem-indica-analise-do-ipam/

be expected that amnesty for landgrabbers and illegal deforesters would be an incentive to intensify this practice in the coming years. Bill 2633/20 has a loophole that would allow legalization, via bidding, of public areas invaded after the deadline for occupation provided for by law (i.e., 2014). Of the 49.8 million hectares of forests under state and federal responsibility, but not yet allocated to any category of use, 11.6 million hectares, or 23%, were irregularly declared as rural properties for private use, under the National System of Rural Environmental Registration (CAR). If the entire area registered to date as private property were legalized, 2.2 to 5.5 million hectares could be deforested in the coming years, according to the deforestation limits defined by the Forest Code and taking into account that deforestation is often beyond permitted limits. In recent years, grabbing of uncategorized public forests has increased: in 2019, this was the land category displaying the most forest felled in the Amazon, according to data from the deforestation alert system of INPE (National Institute of Space Research), Deter. The trend continued in 2020. The following are some of the conditions defined by Provisional Measure 910, for appropriation of public lands by individuals: i) the area must be registered in the Rural Environmental Registry (CAR, " Cadastro Ambiental Rural "): as it is known, any information can be inputted into the "CA R" system up until the present moment without any veracity checking, and ii) the claimant must be carrying out agricultural activities in the area (i.e., should preferably have deforested the area) [35]. The Provisional Measure defines that for areas meeting the requirements above and having up to 15 fiscal modules (i.e. up to 1,650 hectares), the title is to be granted without the need for inspection. Before the Provisional Measure, the exemption from inspection was granted to areas with up to four fiscal modules (i.e. with a maximum of 440 hectares). The exemption from inspection may allow large illegally deforested areas to be taken over by individuals. This is because the Provisional Measure prohibits the regularization only of areas that have been subject to fines or environmental embargoes, and not all environmental violations are known and fined by the government[36]. Given that Fazenda Nossa Senhora do Ituxi is close of public lands and that cases of land grabbing have been proven in the Reference Region, an abnormal increase in deforestation in that region is expected in the coming years. This is primarily because Brazilian legislation increasingly gives every indication that it is highly welcoming to acts of land grabbing, by granting amnesty to landgrabbers and agents of illegal deforestation.

Increased demand for beef on the international market: China's demand for beef is still a reflection of swine flu, which has decimated between 40% and 60% of the country's pig stock about one third of the world's pork production). In addition to this conjuncture, China also contributed to the growth of imports, since it was the only major world economy to record economic growth in 2020, even amid the coronavirus pandemic, and a more long term factor, which is the gradual increase in income of the Chinese population,

[35]https://ipam.org.br/cientistas-mapeiam-grilagem-em-florestas-publicas-na-amazonia/#:~:text=O%20impact%20da%20grilagem%20se,main%20g%C3%A1s%20%20effect%20estufa
[36] https://amazonia.org.br/como-a-mp-da-grilagem-pode-mudar-o-mapa-de-regioes-da-amazonia/

which results in progressively higher consumption of more expensive protein sources , such as Analysts estimate that the price of beef should remain under pressure for the next few years, due to the livestock cycle: the low supply of oxen is not something that can quickly be solved, because cattle production is a multiyear cycle , given that production beginning today will deliver animal s in two, three, or four years[37]. In 2020, Brazil broke its beef export record, with more than 2 million tons sold (8% more than in 2019). For 2021, the projection indicates an increase of 5% on the 2020 values[38] indicating a strong increasing export trend for the coming years. Beef exports have continued to increase, growing by almost 7% in 2020 and close to 8% in 2021, increasing by more than 15% in the 2020/2021[39] period. Chinese importers increased the ir purchases of Brazilian beef by more than 150% in 2020[40].

Conclusion

Given that the national Brazilian and Lábrea Municipality contexts of highly increasing deforestation cannot be attributed to leakage caused by this project activity – being due instead to externalities of larger national and market contexts – the total leakage measured in the Leakage Belt area had deducted from it the average deforestation increase in the Reference Region over the verification period (i.e. 8.13 times higher than forecast). Given the independence of the externalities from the project area's activities, presented in the argument above, the project proponent understands that the method applied does not negatively impact the conservativeness of the quantification of GHG emission reductions.

Therefore, the actual values of deforestation in the Leakage Belt were divided by 8.13 (i.e. increase in deforestation externally to the Leakage Belt and Reference Region), as a correction for the extenalities accounting for the unusual increase in deforestation in Lábrea, which also affected the Leakage Belt and cannot be attributed to this Project Activity. The results of this correction are shown below:

[37] https://www.bbc.com/portuguese/brasil-55664305
[38]https://revistagloborural.globo.com/Noticias/Criacao/Boi/noticia/2021/01/apos-recorde-brasil-projeta-alta-de-5-nas-exportacoes-de-carne-bovina-em2021.html#:~:text=Segundo%20Abrafrigo%2C%20pa%C3%ADs%20alcan%C3%A7ou%20marca,em%20rela%C3%A7%C3%A3o%20ao%20ano%20anterior&text=As%20exports%C3%A7%C3%B5es%20de%20carne%20bovine,by%20fortes%20shipments%20%C3%A0%20China
[39] https://www.avisite.com.br/index.php?page=noticias&id=21284
[40] https://www2.safras.com.br/eng/2020/09/23/meat-exports-in-brazil-will-be-an-important-differential-in-2021/

Ex post deforestation in LK without correction

Year	annual $ABSLLK_t$ ha	cumulative ABSLLK ha
2020	80,263.89	80,263.9
2021*	64,156.81	144,420.7
Total	**144,420.70**	

* Until December 26.

Correction (factor 8.13)

Ex post deforestation in LK with correction

Year	annual $ABSLLK_t$ ha	cumulative ABSLLK ha
2020	9,875.67	9,875.7
2021*	7,893.85	17,769.5
Total	**17,769.52**	

Figure 26 - Results of this correction.

The results of all ex-post estimations of leakage are summarized using the same table format used for the ex-ante assessment:

Table 46 - Annual ex post areas of deforestation in the leakage belt (Table 9.c of VM0015).

Year	Project year	Total - LK	
		annual $ABSLLK_t$ ha	cumulative ABSLLK ha
2020	7	80,263.89	80,263.89
2021*	8	64,156.81	144,420.7

*Until December 26.

The corrected deforestation areas in the Leakage Belt are as follows:

Table 47 - Annual ex post areas of deforestation in the leakage belt with average rate applied.

Year	Project year	Total LK	
		annual $ABSLLK_t$ ha	cumulative ABSLLK ha
2020	7	9,875.7	9,875.7
2021*	8	7,893.9	17,769.5

*Until December 26.

Given that the ex-ante deforestation in the Leakage Belt area (as shown in "Annual base deforestation areas in the Leakage Belt (Table 9.c of VM0015)") are higher than the ex-post corrected deforestation in the same area, the Leakage Belt is set to zero for calculation purposes.

Table 48 - Proportional annual ex post deforestation in the leakage belt.

Year	Project year	Total - LK	
		annual $ABSLLK_t$ ha	cummulative ABSLLK ha
2020	7	0.0	0.0
2021*	8	0.0	0.0
TOTAL		**0.0**	**0.0**

*Until December 26.

Table 49 - Ex post above-ground net carbon stock changes in the leakage belt (Table 22.c.1 of VM0015)

Year	Project year t	Activity data per category x Carbon stock change factor for above-ground biomass in the leakage belt		Total baseline carbon stock change in the leakage belt	
		Forest / Pasture		annual	cumulative
		$ABSLLK_{ct.t}$	$\Delta Cab_{ct,t}$	$\Delta CabBSLLK_t$	ΔCabBSLLK
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2020	7	0.0	0.0	0.0	0.0
2021*	8	0.0	0.0	0.0	0.0

*Until December 26.

Table 50 - Ex post below-ground net carbon stock changes in the leakage belt (Table 22.c.2 of VM0015)

Year	Project year t	Activity data per category x Carbon stock change factor for below-ground biomass in the leakage belt		Total baseline carbon stock change in the leakage belt	
		Forest / Pasture		annual	cumulative
		$BBSLLK_{ct,t}$	$\Delta Cbb_{ct,t}$	$\Delta CbbBSLLK_t$	$\Delta CbbBSLLK$
		ha	$tCO_2\text{-e ha}^{-1}$	$tCO_2\text{-e}$	$tCO_2\text{-e}$
2020	7	0.0	0.0	0.0	0.0
2021*	8	0.0	0.0	0.0	0.0

*Until December 26.

Table 51 - Ex post net carbon stock changes in the wood products in the leakage belt (Table 22.c.6 of VM0015).

Year	Project year t	Activity data per category x Carbon stock change factor for wood products biomass in the leakage belt area		Total baseline carbon stock change in the leakage belt area	
		Forest / Pasture		annual	cumulative
		$WPSLLK_{ct,t}$	$\Delta Cwp_{ct,t}$	$\Delta CwpBSLLK_t$	$\Delta CwpBSLLK$
		ha	$tCO_2\text{-e ha}^{-1}$	$tCO_2\text{-e}$	$tCO_2\text{-e}$
2020	7	0.0	0.0	0.0	0.0
2021*	8	0.0	0.0	0.0	0.0

*Until December 26.

Table 52 - Parameters used to calculate emissions from forest fires in the leakage belt area (Table 23 of VM0015).

Initial Forest Class		Parameters								
		$Fburnt_{icl}$	Cab	$Pburnt_{ab,icl}$	$CEab,icl$	$ECO_2\text{-}ab$	$EBBCO_2\text{-}tot$	$EBBN_2O_{icl}$	$EBBCH_{4icl}$	$EBBtot_{icl}$
IDcl	Name	N/A	$tCO_2e\ ha^{-1}$	N/A	N/A	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$
1	Submontane open ombrophilous forest (As)	1.0	575	0.86	0.5	247	247	1.97	30.2	32.2

Table 53 - Ex post estimated leakage due to activity displacement (Table 34 of VM0015).

Year	Project year t	Total ex post estimated decrease in carbon stocks due to displaced deforestation		Total ex post estimated increase in GHG emissions due to displaced forest fires	
		annual	cumulative	annual	cumulative
		$\Delta CADLK_t$	$\Delta CADLK$	$EADLK_t$	$EADLK$
		tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2020	7	0.0	0.0	0	0
2021*	8	0.0	0.0	0	0

*Until December 26.

Table 54 - Total ex post estimated leakage (Table 35 of VM0015).

Year	Project year t	Total ex post increase in GHG emissions due to displaced forest fires		Total ex post decrease in carbon stocks due to displaced deforestation		Total net carbon stock change due to leakage		Total net increase in emissions due to leakage	
		annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
		$EADLK_t$	$EADLK$	$\Delta CADLK_t$	$\Delta CADLK$	ΔCLK_t	ΔCLK	ELK_t	ELK
		tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2020	7	0	0	0.0	0.0	0.0	0.0	0	0
2021*	8	0	0	0.0	0.0	0.0	0.0	0	0

*Until December 26.

5.4 Net GHG Emission Reductions and Removals

On the second verification calculations, the aboveground biomass data from the monitoring inventory conducted by the Project Proponent was applied. Although, this parameter has not been validated before and is not a parameter monitored by the project.

A new calculation was made for the second verification period applying the value of Average carbon stock per hectare in the aboveground biomass pool of initial forest class icl (Cabicl) of 575 tCO_2/ha, according to the parameter validated in the Project Description, described in section 3.1 Data and Parameters Available at Validation. As result, a lack of 6,852.31 tCO_2e was identified on historical ex post net GHG emissions reductions, as shows Figure bellow.

ORIGINAL - PREVIOUSLY VERIFIED			
Monitoring Period	**Year**	**Project year t**	**Ex post net GHG emission reductions (tCO2e)**
MR1	2013	0	-
	2014	1	1,045,493.08
	2015	2	136,239.04
MR2	2016	3	18,105.94
	2017	4	163,793.22
	2018	5	- 150,888.87
	2019	6	181,925.08
TOTAL			1,394,667.48

UPDATED (CARBON STOCK BY CUMMINGS)			
Monitoring Period	**Year**	**Project year t**	**Ex post net GHG emission reductions (tCO2e)**
MR1	2013	0	-
	2014	1	1,045,493.08
	2015	2	136,239.04
MR2	2016	3	16,718.34
	2017	4	161,922.99
	2018	5	- 152,445.24
	2019	6	179,886.96
TOTAL			1,387,815.17
DIFERENCE			**- 6,852.31**

Figure 27 – Difference on historical ex post net GHG emissions reductions.

In order to correct this difference, a discount of 6,852.31 tCO_2e is being applied to the results of ex post net GHG emissions reductions for the year 2021.

As described in section 3.2.2 Project Description Deviations, adjustments in the Project Area boundaries in order to remove non-forested areas at the time of start date, resulted in a revision of the allocated ('initial') annual deforestation projection to quantify possible baseline losses. The corrections included a total of 38 ha discrepancy of projected deforestation over non-forest areas, identified in the years 2014, 2015, 2017, 2019 and 2021, equating to 28,725.91 tCO_2e which were deducted from the year 2021.

Table 55 – Correction due deforestation projection over non-forested area

Year of correction	Deforestation projection over non-forestated area (ha)	Correction in Ex post net GHG emission reductions (tCO2e)
2014	26.30	19,881.35
2015	1.30	982.73
2017	3.50	2,645.81
2019	3.00	2,267.84
2021	3.90	2,948.19
Total	38.00	28,725.91

The table below displays the quantification of the net change in carbon stocks. As presented in the AFOLU non-permanence risk report (available in the VCS-PD), this project activity has 10% non-permanence risk rating.

Table 56 - Ex post estimated net anthropogenic GHG emission reductions (REDDt) and Voluntary Carbon Units (VCUt) (Table 36 of VM0015).

Year	Project year t	Baseline carbon stock changes		Baseline GHG emissions		Ex post project carbon stock changes		Ex post project GHG emissions		Ex post leakage carbon stock changes		Ex post leakage GHG emissions		Ex post net anthropogenic GHG emission reductions		Ex post VCUs tradable		Ex post buffer credits	
		annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
		$\Delta CBSLPA_t$	$\Delta CBSLPA$	$EBBBSLPA_t$	EBBBSLPA	$\Delta CPSPA_t$	$\Delta CPSPA$	EBBPSPAt	EBBPSPA	ΔCLK_t	ΔCLK	ELKt	ELK	$\Delta REDD_t$	$\Delta REDD$	VCU_t	VCU	VBC_t	VBC
		tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2020	7	42,663	42,663	0	0	17,993	17,993	1,408	1,408	0	0	0	0	23,262	23,262	20,795	20,795	2,467	2,467
2021*	8	186,814	229,476	7,830	7,830	5,436	23,429	853	2,261	0	0	0	0	152,776	176,038	134,638	155,433	18,138	20,605

*Up to December 26.

Table 57 - Results of emission reductions and removals.

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)	Buffer pool allocation	VCUs eligible for issuance
2020	42,663	19,401	0	23,262	2,467	20,795
2021	194,643	6,289	0	152,776	18,138	134,638
Total	237,306	25,690	0	176,038	20,605	155,433