MONITORING REPORT MANOA REDD+ PROJECT

Document Prepared by Biofílica Ambipar Environment Investments S.A.

Project Title	Manoa REDD+ Project
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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The Manoa REDD+ project is a partnership between Biofílica Ambipar Environment Investments S.A. and Manoa Sustentável, Exploração e Serviços Florestais Ltda, located in Manoa Farm, municipality of Cujubim, state of Rondônia. Throughout its almost 30 years of history, Manoa has improved its management techniques, becoming a world benchmark model of forest exploitation allied to nature conservation.

The project activities, which began in 2013, are under the responsibility of Biofílica Ambipar and Manoa. Biofílica works in all stages of the project, from preparation, implementation, monitoring and co-management, and is responsible for the development of all technical documents, for the relationship with the partner, and for conducting and carrying out the validation and verification audits. Manoa owns the land where the project is deployed and is responsible for the co-management of the project, for monitoring and supervising the activities, for the land security and property surveillance as well as for the low impact forest management with certification.

The activities under the Project are characterized by their continuous implementation, focusing mainly on the generation of climate benefits, given the great deforestation pressure that has been occurring in the project region. Among the main activities implemented during the monitoring period we highlight: 1. Deforestation monitoring by means of satellite images; 2. Property surveillance carried out by the security team to prevent deforestation and intrusions in the area; 3. The low impact forest management (FSC certified); 4. Training in low impact forest management techniques; 5. The promotion of socio-environmental education activities in the municipality of Cujubim and 6. Activities related to Biodiversity. For more details about the implementation status of each project activity, see Sections 3.1.1 to 3.1.8.

Section 3.1.8 details how the social activities of the project contribute to a good governance of Manoa Farm, ensuring a broad and transparent management of the territory and consequently helping contain deforestation in the project area, preventing encroachment, disputes and illegal practices, and reducing social tensions. All the activities described herein comprise the current monitoring period (between August 8, 2020 and December 31, 2022) which includes the period affected by the Covid-19 pandemic. In addition to the actions already mentioned, Section 2.2 details Manoa's communication channels and procedures with stakeholders, and 2.3 the project's risks and risk mitigations.

The Manoa REDD+ Project works with the purpose of promoting the development of activities aimed at mitigating climate change, reducing GHG emissions caused by deforestation and forest degradation, promoting social welfare and conserving biodiversity in the municipality of Cujubim. With this, the total GHG emissions reductions for this monitoring period (08/08/2020 to 12/31/2022) were 572,153 tCO_{2e}. The project did not undergo any methodological change, but 3 deviations of the PDD were identified during the monitoring period, as described in section 3.2.2.2.

Audit Type	Period	Program	VVB Name	Number of years
Validation	01-January-2013	VCS and CCB	Rainforest Alliance	-
Verification	01-January-2013 -- 31-December-2016	VCS	Rainforest Alliance	4
Verification	01-January-2017-- 07-August-2020	VCS	Earthood Services Private Limited (ESPL)	4
Verification	08-August-2020 -- 31-December-2022	VCS	Earthood Services Private Limited (ESPL)	2
Total	01-January-2013 -- 31-December-2022	-	-	10

1.2 Sectoral Scope and Project Type

Project Scope: 14 – Agriculture, Forestry and Other Land Use (AFOLU);

Project Category: Reducing Emission from Deforestation and Degradation

Type of Activity: Unplanned Avoided Deforestation (AUD)

Grouped Project: No

1.3 Project Proponent

Organization name	Biofílica Ambipar Environmental Investments S/A
Contact person	Plínio Ribeiro
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Organization name	Manoa Sustentável, Exploração e Serviços Florestais Ltda
Contact person	Murilo Granemann de Souza
Title	Chief Executive Officer (CEO)

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1.4 Other Entities Involved in the Project

Organization name	UNIR – Federal University of Rondônia Foundation
Role in the Project	An important partnership initiated during this period was the agreement with researchers Fernando Henrique Ribas Motta and Dr. Mariluce Rezende Messias, linked to the Federal University of Rondônia Foundation (UNIR) for biodiversity monitoring.
Contact person	Mariluce Rezende Messias
Title	Coordinator of the Laboratory of Mastozoology and Terrestrial Vertebrates, and advisor of the research project entitled "Assessment of the regeneration phase of an area under low impact forest management in two focal groups of vertebrates through the photographic trapping method at Fazenda Manoa, Cujubim (RO)".
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1.5 Project Start Date

The Manoa REDD+Project started on 01-January-2013. This date represents a milestone in Biofílica's first studies that took place to assess the structuring of the REDD+ project. More information about the start date can be found in the project description document.

1.6 Project Crediting Period

The project crediting period is 01-January-2013 to 31-December-2042, resulting in a 30-year period.

1.7 Project Location

The Manoa REDD+ Project is in Brazil, State of Rondônia, municipalities of Cujubim, Itapoã do Oeste and Porto Velho (Figure 1). Access to the area is via Highway BR-364, Porto Velho-Ariquemes, traveling about 140 km up to Highway RO-205, which connects to the municipality of Cujubim via 50 km of dirt road.

The surrounding area is characterized by the presence of several Conservation Units, as well as Land Reform Settlements by the National Institute for Settlement and Land Reform (INCRA). More recently, the region where the project is located has been undergoing extensive change as a result of the advance of soybean farming.

The Project Area (72.843 hectares) is located within the Manoa Farm property, which totals an area of 74,038.748 hectares (data from the most recent Certificate of Rural Property Registration - CCIR). The vertices of the project area are in Table 1 and the area location in Figure 1.

Table 1. Geographic coordinates of Manoa Farm vertices.

Vertex	Coordinate X	Coordinate Y
V 01	62°31'59,243"W	8°59'45,312"S
V 02	62°51'4,501"W	9°0'0,117"S
V 03	62°51'4,595"W	8°56'10,852"S
V 04	62°50'5,834"W	8°54'38,506"S
V 05	62°48'19,203"W	8°50'26,109"S
V 06	62°47'35,825"W	8°52'15,333"S
V 07	62°45'50,68"W	8°50'41,41"S
V 08	62°47'12,746"W	8°48'33,748"S
V 09	62°43'58,219"W	8°39'39,696"S
V 10	62°40'38,687"W	8°40'54,938"S

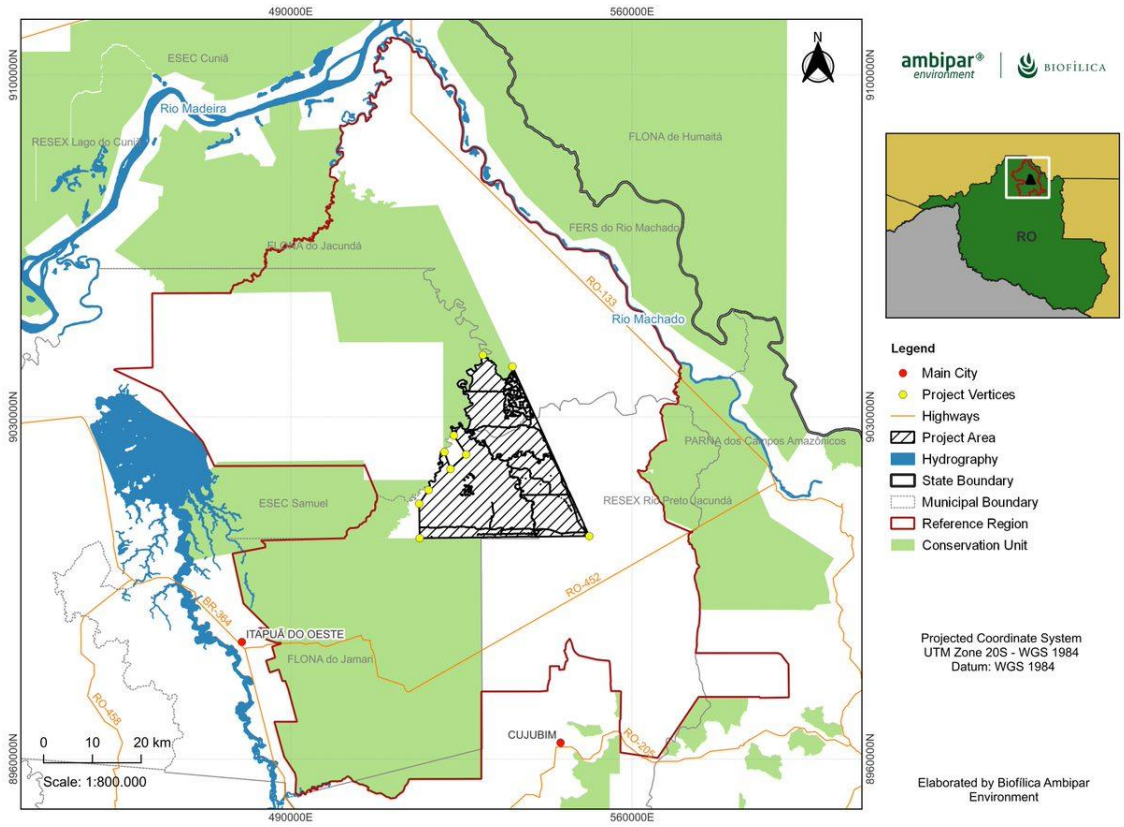


Figure 1. Location of the project boundaries

1.8 Title and Reference of Methodology

For this monitoring report, the VCS (Verified Carbon Standard), version 4.4 was used. The methodology used in the project is the Methodology for Avoided Unplanned Deforestation, VM0015, version 1.1, December 3, 2012.

Project additionality was analyzed according to the VCS approved tool "VT0001 - Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities", version 3.0, February 01, 2012.

Risks to climate benefits, both natural and human-induced, were measured using the AFOLU Non-Permanence Risk Tool, version 4.0, of September 19, 2019.

1.9 Participation under other GHG Programs

Manoa REDD+ Project does not hold or wish to generate any type of environmental credit related to GHG emissions reductions or GHG removals claimed beyond the VCS Program.

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

Not applicable, as the Manoa REDD+ Project does not have any emissions trading programs or mechanisms or wish to reduce GHG emissions from activities that are included in an emissions trading program or other binding limits that include the trading of GHG emission licenses.

Furthermore, the project does not rely on or intend to link any other form of GHG-related environmental credit. In addition, as the monitoring report refers to the period from 08-August-2020 to 31-December-2022 and the verification took place before July 1, 2023, the project impact on the supply chain (scope 3) was not contemplated.

1.11 Sustainable Development Contributions

The Manoa REDD+ Project, despite being found in a region where deforestation and degradation pressure have been increasing at a rapid pace in recent years, managed to contain virtually all unplanned deforestation in the Project Area during the monitored period. A deforested area of only 2.02 hectares was identified and the justification for its occurrence is explained in sections 3.1 and 5.2. The results were ensured mainly due to the good governance applied on the area and the property surveillance activities. Consequently, the project was able to maintain the ecosystem services generated by the permanence of forest vegetation, as well as the aspects associated with biodiversity.

The contribution of the permanence of the benefits linked to forest conservation also occurs thanks to the low impact forest management carried out by Manoa Sustentável, Exploração e Serviços Florestais. Sustainable forest management uses a set of techniques to harvest part of the large commercial trees in the forest, in a system of area rotation, in order to avoid damaging the species that should be preserved and not harm the smaller trees, so that they can grow, ensuring the forest conservation and production sustainability. In addition, there is a special care with PPA (Permanent Preservation Areas) areas, such as riparian forests, water springs, stream banks, areas with a declivity greater than 45°, ensuring the protection of water-related ecosystems. Due to the positive results, the sustainable management model proposed by the company has already been disseminated in 2010 as an example to be followed worldwide by the UN in the publication "Exemplary Cases of Sustainable Management".

In addition to the operational work, Manoa Sustentável, Exploração e Serviços Florestais, through its training activities, ensures the generation of complementary benefits. The development of these activities has allowed the dissemination of knowledge about the importance of sustainable management practices and forest conservation, consequently causing the consolidation of the sustainable development culture. The detailed activities that have brought about positive social results are better described in the following sections 3.1.5 and 3.1.6.

The work carried out by Manoa in the Cujubim region takes into account the support to the local economy, culture and education, demonstrating to the population and local authorities the importance

of maintaining Manoa's activities for the region keeping, thereby, the good relationship with the surroundings and receiving the support by the community to maintain its operations and the forest.

So, with this, the project is - in a global context - mainly aligned with five UN Sustainable Development Goals (SDGs), as described below. The conclusion about this alignment was made by analyzing the targets set for each goal, in relation to the project activities performed in the monitored period and the impacts generated. The supporting evidence of the project contribution to those SDG that were not considered sensible information (due to commercially sensible data or personal data of the people involved) were attached to this document in APPENDIX 3: SD contributions evidence.

Table 2. Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	4.4	4.4.1 Proportion of youth and adults with information and communications technology (ICT) skills, by type of skill, focused on low impact management technical capacities.	Activities implemented to increase	During the monitoring period, 2 technical training courses on low impact forest management were held with environmental institutions (ICMBio and SEDAM)	Throughout the project about 5 technical trainings on low impact forest management were held for universities and interested institutions, with approximately 88 people involved.
2)	4.7	4.7.1 Integration between local school education and education for sustainable development for forest conservation	Activities implemented to increase	During the monitored period 2 environmental education activities were carried out with surrounding schools. With about 59 participants.	Over the project life there were about 8 environmental education activities with schools, with approximately 270 people involved.
3)	6.6	6.6.1 Change in the extent of water-related ecosystems over time, through the estimation of PPA (Permanent Preservation Areas), prior to the forest exploitation activities, so that no exploitation can occur in the PPA areas.	Activities implemented to reduce	Within the monitored period 1,272.56 ha of forest in important areas for protection of aquatic ecosystems (PPA) were protected.	Since the beginning of the project about 3,801 ha of forest in areas of importance for protection of aquatic ecosystems (PPA) have been protected.

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
4)	12.2	12.2.1 The companies in Cujubim that use sustainable raw materials can integrate them into value and market chains, promoting the conservation of natural resources, combined with the social/economic development.	Activities implemented to increase	During the monitored period, 26 companies from Cujubim and 1 company from a nearby municipality (Ariquemes-RO) were prioritized for supply of FSC-certified raw material.	By means of the preservation activities of Manoa Farm, the REDD+ project provides support to 27 local companies with the use of sustainable raw material certified by international standards.
5)	12.8	12.8.1 Support to research projects of local educational institutions, with a focus on education for sustainable development integrated to the education of teachers and students	Activities implemented to increase	Partnerships for 3 biodiversity monitoring research projects were entered into with the Federal University of Rondônia (UNIR).	During the project's existence partnerships were set up for 3 research projects.
6)	13.0	Tons of greenhouse gases emissions prevented or removed	Activities implemented to increase	The Manoa REDD+ Project prevented the emission of 574,021 tCO_{2e} into the atmosphere within the monitoring period.	Prevented the emission of 2,137,581 tCO_{2e} into the atmosphere over the project life.
7)	15.1	15.1.1 Number of hectares of reduced forest loss in the project area measured against the without-project scenario.	Activities implemented to increase	The Manoa REDD+ Project has contributed to the conservation of local biodiversity and the maintenance of ecosystem services through the conservation of the Project Area by avoiding deforestation of 1,459.91 ha of forest.	Conserved 5,244ha of forest that would have been deforested under the without-project scenario to date.

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
8)	15.2	15.2.1 Progress towards sustainable forest management	Activities implemented to crease	The project supported the production of certified wood from low-impact forest management of native species throughout the monitored period, with an average annual exploitation of 22.83 m^3/ha.	Low-impact Forest management has been carried out at the Manoa farm since 2001, a total of 10 years since the beginning of the project. Every project year they have had FSC certification, which has existed for the activity since 2005. Since the start of the project (2013), the annual volume explored has remained below 25 m^3/ha (22.56 m^3/ha on average).
9)	15.5	15.5.1 Red List Index	Activities implemented to increase	During the monitored period 5 threatened species of flora and 9 species of fauna (2 birds, 1 reptile and 6 mammals), according with the IUCN red list, were found in the project area.	There are at least 7 species of flora at some level of threat (VU, EN, CR according to IUCN redlist) and 14 species of fauna (4 birds,VU, 1 repitile, VU, and 9 mammals, VU and EN), covered by the maintenance of their habitats through the maintenance of the forest area. Therefore, the habitat of 21 threatened species of flora and fauna recorded in the project area was guaranteed.

2 SAFEGUARDS

2.1 No Net Harm

Although the project actions aim to promote positive impacts for the social actors in the project area, some negative impacts can occur. So, as a mitigation measure for negative impacts, some points were worked on during the period verified.

Among the activities contemplated in the project, low impact forest management is the one with the highest probability of causing negative impacts. Therefore, with a view to preventing the occurrence of negative impacts, Manoa Sustentável, Exploração e Serviços Florestais Ltda, the company that carries out the management, developed and registered in the Sustainable Forest Management Plan, in the General Procedures Manual, and in the Annual Operational Plan of each UPA a series of operating procedures focused on strategies for reducing impacts that are strictly monitored by the company.

2.1.1 Mitigation of impacts related to social aspects

With regard to social aspects, every year before the beginning of each harvesting, occupational safety and health training sessions are held with the workers, in addition to training in the use of machinery after the delivery of new equipment, as pointed out in Section 2.3; moreover, the use of PPEs by employees is also monitored in order to mitigate the risks and occupational accidents.

Considering the possible negative impacts, such as disbelief and no engagement, that can be triggered by failures in the communication process between the different stakeholders, as pointed out in Section 6.2 of the PD, we sought to strengthen the communication procedures through two main paths: ombudsman channel and the suggestion box. These two points were described in section 2.2.

In addition, during the monitoring period, the proponents assessed that the procedures described in the PDD regarding the identification of conflicts and preventive measures with local stakeholders were not aligned with what was actually being carried out by the project, which resulted in a deviation on this topic that was detailed in section 3.2.2.2, the results of the actual procedures carried out are described in section 2.2.

2.1.2 Mitigation of impacts related to biodiversity

With regard to the possible impacts on biodiversity, two fronts were worked on in the management as a form of mitigation: one linked to the training of employees who would be carrying out management activities, and the other linked to the procedures of the operation itself.

All the functions involved in forest management have specific work procedures and the employees responsible for each one of them are given annual training at the beginning of each harvesting. During these training courses the company tries to keep its employees (own and third party) up to date with the best techniques for reduced impact management, in order to mitigate the impacts on the forest.

Among the mitigating measures for the negative impacts on the flora, the maintenance of 100% of the future cut trees, of the lower class trees (considering individuals with diameters at breast height smaller than 50 cm) and the seed bearing trees, of the primary floristic composition in the permanent preservation areas, stands out, as well as The absolute conservation of rare, endemic, and legally protected species (chestnut and rubber trees), thus contemplating the maintenance of attributes of high conservation value (HCV), specifically the HCV1 – areas containing significant concentrations of biodiversity values, globally, regionally or nationally (e.g. endemism, endangered species, shelter).

As to the protection of seed-bearing individuals, low intensity species, rare species, species protected by law and remaining trees, some preventive measures are taken, such as planning of roads and yards in the field considering the presence of these trees, the survey of their location is done during the 100% inventory of the area that will be managed. With this data, the deviations of the roadbeds and adjustments at the location of the log decks are implemented, the use of felling techniques that direct the fall of trees in forest harvesting, in such a way to avoid mechanical damage to all remaining trees, and the practice of cutting vines so to prevent the felling of the desired individual from affecting nearby trees. In order to assist this planning, all inventoried trees of the Chestnut tree and Rubber tree species are marked on the field forms as "Forbidden Harvesting" and identified with a specific symbol on the forest maps, regardless of their diameter.

Considering the permanent preservation areas and the riparian forests, no trees are extracted that are located within 30 meters from the banks of streams up to 10 meters wide, 50 meters from the banks of creeks up to 50 meters wide, 50 meters from the water springs and in areas with a slant steeper than 45°. Other protective measures are taken such as the adoption of special procedures in the extraction phase seeking to direct the fall of the trees to be cut down so that they do not damage the vegetation existing in these protected areas, there are no construction of campsites in permanent preservation areas, roads crossing rivers or streams and other protected areas are avoided, and when there is no other alternative, bridges are built, not culverts, so as to avoid flooding or damming.

The protection of these species and the preservation of these areas end up acting as mitigation measures for the negative impacts to the fauna as they allow the maintenance of fruit trees to ensure the feeding of the fauna, in addition to acting as temporary shelters until the animal's reflux to the explored areas. Furthermore, forest exploration in a UPA starts close to the most altered areas, making it possible for the animals to escape to interior areas of natural forest.

Other mitigation measures that are adopted for fauna consist of not cutting down trees with nests and planning roads, dragging branches, esplanades and felling of trees in such a way as to maintain the integrity of the nesting areas, as well as installing signs at the limit trails with the words "No Hunting". In addition, all visitors who enter the limits of the Project Area, with prior authorization from the property

manager, undergo a process of identification and registration, and are given guidance on the prohibition of hunting and predatory fishing, capture and persecution of wild animals. Any suspicious action in this regard is immediately reported to IBAMA and SEDAM.

An important measure to mitigate the negative impacts that include both fauna and flora is the frequent surveillance that is carried out on all the property's boundaries, acting against possible actions of intruders who may negatively impact the natural resources and biodiversity of the project area. More details are described in section 3.1.2.

During the monitored period, by means of satellite images, it was possible to identify an increase in pressure for deforestation, invasions and other illegal activities in the surrounding areas (leakage belt and reference region). Through satellite image monitoring and the generation of annual bulletins, it was possible to assist the activities of property surveillance where the coordinate points are passed on for field checking by the surveillance team.

Regarding the salt licks, which is another HCV present in the project area, access to the area is restricted to employees and researchers to promote maintenance of the area and avoid negative impacts to it and to the species that inhabit it. Despite UPA 13, where the HCV is present, not having been explored yet, the salt lick area presents the same procedures regarding care of management activities, both in planning and in operation. Therefore, the existence and location of this area will be taken into account when planning roads, skid trails, terraces and felling of trees in order to maintain the integrity of this HCV.

2.2 Local Stakeholder Consultation

2.2.1 Communication channels

Manoa has in its communication with interested parties a procedure that guides how the relationship with the project stakeholders (see section 3.2.2.2). The consultation and communication with these stakeholders, which enables the discussion about the progress of activities carried out at the property, both in the form of complaints and suggestions, occurs via three methods: application of a questionnaire to survey the positive and negative impacts (Figure 26), availability of the ombudsman channel and development of the suggestion box (Figure 28). Through these methods, it was possible to engage stakeholders in such a way that they influenced the implementation of the project activities by adopting, when appropriate, some suggestion for improvement or innovation, and some corrective measure or compensation in cases of complaints and damages. Procedures used to document the outcomes of the local stakeholder communication for each of the methods mentioned are detailed below.

1. *Application of a questionnaire to survey the positive and negative impacts:*

In 2020 the questionnaires were not applied due to COVID-19 occurrence. As for **2021**, altogether, **six questionnaires were collected**, among the positive impacts reported were the forest conservation/preservation, increased income, road maintenance, and no impacts. Among the negative

impacts there was only one "spoils the road" complaint. In 2022, eight questionnaires were collected, two more than the previous year (Table 3). Among the positive impacts it was pointed out job creation, movement of people/movement in the region, talks given by Manoa, protection of the forests, and only one questionnaire returned with the answer "no positive impacts". Among the negative aspects five said there were no negative impacts, two reported inconveniences with the dust and one complained about the flow of trucks. As for the biggest challenges for the institutions, only one of them, the 23 de Março School, answered the question, reporting difficulties with lack of space, road access during the rainy season and dust.

Table 3. Monitoring of questionnaires applied according with the year of application, type of property (local farmer or local institution) and status of the availability of the interviewee.

Year	2020		2021		2022	
Type of property	No. of questionnaires answered	No. of questionnaires not answered	No. of questionnaires answered	No. of questionnaires not answered	No. of questionnaires answered	No. of questionnaires not answered
Institutions	0	2	0	2	2	0
Farmers	0	8	6	2	6	1
No longer available	0		0		1 - Farmer	

When the critic is Manoa's responsibility and can be solved, the farm provides the directions to solve the dissatisfaction. When it is something that goes beyond its responsibilities, as happened with a request for the installation of a speedbump in 2019, Manoa indicates to whom the request should be forwarded and assists as possible. The request for a speedbump was made during the questionnaire application, at the time done by an outsourced company, the request was than forwarded to Manoa and the manager went personally to the school to understand the solicitation. There he heard the school needs, that included also new trash bins for recycling, and explain that Manoa didn't have the jurisdiction to install the speedbump, that it was the municipality's responsibility, but even so, Manoa was willing to bear the costs of the signaling and provide the recycling bins. The whole process, including the installation and signaling, lasted about a month. In addition, Manoa provided copies of a folder to be distributed by the school to truck drivers in the area, instructing them to reduce the velocity to minimize the dust, to keep them safe regarding the new speedbump, and to keep the children's safe, as is a school area.

In the monitored period the questionnaire was applied by Manoa's engineer and he related that at the instances that the neighbor complained about the dust or road state the neighbor himself expressed that they knew it was a problem outside Manoa's responsibility and that it also depended on the season. Therefore, Manoa considered those states resolved.

The monitoring sheets for the years 2021 and 2022 were delivered to the VVB, also, the monitoring method describe doesn't affect the risks, costs and benefits related to local stakeholders. Furthermore, there were no changes in laws and regulations in the country that could affect this method.

2. *Availability of the ombudsman channel*

During the monitored period there were no complaints received through this channel, however, if there were, the procedure would be to notify the manager to decide what action to take. The response would depend on the type of complaint and its urgency, as described in section 3.2.2.2. A fire notification, for example, would be answered immediately, other complaints might involve Triângulo besides Manoa and would need to be directed to Triângulo headquarters so it could be dealt with in conjunction.

The availability of the ombudsman channel doesn't affect the risks, costs and benefits related to local stakeholders. Furthermore, there were no changes in laws and regulations in the country that could affect this communication channel.

3. *Development of the suggestion box*

In the two years of monitoring, the box was opened by the technicians responsible in front of all the farm's employees, but there were no complaints or suggestions in the monitoring period. Also, the technicians responsible for the opening of the box forgot to document the moment, so, as an improvement to the communication channels of the project, in the future the proponents aim to better document, register and monitor suggestions and complains.

The main reason for no complaints through the suggestion box is that the employees prefer to communicate their dissatisfactions or suggestions directly to the manager or person responsible for the forest management operation. Usually the employees requests are related to the forest management procedures, such as complains about a sector of the management that is not working correctly and consequently overloading the next sector (the harvest sector is not delivering the wood with a proper cutting, for example), or suggestions to improve the management. The instances of complaints about the execution of manage procedures are evaluated in the field by the technicians and resolved as soon as possible with a talk with those involved. The suggestions for improvement are discussed internally with the specialists to see if they can be applied.

Some of the complains are also related to the internet, initially the problem was the absence of internet, latter it was the quality of it. Manoa is working to improve the connection which will probably happen in 2023 and so will be describe in the next monitored period. There are also frequent meetings during the forest management period, detailed below in the "other communication channels" item, where the employees can communicate with their superiors.

The availability of the suggestion box described doesn't affect the risks, costs and benefits related to local stakeholders. Furthermore, there were no changes in laws and regulations in the country that could affect this communication channel.

4. Other communication channels

Besides the three main consultation and communication fronts set up by Manoa, during the harvest period the activities were initiated by speeches and trainings about low impact forest management and the correct procedures (for more details see section 2.3.2) and, then every 20 or 30 days, meetings occurred to reinforce the safety procedures, to hear employees doubts, suggestions and requests. From 2022 onwards those meetings started being documented in reports, shared with the VVB.

The donation requests received by Manoa were evaluated according with the procedure described in section 3.2.2.2 and the activities accepted are described in sections 3.1.5; 3.1.6; 3.1.7 and 3.1.8.

2.2.2 Stakeholders access to project documents

To comply with the reference in section 4.5 of the VCS Registration and Issuance document, the documents related to the validation and first and second VCS verification of the Manoa REDD+ Project were made available by virtual means on the Verra[1] registration platform for stakeholder consultation. The link to Manoa REDD+ Project in the Verra Registry is available at Biofilica Ambipar website[2], where details of the project results are also described.

Upon completion of the current verification (August 2020 to December 2022), the corresponding documents will, as soon as possible, be made available in line with Section 4.5 of the VCS Registration and Issuance.

News and updates about the project have been published in the Biofilica Newsletter via blog[3] and social media (Instagram[4] and LinkedIn[5]). The results obtained for the monitored period were disseminated on these platforms to stakeholders and the audit results will be added after its completion. In addition, a Manoa profile was created on Instagram[6] (Figure 2) to disseminate information about the REDD+ project, sustainable management, biodiversity, and carbon credits.

The reach of each of these media was measured and, on Linkedin of Biofílica Ambipar, three posts related to the Manoa REDD+ Project received more than 6.8k views, in 33 regions, including Porto Velho - RO. On Instagram, Biofílica Ambipar has over 4,380 followers, from at least 12 different locations, the Manoa REDD+ Project posts reached 49k accounts.

[1] Manoa REDD+ Project at Verra registry. Available at: https://registry.verra.org/app/projectDetail/VCS/1571. Access on: July 11, 2023.
[2] Biofilica Ambipar website. Available at: https://www.biofilica.com.br/projeto-redd-manoa/. Access on: July 12, 2023.
[3] Biofilica Ambipar blog. Available at: https://www.biofilica.com.br/blog/. Access on: July 12, 2023.
[4] Biofilica Ambipar Instagram. Available at: https://www.instagram.com/biofilica_br/. Access on: July 12, 2023.
[5] Biofilica Ambipar Linkedin. Available at: https://www.linkedin.com/company/biofilicabr. Access on: July 12, 2023.
[6] Manoa Instagram. Available at: https://www.instagram.com/manoaeco/?igshid=MTI1ZDU5ODQ3Yw%3D%3D. Access on: July 12, 2023.

The Instagram of Floresta Manoa, managed by Grupo Triângulo, focuses mainly on reaching the public in the project region, has 195 followers and reached more than 290 accounts, 5.6% from Cujubim, 5.6% from Rio Crespo and 6.2% from Porto Velho, the remaining percentage is distributed between São Paulo and Curitiba.

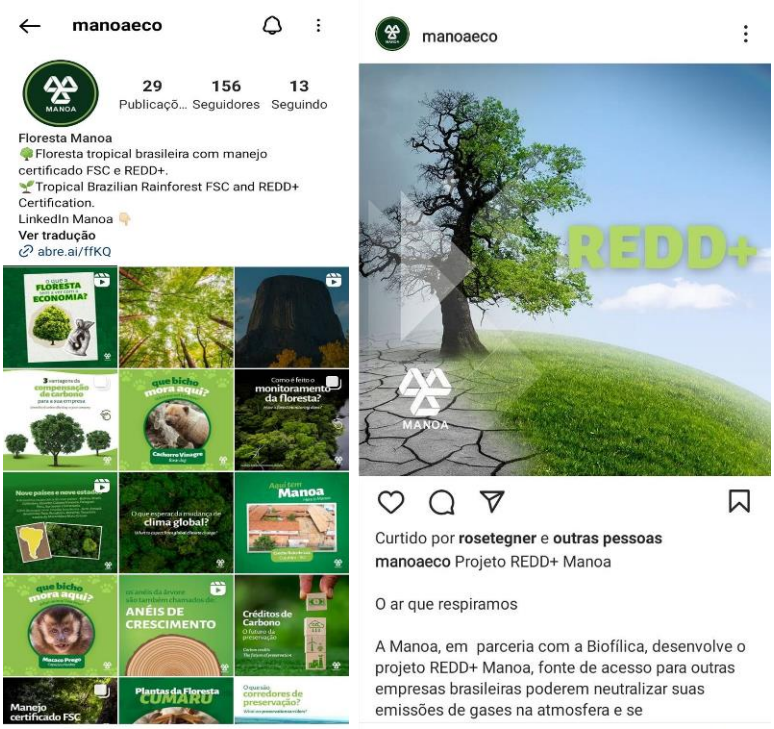


Figure 2. Manoa's Instagram focused on sustainable management, biodiversity and carbon credits, with emphasis on the direct posting about the Manoa REDD+ Project.

Another example of dissemination related to the Manoa REDD+ Project was the distribution of a catalog with information about the project (Figure 3) to participants who visited the Manoa Farm for the training sessions (Figure 4) and to neighbors that responded the questionnaires detailed in section 2.2.1.

Figure 3. Cover of catalog containing information about the Manoa REDD+ Project.

Figure 4. Children who received environmental education at Manoa Farm receiving the Manoa REDD+ Project brochure. 23 de Março School on the left and Castro Alves School on the right.

Furthermore, during the monitored period, there were no changes in risks, costs and benefits related to local stakeholders. Likewise, there were no changes in laws and regulations covering workers' rights in the country.

2.2.3 Process of validation/verification body's site visit

Manoa Farm's employees are also reported on the REDD+ project activities since they are involved and actively participate in it. In this way, as one of the Project stakeholders, the employees receive directions and are reported on all the processes.

The communication of the current audit was carried out on 04/12/2023 (Figure 5) to 31 employees through a Power Point presentation that addressed REDD+ basic concepts, as well as the Project objectives, activities results, the current deforestation status of the project area surroundings and the Project emissions reductions achieved.

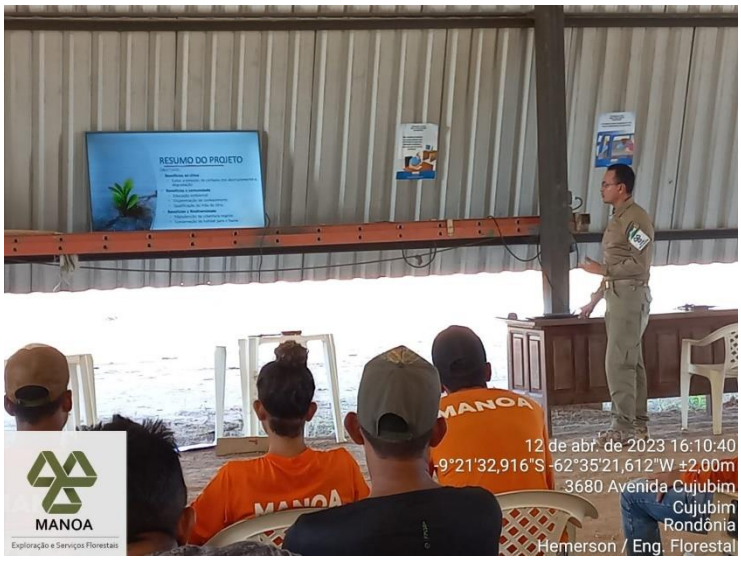


Figure 5. Picture of the communication event to the Manoa team about the current audit and information about the Manoa REDD+ Project

2.3 AFOLU-Specific Safeguards

2.3.1 Risk mitigation

The risk assessment was conducted by applying the VCS approved tool, "AFOLU Non-Permanence Risk Tool, v. 4.0", verified the probable natural and human-induced risks to climate benefits, reported in the Manoa REDD+ Project Non-Permanence Risk Report, as summarized in the table below.

Table 4. Final score of the non-permanence risk for the Manoa REDD+ Project.

Category	Score
a) Internal Risk	0
b) External Risk	5
c) Natural	1
General Score (a + b + c)	10

In addition, during the monitored period, other risks to the project benefits were identified, as well as their respective mitigating measures. These risks are listed below:

Risk: Failure to maintain, beyond the project's credit period, the management practices needed to protect carbon stocks

Mitigation: Since 2019, the landowner has registered his Legal Reserve Area, which represents 95% of the total property, on the land registry, this registration is called "averbação".

According to the Forest Code (Law No. 12.651/2021), part of the rural property must be set apart for environmental preservation. In the Legal Amazon, this minimum percentage is 80%, except in areas of cerrado or campos gerais. In the case of Manoa, they registered an area larger than that required by law, totaling 95%, and which is completely overlapped by the Manoa REDD+ Project Area, reinforcing the owners' commitment to keeping the forest areas within the property conserved.

The Forest Code also allows the legal reserve to be registered in the Rural Environmental Registry (CAR), revoking the obligation for the owner to record the legal reserve in their land registry. However, by registering it, this protection becomes official and permanent, linked to the property and not to the owner. This means that the obligation to conserve the legal reserve continues, even if the property is sold or inherited, guaranteeing the protection of the area on an ongoing basis.

The registration ensures that any attempt to deforest or alter the legal reserve area without authorization is legally challenged. In addition, when the property is transferred, the obligation to maintain the legal reserve is automatically transferred to the new owner, maintaining the conservation of the area regardless of changes in ownership.

Furthermore, Manoa signed a Term within the scope of the Environmental Regularization Program, committing to adopt the necessary measures to maintain and conserve the Permanent Preservation Areas, Legal Reserve and/or Restricted Use Areas of its property. SEDAM will remotely monitor Manoa’s farm limits to ensure compliance with the commitment and, in case the agreement is not respected, fines can be applied.

This shows that registration is a solid and effective way of guaranteeing the conservation of forests on private properties for long periods of time. The registration has no expiration date and aims to make all changes to the property public.

In addition, the Triângulo Group, through Manoa more recently, has owned and occupied the land for more than twenty years, with the aim of keeping the forests conserved and generating socio-environmental benefits, which are recognizably present in this territory. As indicated in the MR in section 3.1, the REDD+ project maintains a surveillance team to inhibit land invasions, as well as ensuring a good relationship with neighboring areas, such as conservation units and other farms. These activities have been carried out since the beginning of the project and are constantly being improved to reinforce the protection of the carbon stocks credited during the project's longevity.

Furthermore, Manoa signed a document stating its commitment to maintain environmental management practices for the next 100 years in the carbon project area (REDD+ Manoa) with the support and partnership of Biofílica Ambipar Environmental S.A. and emphasizing the dedication of the signatory companies to environmental conservation under the terms of the National Environmental Policy Law – Law No. 6,938/81, Art. 2, items IV, VIII and IX:

IV – ecosystems protection, with the preservation of representative areas;

VIII - recovery of degraded areas;

IX - Protection of areas threatened with degradation.

In this way, it can be said that the project is protected by a legally binding commitment to continue the management practices that protect the credited carbon stocks during the project's longevity, including this monitoring period. The updated certificate of full content containing this information has been made available to the VVB.

Risk: Illegal activities such as trespassing and timber theft occurring rampantly around the project area causing degradation and loss of forest cover.

Mitigation: Mitigation of this risk is tied to the involvement of project proponents and efforts to contain deforestation. Throughout the monitoring period, annual deforestation bulletins and analyses of deforestation during the dry season were prepared, both using satellite images.

It was possible to perceive through the analyses the deforestation dynamics, mainly in the project's surroundings, as well as the alteration of these dynamics. As a strong activity present in the project area, the property surveillance of Manoa Farm is constantly carried out. However, there were outbreaks of fire within the project boundaries due to deforestation and fire in neighboring areas bordering the Project Area. In response, occurrence reports were generated, and the analysis of the impacts were included in Sections 3.1.2 and 4.3.3. Also, as a way of engaging the population in the theme regarding environmental education, courses, training and technical visits were provided.

Risk: Problems in marketing the carbon credits, due to variations in the price of credits and absence of a regulated market, and consequent lack of resources to finance the proposed activities.

Mitigation: Biofílica has a revenue department, with commercial, marketing, communication, and market intelligence teams, responsible exclusively for developing materials to publicize the project, participate in national and international events related to REDD+ and carbon markets in order to publicize the project, establish and expand the network of business contacts with potential buyers of the carbon credits to be made at the best possible prices that ensure the financial sustainability of the Project and Biofílica.

The commercial team relies on professionals who are split to serve national and international clients, who deliver the credits to companies and institutions committed to the effective conservation of their areas and the co-benefits to communities and biodiversity. In addition, Biofílica is always looking for financing alternatives, such as donations and partnerships for direct implementation of project activities (not necessarily linked to credit sales).

Risk: Forest management activities may cause negative impacts on the project.

Mitigation: The Forest Management carried out at Manoa Farm follows the premises and guidelines of the FSC certification, which guarantees quality and mitigation of impacts. Moreover, Manoa has a procedure manual and a well-defined Forest Management Plan, documents that guide all the

activities related to the management. Moreover, the management workers were offered training in this theme (described below, in the section 2.3.2).

2.3.2 Impact mitigation activities

Among the actions implemented by the Manoa REDD+ Project, low impact forest management is the activity with the highest probability of causing risks with the local stakeholders, in this case, the management workers. Considering the risks, Manoa Sustentável, Exploração e Serviços Florestais Ltda addresses health and safety at work as a fundamental aspect of the Company's daily activities, thus complying with the *[Programa de Controle Médico de Saúde Ocupacional]* Occupational Health Medical Control Program - PCMSO and the *[o Programa de Prevenção de Riscos Ambientais]* Environmental Risk Prevention Program - PPRA.

The PCMSO is intended for prevention, tracking, and early diagnosis of work-related health problems. In line with the program, the Company performs medical assessments of each employee upon admission and annually, when employee returns to work, in absences longer than 30 days, as well as when employee is dismissed. The PPRA works with the purpose of preserving the health and integrity of all the Company's employees, through the anticipation, recognition, evaluation, and control of environmental risks that exist or may come to exist in the work environment. Thus, by applying the PPRA, the Company monitors and proposes measures to reduce the risks arising from each work activity.

Through lectures and training, preventive occupational action activities related to the PCMSO and PPRA are carried out, such as, for example, the forest fire brigade (Figure 6), training with chainsaws, regulatory standard 06 (personal protection equipment), regulatory standard 12 (safety in machinery and equipment), the importance of teamwork and forms of communication for interpersonal relationships, basic notions on how to recognize the most common venomous animals in accidents, quality of life in the workplace emphasizing the site organization, conducts as to company’s property, equipment, and accommodation, the vaccination calendar for adults and the importance of keeping it updated, basic notions of pre-hospital care, the most common verminosis in adults, basic hand washing and personal hygiene, and sexually transmitted infections (HIV, syphilis, and hepatitis B and C).

The records regarding these activities were made by monitoring reports of the management area of each UPA, by photos - some presented below - and attendance lists, made available to VVB.

Figure 6. Training of the forest fire brigade by a firefighter in 2022.

Furthermore, in order to ensure the worker's health and safety in management activities, the company relies on a general procedure's manual for forest management from 2012, updated in 2020, which must be observed by each and every employee. The manual was made available to the VVB team.

The manual describes the safety equipment that must be used for each function, procedures for proper and safe performance of each activity, instructions on proper disposal of organic and inorganic waste, hygiene measures, and others. The manual also describes the occupational health and safety monitoring plan, which consists of a biannual internal audit regarding the working conditions of the Company's own and outsourced teams and the conditions of PPE use for contracted activities. Through the monitoring report, all the non-conformances are listed along with the respective deadlines for fulfilling the corrective actions. In a second moment, the status and closure or not of the corrective actions are verified at the field.

Among the audited items are food, water quality, living conditions in the camps, occupational health programs, ergonomic conditions of the activities, the existence of an environmental risk prevention program, training, transportation of workers, fuel transportation, risk areas, communication system, condition of machinery and equipment, rest period between workdays, and the use and conservation status of PPEs. Moreover, with a view to having a control over the PPE use, and its pickup by any employee, Manoa has a control sheet (Figure 7).

FICHA DE MONITORAMENTO DE SAUDE E SEGURANÇA NO TRABALHO - USO E ESTADO DE CONSERVAÇÃO DE EPI's					
EMPRESA:					
DATA:	RESPONSÁVEL PELA AVALIAÇÃO:				
EPI	NÃO APLICA	USO	ESTADO DE CONSERVAÇÃO	AÇÃO CORRETIVA	PRAZO
NOME:					
FUNÇÃO:					
Camisa de manga longa					
Calça de nylon almofadada					
Bota com bico de aço					
Capacete					
Viseira					
Protetor auricular					
Luva					
Bota					
Caneleira					
Camisa de cor clara					
ONDE:					
USO = SIM OU NÃO					
ESTADO DE CONSERVAÇÃO: BOM, REGULAR OU RUIM. EM CASO DE RUIM DESCREVER A SITUAÇÃO DO EPI.					

Figure 7. Sheet for monitoring the use and conservation status of PPEs.

All the documents referring to the impact mitigation activities were made available to the VVB team.

2.3.3 Property right acknowledgment

The activities of the Manoa REDD+ Project are and will continue to be developed under the ownership and use rights of Manoa Sustentável Extração e Serviços Florestais Ltda. The ownership and use rights are demonstrated through the following documents, made available to the VVB team:

- Final title of lands, about 74,038.74 hectares in the municipality of Cujubim, State of Rondônia;
- Certificate of Rural Property Registration - CCIR;
- Certificate of Full Content;
- 20-Year History Certificate;
- Domain Recognition Title;
- Rural Environmental Register (CAR);
- Clearance certificate of embargo from IBAMA.

Analysis of project area overlaps

The Manoa REDD+ Project did not carry out any activities in private property or property belonging to indigenous and traditional communities or to the government, only in properties belonging to Manoa Sustentável Extração e Serviços Florestais Ltda. Furthermore, it is important to highlight that there are no traditional peoples and communities in the project area, as presented in Section 2.7 of the PD, and there are no indigenous or quilombola lands in the reference region.

To ensure there are no significant overlaps with public and private areas surrounding the project area, an analysis was made considering georeferenced data of conservation units[7], settlements[8], indigenous land[9], quilombola lands[10], CAR declarations[11] and private lands[12]. Those shapefiles were compared with Manoa's property limits to calculate any overlap.

As shown in Figure 8, there are 4 conservation units and 4 settlements in the reference region. During the analysis an overlap of 27,23ha with FLONA Jacundá (Floresta Nacional do Jacundá) and 8,83ha with Samuel Ecological Station (Estação Ecológica Samuel) were found. To correct the data, SEDAM and ICMBio were contacted and they attributed the overlaps to small technical errors, such as low precision of old data and vector error, respectively. The Samuel Ecological Station was correct by SEDAM and now COMRAR (Coordination of Monitoring and Regularization of Rural Environment) is responsible for actualizing the public data. As for FLONA Jacundá, ICMBio stated that there is an ongoing process to demarcate the unit, therefore it is expected that the situation of the adjoining properties will be normalized after its conclusion. Evidence of communication with these public bodies was made available to the VVB.

[7] MMA - https://dados.mma.gov.br/dataset/unidadesdeconservacao, access on august 2024.

[8] INCRA - https://acervofundiario.incra.gov.br/acervo/login.php, access on august 2024.

[9] FUNAI - https://www.gov.br/funai/pt-br/atuacao/terras-indigenas/geoprocessamento-e-mapas, access on august 2024.

[10] INCRA - https://certificacao.incra.gov.br/csv_shp/export_shp.py, access on august 2024.

[11] SICAR - https://consultapublica.car.gov.br/publico/estados/downloads, access on august 2024.

[12] SIGEF - https://acervofundiario.incra.gov.br/acervo/login.php, access on august 2024.

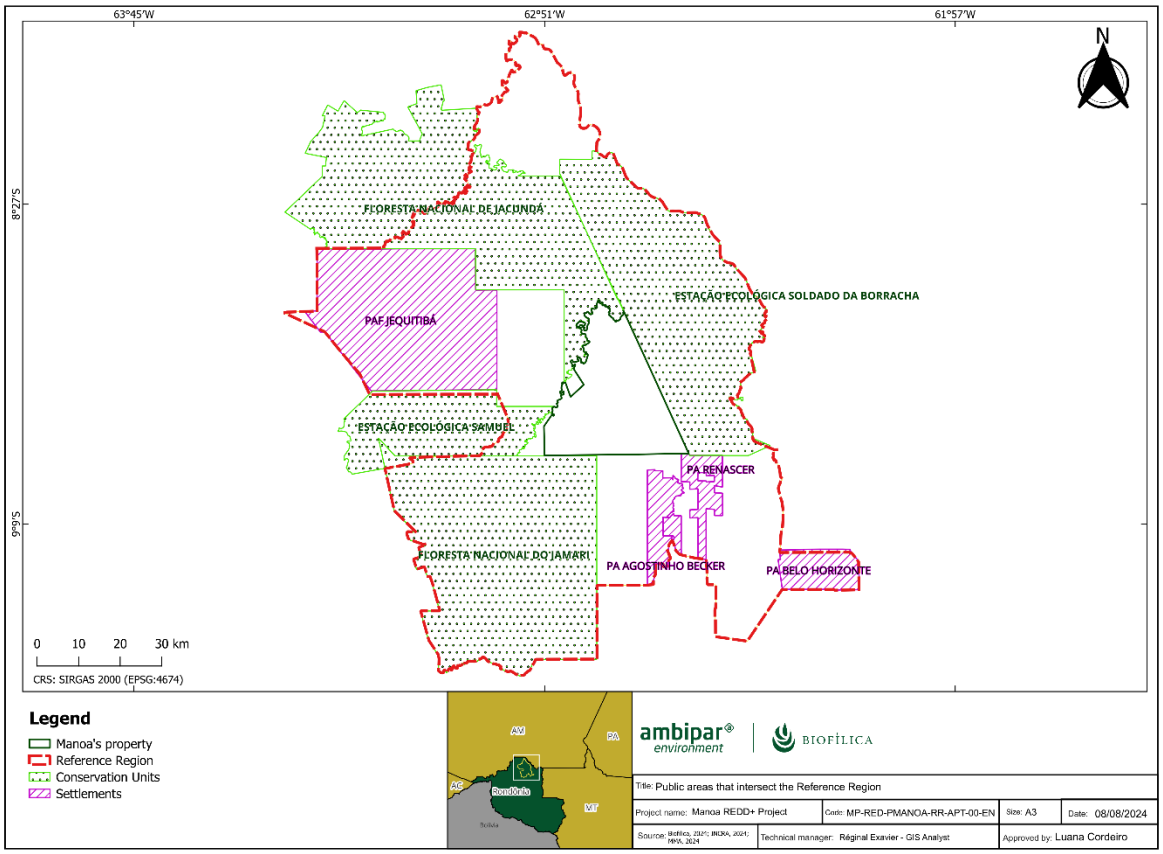


Figure 8. Location of Manoa's property, conservation units and settlements in the reference region.

There are several Rural Environmental Registry (CAR) of surrounding properties in the reference region, as shown in Figure 9. It is important to emphasize that CAR is self-declaratory, which is why there are many undue declarations.For the analysis, the CARs that were listed as "Cancelled by administrative decision", "Cancelled by judicial decision" or "Cancelled due to duplication" were removed. Among the CARs analyzed, 30 showed overlap with Manoa, with the area varying between 22ha and 0.0007ha, and all of them are still at some stage of analysis and subject to rectification.

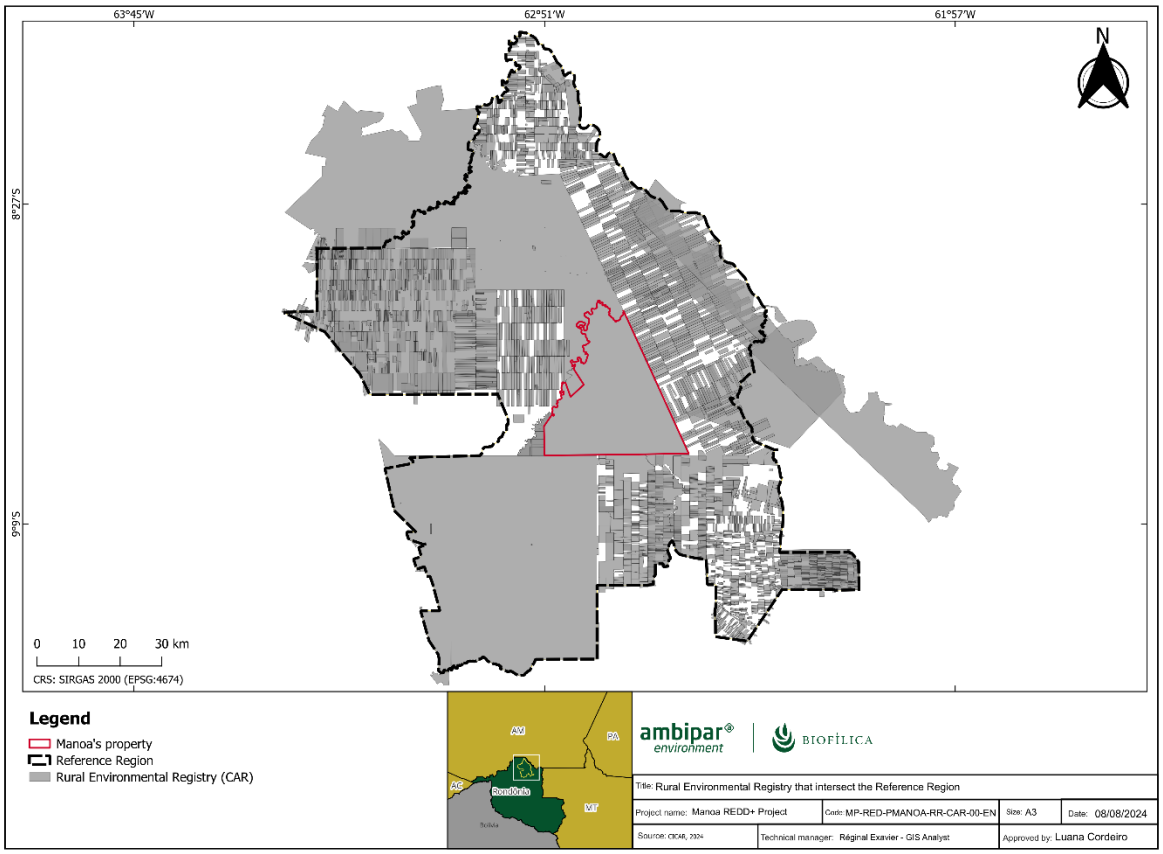


Figure 9. Location of Manoa's property and Rural Environmental Registry (CAR) of surrounding properties in the reference region.

The fact that the CAR has a self-declaration system, where rural landowners enter information about their land without immediate verification by authorities, makes the CAR a fragile document for detailed land analysis, as the data can contain errors, be manipulated or not reflect reality. The lack of rigorous validation reduces the CAR's reliability and opens up space for fraud, such as the incorrect declaration of areas and the omission of illegal deforestation. For this reason, the CAR must be complemented with other documents and checks for an accurate land analysis, so this overlap analysis also used SIGEF data.

The private property data from SIGEF (Figure 10) are more reliable and definitive, as they must comply with a technical and operational rigor that CAR does not need follow. In addition, SIGEF data brings government data closer to that of real estate registries, standardizing the description of the boundaries of a rural property in the data managed by INCRA (National Institute of Colonization and Agrarian Reform) and in the data from the registry offices. Each description (map and descriptive memorial) feeds a single national Database. Therefore, it's the SIGEF data that actually has regulatory value for rural property boundaries.

In the analyzed data, 19 overlaps were found, all with less than 1ha, the largest with 0.135ha and the smallest with 0.0015ha (there is also an overlap of 0,6158 with Fazenda Vista Alegre, which

belongs to the same owner as Manoa Farm). Since these values are insignificant, approximately 0.00084% of Manoa total area, they can be attributed to technical issues such as those indicated in the case of overlaps with conservation units (low precision of old data and/or vector errors). All the data used for the analysis were shared with the VVB.

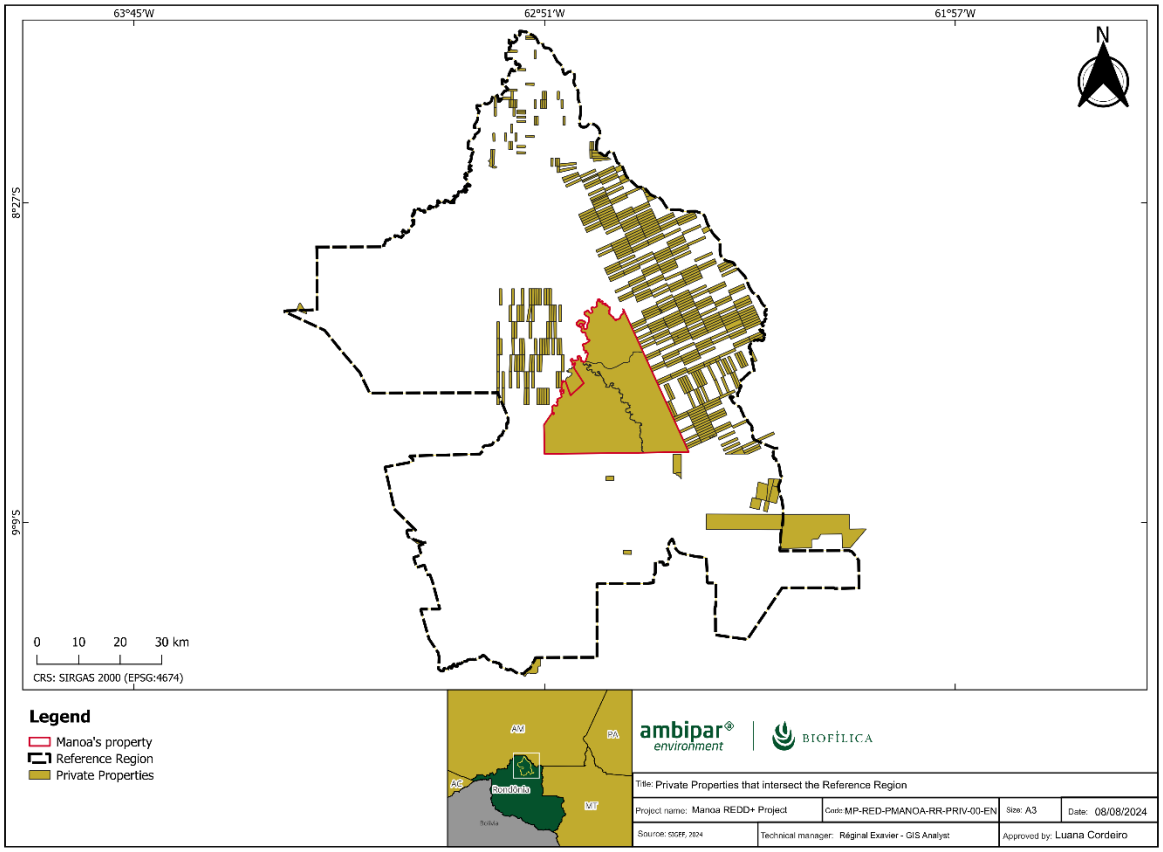


Figure 10. Location of Manoa's property and surrounding private areas in the reference region.

An additional documentary research conducted has concluded that property is under regular conditions, with no liens, encumbrances, or constraints to the full use of the property; so, there is no hindrance to the accomplishment of the Manoa REDD+ Project, such as blockages, liens, mortgages, arrests, or land disputes. The proof of this legitimacy can also be evidenced by obtaining the FSC certification seals that attest to the enterprise legality.

The property where the project is located has a larger area than the area used for the project activities and, thus, there was no interference in neighboring properties. Hence, it was not necessary to seek a free, prior, and informed consent on the property rights of any interested parties. Moreover, the entire process of consultation and communication with these stakeholders took place through the established communication channels described in section 2.2.

2.3.4 Relationship and communication with the surroundings and other stakeholders

The communication with the surroundings and other stakeholders that enables the discussion about the project progress, complaints and suggestions is carried out in three ways: application of a questionnaire to survey the positive and negative impacts, availability of the ombudsman channel, and development of the suggestion box. More details were described in sections 2.2 and 3.2.2.2.

Furthermore, as part of the monitoring of UPAs in the post-exploitation activities, the social aspects in the forest management area (AMF) were monitored. Thus, the following were identified in the region:

- 1 Rural Producers Association (Associação dos Produtores rurais da comunidade São José - ASPROJ).
- 1 Municipal school (Municipal Escola 22 de Março) along the route from the urban area of Cujubim (RO) municipality to the Manoa Farm
- 8 rural properties, with headquarters and employees living there and who neighbors the AMF (Figure 11)

A copy of the management plan public summary was formalized, besides a contact telephone number and digital address of Manoa company's ombudsman to keep a communication channel with the association and school. The social monitoring is described in more detail in the sections 2.2 and 3.2.2.2.

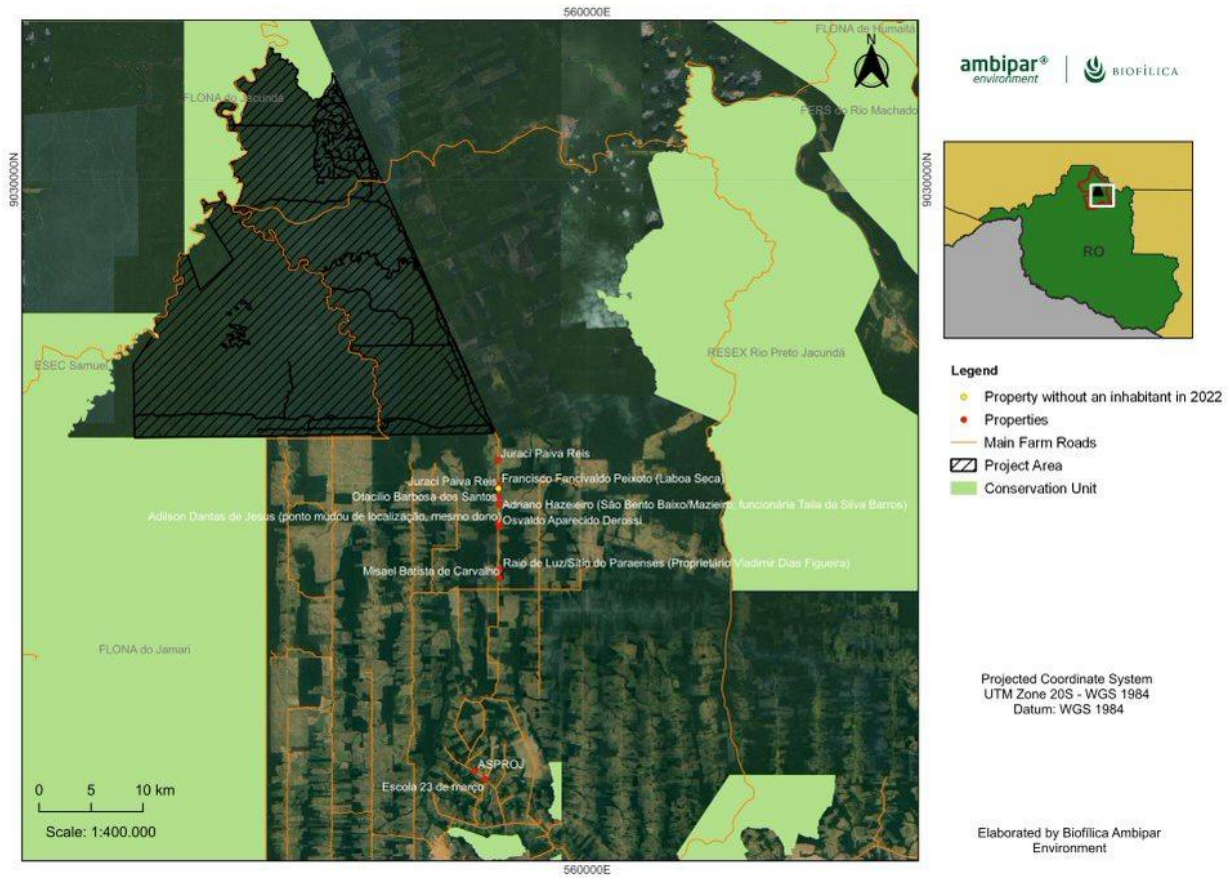


Figure 11. Map of the areas visited to carry out the social monitoring report surrounding the Forest Management Area (AMF).

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The main purpose of the project is to promote the reduction of greenhouse gas emissions (REDD+) resulting from unplanned deforestation and forest degradation. To this end, during the third monitoring period (08-August-2020 to 31-December-2022), deforestation monitoring activities were carried out through satellite images by both proponents and there were improvements in preparing the reporting on property surveillance patrols for better tracking of the activity. In addition, leakage monitoring and of non-permanence risk factors management were carried out, as well as low impact forest management activities and technical training for this kind of management.

Regarding social activities, it is important to highlight that, since there are no indigenous peoples and traditional communities in the project area (as presented in Section 2.7 of the PD), the activities causing social and environmental impacts were aimed at the population of the municipality of Cujubim and are detailed in Section 3.1.6. Furthermore, activities related to Biodiversity were carried out. The relationship between the activities carried out by the project and their impact on the reduction of GHG emissions is dealt with in Section 3.1.8.

3.1.1 Monitoring deforestation through satellite images and generation of annual bulletins

As stated in item 2.2 of the Project Description (PD), one of the activities planned for the Manoa REDD+ Project is the monitoring of deforestation through satellite images and generation of annual bulletins.

This activity occurs annually since the beginning of the project and its purpose, in addition to monitoring deforestation, is to assist field patrols through the bulletins generated by the monitoring. Due to the annual periodicity of the PRODES data, used in the analysis of the Biofílica Ambipar, Manoa started a more frequent monitoring of deforestation, which will be further detailed ahead and in section 3.2.2.2, in order to identify points of attention for property surveillance.

Biofílica Ambipar Monitoring

For the analysis of land use and land cover changes during the monitoring period, the methodologies referred to in item 4.5 of the PD were used, through PRODES data, available in vector format (shapefile) and matrix (raster) and with spatial resolution of 30 meters. According to the PRODES methodology (CÂMARA et al. 2006[13]), the images undergo a geometric correction with a displacement

[13] CÂMARA, G.; VALERIANO, D. M.; SOARES, J. V. **Metodologia para o Cálculo da Taxa Anual de Desmatamento na Amazônia Legal**. 2006. In: PRODES: banco de dados

error of less than 1 pixel (30 x 30 m). These images cover part of the monitoring period (August 2020 to July 1, 2022) and can be located through the Orbit/Point in Landsat scene 231/66 and 232/66. The main activities performed by the PRODES system to monitor forest cover in the Brazilian Amazon are detailed below. In addition, data from the Deforestation Alert System (SAD) produced by Imazon were used for the period not contemplated by PRODES (July 2, 2022 to December 31, 2022). Subsequently, an accuracy analysis of the combined product was made using high resolution images from the Planet satellite.

Despite having a different methodology and analysis interval from PRODES, the SAD is also a monitoring tool for the Legal Amazon based on satellite images used to detect deforestation. The SAD was developed in 2008 to monthly report on the pace of forest degradation and deforestation in the region. It uses the Landsat 7 and 8 satellites from NASA, and Sentinel 1A, 1B, 2A and 2B satellites from the European Space Agency (ESA). Both are in the public domain. Since the region has a lot of clouds during much of the year, to try to increase the ability to detect forest losses even with the presence of clouds, the SAD also uses radar images from the Sentinel 1 satellites (Imazon, 2021[14]). The processing of SAD images is done automatically, followed by a validation of the results by Imazon analysts to eliminate any possible noise.

The satellite image monitoring activity aims to understand the context of deforestation and encroachment, and consequently to improve the agility and assertiveness of field patrols for maintaining the forest cover.

Map Accuracy Assessment

As mentioned earlier, PRODES 2021 covered the period from August 2020 to July 2021. From August 2021 to July 2022 the deforestation increment data also made available by INPE were used. In the period between July and December 2022 the SAD data complemented the PRODES data, allowing the identification of deforestation polygons that occurred during the entire monitoring period. The PRODES data and deforestation increment were acquired from the TerraBrasilis[15] website and those of SAD on the ImazonGeo platform[16].

An accuracy analysis was performed using spatial high resolution satellite images, acquired on the Planet platform, Basemaps Viewer. The Planet images, with a spatial resolution of 4.77 m, are taken by a constellation made up of hundreds of Dove satellites. These images are for free and made available by the Norwegian Government. It results from a partnership between the Norwegian Ministry of Climate and Environment with Kongsberg Satellite Services (KSAT) and its partners Airbus and Planet, to provide

[14] SAD - Imazon, 2022. **Deforestation Alert System**. Available at: https://imazon.org.br/publicacoes/faq-sad/. Accessed on: July 01, 2022.

[15] TERRABRASILIS. **TerraBrasilis**. Available at: http://terrabrasilis.dpi.inpe.br/downloads/. Access on: June 25, 2022.

[16] IMAZONGEO. **ImazonGeo**. Available at: https://imazongeo.org.br/#/. Access on: June 25, 2022.

universal access to high resolution satellite monitoring of the tropics to support efforts to stop destruction of the rainforests in the world (Planet[17], Royal Norwegian Embassy in Brasilia[18]).

13 scenes with acquisition data in November 2022 referring to the monitored area and with a low cloud cover were downloaded. Although the monitored period goes until December 2022, the accuracy analysis used images from November due to the large number of clouds in the images available in December and because, at the time the analysis was made, the images from January were not yet available for download. The images were already georeferenced, and, with a geoprocessing software, a mosaic was made with all the scenes.

A total of 300 points were randomly distributed in the monitored area (Project Area and Leakage Belt). Each point was visually interpreted between four classes: forest, deforestation, hydrography and non-forest. Figure 12 demonstrates the methodology adopted to perform the accuracy assessment of PRODES and SAD mapping.

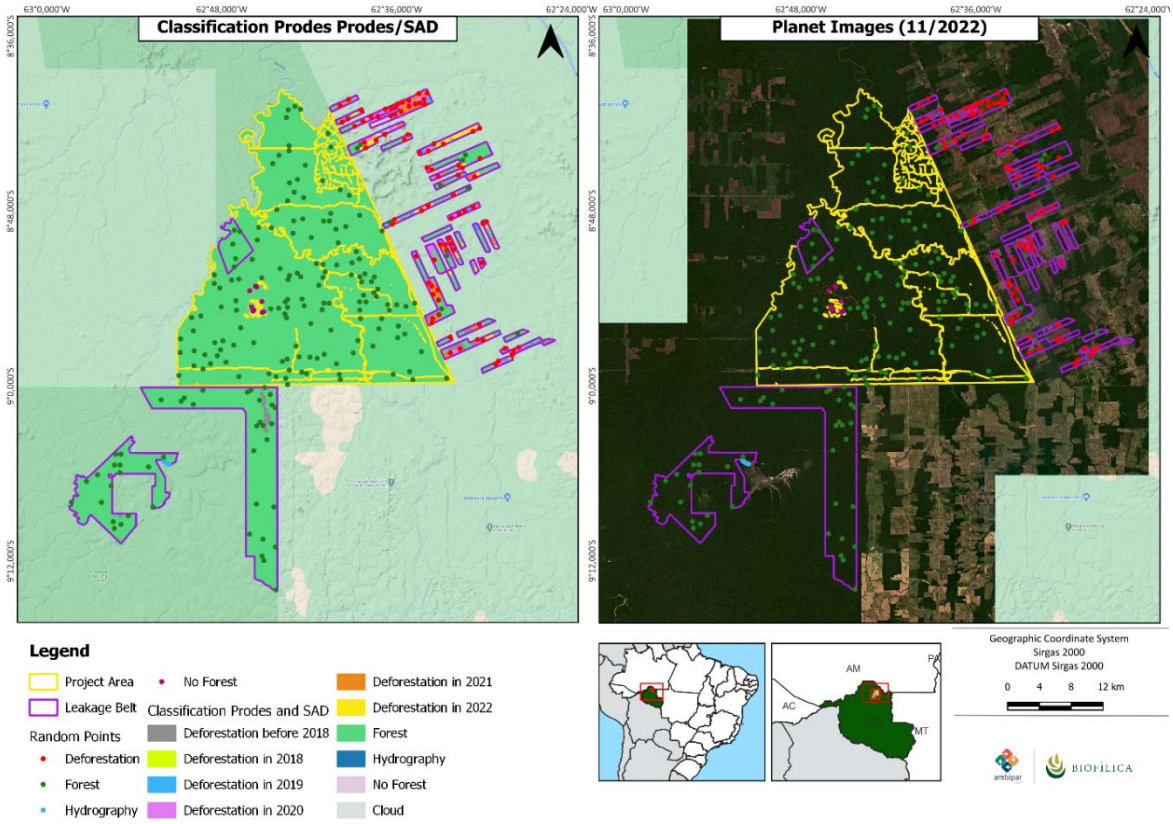


Figure 12. Map of the evaluation of the accuracy points. Source: Biofílica (2022).

[17] PLANET. **Norway's International Climate and Forests Initiative Satellite Data Program**. Available at: https://www.planet.com/nicfi/. Access on: July 01, 2022.

[18] Norway Royal Embassy in Brasília. **New satellite images will enable any person, anywhere, to monitor tropical deforestation.** 2020. Available at: https://www.norway.no/pt/brasil/noruega-brasil/noticias-eventos/brasilia/noticias/novas-imagens-de-satelite-permitirao-que-qualquer-pessoa-em-qualquer-lugar-monitore-o-desmatamento-tropical/. Access on: July 01, 2022.

In possession of the reference points and the land use and land cover map of the monitoring period, it was possible to assess the accuracy of the monitoring data by analyzing the confusion matrix (Table 5) according to Congalton and Green (2019)[19]. The overall accuracy of the monitoring data for the land use and land cover classes, in the monitored area, was 99.3%, while the user and producer accuracies of each class were above 97%, exceeding the minimum of 80% required by VM0015. The confusion matrix was made based on the 300 random points, of which 198 points fell in the forest class, 85 in the deforestation class, 10 in the non-forest class, and 5 in hydrography.

Table 5. Confusion matrix produced by the assessment of PRODES data in the monitored period (2021 to 2022).

		PRODES/SAD x PLANET						
		Reference				Total	User accuracy	Commission error
		Forest	Deforestation	Non-Forest	Hydrography			
Classified	Forest	198	2	0	0	200	99.00%	1.00%
	Deforestation	0	85	0	0	85	100.00%	0.00%
	Non-Forest	0	0	10	0	10	100.00%	0.00%
	Hydrography	0	0	0	5	5	100.00%	0.00%
Total		198	87	10	5	300		
Producer Accuracy		100.00%	97.70%	100.00%	100.00%			
Omission Error		0.00%	2.30%	0.00%	0.00%			
Accuracy Map								99.33%

During the monitored period Biofílica produced annual monitoring bulletins, which include the coordinates of the deforested areas during the analyzed year, thus helping the property surveillance activities. The 2021 and 2022 monitoring bulletins were produced in 2022 and 2023, respectively. The time deficit is mainly due to the fact that PRODES data take about a year to be published for the retroactive year.

The results of the analysis of land use and land cover changes during the monitored period includes the Project Area and the Leakage Belt area, both are described in detail in sections 5.2.6 and 5.3 respectively. It was found a total of 2.02 ha of unplanned deforestation in the project area and zero leakage. There was an increase in deforestation in the Project surroundings, including areas inside the Leakage Belt, however as they were related to the local context and not to project activities the leakage was considered null (see section 3.1.3 and 5.3.1 for details). There were also fire incidents described in Sections 3.1.2 and 4.3.3.

Manoa Monitoring

[19] CONGALTON, Russell G.; GREEN, Kass. **Assessing the accuracy of remotely sensed data: principles and practices**. CRC press, 2019.

The monitoring done by Manoa started in 2022 (as stated and detailed in section 3.2.2.2) to assist in directing patrimonial surveillance activities, since the bulletins generated by Biofílica are carried out annually. This monitoring has two stages (1) monitoring of deforestation and (2) monitoring of fires, both covering a buffer of 10km from the limits of the Farm.

1. Deforestation monitoring

During the 2022 dry season (between May and August) deforestation around the farm was observed monthly with data from the Planet satellite and/or at shorter intervals by the Sentinel satellite and analyzed with QGIS or ARCGIS software.

In 2022, a deforested area was identified and an image chart (Figure 13) was generated so the region could be monitored remotely by the person responsible for preparing the reports described here, as it is common for fires to occur after opening the area (see Figure 25 for Manoa's monitoring flowchart). The remote monitoring of the deforested area involves the verification of fire outbreaks, described in detail in section 3.2.2.2, and special attention to the region at each monthly verification of new cases of deforestation.

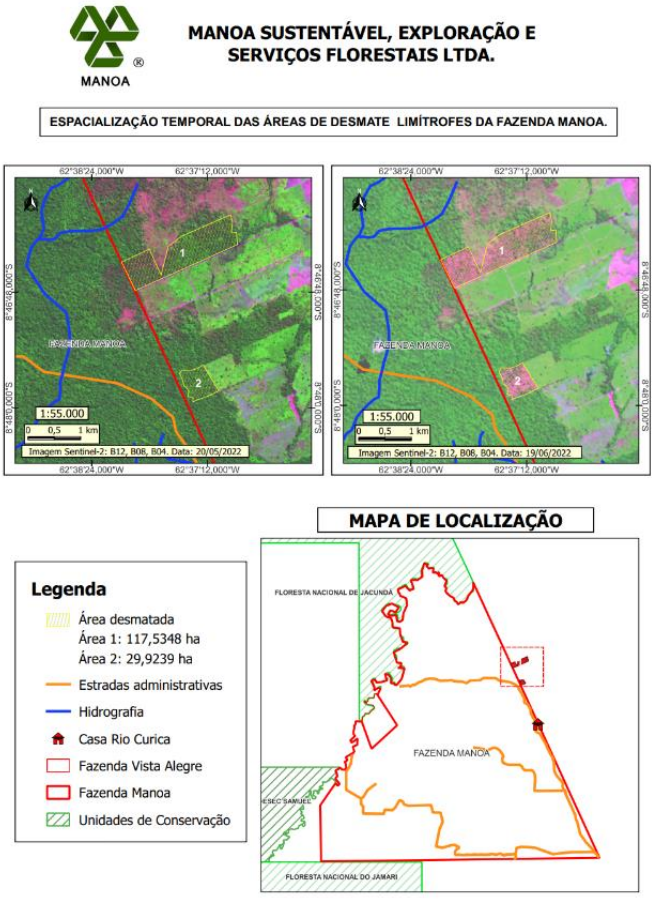


Figure 13. Image chart indicating deforestation around the Manoa Farm.

2. Forest fires monitoring

In 2022, two maps indicating the possible fires within the 10 km buffer around the farm were done (Figure 14). The two maps show a total of 25 hot spots/possible active fires (18 on August 18th and 7 on August 19th).

The inspection team visited the most affected region of the map on the 18th between the 23rd and 25th of August 2022, as shown in Figure 15. Upon returning from the field, the team informed the person responsible for preparing the reports that there was a fire in the region, but that it did not exceed the farm limits. The most affected region on the August 19 map is close to Casa do Curica and had already been monitored in the field since the deforestation shown in Figure 13 took place.

The field team had already informed the person responsible for the complaints that there was a firebreak on the border, so they already knew that the fire would occur and that the border with Manoa was protected by the firebreak.

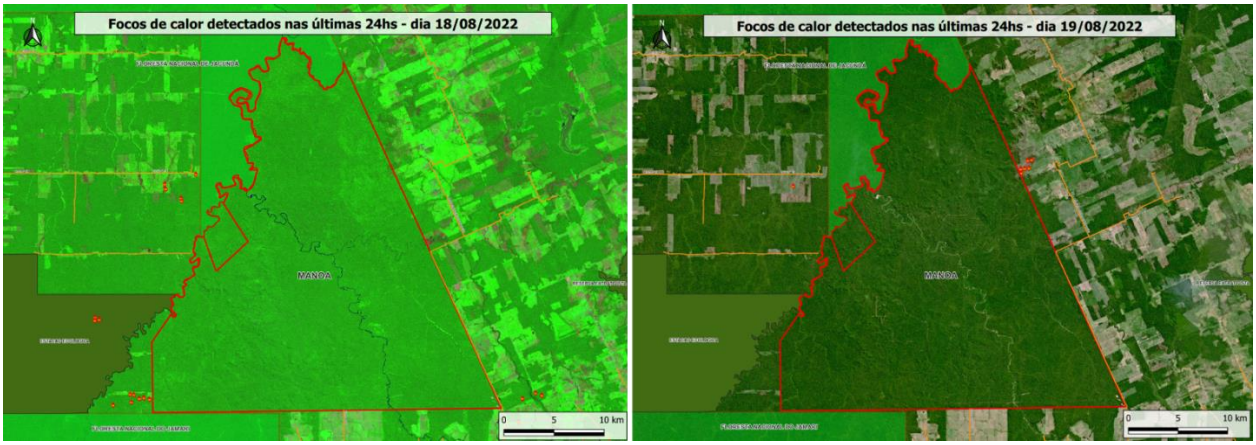


Figure 14. Hotspot/active fire near Manoa's boundaries monitored in 2022. On the left the map with the possible fires that occurred in August 18 and on the right the possible fires that occurred in August 19.

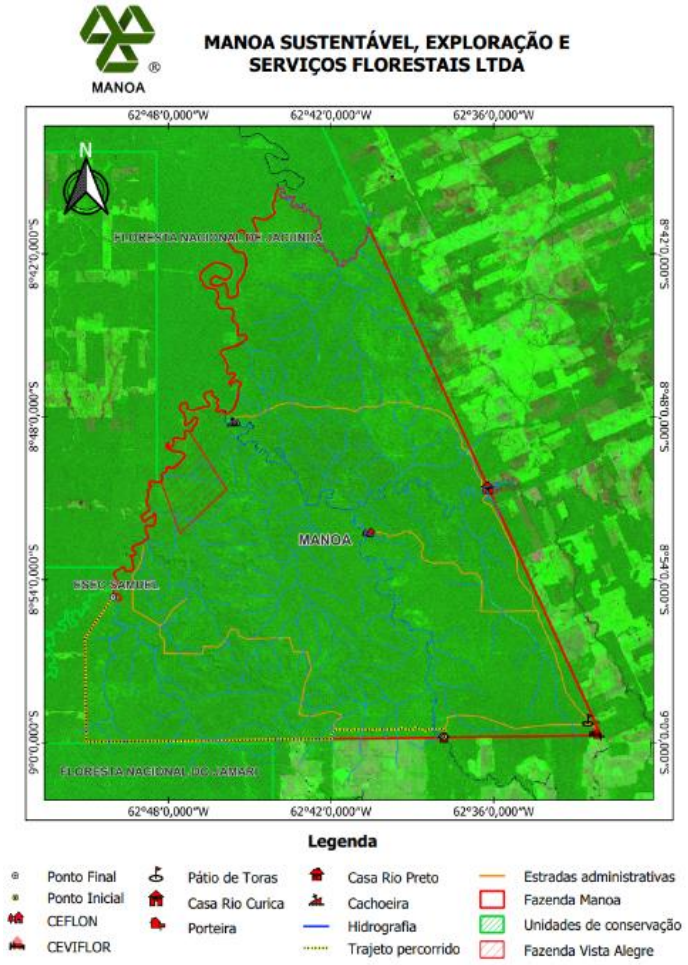


Figure 15. Patrimonial surveillance team rout from August 23 to 25 in 2022. Available at the corresponding surveillance report.

As there was no trespassing of Manoa's boundaries due to deforestation and fires identified in 2022 Manoa's monitoring, no activities were reported to the authorities. However, if the boundaries of the farm were overrun, the authorities would be informed in case of deforestation and the fire brigade and the authorities would be triggered in case of forest fires, as indicated in the flowchart in Figure 25.

With this additional monitoring carried out by Manoa, the remote deforestation monitoring and the patrimonial surveillance activities, detailed in section 3.1.2, became more integrated and, consequently, more efficient. In the future this activity will be better recorded to identify possible improvements and to further monitor its relationship with the implementation of patrols.

According to the actions taken during the monitored period, one may conclude that the Project has achieved the following results and impacts:

- Short term: There was an increase in the effectiveness of fighting trespassing and illegal activities carried out in the project area as well as an improvement in the process of determining areas at risk and decision-making. This is due mainly to more frequent

deforestation monitoring, which aims to identify areas at risk and guide field surveillance to these areas of interest. However, this improvement in effectiveness did not extend to areas close to the project area, as a result of a change in the local context of deforestation agents in the region, information indicated in the dossier delivered to VVB.

- Medium term: Knowledge about the deforestation dynamics in the region was improved, as evidenced by the deforestation dossier shared with the auditors, which has consequently contributed to the constant improvement in the process of determining areas at risk and decision-making for the location of deforestation containment activities.
- Long term: The project keeps contributing to the maintenance of forest cover, the reduction of emissions from deforestation and forest degradation, and the mitigation of global climate change.

3.1.2 Patrimonial Surveillance

In line with the data and images collected by the PRODES Project, during the monitoring period, the annual sending of the Monitoring Bulletin by Biofílica and the periodic monitoring of the loss of forest cover done by Manoa, starting in 2022, Manoa's property surveillance team conducted their patrolling activities within the Farm perimeter. As described previously, Manoa's monitoring and bulletins have helped support the field team since, through the data resulting from these activities, it has been possible to identify the areas at risk and with the highest concentration of deforestation, besides understanding the context of the region where the farm is located, making it possible to take more assertive actions to contain deforestation near the most affected boundaries.

The property surveillance is directly linked to the monitoring of unplanned deforestation. It aims to maintain the integrity of the Project Area, keeping potential deforestation agents away, avoiding the entry of encroachers and adding to the monitoring of unplanned deforestation when it is not possible to prevent these illegal activities. The activity is carried out by the Manoa Farm's employees adopting a strategy to have the "surprise effect", that is, there is not a defined frequency and time of patrols so that the encroachers do not identify a pattern in the inspection action. In case wood theft or invasion is detected, the employees are trained to immediately report the occurrence to the forest manager, who will call the responsible public agencies so that legal measures can be taken.

As a process of improvement and control arising from REDD+ activities in the project, as of July 2020 the patrols started to be recorded by means of standardized forms. Thus, surveillance patrols take place with a team of 2 to 3 people (ideally 3) and priority is given to areas with the highest deforestation pressure. At the field, the team registers the activity with photos, GPS points (tracking) and all possible information about any illegal activities, always adopting the "good neighbor policy".

Manoa's good relationship with the surroundings and the constant presence of the surveillance team in the areas of greatest pressure, helps contain the entry of encroachers in the area. In some cases, the intruders themselves act in the "maintenance" of the property, when they identify and stop, among themselves, the action of other potential agents of deforestation, in such a way to maintain the good

relationship with Manoa Farm. Once the field activity is concluded, the forest manager writes the form with the description of what was done and, afterwards, the form is signed by the team who performed the activity, confirming the information. Finally, the data is sent to Biofílica (São Paulo).

Linked to the activity, at Manoa Farm there are two strategic points, the Casa Rio Preto and the Casa Curica; and as there are farm's employees living in these places the inspection is constant (Figure 16). Part of the investments made by the project are aimed at maintaining these crucial points for this activity. From the beginning to the end of the monitored period (08-August-2020 to 31-December-2022) 31 patrols were made in the project area, 04 in 2020, 12 in 2021 and 15 in 2022. Of the patrols done in 2022 one that happened between August 23 to 25, was due to the identification of hotspots and possible fires near Manoa's boundaries, done by Manoa's remote monitoring describe in section 3.1.1.

The areas of greatest attention for surveillance during the monitored period were the east and west divisions, due to the pressure of deforestation in the surroundings, as well as, since during the monitored period a small portion of the project area was affected by fire outbreaks due to fires started in neighboring properties, details below. Both areas have Casa do Curica and Casa do Rio Preto as strategic points.

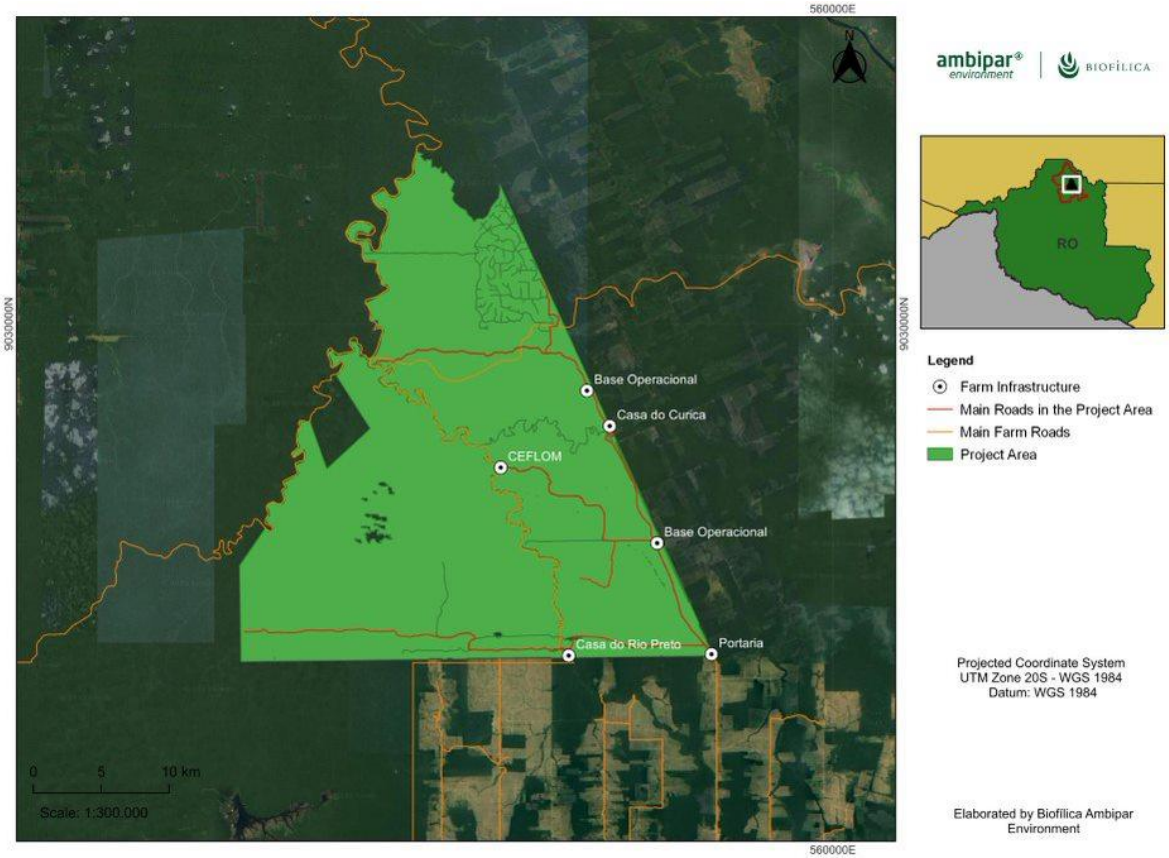
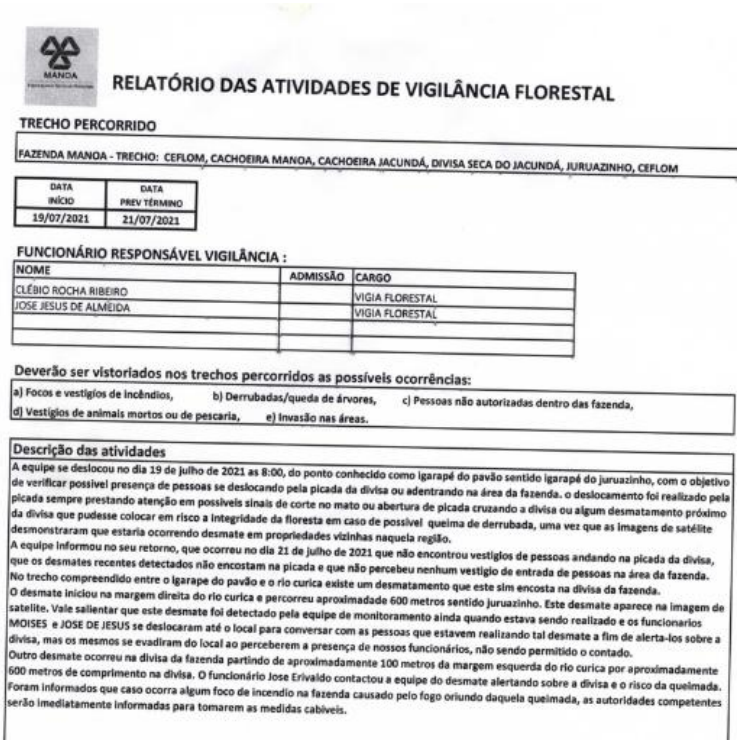


Figure 16. Location of Casa do Curica, Casa do Rio Preto and Other infrastructures at Manoa farm.

During the patrols, deforestation areas were observed around the Manoa Farm. In July of 2021 there was a of loss of vegetation cover very close to the limits of the farm noted by the patrimonial surveillance team and documented in the report of the field campaign done between July 19 to July 21 of 2021 (Figure 17). At the time, Manoa's deforestation monitoring (describe in section 3.2.2.2) wasn't completely structure, so although there was a direction through satellite images, as related in the report, there were no evidence of the remote monitoring done. In the field, the surveillance team tried to contact those responsible for deforestation to reinforce Manoa's presence and property boundaries and thus prevent damage within the project area.



MANOA

RELATÓRIO DAS ATIVIDADES DE VIGILÂNCIA FLORESTAL

TRECHO PERCORRIDO

FAZENDA MANOA - TRECHO: CEFLOM, CACHOEIRA MANOA, CACHOEIRA JACUNDÁ, DIVISA SECA DO JACUNDÁ, JURUAZINHO, CEFLOM

DATA INÍCIO	DATA PREV TÉRMINO
19/07/2021	21/07/2021

FUNCIONÁRIO RESPONSÁVEL VIGILÂNCIA :

NOME	ADMISSÃO	CARGO
CLÉBIO ROCHA RIBEIRO		VIGIA FLORESTAL
JOSE JESUS DE ALMEIDA		VIGIA FLORESTAL

Deverão ser vistoriados nos trechos percorridos as possíveis ocorrências:

a) Focos e vestígios de incêndios, b) Derrubadas/queda de árvores, c) Pessoas não autorizadas dentro das fazenda, d) Vestígios de animais mortos ou de pescaria, e) Invasão nas áreas.

Descrição das atividades

A equipe se deslocou no dia 19 de julho de 2021 as 8:00, do ponto conhecido como igarapé do pavão sentido igarapé do juruazinho, com o objetivo de verificar possivel presença de pessoas se deslocando pela picada da divisa ou adentrando na área da fazenda. o deslocamento foi realizado pela picada sempre prestando atenção em possiveis sinais de corte no mato ou abertura de picada cruzando a divisa ou algum desmatamento próximo da divisa que pudesse colocar em risco a integridade da floresta em caso de possivel queima de derrubada, uma vez que as imagens de satélite desmonstraram que estaria ocorrendo desmate em propriedades vizinhas naquela região.
A equipe informou no seu retorno, que ocorreu no dia 21 de julho de 2021 que não encontrou vestigios de pessoas andando na picada da divisa, que os desmates recentes detectados não encostam na picada e que não percebeu nenhum vestigio de entrada de pessoas na área da fazenda.
No trecho compreendido entre o igarape do pavão e o rio curica existe um desmatamento que este sim encosta na divisa da fazenda.
O desmate iniciou na margem direita do rio curica e percorreu aproximadade 600 metros sentido juruazinho. Este desmate aparece na imagem de satelite. Vale salientar que este desmate foi detectado pela equipe de monitoramento ainda quando estava sendo realizado e os funcionarios MOISES e JOSE DE JESUS se deslocaram até o local para conversar com as pessoas que estavem realizando tal desmate a fim de alerta-los sobre a divisa, mas os mesmos se evadiram do local ao perceberem a presença de nossos funcionários, não sendo permitido o contado.
Outro desmate ocorreu na divisa da fazenda partindo de aproximadamente 100 metros da margem esquerda do rio curica por aproximadamente 600 metros de comprimento na divisa. O funcionário Jose Erivaldo contactou a equipe do desmate alertando sobre a divisa e o risco da queimada. Foram informados que caso ocorra algum foco de incendio na fazenda causado pelo fogo oriundo daquela queimada, as autoridades competentes serão imediatamente informadas para tomarem as medidas cabiveis.

Figure 17. Patrimonial surveillance report stating that deforestation identified by remote sensing monitoring was verified in the field. The surveillance team tried to contact the ones responsible for the deforestation and was successful in one attempt.

On the west side of the Farm, a movement of squatters was noticed along the boundary with the Jamari and Jacundá FLONAS. For this reason, periodic patrols were made in these locations between 04/19/2021 and 08/05/2021 and in 2022, strengthening Manoa's presence.

Whenever possible the security guards talked to the people who were at the location, reminding them of the location of the farm's boundaries. In all conversations, people approached said they were aware of the boundary location and affirmed that the boundaries were respected. In fact, no changes were observed inside the Manoa Farm.

In addition to the deforestation occurring in the surrounding area, the patrols followed cases of fire close to the farm's boundary and followed up when the fire went beyond the boundary, entering the Manoa Farm and, consequently, the project area.

Three fire outbreaks were recorded on the east side of the farm, on 08/24, 08/25 and 10/08, all in 2021. The fire on 08/22/2021 was recorded during the patrols from 08/22 to 08/25 (page 9 of document "202104-202204-relatorio-vigilancia-florestal", marked as "Fire incident 1", in the document comments). According to the patrol report, the employee who was at Casa do Curica actuated the gate via radio, informing that the fire coming from a deforestation on the farm border had entered the property. The notification happened at 3 pm, and at 6 pm, on the same day, a Sunday, the manager and two other employees were already on site to start the firefighting procedures. The fighting was done with a firebreak and a manual knapsack sprayer. On the morning of the 23rd the fire had already diminished considerably, even so, the area was kept under observation until the 25th. A police report was filed (page 7 of document "2021-relatorios-fogo") with an approximation of the affected area and geographical coordinates. Shape and point files were also prepared with the limits of the fire.

The fire on 08/25/2021 was recorded during the patrol from 08/25/2021 to 08/27/2021 (page 8 of document "202104-202204-relatorio-vigilancia-florestal", marked as "Fire incident 2"). The patrol report stated that the fire entered the farm boundaries, however, in conversation with the landowner it was said that the fire remained on the border, not trespassing Manoa and the project area. Even so, a police report was filed (page 10 of the document "2021-relatorios-fogo") for the acting of the responsible agencies.

The fire on 10/08/2021 affected two areas of the Manoa Farm's interior. There is no surveillance patrol report of this moment, the occurrence was recorded during a routine check, and from this a police report was filed and a report on what happened was drawn up (pages 13 and 17 of document "2021-relatorios-fogo" for the fire report and for the police report of "Fire incident 3", respectively). According to the fire report the affected area was mountainous, with sparse vegetation and had vines, an easily combustible material. The same document estimated the total affected area which later, in an in-depth analysis, detailed in section 4.3.3, turned out to be overestimated.

This estimate of the affected area was made by Manoa for detailing in the police report and had two stages: (1) field verification soon after the fire (October 12th) and (2) satellite image analysis for the manual preparation of the shapes in the affected areas. It is worth pointing out that the report was sent to the State Department for Security, Defense and Citizenship of Rondônia on October 14, 2021, so that the appropriate measures could be taken as soon as possible. Because it was prepared so quickly, this initial analysis of affected areas did not have an accurate database. Later on, Biofilica made a detailed analysis of the affected areas, available in Section 4.3.3 using the shapes prepared by Manoa in this initial analysis, and the conclusion was that the impact of the fires was not significant, since the total area affected by the fires accounted for 19.32ha.

Complementarily to the property surveillance actions, Manoa Sustentável, Exploração e Serviços Florestais registers all people who enter the Farm property in a book present in the main entrance gate, where the name of the visitor, date and time of entry and exit, responsible agency or institution and the vehicle license plate are reported.

According to the actions taken during the monitored period one may conclude that the Project achieved the following results and impacts:

- Short term: Despite the identification of fire outbreaks in the project area, the activities managed to ensure the prevention of deforestation and degradation, as there was no significant unplanned deforestation in the project area. The occurrence of these unplanned activities has generated the need for a better understanding of the deforestation dynamics in the surrounding area, requiring adaptations of project activities to deal with their impacts and bring about preventive and mitigating measures;
- Medium term: There was a refinement of the remote monitoring through field checks, and this point keeps being constantly improved, especially regarding the organization of the evidence produced by the Manoa monitoring.
- Long term: The project keeps contributing to the maintenance of carbon stocks, reduced emissions from deforestation and forest degradation, and to the mitigation of global climate change.

3.1.3 Leakage monitoring and of non-permanence risk factor management

For leakage monitoring the same assumptions were used as for deforestation monitoring in the project area (Section 3.1.1). In this sense, as described in Section 3.1.1, through satellite imagery and the consequent generation of annual monitoring bulletins, it was possible to map the forest cover and land cover change in the Leakage Belt.

The generation of bulletins has allowed to identify the regions of greatest risk for the project area and understand the context of the Leakage Belt region. Through this understanding, despite the limitation of Manoa Farm's activities to the project area only, it was possible to identify the areas with the highest deforestation pressure, directly helping to carry out surveillance activities and low impact forest management more effectively.

The risk assessment was carried out by applying the VCS approved tool, "AFOLU Non-Permanence Risk Tool, v. 4.0". The result of the risk tool was presented as an attachment to the MR in this monitored period and reported to the VVB through the Risk Report and Risk Calculation Tool. In addition, the risk of surrounding deforestation, described below, presented itself as being one of the greatest project non-permanence risks.

Deforestation in the Reference region and emissions from Leakage

During the monitored period, it was possible to detect deforested areas in the Leakage Belt, approximately 1,969 ha in 2021 and about 1,043 ha in 2022, both above the anticipated baseline. The areas east of Manoa Farm were heavily affected by deforestation in the monitored period and, as they include many areas of the Leakage Belt, were responsible for the increased deforestation rate within the belt. There was also an increase in the deforestation rate at the east side of Manoa.

The observed periods showed higher values than the year with the most deforestation identified so far, which was 2019 with 1,855 hectares of deforestation. This makes 2021 the year with the most

deforestation identified since the start of the project. These figures can be seen in the spreadsheet below, which shows the history of deforestation in the leakage belt since the start of the project. In addition, the spreadsheet shows the difference between the deforestation identified and what was projected in the baseline, with their respective rates.

Table 6. Comparison of baseline and ex-post deforestation in the Manoa REDD+ Project Leakage Belt

Year	Baseline Deforestation	Forest	Annual deforestation rate	Ex-post Deforestation	Forest	Annual deforestation rate	Difference
	(hectare)	(hectare)	%	(hectare)	(hectare)	%	(hectare)
2013	8	62.411	0,01%	0	62.419	0,00%	8,00
2014	108	62.303	0,17%	0	62.419	0,00%	108,00
2015	59	62.244	0,09%	86	62.333	0,14%	-26,50
2016	16	62.228	0,03%	96	62.238	0,15%	-79,80
2017	28	62.200	0,05%	288	61.949	0,47%	-260,39
2018	47	62.153	0,08%	212	61.737	0,34%	-164,94
2019	98	62.055	0,16%	590	61.147	0,97%	-492,29
2020	88	61.967	0,14%	1.855	59.292	3,13%	-1.766,68
2021	**67**	**61.900**	**0,11%**	**1.969**	**57.323**	**3,44%**	**-1.902,34**
2022	**86**	**61.814**	**0,14%**	**1.043**	**56.280**	**1,85%**	**-957,33**

Regarding the number of polygons, 48 polygons were identified for 2021, of which 22 were larger than 10 hectares, while in 2022, 45 polygons were accounted for, the majority (24) being larger than 10 hectares.

Constantly seeking to understand the context in which the Project is inserted regarding uncontrolled deforestation in the monitored boundaries, the monitoring report previously verified an analysis of deforestation in a 10 km radius of the Manoa farm boundaries, called the "Surrounding Area". In the current monitoring period, this analysis was expanded to the entire Project Reference Region.

The results of this assessment showed that 47,366 hectares of deforestation were identified in 2021 and 42,530 hectares in 2022. The observed periods also showed higher values than the year with the most deforestation identified so far, which was 2019 with 40,733 hectares of deforestation. This makes 2021 the year with the most deforestation identified since the start of the project in the Reference Region. These figures can be seen in the spreadsheet below, which shows the history of deforestation in the RR since the start of the project. In addition, the spreadsheet shows the difference between the deforestation identified and what was projected in the baseline, with their respective rates.

Table 7.Comparison of baseline and ex-post deforestation in the Manoa REDD+ Project Reference Region

Year	Baseline Deforestation	Forest	Annual deforestation rate	Ex-post Deforestation	Forest	Annual deforestation rate	Difference
	(hectare)	(hectare)	%	(hectare)	(hectare)	%	(hectare)
2013	7.031	888.183	0,79%	6.788	888.426	0,76%	243,32
2014	6.975	881.208	0,79%	6.236	882.191	0,71%	739,35
2015	6.921	874.287	0,79%	7.599	874.591	0,87%	-678,36
2016	6.866	867.421	0,79%	13.851	860.740	1,61%	-6.985,09
2017	6.812	860.609	0,79%	16.254	844.486	1,92%	-9.441,74
2018	6.760	853.849	0,79%	18.979	825.507	2,30%	-12.219,44
2019	6.706	847.143	0,79%	26.076	799.431	3,26%	-19.370,22
2020	6.653	840.490	0,79%	40.733	758.698	5,37%	-34.079,65
2021	**6.601**	**833.889**	**0,79%**	**47.366**	**711.332**	**6,66%**	**-40.764,94**
2022	**6.550**	**827.339**	**0,79%**	**42.530**	**668.802**	**6,36%**	**-35.979,97**

Regarding the number of polygons identified, for 2021 850 polygons were identified, of which 665 were larger than 10 hectares, while in 2022, 1,156 polygons were counted, of which 665 were larger than 10 hectares and 491 were smaller than 10 hectares. These differences in the size of the deforested areas may demonstrate a possible change in the actions of the agents that have been carrying out deforestation in the region. After a series of years with high rates of deforestation, exploiting large areas, the siege of areas of possible deforestation has been decreasing, which may result in more punctual action in smaller areas in the coming years.

Although the deforestation data shows that the increase in deforestation is not exclusive to the Leakage Belt, but to the entire Reference Region of the project, according to the research carried out by the proponents, this increase is not related to the project's activities and was not expected by the baseline, but rather occurred because of changes in the local context.

In the construction of the baseline of the Manoa REDD+ Project, there was a logical order of action of the deforestation agents, with the dynamics of deforestation initiated by illegal loggers and invaders (group 1), followed by rural property owners with forest (group 2), groups of "landless", squatters and small cattle ranchers (group 3) and lastly local farmers and medium and large rural producers (group 4), the latter establishing their activities after an expressive period of time in which the area was invaded.

It was expected that, with the maintenance of the baseline scenario activities, there would be an increase in the population of groups 1 and 3 in the Reference Region, Project Area and Leakage belt as long as forest areas were available for advancement, accompanied by the growth of group 4 agents in the medium and long term, mainly motivated by the accumulation of areas with consolidated land use conversion, but unproductive and abandoned by group 2 and 3 agents.

However, in the current scenario of the project, the dynamics of invasions and consequent deforestation have changed: the presence of the activities of ranchers and large rural producers has

happened invasively and without the need for the other three groups, and has become very significant in the region, growing in a short period of time. Additionally, current surveys show that the agents in group 4 are not only local farmers, but landowners who, realizing the opportunity and the ease of expanding their activities in the region, encouraged, and supported by large agricultural companies with globalized capital, have been taking a space in the region (SILVA and MICHALSKI, 2020[20]). Additionally, several actions supported by public entities occurred in the region that stimulated this change of context, facilitating and giving consent to the actions of these deforestation agents. The history of the situations that occurred over these years, stimulating the advance of the agents in the áreas.

According to the historical data shown above, from before 2017-2020 verification of the Manoa REDD+ Project, the deforestation data in the leakage belt was above what was drawn in the project baseline. It was expected that, once the areas were selected because of their similar governance characteristics to the Manoa farm (private areas with total or partially controlled access, with forest cover, where forest exploration occurs or has occurred), the advance of deforestation would occur in a much more gradual way, and for this reason the project proposed in its planning the realization of several long-term activities that could contain the action of agents before the deforestation reached large proportions. However, the local context has changed more rapidly than expected in the baseline, mainly because of the advance of commodities in northern Rondônia, validated by the substitution of pastures, land leasing, and the high price of the hectare of agricultural land (SILVA and MICHALSKI, 2020).

In this context, in March 2018, the Soldado da Borracha Ecological Station (ESEC Soldado da Borracha) was created by Decree No. 22690, with the aim of preserving nature and promoting scientific research. This area, which overlaps the Manoa REDD+ Project's leakage belt, had its property records canceled when it became a Conservation Unit, in accordance with Law 9.985/2000. After the creation of the ESEC, a reduction in deforestation was expected, but the opposite occurred. In September of the same year, the ESEC and 10 other Conservation Units, totaling 537,000 hectares, were considered extinct, resulting in an increase in deforestation. The areas became private property again, until, in 2021, the Rondônia Court of Justice declared the extinction unconstitutional, returning the areas to the public domain. This process resulted in increased land speculation and invasions due to poor governance.

In the leakage belt, despite annual analyses indicating an overall increase in deforested areas, there was no abrupt growth in deforestation observed between years until 2019. A survey identified a significant change in October 2019, following a Military Police operation that arrested a key individual leading a criminal organization. This individual's actions were characteristic of deforestation agents from group 1, as identified in the project's baseline, with his main economic activity linked to forest management, albeit with indications of illegality. Records show that three months after his arrest and that of his allies, deforestation in the region increased by about 15%. This occurred because the intimidating presence of the accused inhibited unbridled deforestation, controlling the invasion of third

[20] Ricardo Gilson da Costa Silva et Amanda Michalski, « A caminho do Norte: cartografia dos impactos territoriais do agronegócio em Rondônia (Amazônia ocidental) », Confins [En ligne], 45 | 2020, Published on May 26, 2020, accessed on November 9, 2021. URL: http://journals.openedition.org/confins/28017 ; DOI: https://doi.org/10.4000/confins.28017

parties from outside the region, in addition to holding illegal possessions of land on which he exercised direct control to carry out his activities.

After his arrest, Line 106, which he previously controlled, became an unrestricted route for invaders to illegally deforest. These invaders aimed to clear land for agricultural crops and generate property speculation for future sales to large producers, completely replacing forest management for logging. According to survey records, invaders no longer remove high-value wood; instead, they clear and burn forest areas within months to establish large crops. Helicopter-assisted pasture planting and advanced machinery use for clearing land and planting soybeans have been documented, indicating the sophisticated nature of these agents, distinct from the squatters and smallholders targeted by the REDD+ project.

These new agents' power and influence were further demonstrated by the proposed new Socioeconomic and Environmental Zoning (ZSEE) for Rondônia. This new zoning proposal reclassified areas of the leakage belt from sub-zone 2.1, which facilitated forest conservation, to sub-zone 1.2, increasing the suitability for agriculture and encouraging agricultural expansion and land speculation. The negotiations for updating the State Zoning further reinforces agricultural speculation even before its approval, which has encouraged large farmers to invest in production, opening new planting areas. These facts demonstrate how the incentives have changed, attracting new agents of deforestation to the region, being influenced by causes not mapped in the baseline, making it impossible for the activities proposed by the project to contain this advance.

In the dossier prepared, this information is detailed with evidence based on references, which demonstrated that the actions by the new deforestation agents in the leakage belt were supported by the whole context of support for economic development in the region, which was not expected in the baseline, changing the context of the actions and evolution of the deforestation agents previously identified by the project.

Moreover, because of this context, Manoa Farm was not able, during the monitored period, to avoid the impact in these areas. Manoa's influence was restricted only to its own property, mainly because of its well-defined land tenure situation and Manoa's good relationship with the neighborhood, since the activities of Low Impact Forest Management allied with the REDD+ activities of the Project are widely known by local organizations and institutions, which strengthens the property governance and consequently increases the protection of the Project Area.

Given this, as occurred in the last verification, the proponents understand that it is appropriate not to account for the leakage identified in the monitored period as a measure not to harm the project, following mainly the guidelines found in VM0015, part 3, task 1, section 1.2.2 (p. 115), and by the Project Developer's Guidebook to VCS REDD Methodologies, of Conservation International.

Forest fires

Another existing risk is fire from anthropogenic causes. As presented in the Monitoring Bulletins, the Project Area (as well as the entire property) suffers pressure from deforestation and hotspots, mainly from deforested surrounding areas.

This risk is mitigated both by the surveillance of the property and in the sustainable forest management plan, where there is a description about forest protection against fires in the management plan area. This protection involves both internal educational and informative campaigns, in the management area and in the areas surrounding the AMF (Figure 18), as well as prevention to request immediate help, since all the campsites are equipped with a communication system (rural telephony, global cell phone, Internet, radio transmitters, etc.), which allows the transmission and receipt of information in case of fire.

Figure 18. Calendar distributed around the project area to improve detection of fire outbreaks with the help of local residents.

In addition, there is training of the Fire Brigade in keeping with NR-23 for compliance with the planning of PCMSO and PPRA activities (Section 2.3), offered to all workers of Manoa's own and outsourced teams, which is linked to low impact forest management activities (Figure 19).

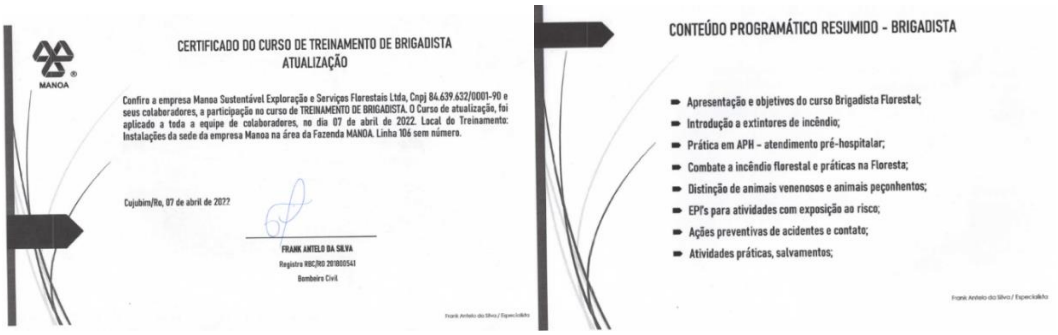


Figure 19. Certificate offered to participants of the Fire Brigade course (front and back).

3.1.4 Low Impact Forest Management (FSC certified)

Manoa's Sustainable Forest Management Plan (PMFS - Plano de Manejo Florestal Sustentável) was prepared in 2002, when Triângulo Pisos e Painéis Ltda started producing engineered flooring. In 2018, Manoa's PMFS, which until then had been approved in the name of the owners of Triângulo Group (individuals), was restated and company Manoa Sustentável Exploração e Serviços Florestais Ltda became the holder of the PMFS, as indicated in the 2017 - 2020 verification and explained in the Section 3.2.2.

The purpose of the PMFS is to guarantee the use of the natural forest resources in the management area for timber production purposes, complying with the environmental legislation in effect and the commitment to maintain environmental quality, economic sustainability, and social responsibility. In this regard, the plan has a number of guidelines that govern all the exploitation stages, from the planning stage to the harvest and post-harvest phases. In 2005, company Manoa Sustentável Exploração e Serviços Florestais Ltda was certified by the FSC (Forest Stewardship Council), for this reason the exploitation of forest resources must be carried out under the reduced impact perspective and FSC certification principles and criteria.

Since 2005, the FSC certification has been validated with annual audits. During the third monitoring period, 2 FSC audits were conducted, ensuring that the forest was exploited using sustainable practices and emphasizing the physical presence of proponent in the area, in addition to strengthening the performance of sustainable forest management activities aligned with REDD+ activities and the sustainable use of natural resources.

Thus, the operations carried out comply with all current legislation (on the federal, state, and municipal levels) and with international forest certification principles. The forestry operations were strategically carried out throughout the monitored period, combined with the inputs prepared by the REDD+ project, in such a way to maintain the forest cover, ensuring the protection of natural habitats and the high value attributes for conservation.

The forest exploitation is guided by the PMFS and, for each Annual Production Unit (UPA) exploited, Annual Operations Plans (POAs) are made, where specific information and procedures are

provided for each UPA to be exploited. In addition, after the exploitation the results are detailed as explained in APPENDIX 2. In this sense, during the monitored period, UPAs 17 and 11 were exploited (Figure 20).

Currently, forest management is one of the main tactics used to contain intrusions in the farm, as this occurs because of physical presence in the area while operations are being carried out. The existence of workers throughout the year in the locations where logging occurs directly strengthens the property governance, discouraging the action of intruders and, consequently, of illegal activities. The Manoa Farm is split into 27 UPAs identified with their respective numbers, however, their exploitation does not occur in a numerically guided manner (first UPA 1, followed by UPA 2, etc.), the definition of the areas that will be exploited goes according to the regions of greatest pressure and risk of deforestation. For this to occur in tune with the REDD+ project data, the information generated by the monitoring bulletins is used to help define the areas that will be exploited in the farm.

Manoa knows that the boundaries ("edges") of the Farm are areas of higher risk and, in addition to this, the information generated in the monitoring bulletins show the development of deforestation outside the farm and the consequent increase of pressure in the surrounding area in specific regions, and the joining of this knowledge helps in the subsequent process of defining the areas to be exploited. Another criterion for the choice of exploitation is logistics, since roads opened for the exploitation of a UPA can be reused to access the UPA being explored afterwards. These strategies are combined with the fact that Manoa has as principle to perform the exploitation "from outside to inside" in the farm boundaries; that is, the initially explored UPAs are those located closest to the farm borders and, later on, the activity migrates to the center of the property.

The UPA 17, exploited in 2021, was chosen for logistical reasons, since it already had roads that were built for the exploitation of UPA 15, while UPA 11, exploited in 2022, was chosen due to the increased pressure of deforestation to the west of the farm (Figure 20). For the same reason, deforestation pressure to the west, the UPA 12 is scheduled for exploitation in 2023.

In addition to the physical presence in the area, forest management is essential for the installation of infrastructure that assists the activities of surveillance and fire containment, strengthening the property security. This situation is illustrated in Figure 20, where UPA 10 and UPA 01 were exploited in areas that had not previously been accessed on the farm.

The infrastructures set up for management operations (roads, bridges and branches) have a high cost, in this sense, the opening of the exploitation areas manages to dissolve this value, since the infrastructures are also used for property surveillance activities, besides facilitating access at points not previously accessed. Due to the high cost of deploying these infrastructures, coupled with the purpose of strengthening the physical presence in the areas, the region where the UPAs to be exploited are defined are used for at least 2 years.

The roads built also help fighting fires, acting as access routes and firebreaks, which is very important, especially in the context of the farm's surroundings where the presence of fire is increasingly constant. In this way, the management activities coupled with the REDD+ scope meet the goals of the VM0015 methodology to avoid unplanned deforestation.

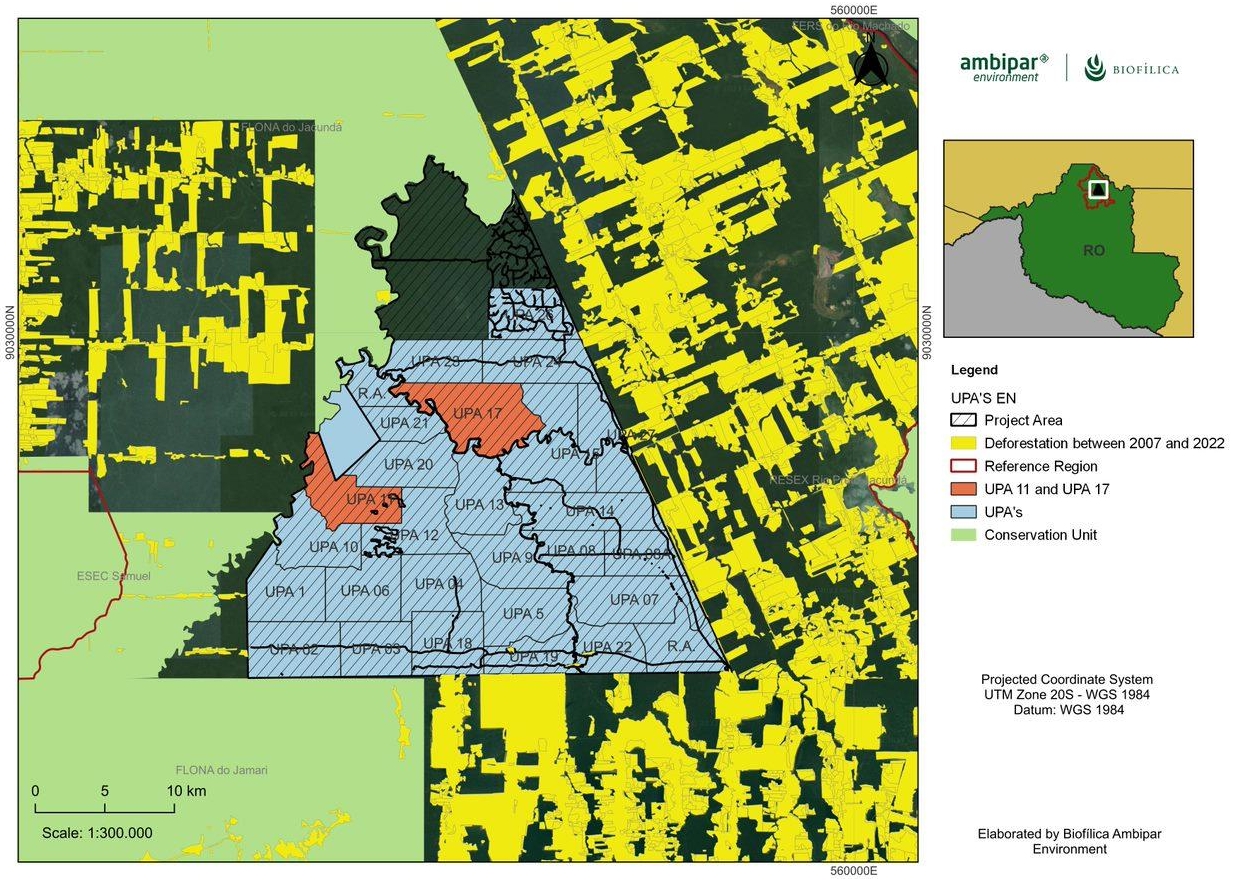


Figure 20. Map with location of UPAs exploited in the monitored period and deforestation in the region.

Commercial relationship with the municipality

Currently there is a great demand from industries outside the municipality of Cujubim (RO) for the raw material produced by Manoa. The high demand is mainly due to the fact that Manoa is a company with a good reputation, reducing the risks related to the purchase of wood, besides the high quality of the product, a situation that stands out in the Amazonian context.

Nevertheless, as an internal policy established by the company, Manoa prioritizes industries of the Cujubim (RO) municipality for the supply of raw material, in order to contribute to the increase of municipal tax generation, job creation and local income flow. The main justification for this action is to show the population and local authorities the importance of its activities, maintaining, consequently, the good relationship with the surroundings and the support of the community to maintain its operations.

Thus, the focus of Manoa's lumber production is currently Cujubim, and actually the product that is sent to the Triângulo (in Curitiba) is processed in the municipality. The process works as follows: the sawmill that buys wood from Manoa does the processing in Cujubim and, later, sells it to Triângulo. Manoa follows the whole wood processing process as a way to maintain the quality of the product required by

Triângulo, also following a policy established by the company. The document related to the local industries that buy the raw material from Manoa was made available to the VVB (document "2022-empresa-e-cnpj").

According to the actions taken during the monitored period one may conclude that the Project achieved the following results and impacts:

- Short term: The activities served as a source of revenue to finance the company's activities, generating jobs and directly influencing the regional economy.
- Medium term: Forest management has ensured Manoa's physical presence in the area, helping fight deforestation in the project area.
- Long term: With low impact management the project manages to maintain the forest cover, biodiversity and areas of high conservation value.

3.1.5 Technical training in low-impact forest management

This section contains relevant information about the project contributions to SDG target 4.4, indicator 4.4.1, cited in section 1.11. The details of the monitoring of the contributions can be found in “APPENDIX 3: SD contributions evidence”.

The main objective of the technical training in low impact management is to disseminate sustainable forestry exploitation techniques among the local players, such as workers in the industry and public agents, increasing the knowledge of all those involved and, consequently, conserving the forest remnants and keeping the forest cover, avoiding unplanned deforestation and degradation.

In September 2021, a 4-day training session was held for the technicians of SEDAM's Forest Development Coordination (CODEF), assessing all the phases of low impact forest management, reaching 21 people. Several themes were addressed, such as forest certification, forest inventory, planning of the exploitation stages at the annual production units (UPAs), reduced impact forest exploitation, internal audits in the management, monitoring of damages in the exploitation, chain of custody, internal control of volume/species explored in the UPAs, in addition to monitoring some of the stages of forest exploitation, such as opening of skid trails, storage yard, felling and sectioning of trees, skidding and, at the end, presentation of Manoa's exploitation control system and information about the logging declaration and tracking in Snaflor+.

In 2022, there was the first technical visit by ICMBio employees so that Manoa could share its experience in the forest management sector, sharing knowledge, techniques and safety procedures in sustainable management (Figure 21). The purpose of the visit was also to start conversations about partnerships between Manoa and ICMBio due to the closeness of the farm to surrounding conservation units and the good practices employed.

Figure 21. Technical visits of ICMBIO employees in 2022.

In the previous monitoring there was the possibility of building a partnership with College of Rondônia (FARO) (referred to in Section 2.2 of the previous MR, which covered the period from January 1, 2017 to August 7, 2020) to develop a training course in low impact management techniques. However, the partnership could not be concluded because FARO closed its activities in August 2022[21]; due to this, the project proponents have been working on a restructuring of this activity with a focus on other strategic partners, which will be described in the next monitoring.

So, according to the actions taken during the monitored period, one may conclude that the Project achieved the following results and impacts:

- Short term: The activities contributed with capacity building on technical and environmental issues for public agencies and workers in the sector.
- Medium term: The project has contributed and should continue to contribute to the improvement of training of public agents to act in other forests in the state, and to the dissemination of sustainable management techniques among local community players.
- Long term: By strengthening the forest management activity the project is contributing to the conservation of forest remnants.

3.1.6 Promote socio-environmental education actions in the municipality of Cujubim

This section contains relevant information about the project contributions to SDG target 4.7, indicator 4.7.1, cited in section 1.11. The details of the monitoring of the contributions can be found in "APPENDIX 3: SD contributions evidence".

[21]Newspaper news available at: https://g1.globo.com/ro/rondonia/noticia/2022/08/05/faculdade-faro-anuncia-o-fim-das-atividades-em-ro-entenda-motivo-e-para-onde-vao-os-alunos.ghtml and https://rondoniaovivo.com/noticia/geral/2022/08/04/fim-de-um-era-faculdade-faro-encerra-atividades-apos-30-anos-em-rondonia.html. Access on: March 14, 2023.

Due to the COVID-19 pandemic the social activities were suspended in year 2021. Through the state decrees of 2020 and 2021 it is possible to confirm the suspension of educational activities throughout the state of Rondônia. On October 21, 2020, Decree 25.470[22] maintained the situation of public calamity initially decreed on March 20, 2020, in Decree 24.887[23], suspending all classroom activities in the state school system and restricting the number of students in classroom classes at private institutions. The in-person educational activities in the State of Rondônia public system were resumed only in October 2021 through Decree 26.462[24]. Between March 2020 and October 2021, the transit was restricted according to the virus contamination peaks and occupation of ICU beds. For this reason, there is no record of socio-environmental education activities during year 2021.

In 2022, environmental education actions were taken with the purpose of providing information and necessary instructions to the local population about the importance of forests, the benefits they generate for humans, and basic knowledge for the protection of these forests. The training sessions took place at CEFLOM (Manoa Forest Education Center).

Two activities were carried out, one with the Escola Municipal 23 de Março (29 people) and another with the Escola Municipal Castro Alves (30 people) (Figure 22) (both Municipal Schools). In both activities, concepts of socio-environmental education were discussed, such as the definition and objectives of environmental education, what activities degrade the environment, how humans interact with the environment, and how to class and recycle waste. Before going into the field to talk about low impact forest management, its operation and benefits, the characteristics of poisonous animals in the region and first aid techniques as a safety measure were discussed.

Figure 22. Visit of Escola Municipal 23 de Março on the left and Escola Municipal Castro Alves on the right.

[22] Decree No. 25.470, of October 21, 2020 - State of Rondonia Official Gazette, Porto Velho, October 22, 2020. Available at https://rondonia.ro.gov.br/publicacao/decreto-n-25-470-de-21-de-outubro-de-2020/#:~:text=Institui%20o%20Sistema%20de%20Distanciamento,14%20de%20maio%20de%202020. Access on: January 31, 2023.

[23] Decree No. 24.887, of March 20, 2020, State of Rondonia Government. Available at: https://rondonia.ro.gov.br/publicacao/decreto-n-25-470-de-21-de-outubro-de-2020/#:~:text=Institui%20o%20Sistema%20de%20Distanciamento,14%20de%20maio%20de%202020. Access on: January 31, 2023.

[24] Decree No. 26.462, of October 15, 2021, State of Rondonia Government. Available at: https://rondonia.ro.gov.br/wp-content/uploads/2021/10/DECRETO-N%C2%B0-26.462-DE-15-DE-OUTUBRO-DE-2021-2.pdf. Access on: January 31, 2023.

The environmental education activities empower society on issues related to the environment, further disseminating knowledge about the subject. From the perspective regarding the importance of conservation and maintenance of forest cover, these activities help contain unplanned deforestation. The environmental education activities were monitored by the monitoring reports of the forest management areas made available to the VVB team, as well as other documents related to the topic.

Other complementary actions

As a complement to the planned activities, other social actions were carried out by the Manoa company, such as donations of T-shirts for the Day of the Tree, in Cujubim, donation of furniture for the Cujubim shelter house ("casa de acolhimento"), donation of sweets for E.M.E.I. Raio de Luz and for the Association of Parents and Friends of the Mentally Handicapped (Associação de Pais e Amigos dos Excepcionais-APAE) of Cujubim on the Children's Day, chocolates for APAE of Cujubim on Easter day and blenders for the São João Batista Parish (Figure 23).

Figure 23. Donation of Easter chocolates to APAE of Cujubim on the left and of sweets for the children's day at E.M.E.I. Raio de Luz on the right.

During the monitoring period there was not a formal construction of the political-pedagogical project of CEFLOM with the participation of local players, as foreseen in item 2.2 of the PD, but the socio-environmental education actions with schools and the technical trainings (mentioned in the section 3.1.5) did occur. Besides this, the complementary actions mentioned here occurred due to demands from local players that were passed on to Manoa, as documented in official letters with requests for donations shared with the auditors. This shows Manoa's good relationship and communication with the stakeholders. Therefore, according to the actions carried out during the monitored period, one may conclude that the Project achieved the following results and impacts:

- Short term: The project contributed with a greater number of people obtaining information regarding the socio-environmental issues in the municipality, being able to act as multipliers.

- Medium and long term: With the socio-environmental education activities the project contributes and intends to continue contributing to medium and long-term changes in the positioning of the local population concerning these issues.

3.1.7 Biodiversity

This section presents relevant information about the project contributions to SDG targets 12.8, indicator 12.8.1, and 15.5 indicator 15.5.1, presented in section 1.11. The monitoring of the contributions is detailed in “APPENDIX 3: SD contributions evidence”.

Partnerships were established with the Federal University of Rondônia (UNIR), with the Manoa REDD+ Project contributing with the purchase of equipment (such as camera traps) and logistical support (accommodation and transportation within the project area), to conduct studies on the biodiversity of the Manoa Farm (Figure 24).

Two research projects are currently in progress at UNIR, entitled "Characterization and Monitoring of the Use of a Ditch by Medium and Large Vertebrate Fauna in an Area of Low Impact Forest Management in the South-Western Amazon" and "Population Estimation of Medium and Large Mammals and Game Birds in Areas under Low Impact Forest Management at Manoa Farm, Cujubim, Rondônia".

Figure 24. Installation of camera traps for monitoring the biodiversity in the Project Area in partnership with UNIR.

According to the actions taken during the monitored period, one may conclude that the Project achieved the following results and impacts:

- Short term: Contributed to monitoring the mastofauna and high conservation value attributes (salt licks).
- Medium term: The project is contributing to an increased knowledge of local biodiversity richness, to the maintenance of key species and high conservation value attributes.

- Long term: It is contributing to the conservation of biodiversity and the maintenance of key resource for the species.

3.1.8 Relationship of social activities and their impact on GHG emissions reductions

During the monitoring period, the Manoa REDD+ Project carried out several activities regarding the work with several regional social groups (since there are no community groups established inside the farm property), causing a direct and indirect impact not only at the municipal level, but also at the state level, mainly through capacity building work with state environmental agencies and the partnership with the university.

To demonstrate the clear relationship between the results of this work and its contribution to the reduction of GHG emissions directly and indirectly, in the short, medium, and long term, the proponents prepared Table 8 below where the main activities carried out in the monitored years are described with their expected impacts on the climate.

All evidence of these actions performed, are better detailed in the items above and were made available to the VVB for analysis and substantiation. In addition, the relation of the impact for reduction of GHG emissions caused by the social activities performed results from an analysis of proponents, based on the local context, where Manoa is a benchmark in the Cujubim region and in the State of Rondônia, regarding the joining of good forest management practices and forest conservation, what has directly reflected on the low rates of deforestation in the Project Area.

We may, then, realize that the good relationship with the neighborhood helps contain invasions and illegal activities in the project area. As a result, it can be seen by the satellite image monitoring (Section 3.1.1) that the project area has a low record of deforestation during the monitored period (a little more than 2 ha affected in the whole project area).

Table 8. Relationship between the social activities in the monitored period and the reduction of GHG emissions

Social activities carried out per year			Impact on GHG emission reductions
Promote socio-environmental education actions in the municipality of Cujubim	2022	With the Escola Municipal 23 de Março, where environmental education was approached, such as the definition and goals of environmental education concepts, which activities degrade the environment, how humans interact with the environment and how to classify and recycle waste and concepts related to low impact forest management, contemplating 29 people.	The environmental education activities empower society on issues related to the environment, further disseminating knowledge about the subject. From perspectives related to the importance of conservation and maintenance of the forest cover and, consequently, the reductions and removals of GHG emissions, these activities act in a preventive

		With the Escola Municipal Castro Alves, 30 people, approaching the same concepts of environmental education, recycling, low impact forest management.	way to contain unplanned deforestation, since the groups approached in these activities are mainly young people. The effective impact of these activities can be seen in the future, through the empowerment of young people on the subject and the development of their effective environmental awareness that will culminate in the preservation of forest areas.
Technical training in low impact forest management	2021	Training lasting 4 days for technicians from the forest development coordination office (CODEF) of SEDAM, assessing all the stages of low impact forest exploitation, reaching 21 people.	The main objective of the technical training courses on low impact management is the dissemination of sustainable forest exploitation techniques among local stakeholders, such as the industry workers and public agents, expanding the knowledge to all those involved. The main consequence of this activity is to help maintain the forest remnants, the forest cover and carbon stocks, avoiding unplanned deforestation and degradation, carrying out forest management activities based on good practices that cause the least impact to the forest beyond the limits of the project area.
	2022	Technical visit by ICMBio's employees so that Manoa could share its experience in the forest management sector, sharing knowledge, techniques and safety procedures in sustainable management.	
Relations with the municipality		As an internal policy established by the company, Manoa supplies raw material for sale primarily to industries in the municipality of Cujubim (RO), in order to contribute to the increase of municipal tax generation, job creation and local income circulation.	The main justification for this action is to show the population and local authorities the importance of maintaining Manoa's activities for the region, consequently maintaining a good relationship with the surroundings and receiving the community's support to maintain its operations. The good relationship with the neighborhood helps contain

	There were other social actions carried out by Manoa, such as donations of T-shirts for the Day of the Tree in Cujubim, the donation of furniture to the Cujubim shelter, donations of sweets to E.M.E.I. Raio de Luz and to the Association of Parents and Friends of the Mentally Handicapped (APAE) of Cujubim, on the Children's Day, chocolates for APAE of Cujubim on Easter day and blenders for the São João Batista Parish. Partnership with the Federal University of Rondônia (UNIR) for conducting the academic researchers in the project area.	intrusion and illegal activities in the project area, strengthening the farm's image and governance in the region. Consequently, through the results of the satellite image monitoring, one notes that the project area remained preserved during the monitored period, causing minimum emissions referring to the activities carried out.

3.2 Deviations

3.2.1 Methodology Deviations

This section does not apply because, considering the monitored period, there was no occurrence of any methodological deviation in the project.

3.2.2 Project Description Deviations

3.2.2.1 Deviations referring to the period 2017 to 2020

Project proponent - Change of land ownership

In 2019, the Manoa Farm was incorporated into the corporate capital of company Manoa Sustentável Extração e Serviços Florestais Ltda, in order to facilitate the bureaucratic procedures with the public agencies that carry out the release and inspection of the Forest Management Plan. Before, the owner was Triângulo Pisos e Painéis Ltda, project proponent indicated in the project PDD. This was a necessary action because those responsible for the public agencies have always had difficulties in understanding why the area's owner was not company Manoa Sustentável Extração e Serviços Florestais Ltda, since it is responsible for the exploitation of the forest management plan.

The change in the land titling merely facilitated the bureaucracy of the responsible public agencies, and the capitalization of the Manoa Farm did not cause costs, only the documentary legalization of property. All the information regarding this process (clarification by the Triângulo Group) and the farm's updated land documents were made available to VVB on a confidential basis.

Since Manoa is a company that is part of the "Triângulo Group", as well as Triângulo Pisos e Painéis Ltda, the Triângulo Group, together with Biofílica, have defined as a result of the real estate

payment and property transfer that Manoa will become the Project proponent together with Biofílica and, therefore, the owner of the carbon credit rights, in place of Triângulo Pisos e Painéis Ltda. Thus, Triângulo Pisos e Painéis Ltda (Released Representative), formerly a project proponent, together with Biofílica Ambipar Environmental Investments S.A., has chosen not to be a proponent anymore, giving way to Manoa Sustentável Extração e Serviços Florestais Ltda (Adherent Representative). This change refers to sections 1.4 (G4), 2.2 (G3), 2.6.2, 3.2 (G5), 8.1 (CL3, CM3 & B3) of the PDD.

This change does not interfere in any way with the Project management and governance process, and it only aims to reflect and formalize the process that has already been actually implemented, as Manoa has already been assuming more responsibilities in recent years since and, besides carrying out the low impact forest management in the project area, has also been taking responsibility for providing infrastructure support to the project activities, as responsible for the land security and property surveillance and, finally, as the land owner.

The change in the project proponents, with the withdrawal of Triângulo and the rise of Manoa, did not affect the project additionality or applicability, mainly because the companies belong to the same group (Triângulo Group) and, thus, the previously established guidelines and responsibilities remain the same. This change was only aimed at improving the management and governance procedures, i.e., this change did not impact any of the definitions established in the PD regarding the governance responsibilities of Triângulo Group or Biofílica.

The formalization of the process for change of Proponents before the Registry will be completed upon completion of the verification analysis by the VVB, so that the ascension and release documents will be sent together with the monitoring and verification report to Verra, since it is only a registration process. Anyway, in the course of the MR, the role of the above-mentioned Proponents becomes clear. The previously established contract was updated by drafting an addendum, which was signed by the legal representative of the institutions and was made available to VVB on a confidential basis.

Project Proponent - New Investing Partner

In July 2021, Ambipar Participações e Empreendimentos S.A. concluded the acquisition of 53.6% of the corporate capital of Biofílica Investimentos Ambientais S.A. The main purpose of this transaction was to speed up the company's growth, potentiated by the Ambipar Group and, as a result, to expand its portfolio of environmental services provided.

As a result of this acquisition, the company underwent a nominal change, approved in a special general meeting, and is now called Biofílica Ambipar Environment Investments S.A. The entry of a partner (Ambipar) in Biofílica did not change the company's corporate purpose, which is still strongly related to the promotion and financing of activities related to the environment and environmental conservation. Its detailed description can be found in Article 3 of the company's updated Bylaws, made available to VVB. The entry of a new partner will have a positive effect in that the contribution of resources, expertise and economies of scale will allow Biofilica to progress more consistently and quickly in its activities related to the environment and environmental conservation.

In addition, there are no contractual or other legal implications to the Manoa REDD+ Project contract, or any other project implemented by Biofílica prior to this transaction, as a result of a new partner joining Biofílica. The main investment objectives of this transaction are the development of technology and expertise regarding Nature Based Solutions techniques.

Monitoring indicators

Considering the monitoring period, there were deviations from two proposed indicators: "Assessment of harvest damages" and "Frequency of surveillance and patrol operations". However, the deviations that occurred did not compromise the project monitoring as can be analyzed in the descriptions below.

The indicator "Assessment of harvest damages" was proposed to assess the damages that occurred in the management operations by comparing the previous and subsequent situation of the individuals present in the installed plots. The indicator was designed to be monitored with the unit m^3/ha, however, the process of recording post-exploitation damage raises the number of damaged and dead individuals in an area analyzed, without considering the volume of each individual. Thus, the indicator was analyzed and reported in the unit of individual/ha.

The indicator "Frequency of surveillance and patrol operations" was initially proposed to assess the operation of the surveillance of property. This activity aims to promote mitigation actions against intrusion in the Project Area and, consequently, to act against illegal and unplanned deforestation and forest degradation. The surveillance actions have occurred continuously throughout the project since 1997, with specific tactics as described in section 3.1.2. From the costs associated with the maintenance of the surveillance infrastructure (Casa do Curica and Casa Rio Preto) it is possible to prove their use and, consequently, the continuity of surveillance operations, as we can note in the recent reports on patrols and in the expenditure reports of Manoa Farm, made available to VVB. However, the registration of activities was only started in 2020. Thus, the monitoring of actions as well as the completion of such indicator was compromised due to the lack of records that could quantitatively prove the actions. Despite this gap, it was possible to indirectly identify the effect of surveillance actions in the Project Area because there was no unplanned illegal deforestation in the area during the verified period. Thus, evidencing that property surveillance actions were taken.

3.2.2.2 Deviations referring to the period 2020 to 2022

Monitoring deforestation through satellite images (Landsat and Resourcesat) and generation of annual bulletins – Manoa remote monitoring

Initially, in item 2.2 of the PDD, specifically within the activity “Monitoring deforestation through satellite images (Landsat and Resourcesat) and generation of annual bulletins” it was intended that the annual deforestation bulletins prepared by Biofílica Ambipar would help guide Manoa's patrimonial surveillance activities. The bulletins, which began to be prepared in 2014, use satellite images to

understand the context of deforestation and encroachment and should, consequently, improve the agility and assertiveness of field patrols for maintaining the forest cover. However, the bulletins depend on the periodicity of the PRODES data that takes about a year to be published for the retroactive year. Therefore, the 2021 and 2022 monitoring bulletins, for example, were produced in 2022 and 2023, respectively (for more details on the bulletins see section 3.1.1).

Surveillance activities, carried out by the Manoa team, began in 1997 and from 2014, the beginning of the REDD+ Manoa crediting period, began to occur monthly. During the monitoring of the project, the registration of each of the surveillance activities was improved for better monitoring of the activity and better archiving of evidence. According with the PDD, the patrolling activity should be combined with the remote monitoring by satellite images (the bulletins) to develop unified strategies that provide greater efficiency in surveillance and strengthening security in the project area limits.

However, since the project validation, the annual periodicity of the bulletins didn't fully meet the proposal, as surveillance activities took place monthly and required monitoring of areas at risk of deforestation with an interval of less than one year for action. In order to meet the satellite monitoring frequency required by the inspection team, the team responsible for managing Manoa's Farm started a new monthly monitoring activity, during the dry season, to identify occurrences of deforestation and fires around the farm. This monitoring has two stages (1) monitoring of deforestation and (2) monitoring of fires, both carried out by the Manoa team and covering a buffer of 10km from the limits of Fazenda Manoa.

Deforestation monitoring is done during the dry season (generally between May and August) using data from the Planet satellite and/or the Sentinel satellite and analyzed with QGIS or ARCGIS software to identify deforestation around the farm. In cases of loss of vegetation cover within or very close to the limits of the farm a map is made so the area can be checked in the field by the surveillance team and remotely by the team responsible for the remote monitoring. In the field, the team tries to contact those responsible for deforestation to reinforce Manoa's presence and property boundaries and thus avoid damage within the project area.

The monitoring of fire outbreaks is done through registration on the NASA[25] website. Whenever there is a heat source within the buffer registered on the site, the Manoa employee responsible for monitoring is alerted by email (generally received within 24 hours after the heat source is detected) and receives information about time, date, satellite that recorded the heat source and location coordinates. After that, the points are checked in the BDQueimadas[26] website to confirm the information, since the focus of heat doesn't always correspond to a forest fire. In addition, by observing graphs of heat sources available in BDQueimadas, which indicates the temperature of the heat source, it is possible to identify the moment of the fire (whether it is going out, it's at the point of most intensity or if it's starting). With this information, a map is generated with the hot spots and the inspection team is called to verify it in

[25] Fire Information for Resource Management System (FIRMS). Available at: https://firms.modaps.eosdis.nasa.gov/map/#d:24hrs;@-56.8,-11.5,6z. Access on: July 06, 2023.
[26] Projeto Platform of Monitoring and Warning of Forest Fires in the Cerrado. Available at: https://queimadas.dgi.inpe.br/queimadas/bdqueimadas#mapa. Access on: July 06, 2023.

the field, generally, because it is information that needs to be verified as soon as possible, the inspection team receives the raw data of the occurrence, and the report is generated later.

There is no periodicity in the elaboration of reports, as they only occur in case of deforestation and/or fires close to the limits of the farm. Monitoring, on the other hand, takes place constantly for the heat sources (possible fires) and at least once a month, during the dry season, for the deforestation of the surroundings. All monitoring steps carried out by Manoa remotely and in the field can be seen in the flowchart in Figure 25 and the results of the monitored period are available in section 3.1.1.

The changes done in this activity don't affect the additionality or applicability of the project. Such changes were made with the sole objective of improving the synergy between the activities proposed by the REDD+ project and the field actions carried out by the surveillance team at Fazenda Manoa, focusing mainly on adapting an existing tool used by the project.

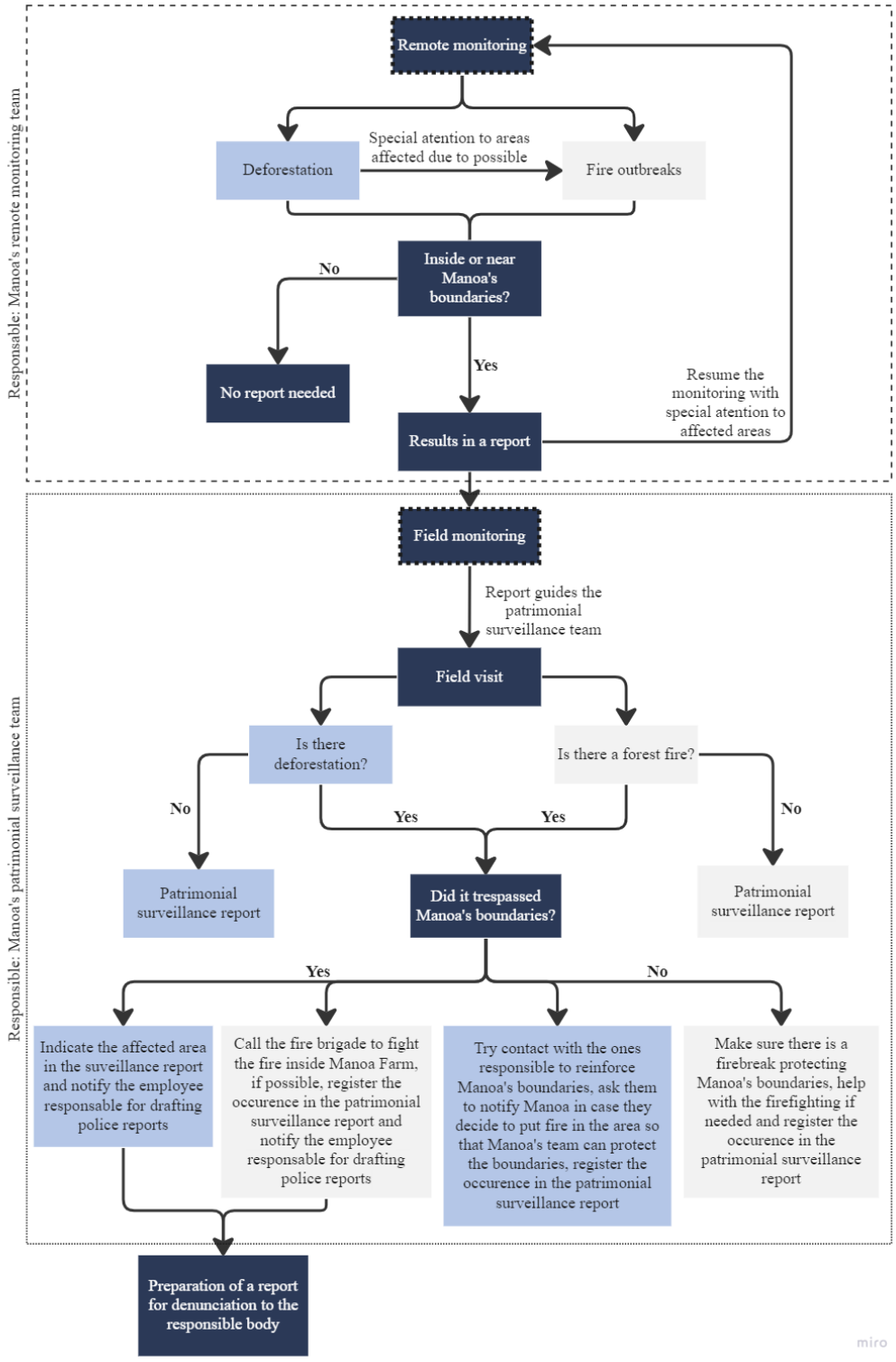


Figure 25. Flowchart detailing the remote and field monitoring of deforestation and fire incidents done by Manoa's team.

Baseline fixed period

During this monitored period (08-August-2020 to 31-December-2022) an error in the fixed baseline period cited in the PDD was found. In section 4.4 “Project boundaries” page 76 of Manoa REDD+ Project PDD the first baseline period is said to end on 31-December-2023. However, the period from 01-January-2013 to 31-December-2023 accounts for 11 years and not 10 as demanded by the VCS Standard v4.4 (for projects registered before 19 January 2022, as is the case for Manoa). Therefore, all documents related from this verification onwards will refer to the first baseline fixed period as 01-January-2013 to 31-December-2022.

Communication procedure, complaints and dispute resolution

Initially, section 2.7.2 of the project's PDD described that conflict identification of conflicts and preventive measures to this theme were available in Manoa’s manual of procedures. During the monitoring period, the proponents assessed that the procedures described in this manual were not aligned with what was being carried out by the project in terms of conflict resolution and communication with stakeholders. As a result, the project's processes for receiving, listening to, responding to, and trying to resolve complaints within a reasonable timeframe were redesigned by the proponents, so that their current implementation is culturally aligned with the farm's activities. In this way, the communication procedure describes the day-to-day actions that have been improved by the REDD+ project in terms of registering and following up on complaints. The Manoa Project's updated communication procedure that has been applied is described below and the results obtained during the monitoring period are detailed in section 2.2.1.

The consultation and communication with the stakeholders, which enables the discussion about the progress of activities carried out at the property, both in the form of complaints and suggestions, occurs via three methods: application of a questionnaire to survey the positive and negative impacts (Figure 26), availability of the ombudsman channel and development of the suggestion box (Figure 28).

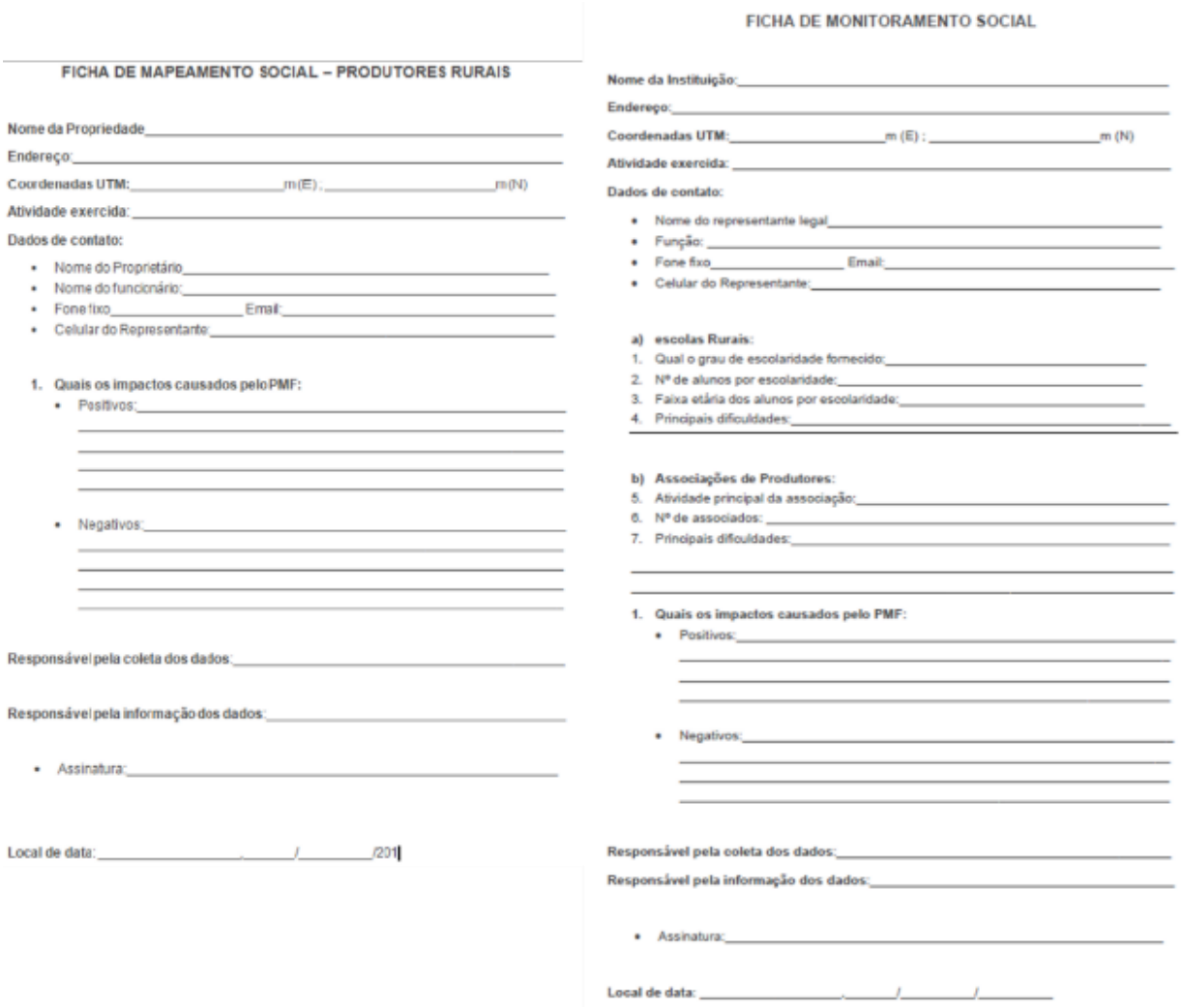
1. *Application of a questionnaire to survey the positive and negative impacts:*

The application of a questionnaire to survey the positive and negative impacts is in line with the monitoring measures established for the social aspects that could be impacted by the forest management and the REDD+ Project activities and, when appropriate, Manoa performs the compensation of impacts.

There are two models of questionnaire (Figure 26), one for the farmers and one for the institutes, that are applied to neighbors present in a 15km line from Manoa entrance gate (Figure 11). Both include one question about the positive and negative impacts of Forest Management, besides that, the questionnaire for the institutions includes an additional question about the biggest challenges faced.

The questionnaire is applied in one day between the months of July and October, to the neighbors present at the moment of Manoa visit. The number of questionnaires answered varies between the years, because not always the owners or employees are present at the time, and because the property can be bought or sold from one year to the other. For example, in one of Juraci Paiva's properties, it was not

possible to apply the questionnaire in 2022 because after the construction of the farm's headquarters in one of the properties, the other one no longer had residents. Another property without data was Sitio dos Paraenses, where it was not possible to collect information in either of the two years monitored, because the residents live in the city and were not in the homestead on the days the questionnaire was applied.



FICHA DE MAPEAMENTO SOCIAL – PRODUTORES RURAIS

Nome da Propriedade:
Endereço:
Coordenadas UTM: m (E) : m (N)
Atividade exercida:
Dados de contato:
- Nome do Proprietário:
- Nome do funcionário:
- Fone fixo: Email:
- Celular do Representante:

1. Quais os impactos causados pelo PMF:
   - Positivos:
   - Negativos:

Responsável pela coleta dos dados:
Responsável pela informação dos dados:
- Assinatura:

Local de data: /201

FICHA DE MONITORAMENTO SOCIAL

Nome da Instituição:
Endereço:
Coordenadas UTM: m (E) : m (N)
Atividade exercida:
Dados de contato:
- Nome do representante legal:
- Função:
- Fone fixo: Email:
- Celular do Representante:

a) escolas Rurais:
1. Qual o grau de escolaridade fornecido:
2. Nº de alunos por escolaridade:
3. Faixa etária dos alunos por escolaridade:
4. Principais dificuldades:

b) Associações de Produtores:
5. Atividade principal da associação:
6. Nº de associados:
7. Principais difículdades:

1. Quais os impactos causados pelo PMF:
   - Positivos:
   - Negativos:

Responsável pela coleta dos dados:
Responsável pela informação dos dados:
- Assinatura:

Local de data: / / /

Figure 26. Models of questionnaires applied for monitoring the impacts. Farmers on the left and institutions on the right.

Along with the questionnaire, Manoa also provides a copy of the public summary of the management plan, that includes information about the REDD+ Project, about the fauna protected in Manoa Farm and about the social impact of Manoa's activities, as well as a contact phone number and digital address of the company's ombudsman channel. In the future the project intends to improve the questionnaire to better understand if the stakeholders know how to contact the farm if needed and to better communicate the REDD+ Project results in the documents distributed during said questionnaires.

2. *Availability of the ombudsman channel*

To promote effective communication with the stakeholders in the surrounding area, in cases of repair of possible damage or negative impacts resulting from the activities, the company makes a public ombudsman channel available. Through the ombudsman's office it is possible to report any origin such as complaints, dissatisfactions or even suggestions. The ombudsman channel is available at the entrance of the farm, for the neighbors easy access, and at Triângulo website[27] (Figure 27).

Figure 27. Triângulo website on the left with the ombudsman channel at the bottom of the page and the sign at Manoa's entrance with phone number and e-mail address to contact Triângulo, if necessary, on the right.

The Financial manager is responsible for registering, analyzing and forwarding the significative requests to the appropriate sector.

3. *Development of the suggestion box*

The third consultation and communication front consist of the suggestion box Figure 28, which was created as one of the project improvements regarding the communication channels, with the aim of dealing with possible suggestions, demands or complaints from Manoa Farm's employees.

The box must be opened by the technicians responsible (either the Forestry engineer or the field coordinator) in front of all the farm's employees, and the records assessed one by one to take the necessary actions considering each demand.

[27] Triangulo website. Available at: https://www.triangulo.com.br/sustentabilidade/. Access on: July 11, 2023.

Figure 28. Suggestion box located in the cafeteria of Manoa Farm.

4. Other communication channels

Besides the three main consultation and communication fronts set up by Manoa, dialog is also established by other means, such as e-mail exchanges, meetings, and informal chats. During the harvest period the activities are initiated by speeches and trainings about low impact forest management and the correct procedures (for more details see section 2.3.2) and, then according with the team availability, meetings led by the forestry engineer occur, to reinforce the safety procedures, to hear employees doubts, suggestions and requests. From 2022 onwards those meetings started being documented in reports, shared with the VVB.

At Manoa's office, the communication with external stakeholder, such as schools and environmental institutions is ministered as follows: Manoa receives the institution request for environmental education, technical training or other by email or phone, evaluates which request will be attended and then proceeds with the activity (see flowchart in Figure 29). The criteria used to define with request will be attended varies with the priority established by Manoa, activities with potential to involve a large sector of the low impact forest management, for example, takes high priority. Activities that result in significant benefit for the community are also prioritized. After the activity, when Manoa receives the thanking notes and or feedback concerning the activity the process is considered concluded. The criteria used to define if the request will be attended will be better described below.

5. Analysis and forwarding of requests

The process of how the requests received by each channel are analyzed and dealt with are presented in a flowchart in Figure 29. The significance of each request is evaluated according with the following criteria:

a) According with the type of request, which can be complaint, doubt, suggestion, compliment, etc.

b) Regardless of the type of demand, those that (1) are related to the company's activities, (2) involve impacts caused by the company, (3) that have the potential to cause environmental, social or economic impact are considered significant.

c) Donation-type requests that do not have the potential to bring community return are automatically considered non-significant, as this type of activity is not part of the company's policy. Manoa prioritizes actions that positively and significantly impact as many people as possible in the community.

Manoa tries to answer the request as soon as possible and the way the result of the analysis of the request is reported to the stakeholders varies according with the communication channel used and with the stakeholder characteristics, for example, internal requests made by employees through the suggestion box can be answered through the notice board, e-mail and/or WhatsApp. However, requests made by the neighbors are usually answered personally, as described in section 2.2.1. Other requests answers will vary according to the most appropriated method (by e-mail, phone, in person, letter etc.). The feedback to the stakeholders is always responsibility of the Forestry Manager and/or Forestry Engineer.

Additionally, whenever a Manoa employee identifies an emergency situation (e.g. forest fire, actions that go against the company policy) in Manoa Farm, regardless of the type of situation, the field coordinator must be informed immediately.

Manoa's Human Resources and the Financial Manager are the ones responsible for accompanying and negotiating with unions, the Ministry of Labor and other institutions related to workers' rights/duties. Contact with the environmental bodies, whether for interpellations, assessments, requests for information or any matter related to the environment, is carried out by the Forestry Management and the Forestry Engineer. Cases involving legal matters are forwarded to the company's legal department.

Demands related to land issues, with the potential for conciliation, are handled by the Forestry Manager. Claims that need to be discussed in court are forwarded to the legal area. Requests or contacts involving the press are made by the Marketing department, which uses its own tools or the specialized work of a press relations agency.

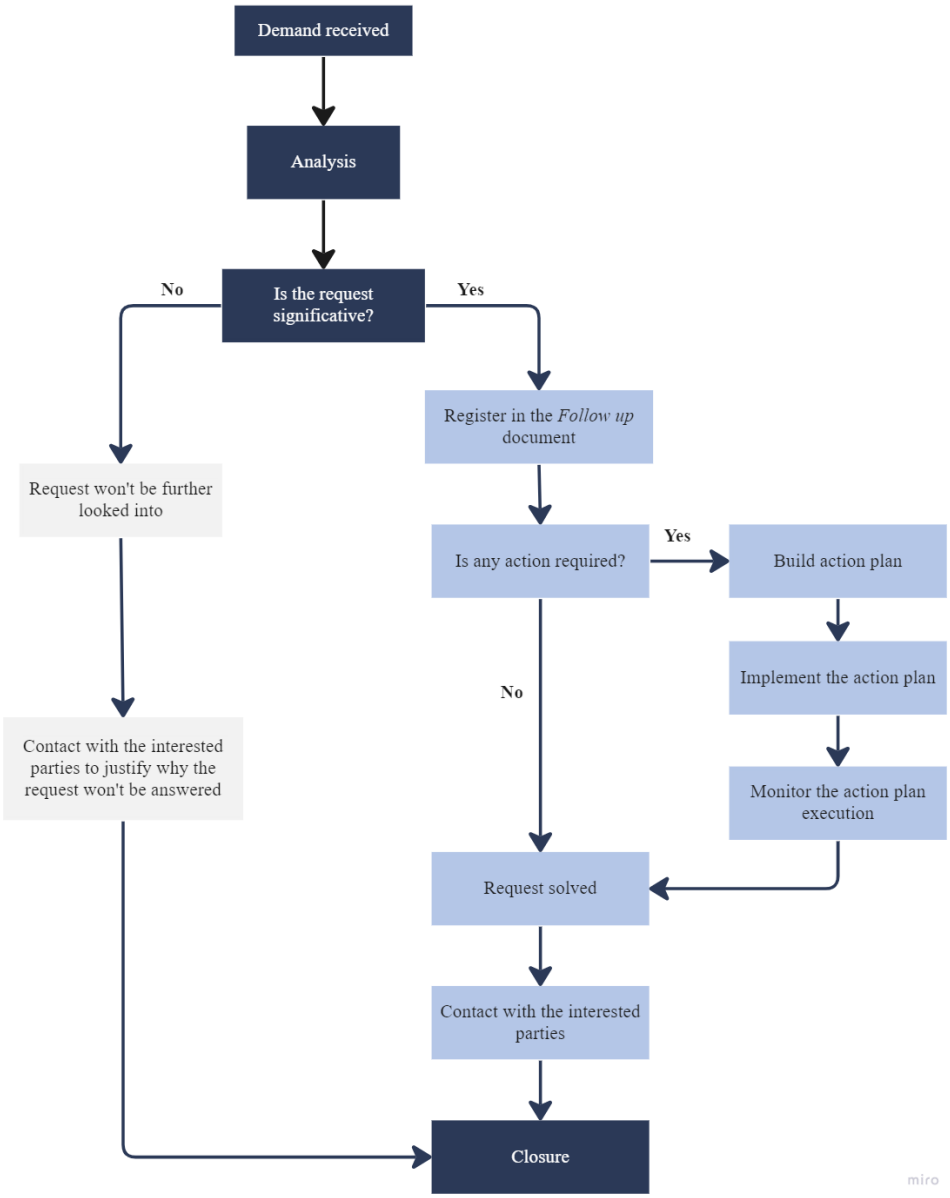


Figure 29. Flowchart of how each request received by the project communication channels is handled.

3.3 Grouped Projects

Does not apply as this is not a grouped project.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	Deforestation
Data unit	Hectare (ha)
Description	Maps of the forest cover areas converted to non-forest cover areas.
Source of data	Measures by means of the PRODES/INPE project data.
Value applied	0.79%/year on average (2000-2012)
Justification of choice of data or description of measurement methods and procedures applied	For mapping deforestation and producing the Forest Cover Excellence Mark Map, data from the PRODES (Satellite of the official mapping of deforestation in the Brazilian Amazon) Digital program were used. A total of 48 Landsat images were used during the analyzed period. The ISOSEG method of unsupervised classification was used in the classification of images to map the forest, non-forest vegetation, hydrography, and deforestation classes.
Purpose of Data	• Baseline scenario determination • Baseline emission calculation • Project emissions calculation • Leakage calculation
Comments	See documents: • Câmara et al. 2006. Methodology to calculate the annual deforestation rate in the Legal Amazon • Determination of the Deforestation Baseline and Dynamics for the Manoa project • http://www.obt.inpe.br/

Data / Parameter	Ctot
Data unit	tCO2e ha-1
Description	Average carbon stock per hectare in every forest class carbon pools used in the baseline scenario.
Source of data	Calculated by allometric equations and field measured data.
Value applied	513 tCO2e ha-1
Justification of choice of data or description of measurement methods and procedures applied.	Estimates of above and below ground biomass were made using forest inventory data, allometric equations developed in areas similar to the project area (SILVA, 2007). The dead wood pool

	was estimated based on forest inventory data and equations by Silva (2007).
Purpose of Data	• Baseline scenario determination • Baseline emissions calculation • Project emissions calculation • Leakage calculation
Comments	See documents: • Estimated Forest Carbon Stocks for the Manoa REDD+ project • Section 5.3 of "Project Description–Baseline Issuance • Section 5.2.2 of the MR – significance of the low impact forest management

Data / Parameter	DBH
Data unit	cm
Description	Diameter at Breast Height (130 cm) for each tree with DBH equal to or greater than 10 cm in each plot of the forest inventory.
Source of data	Measured at the field by Florestal Paisagismo
Value applied	See worksheet with field data
Justification of choice of data or description of measurement methods and procedures applied	Requirement of VCS VM0015 methodology. Forest inventory data collected less than 10 years ago in multiple plots located in wide spatial distribution.
Purpose of Data	• Baseline scenario determination • Baseline emissions calculation • Project emissions calculation • Leakage calculation
Comments	Main estimated variable of carbon stock

Data / Parameter	BGBfw = 0,0469 x DAP2,4754 x fc1 AGBfw = EXP(-1,716 + 2,413 x ln(DAP))
Data unit	Kg (biomass fresh weight)
Description	Equation to convert DBH to fresh biomass
Source of data	1. SILVA, 2007 2. NOGUEIRA, 2008
Value applied	1. BGBfw = 0,0469 x DAP2,4754 x fc1 2. AGBfw = EXP(-1,716 + 2,413 x ln(DAP))

Justification of choice of data or description of measurement methods and procedures applied.	Equation developed for forests with characteristics similar to the forests in the reference region.
Purpose of Data	• Baseline scenario determination • Baseline emissions calculation • Project emissions calculation • Leakage calculation
Comments	-

Data / Parameter	CF
Data unit	t
Description	Carbon content in dry biomass
Source of data	Nogueira, E.; Fearnside, P.; Nelson, B., et al., 2008. Estimations of forest biomass in the Brazilian Amazon: New allometric equations and adjustments to the biomass of the wood volume inventories. Forest Ecology and Management, 256 (11), pp.1853-1867
Value applied	0,485
Justification of choice of data or description of measurement methods and procedures applied	Value found in scientific literature
Purpose of Data	• Baseline scenario determination • Baseline emissions calculation • Project emissions calculation • Leakage calculation
Comments	-

Data / Parameter	44/12
Data unit	tCO2e
Description	Carbon mass for a mass conversion factor of CO2e
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	IPCC default value

measurement methods and procedures applied	
Purpose of Data	• Baseline scenario determination • Baseline emissions calculation • Project emissions calculation • Leakage calculation
Comments	-

Data / Parameter	Opening area for forest management infrastructure
Data unit	Percentage
Description	Area opened for building the necessary infrastructures for sustainable forest management activities such as primary and secondary roads and yards.
Source of data	Post-Exploitation Report and opinion by experts
Value applied	1.6%
Justification of choice of data or description of measurement methods and procedures applied	Data are collected at the field after the harvest activity. Post-exploitation reports
Purpose of Data	• Baseline scenario determination • Baseline emissions calculation • Project emissions calculation • Leakage calculation
Comments	-

4.2 Data and Parameters Monitored

Data / Parameter	Deforestation in the project area and leakage belt
Data unit	Hectare (ha)
Description	Forest cover areas converted to non-forest cover areas in the project area and leakage belt of Manoa REDD+ Project.
Source of data	Remote sensing images from the LANDSAT8 satellite used by the PRODES project corresponding to orbit/point 231/66 and 232/6 complemented by data from the Deforestation Alert System (SAD), produced by Imazon.
Description of measurement methods and procedures to be applied	The monitoring of forest cover in the monitored area was done by overlaying the vector data from PRODES and SAD with the boundaries of the project area and leakage belt of the Manoa REDD+ Project. Polygons mapped as deforested between August 08 2020 and December 31, 2022 were selected for

	quantification of deforested area and subsequent field verification activities.
Frequency of monitoring/recording	Annual
Value monitored	<table><tr><td></td><td>$ABSLPA_{icl,t}$ (ha)</td><td>$ABSLLK_{icl,t}$ (ha)</td></tr><tr><td>2021</td><td>2</td><td>0</td></tr><tr><td>2022</td><td>0.02</td><td>0</td></tr></table>
Monitoring equipment	Remote sensing images from digital processing program, geographic information systems, and navigational GPS.
QA/QC procedures to be applied	Images with special resolution of 30 meters or higher were used in the mapping and the minimum mapping unit was 1 ha. The methodology for assessing the data accuracy is described in Section 3.1.2. The accuracy of the land use and land cover classification map was 99.3%. This information served as a source for the preparation of monitoring bulletins (available to VVB) that were forwarded to the property surveillance team, to perform the field identification of deforestation points with GPS data. This step is also described in Section 3.1.2
Purpose of the data	• Project emissions calculation • Leakage calculation
Calculation method	In case areas of unplanned deforestation are detected, the Forest Cover Excellence Mark Map will be updated by map algebra.
Comments	• PRODES Digital Project: http://www.dpi.inpe.br/prodesdigital/prodes.php • SAD – Imazon, 2022. Deforestation Alert System: https://imazon.org.br/publicacoes/faq-sad More information on quality control and assurance available at: • (CÂMARA et al., 2006). Methodology to calculate the annual deforestation rate in the Legal Amazon.

Data / Parameter	Planned deforestation for forest management infrastructure
Data unit	Hectare (ha)
Description	Areas of forest cover converted to areas of non-forest cover due to the construction of roads, trails, and forest yards needed for forest management.
Source of data	Post-exploitation reports, remote sensing images, technical maps, and field charts specific for monitoring the construction of roads, trails, and forest yards for forest management.
Description of measurement methods and procedures to be applied.	Monitoring of forest cover areas was carried out by means of post-exploitation reports, maps of road, trail and forest patio construction for forest management, and field checks.

	The Forest Cover Excellence Mark Map was updated using the algebraic map. The reduction in carbon stock in the project area was reported during the verification processes.
Frequency of monitoring/recording	During the management year of each UPA (Annual Production Unit)
Value monitored	<table><tr><td></td><td>$APDPA_{icl,t}$ (ha)</td></tr><tr><td>2021</td><td>52</td></tr><tr><td>2022</td><td>59</td></tr></table>
Monitoring equipment	Field sheets and geographic information system
QA/QC procedures to be applied	The mapping of planned deforestation area for implementation of the Forest Management Infrastructure was done by means of high-resolution images and field checks.
Purpose of the data	• Project emissions calculation
Calculation method	For planned deforestation areas identified the Forest Cover Excellence Mark Map was updated by means of the algebraic map.
Comments	-

Data / Parameter	ΔCabBSLLKt
Data unit	tCO2e
Description	Changes in the total carbon stock in the leakage belt area
Source of data	Calculated
Description of measurement methods and procedures to be applied	During the monitored period, no leakage was identified in the project, however, if they had occurred, the following methodology would be applied: • Leakage prevention activities would be listed; • A map showing the areas of intervention and the type of intervention should be prepared; • The areas where leakage prevention activities impact the carbon stock should be identified; • Existing non-forest classes within these areas should be identified in the baseline case; • Carbon stocks should be measured in the identified classes or conservative literature estimates should be used; • Changes in carbon stock in the leakage management areas under the project scenario must be reported using Table 30b in VM0015; • The net carbon stock changes caused by prevention measures during the fixed baseline period and optionally the project crediting period must be calculated;

	The results of the calculations must be reported in Table 30.c of VM0015.
Frequency of monitoring/recording	To be determined depending on the activity
Value monitored	ΔCabBSLLKt (tCO2-e) 2021: 0 2022: 0
Monitoring equipment	Digital processing program remote sensing images, geographic information systems and calculation tables
QA/QC procedures to be applied	Images with special resolution of 30 meters or higher were used in the mapping, and the minimum mapping unit was 1 ha. The methodology for assessing the data accuracy is described in Section 3.1.1. The accuracy of the soil cover and use classification map was 97.3%.
Purpose of the data	• Leak calculation
Calculation method	Evaluation of ex-post estimates in the Leakage Belt against the ex-ante project estimate (Table 35 of VM0015).
Comments	-

Data / Parameter	Assessment of damage due to forest management activity
Data unit	individual. ha^{-1}
Description	Exploitation damage assessment conducted by sampling in the UPAs comparing the before and after situation of the individuals present in the installed plots.
Source of data	Post-exploitation report
Description of measurement methods and procedures to be applied	Once the exploitation has ceased, the plots were remedied to assess damage to the remaining trees with DAP above 10 cm. In the collection of data, damages to the treetop and trunk are considered, encompassing three levels of classification: minor, moderate, and severe. In UPA 17 and 11 the damaged and dead individuals were analyzed in 15 and 16 plots, respectively.
Frequency of monitoring/recording	Annual, upon completion of harvest operations a each UPA
Value monitored	UPA 17 - exploited in 2021 - 7.87 ± 3.39 individuals damaged per hectare - 24.20 ± 7.75 individuals dead per hectare UPA 11 - exploited in 2022 - 6.15 ± 2.26 individuals damaged per hectare - 26.69 ± 40.47 individuals dead per hectare

Monitoring equipment	See documents: 2021-relatorio-monitoramento-AMF-UPA17 2021-12-relatorio-final-UPA-17 2022-relatorio-monitoramento-AMF-UPA11 2022-12-relatorio-final-UPA-11.
QA/QC procedures to be applied	Every quarter the exploitation coordinator randomly visits the areas that have received damage monitoring to assess if the data collection was effective and to take appropriate actions, if necessary.
Purpose of the data	Assessment of the damage caused by exploitation of the remaining trees.
Calculation method	Analysis of trees in the plots on a post-exploitation condition, assessing damage on the treetop and trunk.
Comments	The indicator was planned to be reported in m^3/ha, however, the registration method was done in individual/ha. The description of the deviation can be found in the section 3.2.2. Section 5.2.2 details the significance of the low impact forest management.

Data / Parameter	Frequency of surveillance and patrol operations
Data unit	Number of operations per year
Description	Record the number of surveillance operations carried out on the farm during the monitoring period
Source of data	Patrimonial Surveillance Reports
Description of measurement methods and procedures to be applied	The surveillance actions were followed up by analyzing the patrols that were recorded during the monitoring period.
Frequency of monitoring/recording	Monthly
Value monitored	2020 as from August 08: 4 2021: 12 2022: 15 Total: 31
Monitoring equipment	Not applicable
QA/QC procedures to be applied	The activity is carried out by Manoa Farm's employees adopting a strategy to have the "surprise effect", in case wood theft or intrusion is detected, the employees are trained to immediately report the occurrence to the forest manager.
Purpose of the data	Assessment of property surveillance actions

Calculation method	Not applicable
Comments	The property surveillance actions have taken place since 1997 and has continued over the project. Greater details about the activities can be found in Section 3.1.2. However, the process of recording the patrols carried out has only been formalized since 2020. Therefore, the monitoring was not able to properly represent the surveillance actions that took place in earlier periods. A description of the deviation can be found in the section Monitoring Plan 3.2.2.

Data / Parameter	ΔCPLdPAt
Data unit	Ton of carbon dioxide equivalent (tCO2-e)
Description	Total decrease in carbon stock due to planned logging activities in year t in the Project Area.
Source of data	Calculated as detailed in section 5.2.1.
Description of measurement methods and procedures to be applied.	Monitoring of forest cover areas was carried out by means of post-exploitation reports, maps of road, trail and forest patio construction for forest management, and field checks. And the calculations after the field data collection are described in section 5.2.1.
Frequency of monitoring/recording	During the management year of each UPA (Annual Production Unit).
Value monitored	
Monitoring equipment	Field sheets and geographic information system and proper equation described in section 5.2.1.
QA/QC procedures to be applied	The mapping of planned deforestation area for implementation of the Forest Management Infrastructure was done by means of high-resolution images and field checks.
Purpose of the data	• Project emissions calculation
Calculation method	For planned deforestation areas identified the Forest Cover Excellence Mark Map was updated by means of the algebraic map.
Comments	-

	ΔCPDdPAt (tCO2e)
2021	26.905
2022	30.405

Data / Parameter	ACPAicl,t
Data unit	hectares

Description	Annual area within the Project Area affected by catastrophic events in forest class icl at year t
Source of data	Calculated as detailed in section 5.2.7 and 4.3.3
Description of measurement methods and procedures to be applied.	Remote sensing images
Frequency of monitoring/recording	Each time a catastrophic event occurs
Value monitored	<table><tr><td></td><td>ACPAicl,t (tCO2e)</td></tr><tr><td>2021</td><td>0</td></tr><tr><td>2022</td><td>0</td></tr></table>
Monitoring equipment	Remote sensing images.
QA/QC procedures to be applied	For details see section 4.3.3.
Purpose of the data	• Project emissions calculation
Calculation method	Describe in sections 5.2.7.
Comments	-

Data / Parameter	ΔCUCdPAt
Data unit	Total decrease in carbon total stock due to catastrophic events in year t in Project Area (tCO2-e)
Description	Total decrease in carbon total stock due to catastrophic events in year t in Project Area.
Source of data	Calculated as detailed in section 5.2.7.
Description of measurement methods and procedures to be applied.	Remote sensing images.
Frequency of monitoring/recording	Each time a catastrophic event occurs
Value monitored	<table><tr><td></td><td>ACPAicl,t (tCO2e)</td></tr><tr><td>2021</td><td>0</td></tr><tr><td>2022</td><td>0</td></tr></table>
Monitoring equipment	Remote sensing images.
QA/QC procedures to be applied	Images of high resolution, confirmation in different databases such as PRODES and DETER. For more details see section 4.3.3.

Purpose of the data	• Project emissions calculation
Calculation method	Describe in sections 5.2.7 and 4.3.3.
Comments	-

Data / Parameter	ΔCUFdPAt
Data unit	Ton of carbon dioxide equivalent (tCO2-e)
Description	Total decrease in carbon stock due to unplanned (and planned – where applicable) forest fires in year t in the project area
Source of data	Calculated as detailed in sections 5.2.7 and 4.3.3
Description of measurement methods and procedures to be applied.	Remote sensing images.
Frequency of monitoring/recording	Every time a forest fire event occurs
Value monitored	ΔCUFdPAt (tCO2e) 2021: 0 2022: 0
Monitoring equipment	Remote sensing images.
QA/QC procedures to be applied	For details see section 4.3.3.
Purpose of the data	• Project emissions calculation
Calculation method	Describe in section 5.2.7 and 4.3.3.
Comments	-

Data / Parameter	ΔCUDdPAt
Data unit	Ton of carbon dioxide equivalent (tCO2-e)
Description	Total actual carbon stock change due to unavoided unplanned deforestation at year t in the project area
Source of data	Calculated as detailed in sections 5.2.5, 5.2.6 and 4.3.3
Description of measurement methods and procedures to be applied.	Remote sensing images as described in section 4.3.3.
Frequency of monitoring/recording	Annual

Value monitored	<table><tr><th></th><th>ΔCUDdPAt (tCO2e)</th></tr><tr><td>2021</td><td>921</td></tr><tr><td>2022</td><td>10</td></tr></table>
Monitoring equipment	Remote sensing images.
QA/QC procedures to be applied	For details see section 4.3.3.
Purpose of the data	• Project emissions calculation
Calculation method	Describe in section 5.2.5 and 4.3.3
Comments	-

Data / Parameter	ΔCPSPAt
Data unit	Ton of carbon dioxide equivalent (tCO2-e)
Description	Total project carbon stock change within the project area at year t
Source of data	Calculated as detailed in section 5.4
Description of measurement methods and procedures to be applied.	Remote sensing images as described in section 4.3.3.
Frequency of monitoring/recording	Annual
Value monitored	<table><tr><th></th><th>ΔCPSPAt (tCO2-e)</th></tr><tr><td>2021</td><td>27.826</td></tr><tr><td>2022</td><td>30.414</td></tr></table>
Monitoring equipment	Remote sensing images.
QA/QC procedures to be applied	For details see sections 4.3.3 and 5.4
Purpose of the data	• Project emissions calculation
Calculation method	Describe in section 4.3.3 and 5.4.
Comments	-

4.3 Monitoring Plan

4.3.1 Organizational structure, responsibilities and competencies

The monitoring plan for the Manoa REDD+ Project is a combination of three components: climate, socioeconomic and biodiversity. The results regarding the social and biodiversity scope can be located in sections 2.1, 2.3 and 3.1. The following sections demonstrate only the results regarding the climate component of the project. The competencies and responsibilities of the proponents are described below.

Biofílica Ambipar Environment: is a Brazilian company with 14-year experience in the voluntary carbon market, focused on forest management and conservation in the Amazon biome. In Manoa REDD+ Project, Biofílica acts as co-manager, supporting in the coordination of the monitoring processes during the project's life cycle. In addition, it was also responsible for monitoring the climate aspects, with the support of Manoa, and is a party responsible for marketing the carbon credits.

Biofílica's work is guided by the Operating team (works in all stages of the project, from preparation, implementation, monitoring and management), Commercial team (works mainly in the raising of financial resources to the Project, from the sale of the carbon credits generated in the verifications), and Marketing team (that is present throughout the consumer journey of the carbon credits from REDD projects and provides technical support for creation of materials).

Manoa Sustentável, Exploração e Serviços Florestais: Is the owner of the property where the Manoa REDD+ Project is located, representing the Triângulo Group; it is responsible for carrying out the low impact forest management, for providing infrastructure and logistics support to Biofílica and other professionals involved in the project; and is responsible for the social monitoring and for the land security and property surveillance.

Among the activities performed by Manoa are the monitoring of socioeconomic attributes and indicators related to Sustainable Forest Management, monitoring of forest cover and high conservation value attributes. In addition, it encourages and provides support for the biodiversity monitoring that has been implemented in the area by UNIR, by the creation of a partnership with the Laboratory of Mastozoology and Terrestrial Vertebrates (LABMASTO).

4.3.2 Internal audit performed

The Manoa REDD+ Project don't undergo any official internal audit, except for the one applied in the VCU verification processes. However, the proponents follow the development of the project through alignments and information exchange about the activities carried out and apply the monitoring processes for the activities and indicators, as described in the project design document and based on the annual planning of activities.

Biofílica is responsible for preparing the project documentation, therefore, it is also responsible for receiving, organizing and reviewing all the information generated by the activities carried out by Manoa

in the field. All this information serves as a basis for the preparation of follow-up reports that are verified throughout the life cycle of the project.

The information is shared via Sharepoint by Manoa and the Biofílica team evaluates the data and identifies which activities and indicators the information refers to. In case of doubt about the data, Biofilica performs an alignment with the Manoa team and, if the activity is not in line with the points indicated in the PDD (for example, outside the established frequency), Biofílica seeks to understand with Manoa the reason for that. If an unplanned change is identified, the proponents talk about the processes of improvement and adequacy of information for the project, seeking to understand its applicability in the context of the activities proposed in the PDD.

It is important to highlight that this process is not registered as an internal audit, but it is up to Biofílica, together with Manoa, to ensure that the activities and indicators that must be monitored by the project are carried out in accordance with the planning outlined in the PDD. If this does not happen, the changes are recorded in a change tool, where the entire Project history is described and followed up, later, these changes might be recorded as deviations. All changes identified and recorded in this tool in the current monitoring period were shared with the VVB.

These procedures aim for the constant improvement of the project, focusing on maintaining the good practices planned at the beginning of the project and, if necessary, making changes and/or adaptations to the local reality.

4.3.3 Monitoring Plan for Climate Impacts

The Climate Impact Monitoring Plan contains the essential aspects for showing the reduction of emissions from deforestation and degradation due to avoided unplanned deforestation (according to the applied methodology VM0015). As such, it allows monitoring the changes in carbon stocks over the lifetime of the project resulting from land use changes within the project area and leakage belt.

The Project Climate Impact Monitoring Plan comprises two tasks: (1) Monitoring carbon stock changes and GHG emissions for periodic checks; and (2) Revisiting baseline projections related to fixed future baseline periods. During this monitoring period, only Task 1 was performed and is detailed below.

TASK 1: MONITORING CHANGES IN CARBON STOCKS AND GHG EMISSIONS FOR PERIODIC VERIFICATIONS

1. Monitoring actual changes in carbon stocks and GHG emissions within the Project Area

a) Technical description of monitoring tasks

The monitoring of carbon stock changes and GHG emissions was carried out through the analysis of avoided unplanned deforestation and planned deforestation (Table 9).

Biofílica Ambipar Environment acted in monitoring REDD+ activities by locating the areas of unplanned deforestation, through verification of areas of forest cover by satellite images available from the PRODES Project and SAD, in the period from 2021 to 2022, as described in the section 3.1.1.

The field checking of the deforestation polygons detected by the satellite image analyses was done by Manoa's property surveillance team, as described in Section 3.1.2. In addition, Manoa conducts deforestation analyses during the dry season (for more details see Section 3.1.1), the period of highest deforestation in the region, for better targeting the surveillance team.

b) Data to collect

Table 9. Data collected to monitor changes in carbon stock and GHG emissions for periodic verification in the Project Area.

Parameter	Description	Unit	Source	Frequency	MR Section
$Ctot_{icl}$	Average carbon stock for all carbon pools in the forest class *icl*	Ton of carbon dioxide equivalent (tCO2e.ha-1)	Calculated by allometric equations and field measured data.	Collected in periods of up to 10 years	4.1, Ctot parameter
$APDPA_{icl,t}$	Areas of Planned deforestation in forest class *icl* at year t in the Project Area	Hectare (ha)	Calculated using remote sensing images, technical maps and data, field and post-exploitation management information	Annual	4.2, Planned deforestation for forest management infrastructure parameter
$\Delta CPLdPA_t$	Total decrease in carbon stock due to planned logging activities in year t in the Project Area.	Ton of carbon dioxide equivalent (tCO2-e)	Calculated	Annual	5.2.1 and 4.2
$ACPA_{icl,t}$	Annual area within the Project Area affected by catastrophic events in forest class *icl* at year *t*	Hectare (ha)	Calculated using remote sensing images	Each time a catastrophic event occurs	5.2.7 and 4.2
$\Delta CUCdPA_t$	Total decrease in carbon total stock due to catastrophic events in year t in Project Area	Ton of carbon dioxide equivalent (tCO_2-e)	Calculated	Each time a catastrophic event occurs	5.2.7 and 4.2

$\Delta CUFdPA_t$	Total decrease in carbon stock due to unplanned (and planned – where applicable) forest fires in year *t* in the project area	Ton of carbon dioxide equivalent (tCO_2-e)	Calculated	Every time a forest fire event occurs	5.2.7 and 4.2
$\Delta CUDdPA_t$	Total actual carbon stock change due to unavoided unplanned deforestation at year t in the project area	Ton of carbon dioxide equivalent (tCO_2-e)	Calculated	Annual	5.2.6 and 4.2
$\Delta CPSPA_t$	Total project carbon stock change within the project area at year t	Ton of carbon dioxide equivalent (tCO_2-e)	Calculated	Annual	5.4 and 4.2

c) Summarized description of data collection procedures

Monitoring of land use and land cover changes

Monitoring of unplanned deforestation in the Project Area was based on data processed by the PRODES project, identifying areas of land use conversion and complemented by SAD for the period when PRODES was not available. The procedures performed for data collection and processing were described in Section 3.1.1 of this document.

The monitoring of planned deforestation caused by forest management activities used information contained in maps and shapefiles for the planning of roads and trails, post-exploitation monitoring reports of the managed areas, as well as information from the planning of yards (quantity and average size) installed per UPA, for the respective years monitored.

Monitoring of carbon stocks and non-CO2 emissions

According to VM0015 (p. 107), in forest management areas the monitoring of carbon stocks is mandatory if the areas are subject to a significant reduction of carbon stock in the project scenario, in relation to the ex-ante assessment.

Carbon stock monitoring is carried out through forest inventory, measuring the diameter at breast height (DBH = 130 cm), for each tree with DBH greater than or equal to 10 centimeters within the forest inventory plots. DBH is the main variable used to estimate carbon stock and carbon stock changes in the Manoa REDD+ project.

As the management carried out is of low impact (item better described in Section 5.2.3), not causing the opening of the forest canopy, the impact caused by logging was considered not relevant and,

because of this, the monitoring was not renewed, keeping the value used at the beginning of the project and in previous verifications.

The monitoring of non-CO2 emissions from forest fires is done through satellite image mapping, identifying the affected area, and calculations described in VM0015 (Section 6.2 - Baseline non-CO2 emissions from forest fires), and the methods applied in this monitored period as well as the results obtained are described in detail below.

d) Quality control and assurance procedures

Monitoring of land use and land cover changes

In order to validate the information obtained from the PRODES and SAD mapping, the mapped information on the occurrence of deforestation was checked through high resolution images from Planet's Dove satellite, with 4.77 m spatial resolution, and data collected at the field with a navigation GPS so as to corroborate with the information obtained by the satellite images (see Section 3.1.1). Thus, field checks and surveillance reports were considered validation tools for the deforestation areas identified by PRODES.

Another methodology employed for validation is the achievement of accuracy. The minimum accuracy in land use and land cover classification is 80%. The analysis was done using the Planet satellite image, and the description of the accuracy method is contained in item 3.1.1 of this document.

Monitoring carbon stocks and non-CO2 emissions

The procedure of control and quality assurance of the forest management is conducted by Manoa at the phases of pre-harvest inventory, during and after harvest. In the pre-harvest inventory, the entire UPA that will be exploited is covered in parallel strips duly identified in the field, at a distance of 50 m from each other and an inventory is made of 100% of the individuals, as reported in the general procedure's manual. All merchantable trees with a DBH greater than or equal to 50 cm, and all trees intended for future harvesting with DBH between 35cm and 50cm, are measured. In addition, the efficiency of individuals for future harvesting is characterized, considering the presence or absence of pests and diseases, a good conformation of the canopy, etc. After harvesting, the impacts are assessed in detail as described in Appendix 2 of this report.

The original reports and field sheets are accessed by Biofílica, which seeks to maintain a copy of these documents along the project life cycle. Spreadsheets and reports of inventory and monitoring of the permanent plots are made available to the verifying body at each verification event.

e) Data Archiving

Biofílica Ambipar Environment keeps all data and reports from the Manoa REDD+ Project stored in digital files throughout the Project duration period. The original reports and collected field sheets produced by the property security activity are stored by Manoa. All documents related to monitoring of the Manoa REDD+ Project are compiled in paper and/or digital files and made available to verifiers at each verification event.

1.1.Project Implementation Monitoring

The main actions contemplated for the "climate" component of the Manoa REDD+ Project are the monitoring of deforestation by satellite images and generation of annual bulletins and image maps, property surveillance, and low impact forest management.

The first three are essential for maintaining and increasing carbon stocks by reducing emissions from deforestation and forest degradation. Low impact forest management, on the other hand, aims to ensure that there is a source of income from forest exploitation using sustainable practices, consequently contributing to the reduction of impacts and to the maintenance of forest cover and high value attributes for conservation.

The implementation of the project activities is monitored through physical/financial schedules, performance and quality monitoring reports, such as the post-exploitation reports of each UPA and the monitoring reports of the forest management area, forest cover maps, meeting reports, surveillance patrol reports as well as other possible relevant documents.

1.2.Monitoring of land use and land cover changes within the Project Area

The monitoring of unplanned deforestation was developed by mapping the forest cover of the Project area, which data are annually provided by PRODES and SAD. Subsequently, the mapping was validated from the accuracy assessment with Planet satellite imagery as described in Section 3.1.1.

The monitoring of land use and land cover changes within the Project Area was also supported by the activities carried out by the property surveillance team, as indicated in Section 3.1.2.

Low impact forest management activity is carried out by Manoa Sustentável, Exploração e Serviços Florestais following strictly the monitored norms, laws, and operating procedures in order to cause the least possible impact during logging activities to the social and environmental well-being. To monitor the activity and the related indicators "Planned Deforestation for Forest Management Infrastructure" and "Assessment of Harvest Damages", presented in section 4.2, the following were analyzed: annual operational plans of each harvested UPA in the verified period, the post-exploitation reports and the monitoring reports of the forest management area, maps, and satellite images containing the information about the areas of forest cover converted to the non-forest class.

The data on deforestation events were compared to the baseline scenario, and the emission reduction values for the monitored period were based on the comparison between predicted and actual deforestation.

1.3.Monitoring Changes in Carbon Stock

Within the Project Area

Although the ex-ante estimate of carbon stock by forest class was not expected to change during the baseline period, the VCS VM0015 Methodology calls for monitoring of carbon stock within the Project Area as it is subject to significant reduction in carbon stock under the project scenario – in connection with the ex-ante assessment. This reduction can occur in areas subject to planned deforestation from planned forest management activities or in areas subject to unplanned depletion of carbon stock, such as in cases of catastrophic events or forest fires.

The total change in carbon stock due to unavoided unplanned deforestation within the project area is calculated as follows:

$$\Delta \text{CUDdPA}_t = \sum_{y=1}^{t} \left(\sum_{icl=1}^{icl} AUDPA_{icl,y} * \Delta Ctot_{icl,t-y} - \sum_{fcl=1}^{fcl} AUDPA_{fcl,y} * \Delta Ctot_{fcl,t-y} \right) \quad (1)$$

Where:

ΔCUDdPAt: Carbon stock total changes due to unavoided unplanned deforestation in Project Area in year *t*.

AUDPAicl,y: Unplanned deforested area in initial forest class *icl* in year *t* within the Project Area in the Project scenario;

ΔCtoticl,Ac: Loss of carbon stock in the initial forest class icl at the age of change Ac (number of years after the change of use and soil cover);

AUDPAfcl,y: Post deforestation non forest class area fcl in year t in the Project Area after unplanned deforestation in the Project scenario;

ΔCtotfcl,Ac: Gain of carbon stock in final post deforestation non-forest class fcl at the age of change Ac (number of years upon change of soil use and soil cover).

If there is a significant reduction in carbon stock due to sustainable forest management activities, this reduction will be reported in the verification processes by means of Table 29 of the VCS VM0015 Methodology, version 1.1.

Within the Leakage Management Areas

Under the Project scenario, no areas are subject to planned carbon stock decrease within the Leakage Management Areas.

Ex-post estimation of non-CO2 emissions due to forest fires

Emissions due to biomass burning are not computed in this project. According to Methodology VM0015, non-CO2 emissions can be conservatively omitted since, as demonstrated by scientific research, the occurrence of natural fires is rare in the Amazon region, with anthropogenic fires related to human occupation prevailing (SCHROEDER et al, 2009[28]). Furthermore, besides the project not including or encouraging activities associated with fire, it promotes mitigation actions against deforestation caused by these agents, both by strengthening the property surveillance and monitoring the farm areas. Another mitigation measure is based on the training of fire brigades for forest management employees.

However, in 2021, within the monitoring period of this document, there were three fire records in the project area, which occurrences were due to fires started in surrounding deforested areas as described in Section 3.1.2. To check how much of the project area was affected by fire, additional analysis was done with secondary data from monitoring databases, focusing on the areas pointed out by Manoa as impacted (see section 3.1.2).

This analysis was split into 4 parts, data were initially collected from DETER[29] (Deforestation Detection in Real Time), a platform coordinated by INPE which presents, among other classes, data of forest fire scars. The survey with DETER data aimed to identify additional areas to what was indicated by Manoa, which could have been impacted by the burning of vegetation. No fire scars were found within the project area on the dates close to the identified fire outbreaks, as well as in periods after the fire the DETER kept not identifying areas of scar caused by fire.

Since DETER did not identify areas of burning, in the second part of the analysis, the PRODES monitoring data published in 2021 were used to verify if the deforestation that was already identified within the Project Area was related to these impacted areas, and this analysis was done by overlapping the geographic data. Polygons classed as deforestation were found for the three reported fire events, as represented in Figure 30 and Figure 31. The area of these deforestation polygons was 0.775ha for fire incident 1, 0.633ha for fire incident 2, and 1.218ha for fire incident 3, totaling 2.626ha of deforestation due to fires in the project area.

[28] SCHROEDER, W. et al. **The Spatial Distribution and Interannual Variability of Fire in Amazonia**. Amazonia and Global Change, v. 186, p. 43 60, 20 09.

[29] Sistema de Detecção do Desmatamento na Amazônia Legal em Tempo Real (DETER). Available at: http://www.obt.inpe.br/OBT/assuntos/programas/amazonia/deter/deter. Access on: July 6, 2023.

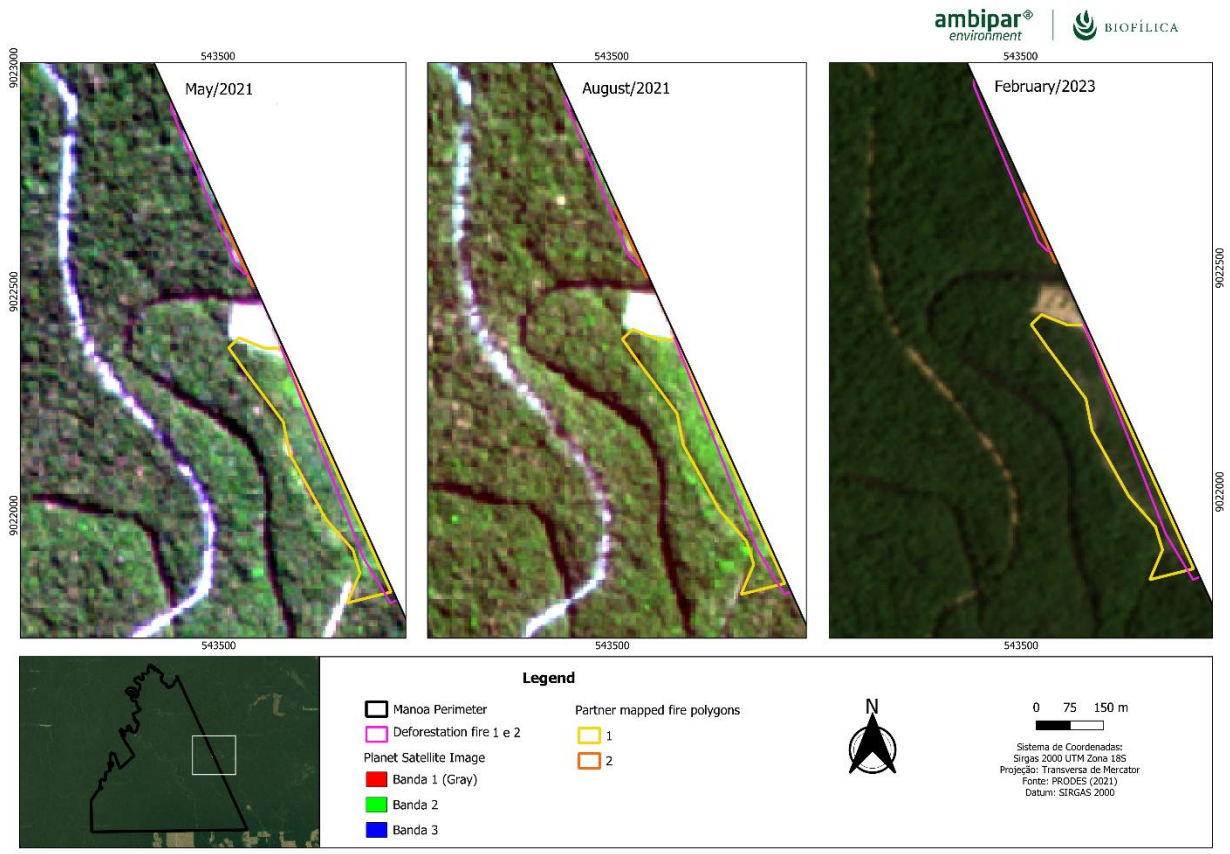


Figure 30. Affected area polygon prepared by Manoa with the deforestation polygons registered by PRODES 2021, for the fires on 08/24/2021 and 08/25/2021, treated in this report and in the additional documents as "Fire incident 1" (corresponding to the yellow polygon 1 in the figure) and "Fire incident 2" (corresponding to orange polygon 2 in the figure) respectively.

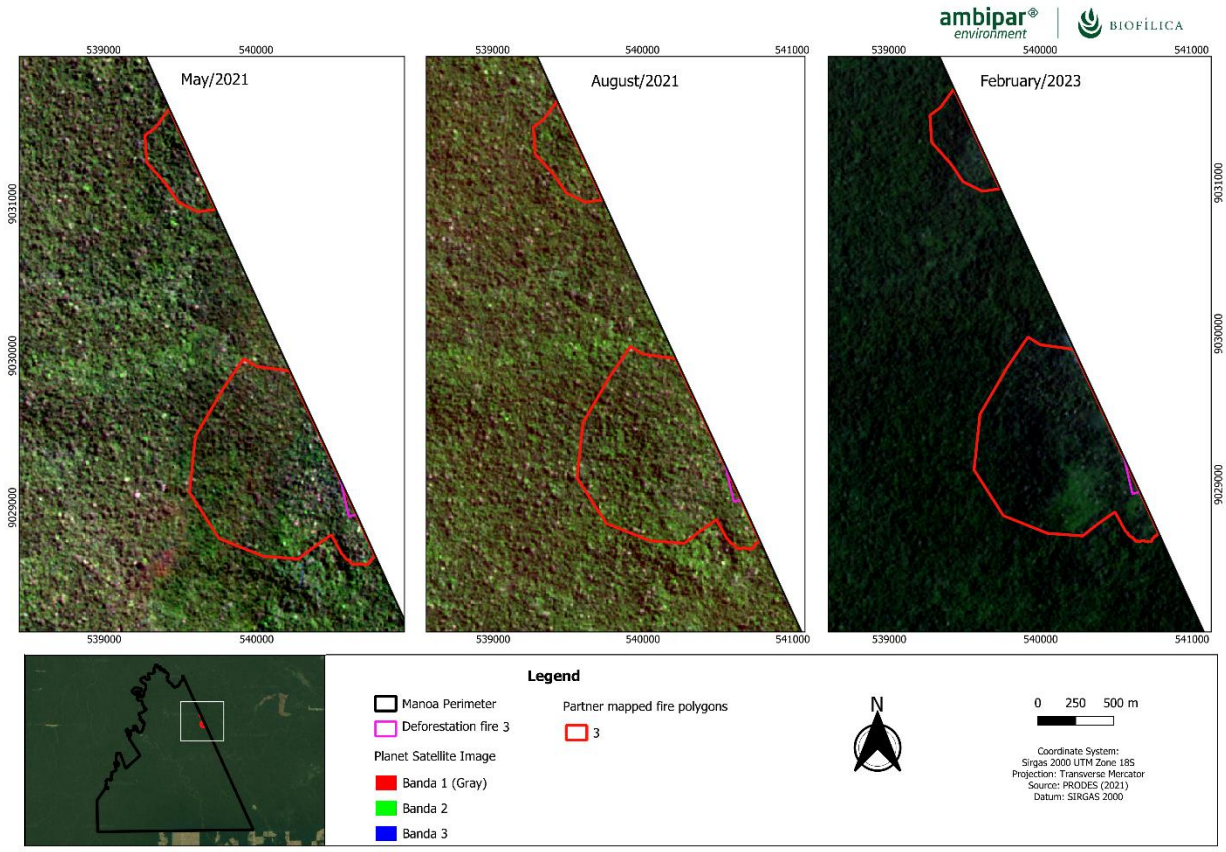


Figure 31. Affected area polygon prepared by Manoa with the deforestation polygons registered by PRODES 2021, for the fire on 10/08/2021, treated in this report and in the additional documents as "Fire incident 3".

It is important to emphasize that, for this monitoring report, the calculation of the project emissions was made based on PRODES data published in 2022, the most recent year in the database, and for this reason the values presented in the fire analysis had a divergence of 0.55 hectares from what was indicated in the areas of unavoided unplanned deforestation in the project. This occurs because the proponents -- as the people responsible for monitoring the areas and who understand the dynamics of the PRODES database -- see it as a conservative measure to use the most current deforestation data to be able to collect information from the entire period and consequently generate the emissions avoided by the project.

In addition, to ensure that all the affected area was accounted for, the third part of the analysis involved Planet Explorer[30] online tool, that provides images from satellites PlanetScope, SkySat, RapidEye, Sentinel-2 and Landsat-8. From that, high resolution images were used to identify possible fire damage in the areas affected. This analysis found more areas affected by fire incident 1 and fire incident 3, as exhibit in Figure 32 and Figure 33.

[30] Planet Explorer. Available at: https://developers.planet.com/docs/apps/explorer/. Access on: August 21, 2023.

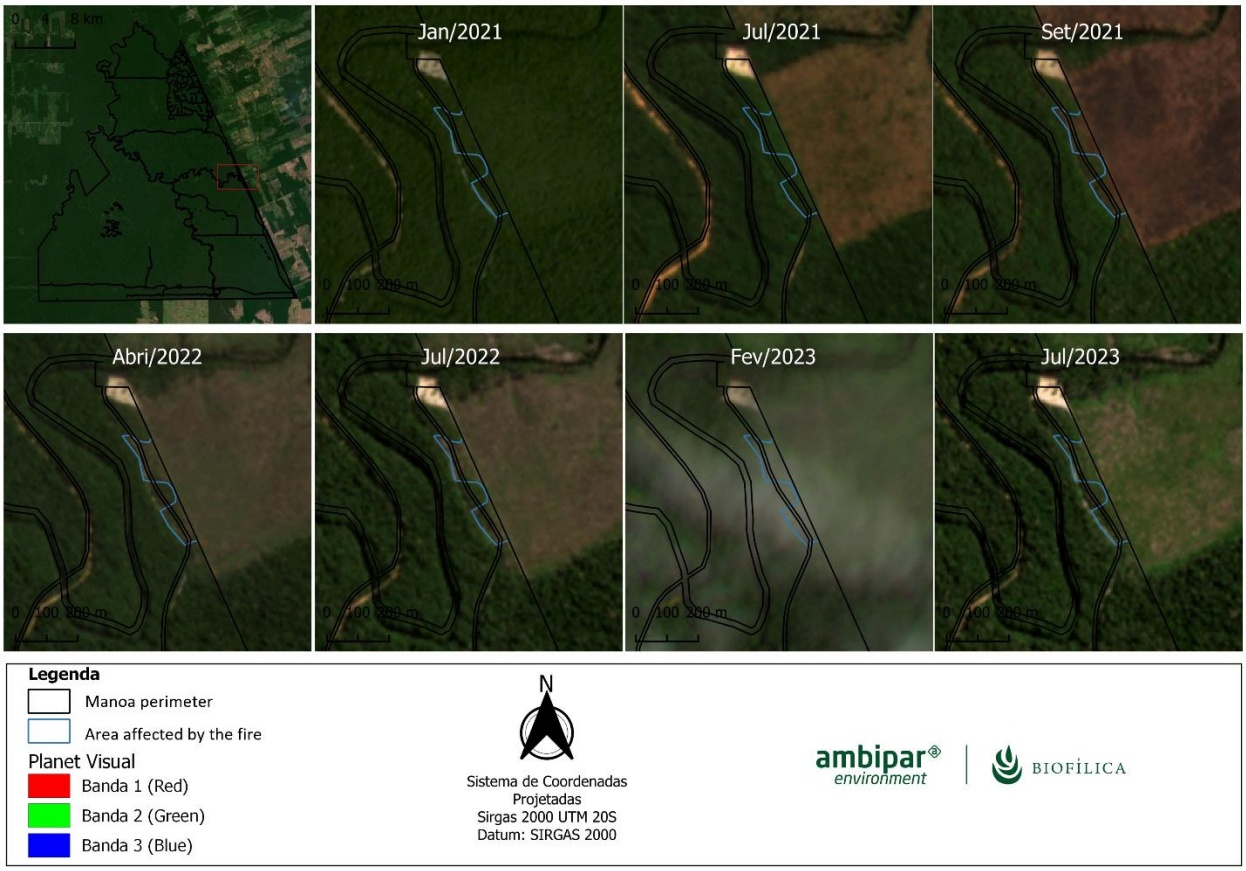


Figure 32. Satellite images analysis of the fire on 08/25/2021, treated in this report and in the additional documents as "Fire incident 1", before (Jan and Jul/2021), recently after (Set/2021) and months after the event (Abril/2022, Jul/2022, Fev/2023 and Jul/2023).

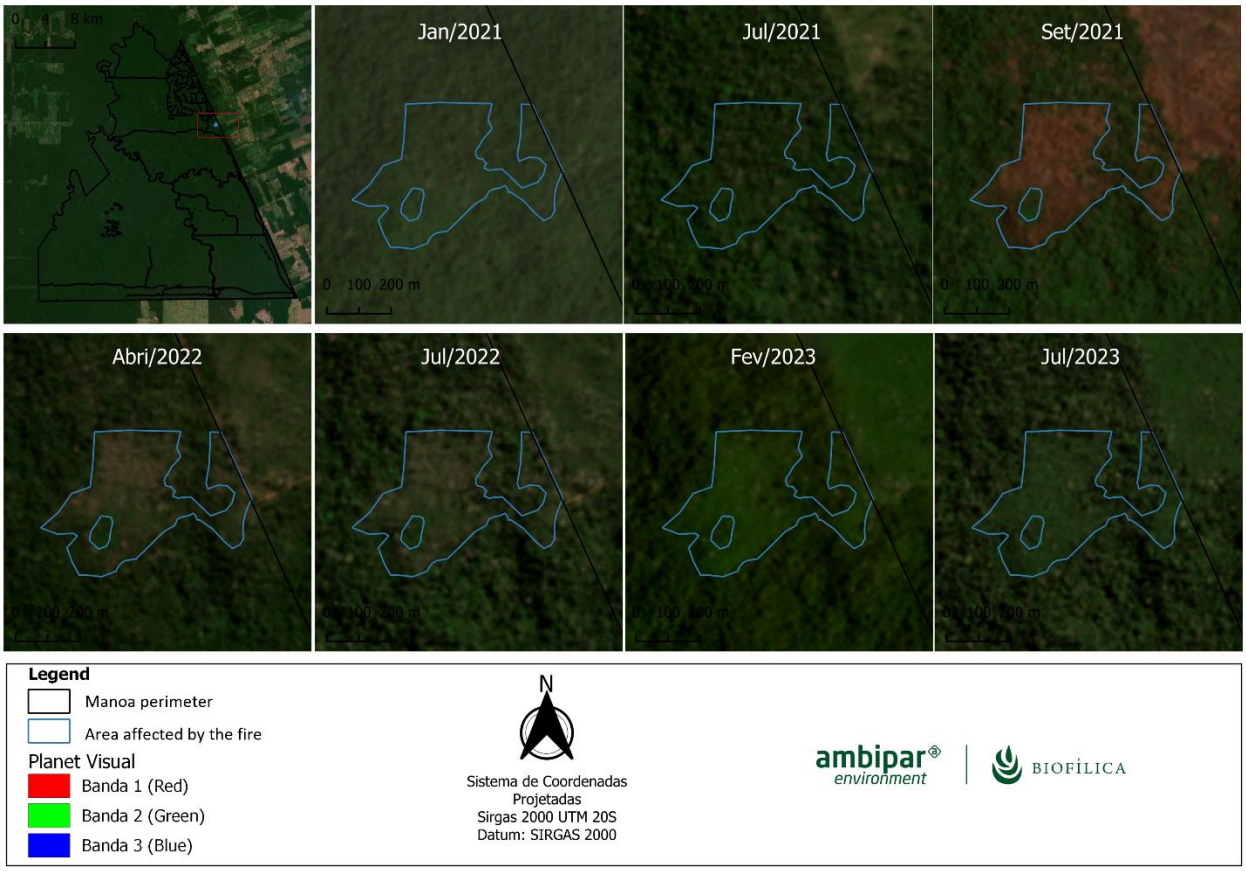


Figure 33. Satellite images analysis of the fire on 10/08/2021, treated in this report and in the additional documents as "Fire incident 3", before (Jan and Jul/2021), recently after (Set/2021) and months after the event (Abril/2022, Jul/2022, Fev/2023 and Jul/2023).

From this analysis is also possible to identify the moment the fire incident 3 occurred more precisely. Manoa surveillance team noticed the fire occurrence in October 08 (see section 3.1.2), however, images from September 26 (Figure 33) show that the fire had already occurred. The recent improvement in the project activities related to forest fire monitoring (see sections 3.1.1 and 3.2.2.2) should expedite mitigation measures and keep the project area safer.

Finally the last part of the analysis involved the NDVI (Normalized Difference Vegetation Index) calculation for additional verification of possible damage and biomass loss in the affected areas. The NDVI is calculated from the difference between the reflectances of the near infrared (NIR) and the visible light (RED) bands, divided by the sum of the reflectances of these two bands, as the following equation:

$$NDVI = (NIR - RED)/(NIR + RED) \quad (2)$$

Where:

NDVI = Normalized Difference Vegetation Index

NIR = Near-infrared Reflectance

RED = Red Reflectance

The result is a raster image that displays values ranging from -1 to 1, so that areas that are closer to 1 indicate greater health of the vegetation, while values closer to -1 indicate the presence of bare soil in degraded areas (MEDEIROS, 2013[31]) or, in this case, the confirmation of degradation occurrence by fire.

First the NDVI analysis was done for the areas considered deforested by PRODES 2021, on different dates, to observe the state of the region before and after the reported fires (Figure 34, Figure 35 and Figure 36).

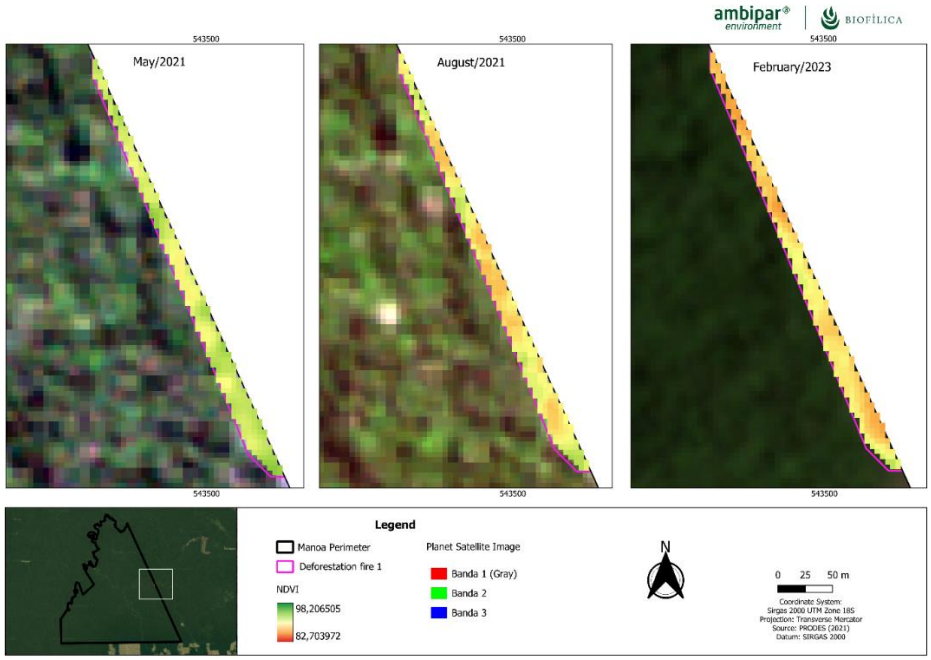


Figure 34. NDVI analysis on different dates for areas considered deforested by PRODES 2021 within or near the polygon prepared by Manoa referring to fire incident 1 (08/24/2021).

[31] MEDEIROS, A. How to Calculate NDVI on the QGIS. In: MEDEIROS, Anderson. How to Calculate NDVI On the QGIS ClickGeo, s.a. Available at: https://clickgeo.com.br/qgis-fazer-ndvi/. Access on: August 21, 2021.

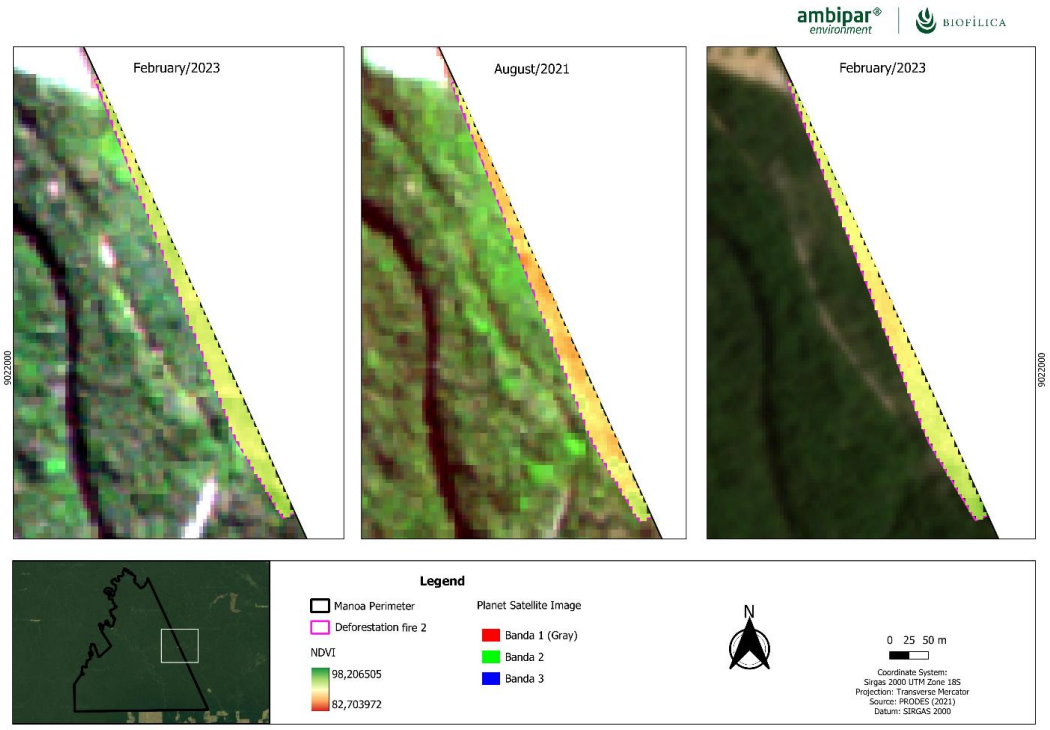


Figure 35. NDVI analysis on different dates for areas considered deforested by PRODES 2021 within or near the polygon prepared by Manoa referring to fire incident 2 (8/25/2021).

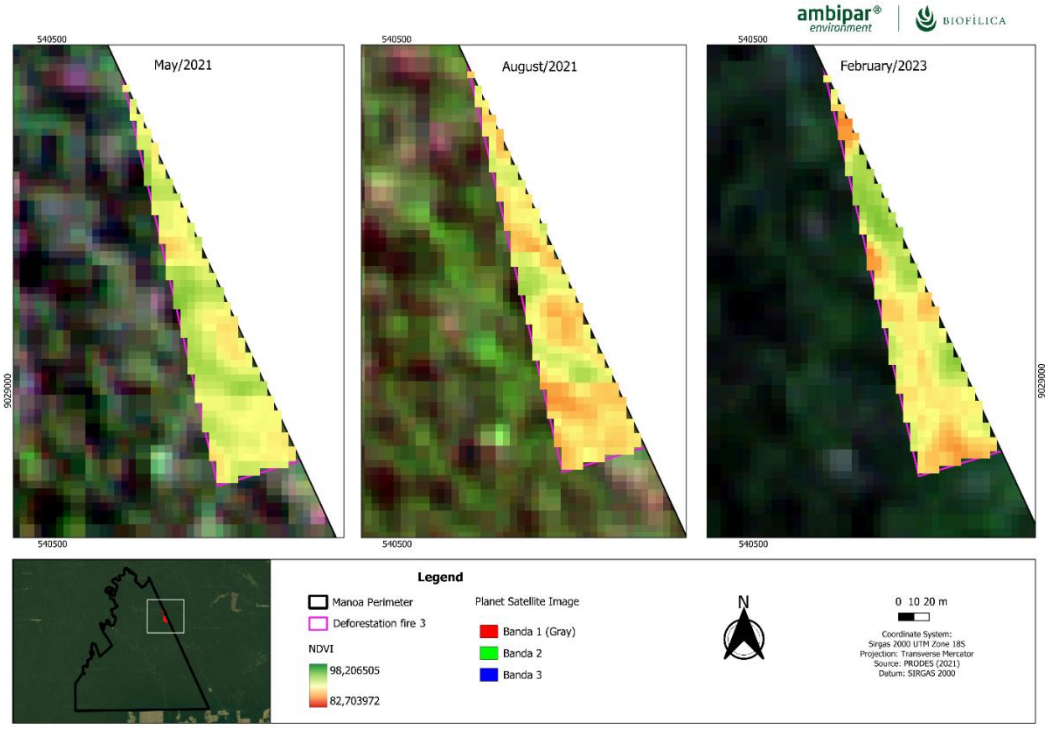


Figure 36. NDVI analysis on different dates for areas considered deforested by PRODES 2021 within or near the polygon prepared by Manoa referring to fire incident 3 (10/8/2021).

In the areas affected by fire incidents 2 and 3 (Figure 35 and Figure 36) it is possible to verify regions near or above 0, showing that the damage caused by the fires was not so severe and the vegetation already shows signs of recovery. The area affected by fire incident 1 (Figure 34) also presents areas close to 0, in the NDVI analysis, although in smaller proportion than the areas of fires 2 and 3, and presents regions close to 1 in an even smaller proportion. In Figure 43 there is a recent photographic record of a region affected by the fire.

Then, the analysis was done for the entire area affected by the fire incident 1 and 3, so the affected polygon could be estimated and to verify the signs of vegetation recovery Figure 37 and Figure 38.

Figure 37. NDVI analysis of the fire on 08/25/2021, treated in this report and in the additional documents as "Fire incident 1", before (Jan and Jul/2021), recently after (Set/2021) and months after the event (Abril/2022, Jul/2022, Fev/2023 and Jul/2023).

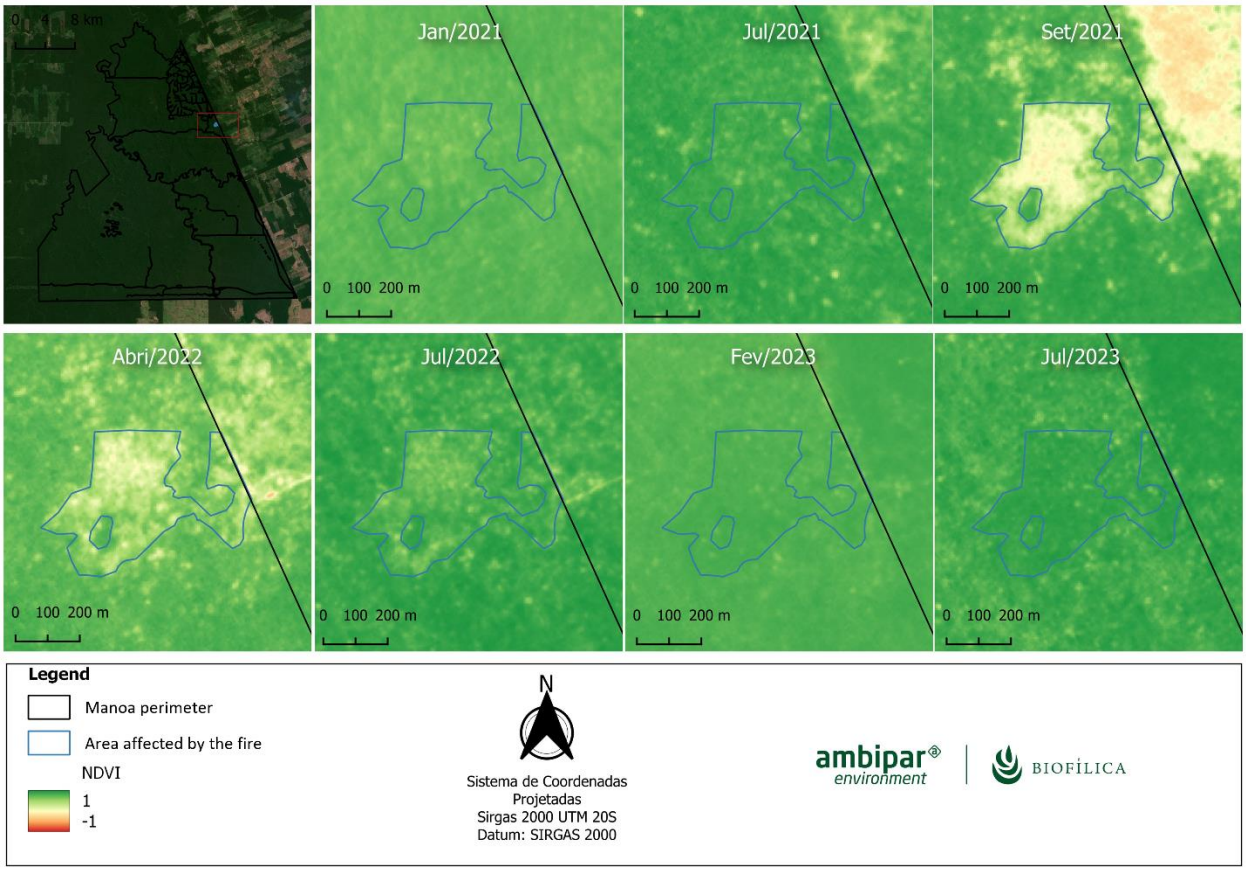


Figure 38. NDVI analysis of the fire on 10/08/2021, treated in this report and in the additional documents as "Fire incident 3", before (Jan and Jul/2021), recently after (Set/2021) and months after the event (Abril/2022, Jul/2022, Fev/2023 and Jul/2023).

To better identify the area affected in fire incidents 1 and 3 an additional NDVI analysis was used. First the NDVI pixel values before the fire were subtracted from the NDVI pixel of after the fire (Figure 39 and Figure 41). The result was a raster file with only area that was in fact burned (ΔNDVI)[32]. After that the difference between months after the fire and right after the fire were calculated, resulting in the regenerating area (Figure 40 and Figure 42). The affected and regenerating rasters enabled the delimitation of the affected polygons.

[32] LEAL, Fabrício Assis et al. Utilização do NDVI na análise da vegetação após ocorrência de incêndio. Nativa, v. 7, n. 2, p. 226-231, 2019.

Figure 39. NDVI difference calculated for fire incident 1, considering the subtraction between the pixels values from September 2021 and July 2021 (after and before the fire).

Figure 40. NDVI difference calculated for fire incident 1, considering the subtraction between the pixels values from July 2022 and September 2021 (months after the fire and right after the fire).

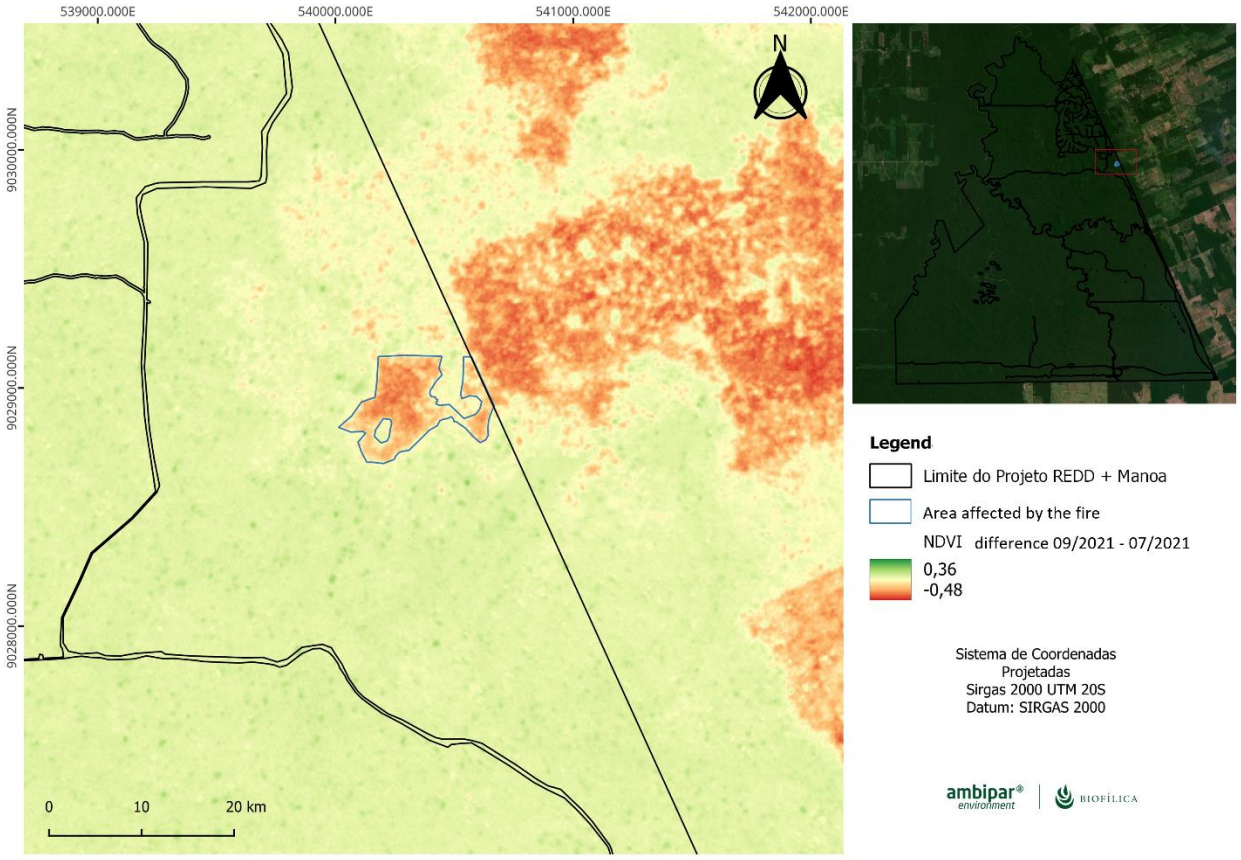


Figure 41. NDVI difference calculated for fire incident 3, considering the subtraction between the pixels values from September 2021 and July 2021 (after and before the fire).

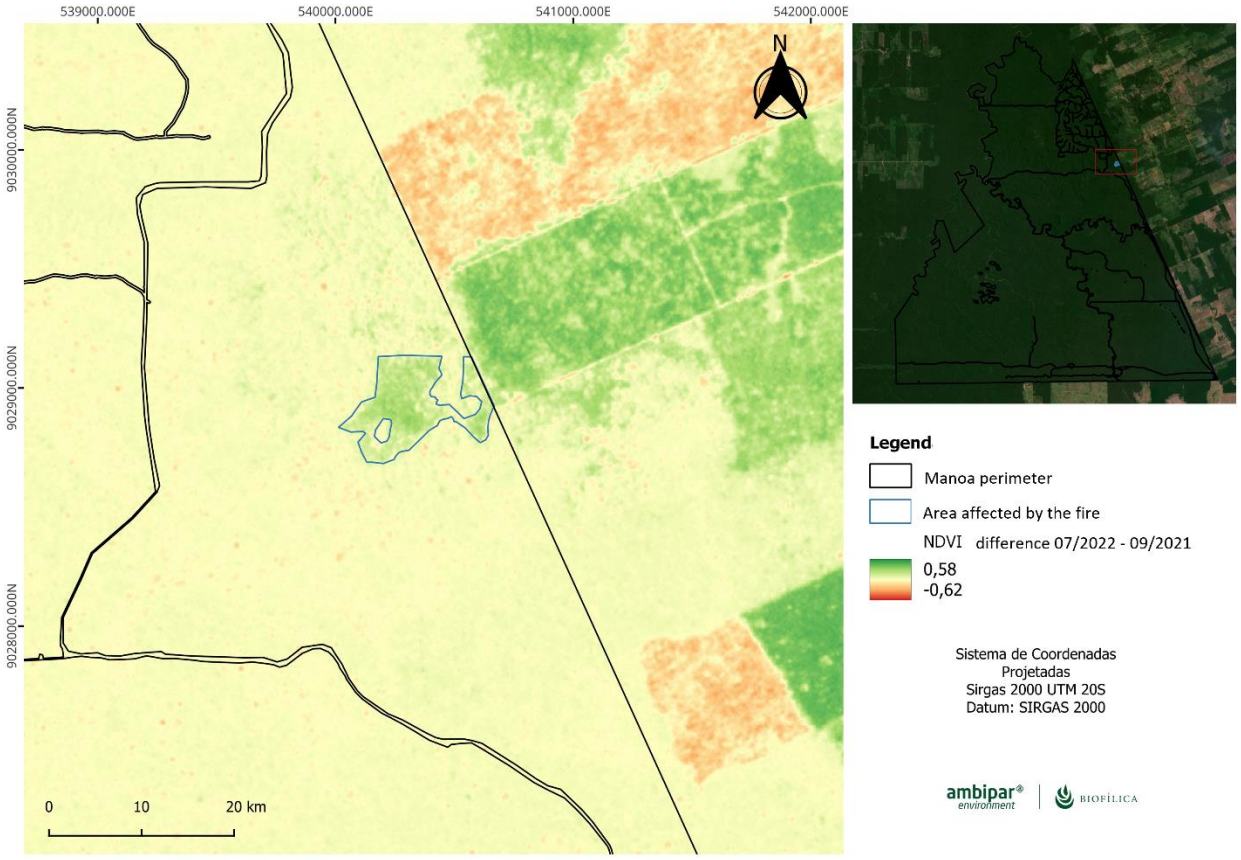


Figure 42. NDVI difference calculated for fire incident 3, considering the subtraction between the pixels values from July 2022 and September 2021 (months after the fire and right after the fire).

The satellite images and the NDVI analysis of fire incidents 1 and 3 showed vegetation loss of 1.93ha and 14.76ha respectively. The sum of all the affected areas identified in the different analysis resulted in 19.32ha.

Through the detailed analysis of the PRODES data, satellite images and the NDVI analysis it is possible to conclude that the areas affected by the registered fires that actually resulted in the loss of carbon stock are smaller than the areas pointed out by Manoa in the simple analysis carried out initially, and that part of the damaged regions already show signs of improvement.

It is important to highlight that since the identification of this impact on the forest Manoa's surveillance teams have defined these areas as priority for monitoring, carrying out constant checks, both to prevent the repetition of new outbreaks of fire, and to conduct the regeneration of the affected area. More details about these activities can be found in section 3.1.2.

a)

b)

Figure 43. a) - Photo on the left taken in February 2023 near "Casa do Curica" on the border affected by the fire incident 1. On the left side of the image there is an area outside the project area, on the right side, an area within the Manoa boundary. b) - Photo on the right was taken in august 2023 in the area affected by the fire incident 3.

Thus, to analyze the significance of these impacted areas, the non-CO_2 emissions associated with the 19.32 hectares identified were initially calculated. After the significance analysis if the value found was greater than 5%, the values of emissions caused by unavoided unplanned deforestation would be subtracted by the value of emissions caused by the loss of forest biomass caused by fire; therefore, we understand that a double count of emissions for the project would be avoided.

The value found in the significance analysis of these emissions was 0.05%, which can be considered as not significant (>5%), thus, the emissions from these affected areas were not incorporated into the calculations for the monitored period. The calculating significance spreadsheet, shared with VVB, used the formulas presented in Section 6.2 of VM0015, version 1.1.

$$EBBtot_{icl,t} = EBBN2O_{icl,t} + EBBCH4_{icl,t} \quad (3)$$

Where:

EBBtoticl,t: Total GHG emissions from biomass burning in forest class icl in year t (tCO2-e.ha-1);

$EBBN_2O_{icl,t}$: N2O emissions from biomass burning in the icl forest class in year t ($tCO2_{2\text{-}e.ha\text{-}1}$);

$EBBCH_{4icl,t}$: CH4 emissions from biomass burning in the icl forest class in year t ($tCO2_{2\text{-}e.ha\text{-}1}$);

$$EBBN2O_{icl,t} = EBBCO2_{icl,t} * 12/44 * NCR * ER_{N2O} * 44/28 * GWP_{N2O} \quad (4)$$

$$EBBCH4_{icl,t} = EBBCO2_{icl,t} * 12/44 * ER_{CH4} * 16/12 * GWP_{CH4} \quad (5)$$

Where:

$EBBCO_{2icl,t}$: Per hectare CO2 emission from biomass burning in slash and burn in forest class icl at year t; tCO2-e ha-1;

$EBBN_2O_{icl,t}$: Per hectare N2O emission from biomass burning in slash and burn in forest class icl at year t; tCO2-e ha-1;

$EBBCH_{4icl,t}$: Per hectare CH4 emission from biomass burning in slash and burn in forest class icl at year t; tCO2-e ha-1;

NCR: Nitrogen to carbon ratio (IPCC default value = 0.01); dimensionless;

ERN_2O: Emission ratio for N2O (IPCC default value = 0.007);

$ERCH_4$: Emission ratio for CH4 (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);

$$EBBCO2_{icl,t} = Fburnt_{icl} * \sum_{p=1}^{p}(C_{p,icl,t} * Pburnt_{p,icl} * CE_{p,icl}) \quad (6)$$

Where:

$EBBCO_{2icl,t}$: Per hectare CO2 emission from biomass burning in the forest class icl at year t; tCO2-e ha-1;

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; tCO2-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, ...lcl (pre-deforestation) forest classes;

t: 1, 2, 3, ... t, year of the proposed project crediting period; dimensionless.

Monitoring of natural disturbance impacts and other catastrophic events

Losses in carbon stock and increases in GHG emissions due to natural disturbances or catastrophic events, if any, would be controlled through satellite monitoring of forest cover using the same methods applied for forest cover monitoring in the Project Area.

The main activities to be developed for data collection and processing are:

- Selection of optical satellite images with less cloud cover, taken at times close to the Amazon dry season and with improper radiometric quality;

- Georeferencing of the satellite images with topographic charts at a scale of 1:100,000 or NASA images in MrSID in orthorectified format;

- Mapping affected forest cover areas.

During this monitoring period no significant reduction in carbon stock due to natural disturbances or catastrophic events was identified. If there were, emissions derived from natural disturbances or catastrophic events were estimated by multiplying the area of mapped forest loss by the average forest carbon stock.

2. Leakage Monitoring

a) Technical description of monitoring tasks

The Manoa REDD+ Project involves two leakage source monitoring activities:

- Monitoring the reduction in carbon stocks and/or increase in GHG emissions correlated with leakage prevention measures if Project proponents implement activities such as tree planting, agricultural intensification, fertilization, forage production and/or other improvement measures in agricultural and pasture areas.

In case these activities imply a reduction in carbon stocks and/or an increase in GHG emissions in the leakage management areas, these changes in carbon stocks and/or GHG emissions will be calculated by the Biofilica Ambipar Environment's technical team.

During the monitored period the project proponents did not carry out any of the mentioned interventions. Therefore, changes in carbon stock and GHG emissions associated with prevention activities and leakage were not accounted for.

- Monitoring of forest cover in the Leakage Belt using satellite images, carried out by Biofilica Ambipar Environmental Investments. Monitoring of forest cover in the Leakage Belt was carried out using satellite images from the PRODES program to account for the reduction in carbon stock and the increase in GHG emissions due to leakage displacements.

b) Data to be collected

Table 10. Data collected for monitoring the Manoa REDD+ Project leak.

Data/Parameter	Description	Unit	Source	Frequency	MR Section
$\Delta CabBSLLK_t$	Total changes in the carbon stock in the leak belt area	Ton of carbon dioxide equivalent (tCO2-e)	Calculated	Annual	4.2, ΔCabBSLLKt parameter

c) Summarized description of data collection procedures

Monitoring of carbon stock and GHG emission changes associated with leakage prevention activities

No reductions in carbon stocks due to activities in the leakage management area occurred, as no activities to improve agricultural techniques or grazing land management that could alter carbon stocks and increase GHG emissions compared to the baseline scenario were implemented during this monitoring period.

However, if decided that these activities are necessary, the ex-ante carbon stock changes and GHG emissions associated with these activities would be estimated through Step 8 of the VM0015 methodology, and if significant, would be monitored and data provided to verifiers at each verification event through tables 30b, 30c, 31, 32 and 33 of the VM0015 methodology, version 1.1.

In the event that leakage prevention activities are implemented in the Leakage Management Area, some major activities will be undertaken to collect and process data to monitor carbon stock changes:

- Leakage prevention activities will be listed;
- A map showing the areas and type of intervention will be prepared;
- Areas where leakage prevention activities impact carbon stock will be identified;
- Non-forest classes existing within these areas in the baseline case will be identified;
- Carbon stocks will be measured in the identified classes or conservative literature estimates will be used;
- Changes in carbon stock in the leakage management areas under the project scenario will be reported using table 30b of VM0015;
- The changes in net carbon stock that the leakage prevention measures cause during the fixed baseline period and optionally the project crediting period will be calculated;
- The results of the calculations will be reported in table 30.c of VM0015.

Monitoring the reduction of carbon stock and increase in GHG emissions due to leakage displacement

Activity data for the Leakage Belt area were determined using the same methods applied to monitoring deforestation in the Project Area (section 1.2).

If during the monitoring process a deforestation event greater than expected for the baseline scenario is identified in the Leakage Belt (this was not the case during this monitoring period), and such deforestation is attributed to the deforestation agents in the Project Area, the carbon stock losses will be accounted for and reported using Tables 22c and 21d of the approved methodology VM0015, version 1.1.

d) Quality control and assurance procedures

Monitoring of carbon stock and GHG emission changes associated with leakage prevention activities

Would be determined according to the activity if implemented, however, no leakage prevention activities were implemented during this monitoring period.

Monitoring of carbon stock decrease and increased GHG emissions due to leakage displacement

The quality control and quality assurance procedures were the same as those applied to the deforestation monitoring in the Project Area (item 1).

e) Data Archiving

Biofílica Ambipar Environment keeps all data and reports from the Manoa REDD+ Project stored in digital files throughout the Project duration period. The original reports and collected field sheets produced by the property security activity are stored by Manoa. All documents related to monitoring of the Manoa REDD+ Project are compiled in paper and/or digital files and made available to verifiers at each verification event.

2.1. Monitoring changes in carbon stock and GHG emissions associated with leakage prevention activities

There was no decrease in carbon stocks associated with activities undertaken in the Leakage Management Areas, as no activities to improve agricultural techniques or grazing land management that could alter carbon stocks and increase GHG emissions compared to the baseline scenario were implemented during this monitoring period.

However, if decided that these activities were necessary, the ex-ante carbon stock changes and GHG emissions associated with these activities would be estimated through Step 8 of the VM0015 methodology. If significant, the activities and associated emissions will be monitored and the data will be made available to verifiers through tables 30b, 30c, 31, 32 and 33 of VM0015, version 1.1.

The following activities that could cause a reduction in carbon stock or an increase in GHG emissions in Leakage Management Areas are:

- Changes in carbon stock due to activities implemented in the Leakage Management Areas;

- Methane (CH4) and nitrous oxide (N2O) emissions derived from livestock intensification (involving changes in animal diet and/or number of animals).

Nitrous oxide (N2O) emissions from nitrogen fertilization are always considered insignificant, according to the most recent version of the VCS-VM0015 standard. Consumption of fossil fuels is always considered insignificant in the AUD of the project activities and should not be considered.

Furthermore, as noted above, no activities were performed that would cause a significant increase in CH4 and N2O emissions. Thus, Tables 31 and 32 of VM0015 were not applied.

2.2 Monitoring the reduction of carbon stock and increase in GHG emissions due to leakage displacement

Activity data for the Leakage Belt area were determined by the same methods as applied to monitoring deforestation in the Project Area (item 1).

No deforestation event greater than expected for the baseline scenario were identified within the Leakage Belt. However, if during the monitoring process a deforestation event larger than expected in the baseline scenario is identified in the Leakage Belt, and such deforestation is attributed to the deforestation agents in the project area, the losses in carbon stock will be accounted and reported using Tables 22c and 21c of the approved Methodology VM0015. No such situation was identified in the Leakage Belt during the monitoring period.

The total change in carbon stock due to unavoided unplanned deforestation within the Leakage Belt area was calculated as follows:

$$\Delta CBSLLK_t = \sum_{y=1}^{t} \left(\sum_{icl=1}^{icl} AUDLK_{icl,y} * \Delta Ctot_{icl,t-y} - \sum_{fcl=1}^{fcl} AUDLK_{fcl,y} * \Delta Ctot_{fcl,t-y} \right) \quad (7)$$

Where:

ΔCBSLLKt: Total change in carbon stock due to unavoided unplanned deforestation within the Leakage Belt area in year t;

AUDLKicl,y: Unplanned deforestation area in the icl forest class in year t within the Leakage Belt a rea in the scenario with the project;

ΔCtoticl,Ac: Loss in carbon stock in the initial forest class icl at the time of change Ac (number of years after the change in land use and cover (LU/LC));

AUDLKfcl,y: Non forest class area fcl at time t within the Unplanned Post Deforestation Leakage Management Belt area in the project scenario;

ΔCtotfcl,Ac: Gain in carbon stock in the final non forest class fcl post deforestation in the period of change Ac (number of years after the change in land use and cover (LU/LC)).

2.2.Estimated total leakage ex-post

The results were presented to the verifying body through Table 35 of Methodology VM0015, version 1.1.

3. Net ex-post GHG reductions

a) Technical description of monitoring tasks

In the verification processes, the results were presented using Table 36 of the approved Methodology VM0015 version 1.1, together with the spatial data (deforestation maps).

b) Collected data

Table 11. Data collected for monitoring the ex-post GHG net reductions for the Manoa REDD+ Project

Parameter	Description	Unit	Source	Frequency	MR Section
$\Delta REDD_{,t}$	Net anthropogenic greenhouse gas emission reduction attributable to the AUD project activity at year t	Ton of carbon dioxide equivalent (tCO_2-e)	Calculated	Annual	5.4
$VCU_{,t}$	Number of Verified Carbon Units (VCUs) to be made available for trade at time t	Ton of carbon dioxide equivalent (tCO_2-e)	Calculated	Annual	5.4

c) Summarized description of data collection procedures

The calculation of the quantity of Verified Carbon Units (VCUs) that were produced by the Manoa REDD+ Project activities in the years 2021 and 2022 was done using equations 19 and 20 from Methodology VM0015 version 1.1.

d) Quality control and quality assurance procedures

All tasks and tools indicated in part 2 of the approved VM0015 Methodology were used to ensure that the data are appropriate for the verification process and the number of Verified Carbon Units is reliable.

e) Data Archiving

All data and reports from the Manoa REDD+ Project are stored by Biofílica in digital files throughout the project. All documents relating to Project monitoring will be made available to the verifying body at each verification event.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

The estimation of unplanned deforestation in the project area in the without project scenario was implemented by applying the following steps:

- Analysis of historical land use and land cover change between 2000 and 2012 in the Reference Region of the Manoa REDD+ Project area;
- Analysis of agents, drivers and underlying causes of deforestation and future development for the Manoa REDD+ Project Reference Region;
- Annual baseline estimation of the areas of unplanned deforestation in the Reference Region (RR), Project Area (PA) and the Leakage Belt (LB).

All detailed process is described in REDD+ Project Description Document. To determine reduced emissions, the stock estimated in the primary forest inventory, carried out in 2015 and previously described in project description document, was multiplied by 3.6667 (44/12), as 1 kg of C is equivalent to 3.66667 kg of CO2eq (CO2 mass = 44 and C mass = 12; 44/12 = 3.66667).

Thus, the carbon estimate calculated for the above and below ground stocks considering the averages of the values calculated for managed forest and primary forest was 119.01 tC/ha (± 9.95 t.C/ha), for the above ground reservoir and 20.89 tC/ha (± 1.79 t.C/ha), for the below ground reservoir. Further information can be obtained in the document Final Carbon Stock Report (Florestal-Planejamento, Paisagismo e Consultoria Ltda, 2015). Table 12 presents average carbon values per hectare for each initial class of land use and land cover considered for the baseline scenario present in the project area and leakage belt.

Table 12. Carbon stock per hectare for the initial class icl existing in the Project Area and in the Leakage Belt.

Initial forest class *icl*						$Ctot_{icl}$	
Name:	Forest						
ID_{icl}	1						
Average carbon stock per hectare + 90% CI							
Cab_{icl}		Cbb_{icl}		Cdw_{icl}			
C stock	± 95% CI	C stock	± 95% CI	C stock	± 95% CI	C stock	± 95% CI
$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$

436.4	10.0	76.6	1.8	-	-	513.0	11.7

Cab_{icl} = Average carbon stock per hectare in the above-ground biomass carbon pool of class icl (tCO2e/ha);

Cbb_{icl} = Average carbon stock per hectare in the below-ground biomass carbon pool of class icl (tCO2e/ha);

Cdw_{icl} = Average carbon stock per hectare in the dead wood biomass carbon pool of class icl (tCO2e/ha);

$Ctot_{icl}$ = Average equivalent carbon stock per hectare for total biomass pool for initial forest class (tCO2e/ha).

To calculate baseline, number of hectares of each forest class that could be deforested in case of project absence were extracted from the land use and land cover maps.

Baseline projection results show a deforestation between 2021 and 2022 of 1,417 hectares in the Project Area (Table 13) and 153 hectares in Leakage Belt (Table 14).

Table 13. Annual baseline unplanned deforestation areas in the Project Area for the monitored period 2021-2022.

Area established after deforestation per zone within the Project Area		Total baseline deforestation in the project area	
IDz>	1		
Name:	Zone 1	$ABSLPA_t$	ABSLPA
Project Year *t*	ha	ha	ha
2021	715	715	715
2022	702	702	1,417

Table 14. Annual unplanned deforestation areas of baseline in the Leakage Belt for the monitored period 2021-2022.

Area established after deforestation per zone within the leakage belt		Total baseline deforestation in the Leakage Belt	
IDz>	1		
Name:	Zone 1	$ABSLLK_t$	ABSLLK
Project Year *t*	ha	ha	ha
2021	67	67	67

2022	86	86	153

To calculate carbon stock changes in Project Area and Leakage Belt Area baseline for year t, the method 1 of VM0015, version 1.1, was used, by means of the equation included in page 72 of this VM0015, shown below:

$$\Delta CBSLPA_t = \sum_{p=1}^{P}\left(\sum_{icl=1}^{Icl} ABSLPA_{icl,t} * \Delta Cp_{icl,t=t*} - \sum_{z=1}^{Z} ABSLPA_{z,t} * \Delta Cp_{z,t=t*} + \sum_{icl=1}^{Icl} ABSLPA_{icl,t-1} * \Delta Cp_{icl,t=t*+1} - \sum_{z=1}^{Z} ABSLPA_{z,t-1} * \Delta Cp_{z,t=t*+1} + \sum_{icl=1}^{Icl} ABSLPA_{icl,t-2} * \Delta Cp_{icl,t=t*+2} - \sum_{z=1}^{Z} ABSLPA_{z,t-2} * \Delta Cp_{z,t=t*+2} + \cdots + \sum_{icl=1}^{Icl} ABSLPA_{icl,t-19} * \Delta Cp_{icl,t=t*+19} - \sum_{z=1}^{Z} ABSLPA_{z,t-19} * \Delta Cp_{z,t=t*+19}\right) \quad (8)$$

$\Delta CBSLPA_t$: Total baseline carbon stock change within the project area at year (tCO2e)

$ABSLPA_{icl,t}$: Area of initial forest class icl deforested at time t within the project area in the baseline case (ha);

$ABSLPA_{icl,t-1}$: Area of initial forest class icl deforested at time t-1 within the project area in the baseline case (ha);

$ABSLPA_{icl,t=t-19}$: Area of initial forest class icl deforested at time t-19 within the project area in the baseline case (ha);

$\Delta Cp_{icl,t=t*}$: Average carbon stock change factor for carbon pool p in the initial forest class icl applicable at time t (as per Table 20.a) (tCO2-e.ha-1);

$\Delta Cp_{icl,t=t*+19}$: Average carbon stock change factor for carbon pool p in the initial forest class icl applicable at time t=t*+19 (20th year after deforestation, as per Table 20.a) (tCO2-e.ha-1);

$ABSLPA_{z,t}$: Area of the zone z "deforested" at time t within the project area in the baseline case (ha);

$ABSLPA_{z,t-1}$: Area of the zone z "deforested" at time t-1 within the project area in the baseline case (ha);

$ABSLPA_{z,t-19}$: Area of the zone z "deforested" at time t-19 within the project area in the baseline case (ha);

$\Delta Cp_{z,t=t*}$: Average carbon stock change factor for carbon pool p in zone z applicable at time t=t* (according to Table 20.b) (tCO2 e.ha -1);

$\Delta Cp_{z,t=t+1}$: Average carbon stock change factor for carbon pool p in zone z applicable at time t=t*+1 (2nd year after deforestation, according to Table 20.b) (tCO2 e.ha -1);

$\Delta Cp_{z,t=t^*+19}$: Average carbon stock change factor for carbon pool p in zone z applicable at time t=t*+19 (20th year after deforestation, according to Table 20.b) (tCO2 e.ha -1).

The total emissions in the Project Area baseline scenario are shown in Table 15 and the Leakage Belt in Table 16.

Table 15. Total changes in the carbon stock of the Project Area baseline scenario (Table 21.b. VM0015).

Carbon stock changes by initial forest class icl		Total change in the carbon stock of the initial forest class of the Project Area		Changes in post-deforestation carbon stock per zone		Total changes in post-deforestation carbon stock per zone in the Project Area		Total changes in carbon stock in the Project Area	
$_{icl}$ID >	1	$\Delta CBSPLA_{iclt,}$	$\Delta CBSPA_{icl}$	ID_{says}>	1	$\Delta CBSPA_{z,t}$	$\Delta CBELPA_{z}$	$\Delta CBSLPA_{t}$	$\Delta CBSLPA$
Name:	Forest	annual	cumulative	Name:	Zone 1	annual	cumulative	annual	cumulative
Project Year *t*	tCO_2e	tCO_2e	tCO_2e	Project Year *t*	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e
2021	347,875	347,875	347,875	2021	30,262	30,262	30,262	317,613	317,613
2022	347,579	347,579	695,454	2022	34,798	34,798	65,060	312,781	630,394

Table 16. Total changes in the carbon stock of the Leakage Belt baseline scenario (Table 21.c. VM0015).

Changes in carbon stock by initial forest class icl		Total change in carbon stock of initial forest class in the Leakage belt		Changes in post-deforestation carbon stock per zone		Total post-deforestation carbon stock changes per zone in the Leakage Belt		Total Carbon Stock Changes in the Leakage Belt	
$_{icl}$ID >	1	$\Delta CBSLK_{iclt,\ t}$	$\Delta CBSLK_{icl}$	ID_{says}>	1	$\Delta CBSLK_{z,\ t}$	$\Delta CBSLK_{z}$	$\Delta CBSLK_{t}$	$\Delta CBSLK$
Name:	Forest	annual	cumulative	Name:	Zone 1	annual	accumulated	annual	accumulated
Project Year *t*	tCO_2e	tCO_2e	tCO_2e	Project Year *t*	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e
2021	33,212	33,212	33,212	2021	3,354	3,354	3,354	29,858	29,858
2022	42,162	42,162	75,374	2022	3,910	3,910	7,263	38,252	68,111

After this analysis, the ex-post assessment of the monitored period (2021 and 2022) was performed, and the results of the monitoring period are presented in the tables on the following pages.

5.2 Project Emissions

5.2.1 Emissions due to planned deforestation

Emissions associated with planned deforestation occur since the beginning of the project and are related with SDG target 15.1, indicator 15.1.1 (see section 1.11 and Appendix 3 for details). Between 2013 and 2022, they resulted in total emissions from planned deforestation of 194,409.00 tCO2e. Table 17 shows the decrease in carbon stock due to planned deforestation in the Project Area in this monitored period only.

These values were obtained by multiplying the sum of the areas of infrastructure annually opened for roads, tracks and storage yards (necessary for the management of each Annual Production Unit - UPA), by the average variation in carbon stock, as shown in the equation below:

$$\Delta CPDdPA_t = (APDPA_{icl,t} \times Ctot_{icl,t}) \quad (9)$$

Where:

$\Delta CPDdPA_t$: Total decrease in carbon stock due to planned deforestation at year t in the Project Area.

$APDPA_{icl,t}$: Planned deforestation area in forest class icl at year t in the Project Area;

$Ctot_{icl,t}$: Average carbon stock in all carbon pools accounted in the forest class *icl* at year *t*.

Table 17. Carbon stock decrease due to planned deforestation in the Project Area (table 25.a VM0015).

Project Year *t*	Areas of planned deforestation x Carbon stock change (decrease) in the project area		Total carbon stock decrease due to planned deforestation	
	IDcl =	1	annual	cumulative
	APDPAicl,t	Ctoticl,t	ΔCPDdPAt	ΔCPDdPA
	ha	tCO2e ha-1	tCO2e	tCO2e
2021	52	513.0	26,905	26,905
2022	59	513.0	30,405	57,310

5.2.2 Emissions due to planned logging activities

As established in the PDD, a significance analysis was performed based on the "Tool for testing significance of GHG emissions in A/R CDM project activities" in order to assess the impact of emissions from logging activity on project emissions.

For the calculation were used data obtained from the monitory report of the forest management area (Relatório de monitoramento da área de manejo florestal – AMF) of each UPA, prepared by Manoa,

which indicates the annual intensity of forest exploitation in the monitored period, the amount of carbon extracted and the total area explored in different categories, such as principal and secondary roads, esplanades and clearings. The field spreadsheets with information about the carbon stock of each tree explored in each UPA were also used.

First, the total areas impacted by the management, that is, the effective exploration areas and the temporary opening areas of each UPA were organized (Table 18). For the calculation of the effective area, the permanent protection area (APP) that can't be explored, were excluded. The areas impacted due to skid trails and the opening of clearings were considered "temporary opening areas", as they don't remove the forest canopy and don't leave the soil completely exposed, as do the roads and esplanades, therefore, the recovery of those areas is faster, and the carbon stock affected less significant. The significance was assessed in two different ways; (1) considering only the temporary opening areas and (2) considering the effective management area, this area excludes the road openings and esplanades from the effective exploration area, as they have already been accounted for as emissions from planned deforestation. Every step of each significance calculation is describe below.

Table 18. Areas explored in each UPA during the monitored period with details of every type of exploration in the areas.

				Included in the planned deforestation calculation			Temporary opening areas	
UPA (year)	Total area (ha)	Permanent protection area (APP) (ha)	Effective exploration area (ha)	Principal access road (ha)	Secundary road	Esplanades (ha)	Skid trails	Clearings
17 (2021)	3,470.64	769.79	2,700.9	5.70	30.91	15.84	100.63	239.59
11 (2022)	3,111.47	506.51	2,605.0	9.73	32.83	16.71	88.49	155.68

The next step involved the calculation of the carbon stock decrease. That step was done in two different ways: (1) one considering the total carbon stock decrease in the temporary opening areas and (2) another considering the total carbon stock decrease estimated trough the field spreadsheet of felled trees in each UPA. In both cases the carbon stock was converted to CO_2e and used only the aboveground carbon stock, as the below ground stock is not affected by the forest management.

The calculation using the temporary opening areas estimated the total carbon decrease by multiplying the areas of low impact management by the amount of CO_2e decrease per hectare (Table 19). The amount of CO_2e decrease was estimated according with West et al. (2013)[33] findings, that states that carbon decrease in low impact management is estimated in 17%. As Manoa's above ground stock is estimated at 436.4tCO_2e/ha, the carbon decrease expected is 17% of that value, resulting in 74.2tCO_2e/ha.

[33] West, T.A.P.; Vidal, E.;Putz, F.E. 2013. Forest biomass recovery after conventional and reduced-impact logging in Amazonian Brazil. Forest Ecology and Management, 314, 59-63.

Table 19. Total carbon stock decrease calculated from the temporary opening areas.

Year	UPA	Temporary opening áreas (ha)	Total carbon stock decrease due to planned deforestation (tCO2e)
2021	17	340.22	25,238.96
2022	11	244.17	18,113.23

As for the carbon stock decrease calculated using the field spreadsheet data of felled trees, it was the result of the sum of the carbon stock of each felled tree converted to CO_2e (Table 20). Note that this calculation uses data of the effective management area, as the felled tree are distributed throughout the whole UPA. While the calculation using the of temporary opening areas considers the carbon decrease of only those temporary openings locations.

Table 20. Total carbon stock decrease calculated from the field spreadsheet data of felled trees.

Year	UPA	Extracted carbon (tC)	Total carbon stock decrease due to planned deforestation (tCO2e)
2021	17	39,567.91	145,082.33
2022	11	37,897.72	138,958.32

The third step considers the regeneration potential of the affected areas. This step was also done in two ways: (1) considering only the temporary opening areas (Table 21) (2) and another considering the effective management area (Table 22). The regeneration potential also used data from West et al. (2013)[34], that states that the regeneration potential in the study area is $4.6tCO_2e$/ha per year. That value was multiplied by the corresponding area of each way of calculating the significance, resulting in the regeneration potential per year in those areas.

Table 21. Carbon stock regeneration per year in the temporary opening areas.

Year	UPA	Temporary opening áreas (ha)	Carbon stock regeneration (tCO2e/ano)
2021	17	340.22	1,571.83
2022	11	244.17	1,128.05

[34] West, T.A.P.; Vidal, E.;Putz, F.E. 2013. Forest biomass recovery after conventional and reduced-impact logging in Amazonian Brazil. Forest Ecology and Management, 314, 59-63.

Table 22. Carbon stock regeneration per year in the effective management area.

Year	UPA	Effective management area (ha)	Carbon stock regeneration (tCO2e/ano)
2021	17	2,648.40	12,235.62
2022	11	2,545.69	11,761.08

The final step of the significance assessment includes the time expected for the UPAs to recover 100% of their stocks. Considering only the aboveground biomass and the intensity of exploitation at Manoa, the recovery of the original stock is expected to happen in about 11 years. As it takes 30 years for a managed area to be explored again, the UPAs carbon stock will be fully regenerated before the second management cycle. In West et al. (2013)[35] study area, with an exploration intensity of 38.9 m^3/ha (much higher than the Manoa average, that is around 23m^3/ha), the stock was completely recomposed in 16 years. Figure 44 demonstrates the similarities between West et al. (2013) study area and the Manoa area, reinforcing that the comparison with the study is adequate due to the similarity of both areas.

Similarity Criteria

Criteria	Manoa	Reference
Vegetation	Ombrophylous Forest (evergreen tropical forest)	Ombrophylous Forest (evergreen tropical forest)
Climate (Koppen)	Am	Am
Average annual rainfall	2.160,8 mm (wet season) - 22,9 mm (dry season)	1.700 mm (wet season) - < 50mm (dry season)
Soil	Predominately yellow latosols and red/yellow latosols	Predominately yellow latosols
Terrian	undulating	undulating

Figure 44. Analysis of the similarity between the compared areas (Manoa and the study area of West et al., 2013).

Therefore, for this step, the regeneration potential calculated in the third step is multiplied by 11, considering the expected recovery time for Manoa, again in two ways; (1) considering only the areas of temporary opening and (2) considering the effective management area. Both regeneration stocks were

[35] West, T.A.P.; Vidal, E.;Putz, F.E. 2013. Forest biomass recovery after conventional and reduced-impact logging in Amazonian Brazil. Forest Ecology and Management, 314, 59-63.

compared with the ex-post net anthropogenic GHG emission reductions of each year of the monitored period to assess the significance as shown in the tables below.

Table 23. Significance of the low impact management considering only the areas of temporary opening.

Year	UPA	Carbon stock regeneration (tCO2e in 11 years)	Total carbon stock change in the project case (tCO2e)	Ex post net anthropogenic GHG emission reductions	Significance
2021	17	17,290.13	7,948.83	289,787	2.7%
2022	11	12,408.60	5,704.63	282,366	2.0%
				Average	2.4%

Table 24. Significance of the low impact management considering the effective management area.

Year	UPA	Carbon stock regeneration (tCO2e in 11 years)	Total carbon stock change in the project case (tCO2e)	Ex post net anthropogenic GHG emission reductions	Significance
2021	17	134,591.85	10,490.49	289,787	3.6%
2022	11	129,371.87	9,586.45	282,366	3.4%
				Average	3.5%

The column "Total carbon stock change in the project case (tCO2e)" in both Table 23 and Table 24 shows the difference of the "Total carbon stock decrease due to planned deforestation (tCO2e)" and the "Carbon stock regeneration (tCO2e in 11 years)" for each way of assessing significance (using only the temporary opening areas and using the effective management area). The "Significance" column shows the result of the "Ex post net anthropogenic GHG emission reductions" divided by the "Total carbon stock change in the project case (tCO2e)". In both ways of calculating the significance the average value and the value of each UPA was less than 5%, the threshold of significance required by the methodology, therefore, the low impact management in areas that were not considered in the planned deforestation stock decrease can be disregarded from the scope of emissions of the project.

In addition, during the project validation, the NCR12 discussed the forest management significance, and it was concluded that emissions from the activity were conservatively excluded due to the net positive carbon increment caused by regeneration, and also because the management activities were already present in the baseline scenario. As the carbon stocks calculated in the project area used parcel in areas in different stages of management, the management effects on the inventory were considered in the emissions reductions in a broad sense. All calculations related to significance testing were shared with the audit team.

Besides that, the timber extraction from Sustainable Forest Management was targeted to obtain long-lived timber products and, since VM0015 considers it conservative to disregard these products from the calculations, all extraction activities were excluded.

Table 25. Carbon stock decrease due to planned logging activities in the project area (Table 25.b VM0015).

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
	APLPAicl,t	Ctoticl,t	ΔCPLdPAt	ΔCPLdPA
	ha	tCO2e ha-1	tCO2e	tCO2e
2021	0	513.0	0.0	0.0
2022	0	513.0	0.0	0.0

5.2.3 Emissions due to fuel-wood and charcoal activities

No emissions occurred associated with planned activities of fuel-wood collection and charcoal production in the Project Area.

Table 26. Carbon stock decrease due to planned fuel-wood collection and charcoal production in the Project Area (table 25.c.VM0015).

Project Year t	Areas of planned fuel-wood & charcoal activities x Carbon stock change (decrease) in the project area		Total carbon stock decrease due to planned fuel-wood and charcoal activities	
	IDcl =	1	annual	cumulative
	APFPAicl,t	Ctoticl,t	ΔCPFdPAt	ΔCPFdPA
	ha	tCO2e ha-1	tCO2e	tCO2e
2021	0	513.0	0.0	0.0
2022	0	513.0	0.0	0.0

5.2.4 Removal due to carbon increase of planned activities

The carbon stock increase due to planned activities in the areas that would be deforested in the baseline was omitted.

Table 27. Total ex post carbon stock decreases due to planned activities in the Project Area (table 25.d. VM0015).

Project Year t	Total carbon stock decrease due to planned deforestation		Total carbon stock decrease due to planned logging activities		Total carbon stock decrease due to planned fuel-wood and charcoal activities		Total carbon stock decrease due to planned activities	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	ΔCPDdPAt	ΔCPDdPA	ΔCPLdPAt	ΔCPLdPA	ΔCPFdPAt	ΔCPFdPA	ΔCPAdPAt	ΔCPAdPA
	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e
2021	26,905	26,905	0	0	0	0	26,905	26,905
2022	30,405	57,310	0	0	0	0	30,405	57,310

5.2.5 Total ex post carbon stock decrease in the Project Area

There were carbon stock decreases associated with the planned activities due to the low impact management and due to unavoided unplanned deforestation in the Project Area in the monitored period.

Table 28. Total Ex post estimated net carbon stock decrease in the Project Area (table 27 of VM0015).

Project Year t	Total carbon stock decrease due to planned activities		Total carbon stock increase due to planned 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
	ΔCPAdPAt	ΔCPAdPA	ΔCPAiPAt	ΔCPAiPA	ΔCUDdPAt	ΔCUDdPA	ΔCPSPAt	ΔCPSPA
	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e
2021	26,905	26,905	0	0	921	921	27,826	27,826
2022	30,405	57,310	0	0	10	930	30,414	58,240

5.2.6 Emissions due to unavoided unplanned deforestation in the Project Area

The unplanned total deforestation in the Project Area during this monitoring period is 2.09 hectares, this value is related to the project contributions to SDG target 15.1, indicator 15.1.1 (see section 1.11 and Appendix 3 for details). The data accuracy for the land use and cover classes in the monitored area was 99.3%, a value higher than the 80% set forth by VM0015. Analysis methodology and

results of this analysis are described in Section 3.1.1. Data referring to years 2021 and 2022 are shown in Table 29.

Table 29. Annual areas deforested in each zone within the Project Area (Table 13.b. VM0015).

Area established after deforestation per zone within the project area		Total monitored deforestation in the Project Area		Baseline
IDz>	1			
Name:	Zone 1	Annual	Cumulative	Annual
Project Year *t*	ha	ha	ha	ha
2021	2.07	2.07	2.07	715
2022	0.02	0.02	2.09	702

5.2.7 Emissions due to forest fires and catastrophic events

Within the monitored period, there were not significant emissions originated from forest fires and catastrophic events in the Project Area (Table 30 and Table 31) as detailed in section 4.3.3.

Table 30. Ex post actual carbon stock decrease due to forest fires in the project area (table 25.e. VM0015).

Project Year t	Areas affected by forest fires x Carbon stock change (decrease)		Total carbon stock decrease due to forest fires	
	IDcl =	1	annual	cumulative
	AUFPAicl,t	Ctoticl,t	ΔCUFdPAt	ΔCUFdPA
	ha	tCO2e ha-1	tCO2e	tCO2e
2021	0	513.0	0	0
2022	0	513.0	0	0

Table 31. Ex post carbon stock decrease due to catastrophic events in the project area (table 25.f. VM0015).

Project Year t	Areas affected by catastrophic events x	Total carbon stock decrease due to catastrophic events

	Carbon stock change (decrease)			
	IDcl =	1	annual	cumulative
	ACPAicl,t	Ctoticl,t	ΔCUCdPAt	ΔCUCdPA
	ha	tCO2e ha-1	tCO2e	tCO2e
2021	0	513.0	0	0
2022	0	513.0	0	0

5.2.8 Total ex post carbon stock decrease in the Project Area

Carbon stock total variation (ex-post) in Project Area used the same methods as provided in items 6.1.2 and 6.1.3 of VCS methodology approved VM0015, considering changes observed in monitoring period.

The change in ex-post carbon stock in the Project Area is presented in Table 32, and the total change in ex-post carbon stock from the Project Area in the project scenario in this monitoring period is presented in Table 33.

Table 32. Change in ex-post carbon stock in the Project Area (table of 21.b.2. VM0015).

Carbon stock changes per initial forest class icl		Total carbon stock change of initial forest class in the project area		Carbon stock changes per post-deforestation zone z		Total carbon stock change of post-deforestation zones in the project area		Total net carbon stock change of the project area	
IDicl>	1	ΔCBSLPAicl,t	ΔCBSLPAicl	IDiz>	1	ΔCBSLPAz,t	ΔCBSLPAz	ΔCBSLPAt	ΔCBSLPA
Name:	Forest	annual	cumulative	Name:	Zone 1	annual	cumulative	annual	cumulative
Project Year *t*	tCO2-e	tCO2-e	tCO2-e	Project Year *t*	tCO2-e	tCO2-e	tCO2-e	tCO2-e	tCO2-e
2021	921	921	921	2021	0	0	0	921	921
2022	23	23	944	2022	13	13	13	10	930

Table 33. Ex post estimated net carbon stock change in the project area under the project scenario (table 27 VM0015).

Project Year t	Total carbon stock decrease due to planned activities		Total carbon stock increase due to planned activities		Total carbon stock decrease due to fires and catastrophic events		Total carbon stock increase due to fires and catastrophic events		Total ex post carbon stock change in the project case	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative

	ΔCPAdPAt	ΔCPAdPA	ΔCPAiPAt	ΔCPAiPA	ΔCFCdPAt	ΔCFCdPA	ΔCFCiPAt	ΔCFCiPA	ΔCPSPAt	ΔCPSPA
	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e
2021	26,905	26,905	0	0.0	0.0	0.0	0.0	0.0	26,905	26,905
2022	30,405	57,310	0	0.0	0.0	0.0	0.0	0.0	30,405	57,310

5.2.9 Non-CO_2 emissions due to forest fires

During the monitoring period, fires were recorded in the project area as described in Section 3.1.2. According to VM0015, item 1.1.4 (page 112) reductions in carbon stocks from natural disturbances or man-made events, such as forest fires, should be accounted for when significant (above 5%). The calculation of significance was done according to Section 6.2 of VM0015 (page 81) and the spreadsheet was shared with VVB. Because the result was 0.01% the reported fires were considered not significant and, therefore, were not monitored.

Table 34. Total (ex-post) carbon stock changes and non-CO2 emissions in the Project Area (Table 29 VM0015)

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 ante estimated actual non-CO2 emissions from forest fires in the project area	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	ΔCPAdPAt	ΔCPAdPA	ΔCPAiPAt	ΔCPAiPA	ΔCUDdPAt	ΔCUDdPA	ΔCPSPAt	ΔCPSPA	EBBBSLPAt	EBBPSPA
	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2-e	tCO2-e
2021	26,905	26,905	0	0	921	921	27,826	27,826	0	0
2022	30,405	57,310	0	0	10	930	30,414	58,240	0	0

5.3 Leakage

A source of leakage was monitored: leakage due to the displacement activity. Leakage due to displacement activity was monitored by mapping to change of forest cover in the Leakage Belt.

As provided in methodology VCS VM0015, deforestation detected above baseline in Leakage Belt area was considered leakage by displacement. Leakage Belt area activity data was defined using the same methods applied in Project Area deforestation mapping.

5.3.1 Total decrease in carbon stock (ex post) in the Leakage Belt

As mentioned above for the Project Area, PRODES and SAD data used in the Leakage Belt monitoring also had accuracy analyzed, and were similar to Project Area findings. The accuracy of the data used for monitoring the Leakage Belt and Project Area was analyzed, resulting in 99.3% (see section 3.1.1 for more details).

As mentioned in Section 3.1.3, and in line with the information provided in the dossier prepared by the proponents, it was considered appropriate not to account for the leakage identified in the monitored period as a conservative measure to not jeopardize the project, following mainly the guidelines found in VM0015, part 3, task 1, section 1.2.2 (p. 115), and by the Project Developer's Guidebook to VCS REDD Methodologies, by Conservation International.

Table 35. Areas deforested annually in each zone within the monitored Leakage Belt (Table 13.c. VM0015).

Area established after deforestation per zone within the leakage belt		Total monitored deforestation in the Leakage Belt		Baseline
IDz>	1			
Name:	Zone 1	Annual	Cumulative	Annual
Project Year *t*	ha	ha	ha	ha
2021	0	0	0	67
2022	0	0	0	86

Carbon stock total change due to unavoided unplanned deforestation in Leakage Belt in this monitoring period is provided in Table 36.

Table 36. Change in ex-post carbon stock in the Leakage Belt area (table 21.c.2. VCS VM0015)

Carbon stock changes per initial forest class icl		Total carbon stock change of initial forest class in the leakage belt area		Carbon stock changes per post-deforestation zone z	Total carbon stock change of post-deforestation zones in leakage belt area		Total net carbon stock change of the leakage belt area	
IDicl>	1	ΔCBSLLKicl,t	ΔCBSLLKicl	1	ΔCBSLLKz,t	ΔCBSLLKz	ΔCBSLLKt	ΔCBSLLK
Name:	Forest	annual	cumulative	Zone 1	annual	cumulative	annual	cumulative
Project Year t	tCO2-e	tCO2-e	tCO2-e	tCO2-e	tCO2-e	tCO2-e	tCO2-e	tCO2-e
2021	1,389	1,389	1,389	1,172	1,172	1,172	217	217

2022	1,389	1,389	2,777	1,172	1,172	2,343	217	434

5.3.2 Estimated total ex post leakage

Carbon stock ex-post total changes in Leakage Belt due to displacement activities within this monitored period are provided in Table 37. The leakage was calculated by the difference between ex-post and ex-ante analyses.

In this case, as a result, the value of carbon stock changes in the monitoring period for the years 2021 and 2022 were less than zero (<0), so ex-post leakage was set to zero in these monitored years, as recommended by item 1.2 - Leakage Monitoring, from VCS VM0015.

Table 37. Total ex-ante and ex-post carbon stock changes from baseline in the Leakage Belt.

Total ex ante net carbon stock change of the leakage belt area			Total ex post net carbon stock change of the leakage belt area		Total ex-post leakage	
IDiz>	ΔCBSLLKt	ΔCBSLLK	ΔCBSLLKt	ΔCBSLLK	ΔCBSLLKt	ΔCBSLLK
Name:	annual	cumulative	annual	cumulative	annual	cumulative
Project Year t	tCO2-e	tCO2-e	tCO2-e	tCO2-e	tCO2-e	tCO2-e
2021	29,858	29,858	217	217	0	47,441
2022	38,252	68,111	217	434	0	47,441

5.4 Net GHG Emission Reductions and Removals

The decrease of anthropic GHG emissions was calculated according to equations 19, 20 and 21 of methodology VCS VM0015 version 1.1. Risk factor was estimated using Non-Permanence Risk Report, resulting in VCS credit buffer (VBC) of 10%. Ex-post GHG emission reductions calculated36 are presented in Table 36.

$$\Delta REDD_t = (\Delta CBSLPA_t + EBBBSLPA_t) - (\Delta CPSPA_t + EBBPSPA_t) - (\Delta CLK_t + ELK_t) \quad (10)$$

Where:

$\Delta REDD_t$: Ex post estimated net anthropogenic greenhouse gas emission reduction attributable to the AUD project activity at year t(tCO2e);

[36] The values shown in Table 27 adopt a conservative practice of rounding off downward from the final calculation done using equations 19, 20 and 21. So, there is a difference of 2.0 between the values.

$\Delta CBSLPA_t$: Sum of baseline carbon stock changes in the Project Area at year t (tCO2e);

$EBBBSLPA_t$: Sum of baseline emissions from the burning of biomass in the Project Area in year t (tCO2e);

$\Delta CPSPA_t$: Sum of ex-post estimated actual carbon stock changes in the project area at year t (tCO2e);

$EBBPSPA_t$: Sum of (ex post estimated) actual emissions from biomass burning in the project area at year t (tCO2e);

ΔCLK_t: Sum of ex-post estimated leakage net carbon stock changes at year t (tCO2e);

ELK_t: Sum of ex post estimated leakage emissions at year t (tCO2e);

t: 1, 2, 3 … T, one year of proposed credit period (without dimension).

$$VCU_t = \Delta REDD_t - VBC_t \quad (11)$$

$$VBC_t = (\Delta CBSLPA_t - \Delta CPSPA_t) * RF_t \quad (12)$$

Where:

VCU_t: Number of Verified Carbon Units that can be traded at year t (tCO2e);

$\Delta REDD_t$: Reduction of ex-post anthropogenic GHG emissions attributed to the AUD activity of the project in year t (tCO2e)

VBC_t: Number of Buffer credit deposited in the VCS buffer at time t (t CO2-e);

$\Delta CBSLPA_t$: Sum of baseline carbon stock changes in the Project Area at year t (tCO2e);

$\Delta CPSPA_t$: Sum of ex-post carbon stock changes in the Project Area at year t (tCO2e);

RF_t: Risk factor used to calculate VCS buffer credit (%);

t: 1, 2, 3 … T, one year of proposed credit period (without dimension).

Following rule 4.1.2 of the Registration and Issuance Process v4.4 (October 2023), since the project is more than one year old, the vintages generated were separated for each calendar year within a verification period.

Table 38. Ex-post reduction of anthropogenic GHG emissions (ΔREDDt) and Verified Carbon Units (VCUt) (Table 36 VM0015).

Year	Baseline carbon stock changes	Ex post project carbon stock changes	Ex post leakage carbon stock changes	Ex post net anthropogenic GHG emission reductions	Ex post buffer credits	Ex post VCUs tradable
	annual	annual	annual	annual	annual	annual
	ΔCBSLPAt	ΔCPSPAt	ΔCLKt	ΔREDDt	VCBt	VCUt
	tCO2-e	tCO2-e	tCO2-e	tCO2-e	tCO2-e	tCO2-e
08/Ago/2020 - 31/Dec/2020	105,066	9,707	0	95,359	9,536	85,823
01/Jan/2021 – 31/Dec/2021	262,664	24,267	0	238,397	23,839	214,558
01/Jan/2022 – 31/Dec/2022	262,664	24,267	0	238,397	23,839	214,558
Total	630,394	58,240	0	572,153	57,214	514,939

Table 39 shows the percent difference between estimated and avoided emissions by the project during the monitored period and is a relevant data for the project contribution to SDG target 13.0 (see details of this SDG target in section 1.11 and Appendix 3). The ex-ante emissions/reductions/removals column presents the ex-ante Net GHG value for the monitored period. The value was calculated at validation and can be found in section 5.6 of Project REDD+ Manoa PDD, table 48. The achieved emissions reductions/removals column represents the Net GHG ex-post values of the monitored period, shown in Table 36.

Table 39. Percent difference between estimated emissions and avoided emissions by the project during the monitored period.

Ex-ante emissions reductions/ removals	Achieved emissions reductions/ removals	Percent difference	Justification for the difference
492,718	572,153	-16%	During the monitoring period, was identified a much smaller area of unplanned deforestation than expected in the baseline, but the project continued to have emissions as a result of planned deforestation from low impact forest management. In addition, no leakage was detected in this monitored period. Consequently, during the monitored period, a negative percentage difference was identified for the project, where more emissions were avoided in the monitored period than expected in the baseline.

APPENDIX 1: FREL AMAZONIA

The Forest Reference Emission Level, or FREL, aims to technically assess the payment for REDD+ activities. To this end, emission levels were measured in the national scope for the Amazon biome (Amazon FREL), allowing to assess the actual effects of policies and measures to reduce greenhouse gas emissions. The FREL is a requirement for developing countries wishing to obtain recognition by the UNFCCC of their national forest mitigation efforts for the purpose of payments for results from REDD+ activities.

The reference level is taken from the document "Brazil's submission of a Forest Reference Emission Level (FREL) for reducing emissions from deforestation in the Amazon biome for REDD+ results-based payments under the UNDCCC from 2016 to 2020"[37], an updated version of the one submitted in 2014. The document was submitted by Brazil and approved by the UNFCCC in 2018.

As an enhancement of the emission analysis, as well as the project's reduction data, a comparison was made with the values reported by the Amazonia FREL. First, the methodological context and assumptions used by the FREL were intensively analyzed, with the purpose of understanding the project's insertion on the national level, as well as an exercise to track government updates regarding emissions levels and whether the project is following these updates.

The values taken from the updated FREL have as annual average deforestation area of 1,402,919.78 ha in the Legal Amazon, which refers to 751,780,503.37 tCO2 emitted annually. On the other hand, in the monitored period, the project figures show that an average of 28,185.93 tCO2e were emitted annually, referring to the average deforested area in the project area of 55.08 ha. It is important to emphasize that the areas and emissions from planned and unplanned deforestation in the project area (Table 17 and Table 29) were considered. A simple rule of three was made taking into account the annual deforestation of the project and extrapolating to the reference level values, the project should emit annually the equivalent to 29,517.99 tCO^2.

The total percentage of project emissions was also checked against the reference level to understand the representativeness of project emissions with the total FREL value (751,780,503.37 tCO2). It was identified that the project emissions in the monitored period represented only 0.00013% of the Legal Amazon total emissions.

Making a methodological comparison between the FREL and the Manoa REDD+ Project, it is possible to notice a difference. The reference level is based on an extremely robust and reliable methodology, for this reason, some notes should be taken into account to explain this difference.

First, the national reference level considered the years 1996 to 2015 in its calculations, consisting of a different period than the one monitored by the project (2021 to 2022). In addition, the

[37] BRAZIL. Ministry of Environment, Science, Technology and Innovation. Brazil's submission of a Forest Reference Emission Level (FREL) for reducing emissions from deforestation in the Amazonia biome for REDD+ results-based payments under the UNFCCC from 2016 to 2020.Brasília, DF: MMA, Jan. 2018.

methodology associated with FREL integrated the burlap into its carbon stock calculations and, consequently, the final emissions values took the burlap into account as well. There was also a differentiation of forest physiognomies and their emission factors.

Another important point is the fact that the Manoa REDD+ Project was developed in a very local context, different from the FREL, where an analysis of the Legal Amazon as a whole was done. In this regard, the methodological differences approached cause the emission final results to be different among themselves.

Finally, it is important to highlight the importance of the FREL as a national initiative to monitor emissions at a broader level, in addition to strengthening national strategies of the REDD+ scope. The Manoa REDD+ Project will follow the updates at the national level in order to contribute to the progress and improvement of REDD+ projects in the national territory.

APPENDIX 2: RESULT OF THE LOW IMPACT FOREST MANAGEMENT

As a way to demonstrate the low impact of forest management operations, the results compiled from the post-exploitation reports of UPAs exploited in the monitored period (2021-2022) were brought in.

UPA 17 was exploited between April and November 2021. The UPA total area is 3,470.64 ha, with about 77%, 2,700.85 ha, corresponding to the effective management area. In the pre-exploitation inventory, 40,015 trees of various species were inventoried, totaling a volume of 165,233.4284 m^3, equivalent to 11.53 trees/ha and 47.61 m^3/ha. 116,155.1052 m^3 were intended for felling, respecting the limit of exploitation intensity of 25m^3/ha, as allowed by the AUTEX (Exploration Authorization). After the SEDAM inspection, on 20/19/2022 the exploitation of UPA 17 was considered closed.

UPA 11 was explored between May and December 2022. In the Annual Operational Plan (POA) of UPA 11 it is possible to identify that its effective management area, 2,604.96 ha, corresponds to about 83.72% of the area total (3,111.47 ha). In the pre-exploratory inventory, 50,174 trees were inventoried, which added up to a total volume of 232,166.49 m^3, corresponding to 19.26 trees/ha, of which 65,097 m^3 were authorized for harvesting (as described in the post-exploratory report of UPA 11), corresponding to 25m^3/ha of exploration intensity. At the end of the management of this UPA, the exploited volume, according to the AMF report, was 57,500.19 m^3, which corresponds to 22.07 m^3/ha.

The Annual Operation Plan for UPA 15 was prepared in January 2020, its exploration activities began in April 2020 and were completed in December 2020, and the inspection ended in February 2021, outside the previous monitoring period. For this reason, although emissions from planned deforestation were already included in the previous report, the details of the exploitation results will be stated here. The effective management area of UPA 15 (2,949.55 ha) corresponds to 83% of the total area of the UPA (3,536.84 ha), with a total exploitable volume of 148,222.737 m^3, corresponding to 50.25 m^3/ha. Of these, 59,373.78m^3 (20.14 m^3/ha), 40.06% of the total were exploited, as described in the AMF document of UPA 15. From the inspection conducted by SEDAM, in February 2021, the exploitation activities of UPA 15 were considered closed, with the technical opinion that the information collected at the field is in keeping with the methodology described in the Census Inventory filed by the environmental agency.

In addition, annual post-exploitation monitoring of the exploited UPAs is carried out. In this way, damage to the remaining trees was assessed, as well as the impacts in the construction of infrastructure (roads, yards, branches, and clearings) and the dragging of trees, monitoring of fauna and of high conservation value attributes, and monitoring of social aspects in the assessed forest management area. All the documents referring to the exploitation of the UPAs were handed to VVB.

APPENDIX 3: SD CONTRIBUTIONS EVIDENCE

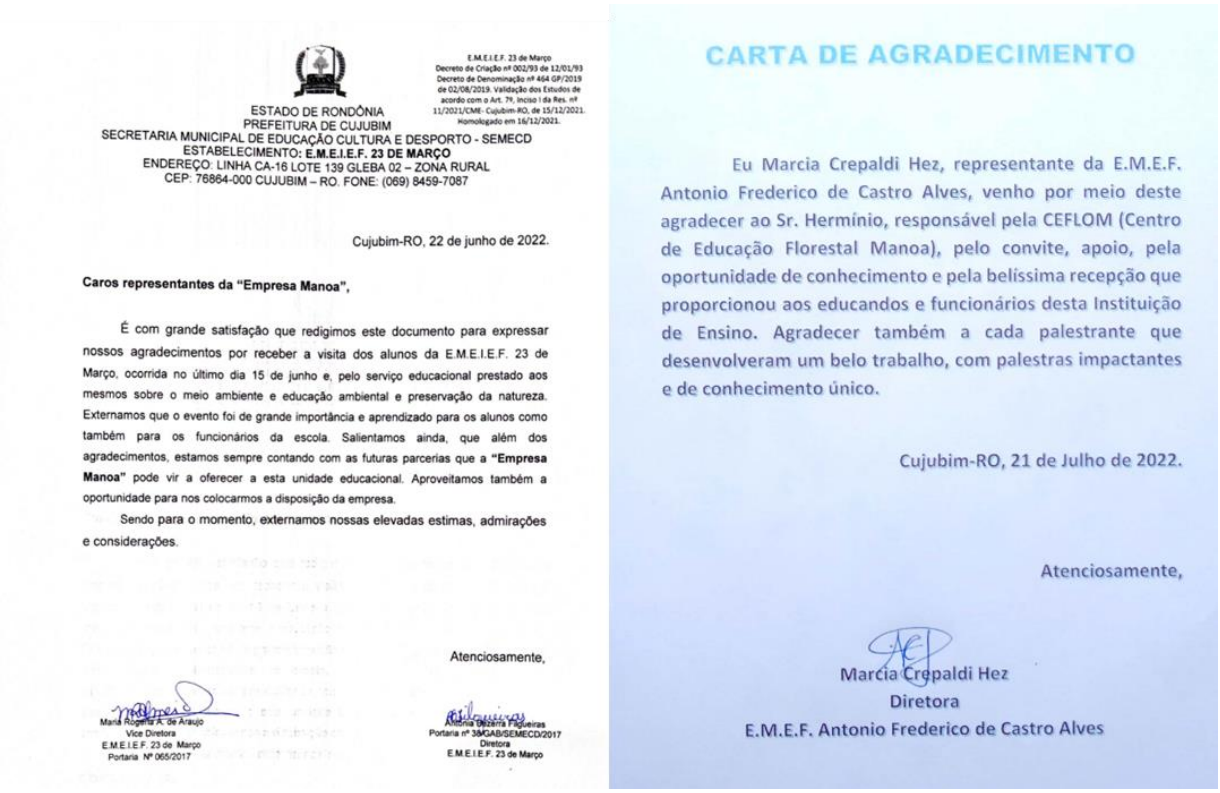
This appendix describes and presents the evidence and indicators used to demonstrate the project's contributions to the SDGs described in Table 2 section 1.11. All documents presented here have been shared with the VVB, however not all documents shared with the VVB have been added to this appendix as some contain confidential and commercially sensitive information.

SDG 4.4: For monitoring indicator 4.4.1, technical training for low-impact forest management with environmental institutions (ICMBio and SEDAM) done during the monitored period were considered. The details of these activities can be found in section 3.1.5 of this MR, and it is also possible to check, in a complementary way, the publication of the Diário da Amazônia[38] of September 11, 2021.

Additionally, all the evidence proving the activities were carried out were made available to the VVB. Due to the fact that some available data contain personal information of the participants of the events, they were presented in confidentiality, not being published in this documentation.

SDG 4.7: Project contributions to SDG 4.7.1 were tracked through photos, attendance lists, thank you letters and material presented at educational events. Thank you letters from schools that participated in environmental education during the monitored period can be found in Figure 45, photos taken during the events and information about the topics addressed can be found in section 3.1.6. The attendance lists were not attached to this document because they contain personal data of the participants, therefore, they were shared only with the VVB.

[38] DIÁRIO DA AMAZÔNIA (Porto Velho - RO). Sedam promove IV Dia de Campo Florestal na Fazenda Manoa. Porto Velho - RO, 11 set. 2021.Available at: https://www.diariodaamazonia.com.br/sedam-promove-iv-dia-de-campo-florestal-na-fazenda-manoa/. Access on: July 05, 2023.



E.M.E.I.E.F. 23 de Março
Decreto de Criação nº 002/93 de 12/01/93
Decreto de Denominação nº 464 GP/2019 de 02/08/2019. Validação dos Estudos de acordo com o Art. 79, inciso I da Res. nº 11/2021/CME- Cujubim-RO, de 15/12/2021. Homologado em 16/12/2021.

ESTADO DE RONDÔNIA
PREFEITURA DE CUJUBIM
SECRETARIA MUNICIPAL DE EDUCAÇÃO CULTURA E DESPORTO - SEMECD
ESTABELECIMENTO: **E.M.E.I.E.F. 23 DE MARÇO**
ENDEREÇO: LINHA CA-16 LOTE 139 GLEBA 02 – ZONA RURAL
CEP: 76864-000 CUJUBIM – RO. FONE: (069) 8459-7087

Cujubim-RO, 22 de junho de 2022.

Caros representantes da "Empresa Manoa",

É com grande satisfação que redigimos este documento para expressar nossos agradecimentos por receber a visita dos alunos da E.M.E.I.E.F. 23 de Março, ocorrida no último dia 15 de junho e, pelo serviço educacional prestado aos mesmos sobre o meio ambiente e educação ambiental e preservação da natureza. Externamos que o evento foi de grande importância e aprendizado para os alunos como também para os funcionários da escola. Salientamos ainda, que além dos agradecimentos, estamos sempre contando com as futuras parcerias que a **"Empresa Manoa"** pode vir a oferecer a esta unidade educacional. Aproveitamos também a oportunidade para nos colocarmos a disposição da empresa.

Sendo para o momento, externamos nossas elevadas estimas, admirações e considerações.

Atenciosamente,

Maria Rogéria A. de Araujo
Vice Diretora
E.M.E.I.E.F. 23 de Março
Portaria Nº 065/2017

Andreia Oliveira Figueiras
Portaria nº 38/GAB/SEMECD/2017
Diretora
E.M.E.I.E.F. 23 de Março

CARTA DE AGRADECIMENTO

Eu Marcia Crepaldi Hez, representante da E.M.E.F. Antonio Frederico de Castro Alves, venho por meio deste agradecer ao Sr. Hermínio, responsável pela CEFLOM (Centro de Educação Florestal Manoa), pelo convite, apoio, pela oportunidade de conhecimento e pela belíssima recepção que proporcionou aos educandos e funcionários desta Instituição de Ensino. Agradecer também a cada palestrante que desenvolveram um belo trabalho, com palestras impactantes e de conhecimento único.

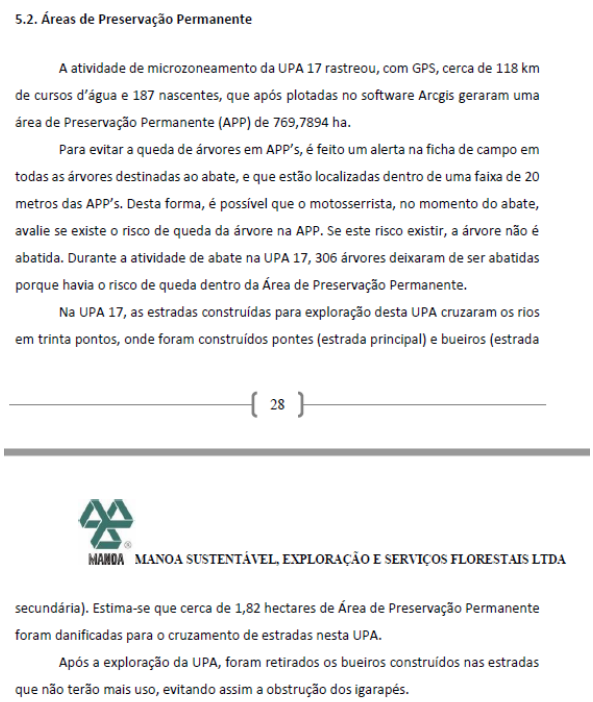
Cujubim-RO, 21 de Julho de 2022.

Atenciosamente,

Marcia Crepaldi Hez
Diretora
E.M.E.F. Antonio Frederico de Castro Alves

Figure 45. Thanking letters of the schools that visited Manoa Farm during the monitored period.

SDG 6.6: The monitoring of indicator 6.6.1 is carried out based on the information made available in the Annual Productive Unit (UPA) impact monitoring report, prepared annually by the Fazenda Manoa team after the end of the low-impact forest management. This report contains, among other things, detailed information on the Permanent Preservation Areas (APP) of the explored UPA, as exemplified in Figure 46, indicating which area of the UPA has bodies of water and springs, how the management was adapted to minimize the impact in these regions and, finally, how much of the total area of the APP was impacted by the management.



5.2. Áreas de Preservação Permanente

A atividade de microzoneamento da UPA 17 rastreou, com GPS, cerca de 118 km de cursos d'água e 187 nascentes, que após plotadas no software Arcgis geraram uma área de Preservação Permanente (APP) de 769,7894 ha.

Para evitar a queda de árvores em APP's, é feito um alerta na ficha de campo em todas as árvores destinadas ao abate, e que estão localizadas dentro de uma faixa de 20 metros das APP's. Desta forma, é possível que o motosserrista, no momento do abate, avalie se existe o risco de queda da árvore na APP. Se este risco existir, a árvore não é abatida. Durante a atividade de abate na UPA 17, 306 árvores deixaram de ser abatidas porque havia o risco de queda dentro da Área de Preservação Permanente.

Na UPA 17, as estradas construídas para exploração desta UPA cruzaram os rios em trinta pontos, onde foram construídos pontes (estrada principal) e bueiros (estrada

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MANOA MANOA SUSTENTÁVEL, EXPLORAÇÃO E SERVIÇOS FLORESTAIS LTDA

secundária). Estima-se que cerca de 1,82 hectares de Área de Preservação Permanente foram danificadas para o cruzamento de estradas nesta UPA.

Após a exploração da UPA, foram retirados os bueiros construídos nas estradas que não terão mais uso, evitando assim a obstrução dos igarapés.

Figure 46. Image of UPA's 17 post exploratory report.

To account for APPs and, therefore, areas related to aquatic ecosystems, information from all post-exploratory reports since the beginning of the project was compiled, as shown in Figure 47. During the monitored period, 1,272.56 ha of APPs were protected. The total APP area in each UPA explored was considered and the area damaged during low-impact forest management was subtracted, thus, it was possible to obtain the total APP protected for each UPA explored since the beginning of the project.

UPA	Ano de exploração	Área de APP total (ha)	APP danificada (ha)	APP total protegida (ha)
Reserva Absoluta	-			
Reserva Absoluta	-			
Áreas exploradas durantes outros períodos de monitoramento				
UPA 01	2018	184,96	0,3	184,66
UPA 04	2014/2015/2016	422,47	0,5	421,97
UPA 06	2015/2016	358,03	0,5	357,53
UPA 07	2013	297,04	0,52	296,52
UPA 10	2019	254,13	0,3	253,83
UPA 27	2017	427,03	0,2	426,83
UPA 15	2020	587,29	0,2	587,09
Áreas exploradas durante o período de monitoramento atual				
UPA 17	2021	769,79	1,82	767,97
UPA 11	2022	506,51	1,92	504,59
Áreas que serão exploradas até 2030				
UPA 03				0
UPA 05				0
UPA 09				0
UPA 12				0
UPA 13				0
UPA 16				0
UPA 20				0
UPA 21				0
			verificação 2021-2022	1.272,56
			Total Projeto 2013 a 2022	3.801,00

Figure 47. Spreadsheet with information about APP of each UPA explored during the Manoa REDD+ project existence.

SDG 12.2: The project's impact on SDG 12.2.1 was monitored through Forest Origin Documents (DOF). This document presents the place of origin of the wood product, in this case the Manoa Farm, and the destination of the cargo, sawmills in the surroundings of the enterprise. In all, 27 local sawmills (26 in the municipality of Cujubim and 1 in the municipality of Ariquemes) benefited from the low-impact forest management carried out in the project area. As it contains confidential information, such as sales details, including product prices, the DOF was made available only to VVB, on a confidential basis.

SDG 12.8: Indicator 12.8.1 was monitored through documents that sign the partnership between the REDD+ Manoa project and UNIR, such as, for example, research projects. Two of the projects have not yet been published, so they are considered sensitive documents as they are third-party research projects that have not yet been published. One of the projects was published in December 2022 (Figure 48) and is available online for reading. In addition, some images of the data collection can be seen in section 3.1.7. Information considered sensitive was made available only to VVB.

Research, Society and Development, v. 11, n. 17, e82111738937, 2022
(CC BY 4.0) | ISSN 2525-3409 | DOI: http://dx.doi.org/10.33448/rsd-v11i17.38937

Carnívoros de médio e grande porte em áreas sob manejo florestal de baixo impacto no arco do desmatamento, Cujubim, Rondônia

Medium and large carnivores in areas under low impact forest management in the arc of deforestation, Cujubim, Rondônia

Carnívoros medianos y grandes en áreas bajo manejo forestal de bajo impacto en el arco de deforestación, Cujubim, Rondônia

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Figure 48. Research paper published in December 2022 with data collected at Manoa Farm and with logistic support provided by the Manoa REDD+ Project.

SDG 13.0 and SDG 15.1: The evidence related to those SDG can be found along this and the previous monitoring reports, especially in section 5.4, Table 39 for SDG 13,0. For SDG 15.1 the expected deforestation projected for the monitored period was 1,570 ha, but only 2.09ha of unavoided deforestation and 111 ha of planned deforestation happened in the project area, resulting in 1,415 ha of avoided deforestation in the monitored period (see sections 5.2.1 and 5.2.6, Table 17 and Table 29).

SDG 15.2: Indicator 15.2.1 was monitored through the post-exploratory reports mentioned in SDG 6.6. These reports include data on the explored volume of each UPA, as exemplified in Figure 49. For monitoring the indicator, the explored volume of each managed UPA was compiled since the beginning of the project (Figure 50) to calculate the average exploration volume of the monitored period and since

the beginning of the project. Thus, it was possible to observe that the average volume of exploration in the monitored period was 22.83 m³/ha and since the beginning of the project 22.56 m³/ha, reinforcing the low impact of the management carried out in the region.

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A Tabela 2 apresenta o resumo da exploração da UPA 17. O volume passível de exploração era de 116.155,11 m³ (43,01 m³/ha). O volume efetivamente explorado foi de 63.707,11 m³ (23,59 m³/ha), que representa 55% do volume passível de exploração. Das 91 espécies autorizadas, 32 espécies não foram comercializadas devido à falta de procura e/ou baixos preços. O restante das espécies que foram exploradas (59) era representado por 20.866 indivíduos. Destes, foram visitados 16.357 indivíduos.

Figure 49. Image of UPA's 17 post exploratory report about volume of wood explored.

UPA	Ano de exploração	Volume de exploração m³/ha
Reserva Absoluta	-	
Reserva Absoluta	-	
Áreas exploradas durantes outros períodos de monitoramento		
UPA 01	2018	23,96
UPA 04	2014/2015/2016	23,51
UPA 06	2015/2016	18,78
UPA 07	2013	26,80
UPA 10	2019	24,86
UPA 27	2017	19,37
UPA 15	2020	20,13
Áreas exploradas durante o período de monitoramento atual		
UPA 17	2021	23,59
UPA 11	2022	22,07
Áreas que serão exploradas até 2030		
UPA 03		
UPA 05		
UPA 09		
UPA 12		
UPA 13		
UPA 16		
UPA 20		
UPA 21		
Média total	22,56	
Média 2021-2022	22,83	

Figure 50. Spreadsheet with information about volume of wood explored in each UPA managed during the Manoa REDD+ project existence.

SDG 15.5: Finally, indicator 15.5.1 was monitored through the operation plan of the UPAs managed in the monitored period and through the scientific papers cited in SDG 12.8. Regarding the endangered flora, Table 40, taken from the Exploration Plan of UPA 17 presents an example of how the species in the forest management area are identified and among them some of the endangered species found in the region are highlighted, the table with all the species can be found in the complete report of each of the UPAs explored.

In UPA 11 (2022) and 17 (2021), 5 species that are in some degree of threat on the IUCN list were found, they are:

- *Bertholletia excelsa* (brazil nut) listed as vulnerable by the IUCN;
- *Couratari guianensis* (fine-leaf wadara) listed as vulnerable by the IUCN;
- *Cedrela odorata* (pink cedar) listed as vulnerable by the IUCN;
- *Esenbeckia leiocarpa* (guarantã) listed as vulnerable by the IUCN;
- *Manilkara elata* (cow tree) listed as threatened on the IUCN list.

The data on the endangered fauna found in the region cannot be disclosed because it is from scientific works in progress and not yet published and, therefore, sensitive information. So, they were only shared with VVB. However, we list here the species that are on some degree of threat, according with IUCN, and were found in the studies carried out in the project area.

Among the mammals are 6 species, all listed as vulnerable by the IUCN:

- *Plecturocebus brunneus* (brown titi monkey);
- *Tapirus terrestris* (tapir);
- *Myrmecophaga tridactyla* (giant anteater);
- *Tayassu pecari* (white-lipped peccaries);

1) *Priodontes maximus* (giant armadillo);

- *Mico rondoni* (Rondônia marmoset).

Among the birds 2 species were found, both vulnerable according to the IUCN:

- *Psophia viridis* (dark-winged Trumpeter);
- *Tinamus tao* (grey tinamou).

And 1 reptile, *Chelonoidis denticulata* (yellow-footed tortoise), also vulnerable on the IUCN list, totaling 9 species.

Table 40. Flora species found in UPA 17, with highlights to threatened species.

NOME VULGAR	NOME CIENTIFICO
CANELA-PRECIOSA	OCOTEA SP
CAROBA	JACARANDA COPAIA
CASTANHEIRA	BERTHOLLETIA EXCELSA
CAUCHO	CASTILLA ULEI
CAXETA	SIMAROUBA AMARA AUBL.
CAXETAO	SIMABA SUBCYMOSA
CEDRINHO	ERISMA CALCARATUM
CEDRINHO BABAO	VOCHYSIA OBIDENSIS
CEDROMARA	CEDRELINGA CATENAEFORMIS DUCKE
CEDRORAMA	VOCHYSIA GRANDIS MART.
CEDRO-ROSA	CEDRELA ODORATA L.
COPAIBA	COPAIFERA GUIANENSIS
COPAIBEIRA	COPAIFERA MULTIJUGA HAYNE
CORACAO-DE-NEGRO	SWARTZIA SP
CRUILI	MOURIRI GUYANENSIS
CUIARANA	VISMIA BRASILIENSIS
CUMARU	DIPTERYX FERREA DUCKE
CUPIUBA	GOUPIA GLABRA
CUPUARANA	MATISIA PARAENSIS
ENVIRA	XILOPIA SPP
FAVA AMARGOSA	VATAIREA FUSCA
FAVA-ARARA-TUCUPI	PARKIA MULTIJUGA BENTH.
FAVEIRA-BRANCA	PARKIA SP
FAVEIRA-FERRO	DINIZIA EXCELSA DUCKE
FREIJO	CORDIA GOELDIANA HUBER
FREIJO BRANCO	CORDIA EXALTATA LAM.
GARAPEIRA	APULEIA MOLARIS SPRUCE EX BENT
GARROTE	BAGASSA GUIANENSIS AUBL.
GUARANTA	ESENBECHIA LEIOCARPA ENGL
INHAIBA	LECYTHIS LURIDA (MIERS)
IPE	TABEBUIA SERRATIFOLIA
ITAUBA	MEZILAURUS ITAUBA
ITAUBARANA	ORMOSIA EXCELSA
JATOBA	HYMENAEA COURBARIL
JEQUITIBA	ALLANTOMA LINEATA
JEQUITIBA ROSA	CARINIANA MICRANTHA DUCKE
JITO	GUAREA SILVATICA C.DC.
JITO PRETO	GUAREA KUNTHIANA
LANDIUM	CALOPHYLLUM BRASILIENSE CAMBES
LEITEIRO	SAPIUM AEREUM KLOTZSCH
LIBRA	ERISMA UNCINATUM
LOURO	NECTANDRA DISCOLOR (H.B.K.) NE
LOURO FAIA	ROUPALA MONTANA
MACACAUBA	PLATYMISCIUM BLANCHETII
MACARANDUBA	MANILKARA HUBERI (DUCKE) CHEVA
MACUCU	LICANIA GLABRA