wildsense

Manjarisoa

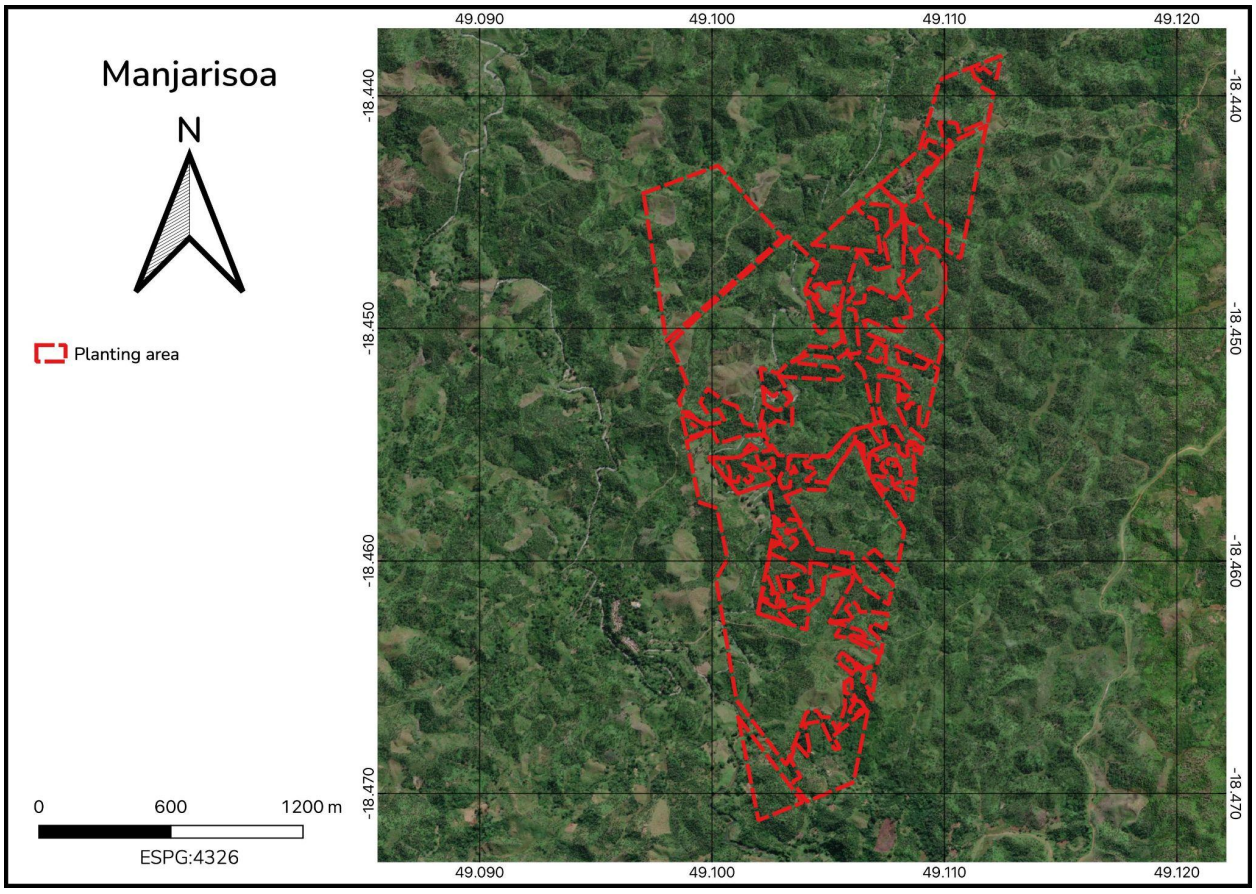
Reforestation project 2022 - Madagascar

Table of contents

1. EXECUTIVE SUMMARY

The Manjarisoa project is a reforestation project located in North Eastern Madagascar, in the region of Toamasina (18°27'47.1"S 49°06'43.9"E). ForestCalling's restoration efforts will generate significant environmental and social benefits, such as ecosystem restoration, species conservation and re-introduction, as well as contribute to local livelihoods. Over the next year, local communities will plant a total of **194,484 native trees**, which will absorb a total of **115,951 tonnes of carbon equivalent** over its lifetime (hence **115,951 carbon credits** of which **92,761** can be sold and **23,190** will be set aside as an insurance pool in the case of unexpected events). Wildsense will remotely monitor the project using satellite imagery to ensure the planted trees survive over the project's lifetime.

Note that this due diligence was updated on January 16, 2023 after important changes in the reforestation plan were made by ForestCalling.



➜ WILDSENSE

Founded in 2020, Wildsense selects, certifies and verifies carbon sequestration projects to bring more transparency to voluntary carbon markets. We are on a mission to build a wilder world where people and nature thrive. This is why, since our beginnings, we have been monitoring the health of over 1 million hectares of forests across the world using cutting edge remote sensing technology. The company currently employs ten full-time employees, mainly consisting of remote sensing and data engineers, as well as developers. We are also supported and empowered by the European Space Agency (ESA).

➜ OUR APPROACH[1]

To ensure our alignment with the guiding principles set out by the Task Force on Scaling Voluntary Markets & the IPCC, we have established a rigorous project selection, project verification and project guarantee process. Beyond the carbon sequestered by each project, we most of all evaluate the co-benefits to biodiversity and communities. Wildsense sources, selects, certifies and verifies each reforestation and restoration project according to 3 major principles: carbon, biodiversity and livelihoods.

➜ PROJECT DEVELOPER

ForestCalling Action was founded in 2020 by John Galloula to save tropical forests and stop deforestation. Their model focuses on the acquisition of threatened rainforests to create natural reserves, and to protect biodiversity and ecosystems. In 2021, they restored over 25 ha of the Rabesoa forest in Madagascar, protecting an estimated 200 lemurs which are endangered species on the island. ForestCalling Action hopes to expand their impact by protecting more tropical forests and creating local employment. Their passionate team is mainly composed of Malagasy scientists, managers and forest rangers, all committed to protecting threatened territories.

[1] Refer to the section "Our Methodology" for more information

2. THE PROJECT

In the last 60 years, Madagascar has lost almost half of its tropical rainforest. In 2017 only, 510,000 hectares (48.5 times the size of Paris!) were destroyed, making Madagascar the fourth most deforested country in the world[2]. Additionally, because Madagascar has been physically separated from mainland Africa about 200 million years ago, many of the plants and animals that live on the island are endemic (i.e. found nowhere else in the world), making it an extremely important biodiversity hotspot. Scientists estimate that about 90% of the plants on Madagascar are endemic, while about 85% of animals are endemic[3].

Manjarisoa is a site located in the tropical inland region of Atsinanana on the East coast of Madagascar. This 680-hectare forest has undergone severe degradation mainly from slash-and-burn agricultural practices, overgrazing and illegal charcoal production. Additionally, the site was threatened of being erased and transformed into ponds for industrial fish farming by an Asian industrial group. ForestCalling's reforestation project is therefore essential to prevent such transformation from happening, and to protect and restore this secondary rainforest and the biodiversity it hosts.

ForestCalling has secured part of the forest by buying out 300 hectares of land in Manjarisoa (lease can be found here). They will be looking at securing the remaining land and expanding the program over the next few years. As of now, the project consists in the rehabilitation of **300 hectares** of tropical forest. A total of **91 people** from the local community will be hired to build the **one-hectare long nursery**, grow the seedlings, plant **194,484 trees** and monitor their growth over the next 20 years. The Manjarisoa project has been carefully selected to meet our three criteria:

1. Carbon

Across every phase of the project, 5 "fast-growing" and native species will be planted on the site to foster the reintroduction of the lemur: Aramy (*Canarium madagascariense*), Harongana (*Harungana madagascariensis*), Mantaly (*Terminalia mantaly*), Tavolo (*Cryptocarya crassifolia*), and Vintananona (*Calophyllum chapelieri*). These tree species are all endemic to the island (i.e. only found in Madagascar), have a carbon sequestration capacity ranging from 0.46 tCO_2e to 1.88 tCO_2e per tree over the next 20 years, and a planting density of around 400 to 1,600 trees per hectare. A total of 194,484 trees will be planted, with an expected mortality rate of 30%. The

[2] 2017 Was the Second-Worst Year on Record for Tropical Tree Cover Loss

[3] Goodman, S., & Benstead, J. (2005). Updated estimates of biotic diversity and endemism for Madagascar. Oryx, 39(1), 73-77. doi:10.1017/S0030605305000128

reforestation plan has been designed based on the Malagasy National Inventory, research from the CIRAD (French Agricultural Research Centre for International Development)[4], and local informal data (i.e experience from other project developers and nurseries in the region[5]). *Details about the species selected for planting are available in Appendix 2*.

2. Biodiversity[6]

The reforestation plan is adapted to the local environment and takes into account the social context of communities surrounding the Manjarisoa forest. ForestCalling's project will rehabilitate an area that was destroyed by slash-and-burn practices and illegal charcoal production, by involving the same communities overusing this forest and offering them an economic alternative that will improve their livelihoods while restoring the ecosystem. The project will follow a rigorous plan to plant native species, thereby restoring the habitat of many endangered species: 6 species of lemurs, 6 species of frogs, 6 bird species, 2 species of snakes, 2 species of lizards and 3 species of small mammals were identified in the area, several of which are close to extinction. *For further information regarding the current status of the prior species, refer to the list of endangered species Appendix 3*.

3. Livelihoods

In the Manjarisoa restoration project, 91 people will be hired for the following tasks: building of the nursery (20 men during 4 months), sowing activities (20 people - 9 men and 11 women - during 4 months), planting activities (40 people - 25 men and 15 women - for 6 months), operational coordination (one man, permanent), nursery management (4 men - permanent) and forest guarding (6 people - 5 men and one woman - permanent).

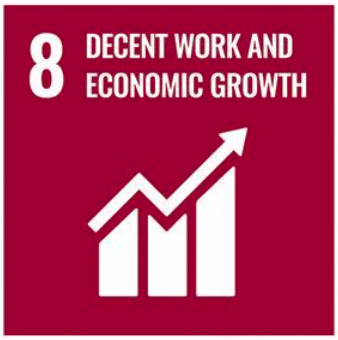
Local communities will be paid more than local living wages for their work. A more comprehensive social plan is being developed in partnership with INSUCO, including the development of local economic alternatives to ensure the community does not live off the forest anymore. This program will be aimed at improving local livelihoods and securing the protection of the forest for the entire duration of the project, and beyond. In

[4] Combining global tree cover loss data with historical national forest cover maps to look at six decades of deforestation and forest fragmentation in Madagascar
[5] Mostly conversations with the national Ministry of Environment and data gathered at the Graine de Vie nursery in Antananarivo.
[6] For more information, refer to the reforestation plan through this link.

a later phase of the program, more locals will be hired to work in the lemurs reintroduction centre.

Please find the full photo and video album of the project here.

The Manjarisoa project also meets 3 United Nations Sustainable Development Goals[7]:



SDG 8: Decent work and economic growth

ForestCalling contributes to local economic development by hiring 91 locals and by purchasing their seedlings from a local nursery. All workers will be paid more than local living wages for their services and ForestCalling will aim at achieving gender parity within its local hires.

SDG 13: Climate action

Each planted tree will sequester additional atmospheric carbon during its lifetime. Our remote sensing tools monitor each project to ensure that trees are actually planted and that greenhouse gases are effectively being removed from the atmosphere, thus participating in limiting global warming and fighting climate change.

SDG 15: Life on land

Rehabilitating the Manjarisoa forest will restore lost habitat for many vulnerable and endangered species such as the lemur, and different types of frogs, birds, snakes, lizards and small mammals. Refer to *Appendix 3* for more information.

[7] The United Nations's 17 Sustainable Development Goals

3. OUR METHODOLOGY

➜ Project Selection

We are currently putting together a scientific committee to verify our selection criteria, double-check our baseline methodology and help us improve our risk modelling matrix to assess project guarantees and insurance (see “Project Guarantee” below). A robust methodology should therefore be released by Q2-2023. Until then, we select and rate our projects based on a thorough analysis of the following criteria:

- **Project Quality**

We select projects that not only support local communities but also positively impact biodiversity and endangered species. We have established 3 main criteria for our project selection process:

1. **Carbon.** All planted trees must stay in the ground to ensure that carbon is sequestered in the soil in the long-term. We require planted trees to be native species, preferably endemic, to the ecosystem and that a minimum of three species are planted. Diversity and endemism make the ecosystem more resilient to the spread of diseases and pest invasions. We also use our satellite technology to monitor forest cover in the long run and ensure permanence and durability.
2. **Biodiversity.** Projects must improve local ecosystems by restoring biodiversity hotspots. We strive to find and certify projects that form corridors between or buffer zones around existing habitats, with a species protection or reintroduction aspect. We are also in the process of testing out different bio-monitoring techniques, such as bioacoustics and environmental DNA, to analyse which is most efficient in assessing biodiversity improvements in a specific ecosystem.
3. **Livelihoods.** In order to favour community ownership of projects, seed collecting, tree planting and project management must be carried out by locals. We include a gender component to our certification, however we do understand and respect local traditions and customs which may prevent us from guaranteeing gender parity in some projects. All workers must be paid fair living wages or rewarded in the form of economic alternatives. We are currently working with Insuco, an international independent consulting firm, to refine this criterion.

- **Carbon Offset Requirements**

We carefully select projects based on existing carbon absorption and the potential for future carbon removal. This is why we have calculated a baseline (see *Appendix 4*) and identified risks (see *Appendix 5*) that might impact our project's ability to absorb carbon in the long term, in order to mitigate and compensate for such risks (see "Project Guarantee" below). Such metrics are based on the IPCC's 4 guiding principles, including:

1. **Additionality** ensures that the project is generating a greenhouse gas emission reduction that would not occur otherwise. Wildsense measures project carbon baselines before restoration begins and estimates the carbon potential over the lifetime of the project to respect this principle. The Manjarisoa project will absorb approximately **115,951 tonnes of CO2 equivalent** by the end of the project duration and even more after the project has been completed. 20% of the total carbon absorbed will be "set aside" as an insurance pool and hence will not be sold as carbon credits to make up for any natural disaster. Hence, **23,190** credits out of the **115,951** will be saved and **92,761 carbon credits will be used for compensation through this project**. *See Appendix 4 for more information on our calculations.*

2. **Durability** ensures that emissions are kept out of the atmosphere for the entire duration of the project and beyond. We monitor forest cover change to ensure that the project's integrity is maintained over the next 20 years. The duration of the monitoring period is typically determined by the time taken for all planted trees to reach maturity and re-create a full canopy cover. In this case, considering that we have little information on the maturity of the species planted, we based our monitoring period in comparison to other projects that we certify. We will therefore monitor the evolution of the project for the next 20 years and carry out a monitoring assessment to gauge if we need to extend that period. Beyond our satellite monitoring, project developers also work hand-in-hand with local communities through official agreements to ensure that economic alternatives to deforestation are found, thus ensuring the long-term sustainability of the project. Our risk assessment also looks at the likelihood that the project will be successful based on geopolitical, climate change, socio-economic, land-ownership, and management structure factors in each area. *See Appendix 6 for details on each factor.*

3. **Leakage** occurs when emissions avoided through a particular carbon project are displaced, and simply occur elsewhere. For each project, we define and monitor forest cover change and potential leakage areas around our planting zones. The leakage area defined for this project consists of a 5-kilometre radius around the 680 hectare forest. The area where the Manjarisoa forest is located already suffers from deforestation carried out by local communities. A leakage situation will be declared only if the rate of deforestation in the leakage area exceeds the average rate of deforestation analysed over the area in the past 5 years. *See Appendix 7 for the map of the monitored leakage area.*

4. **Double counting** is the risk associated with the double claim of a carbon credit by both the project developer and the credit issuer. To avoid such confusion and transparently account for every ton of carbon sold, each of our projects is recorded into a double-registry system. All sold tons will be displayed on APX meta registry starting Q2-2023, to ensure complete transparency and third-party verification.

➜ Project Verification & Monitoring

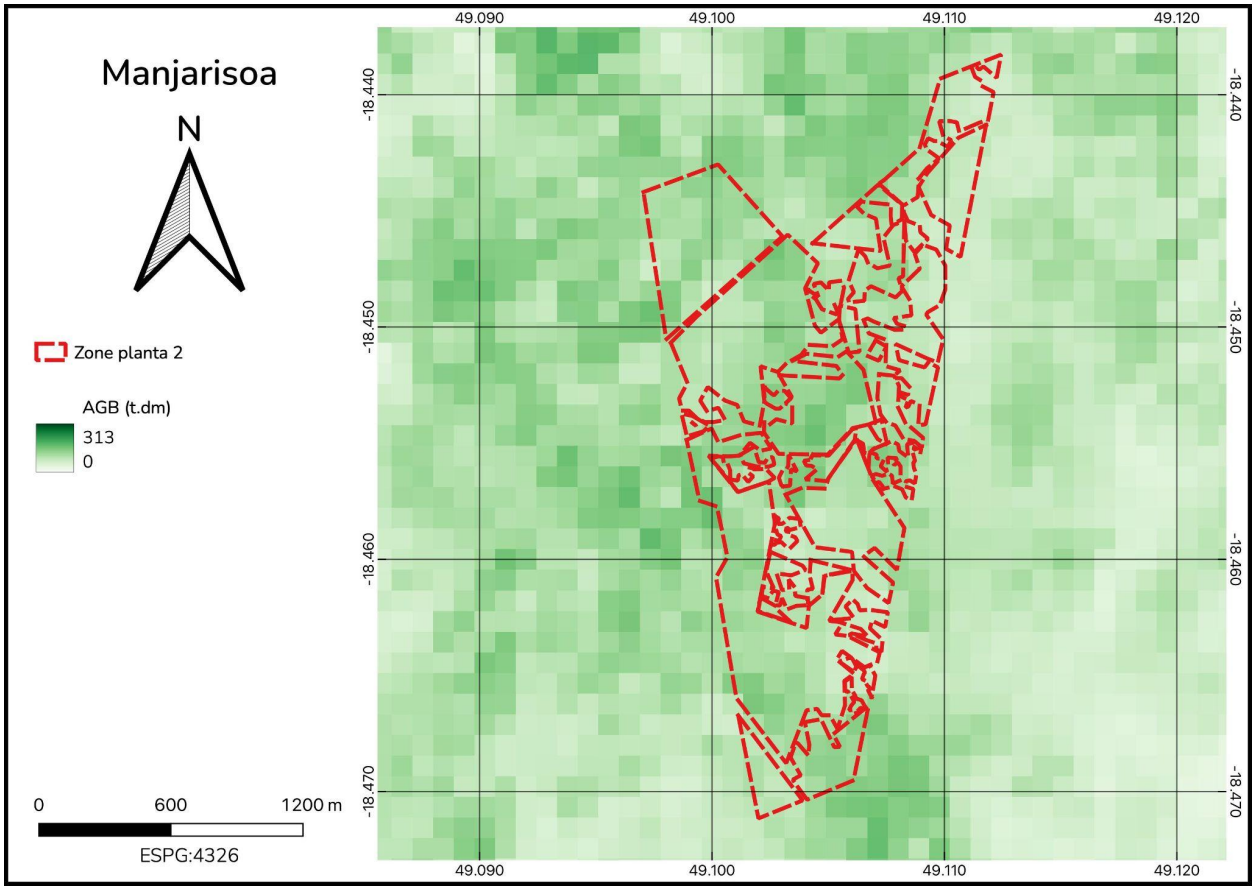
Wildsense verifies projects using its proprietary satellite monitoring technology and field data collected through the Wildsense app.

1. **Satellite monitoring**[8]

   Wildsense monitors its projects on a quarterly basis, using cutting-edge remote sensing technology, backed by the European Space Agency. More specifically, we first establish baselines by checking forest and shrub cover prior to the beginning of the project and we then monitor changes in forest cover by following the evolution of the canopy cover using deep learning and machine learning techniques. Such models, developed by our team of engineers, allow us to monitor in almost real-time the evolution of our projects by making sure that trees are actually planted and dieback rates remain low.

   During the first 5 years of the project, developers must track seedlings' growth and mortality rates themselves on a quarterly basis, as our satellite models are not yet able to precisely track seedlings of such a young age.

[8] See *Appendix 8* for an NDVI photo of our project and refer to this document for a better understanding of our satellite technology.



2. Field data collection & verification

In collaboration with project developers, we have developed an app to facilitate data collection and verification. We are in the process of testing it on the ground before it gets publicly released in Q2-2023. Local caregivers will be able to take photos, videos, and audio - geolocated and timestamped to report project KPIs on a quarterly basis. Our app will also include in the future a tree species identification feature allowing users to verify if the right species are actually planted, thus ensuring that it matches the project planning as detailed in this document. So far, we have done all of the above manually.

If the project developer does not wish to use our dedicated field app, they must provide (1) geolocalized and time-stamped baseline photos of the sites prior to planting work, and (2) additional geolocalized and time-stamped photos of the site based on the verification schedule agreed upon with the project developer. Wildsense will use those pictures to verify tree cover under the canopy, identify tree species and related

biodiversity, and assess tree health. Biodiversity & impact on livelihoods are self-reported by project developers.

Please note that verification intervals can vary depending on project type and our contract with project developers. See Appendix 9 for more information on the project timeline and project costs. All quarterly reports will be sent directly to project financer(s).

ForestCalling is hiring 6 people from the local community to act as forest guards, monitoring the entire project area on a daily basis, tracking tree growth and potential mortalities, and preventing potential degradation.

➜ Project Guarantee

Not every tree makes it. To insure against any potential losses, we conduct a risk assessment analysis for each project and calculate contribution to a common insurance pool accordingly. We then monitor forest cover to verify the validity of carbon credits over the lifespan of the project and replace any credit which fails with a credit from the insurance pool. ***Note that the role of the insurance pool is solely to back projects against natural disasters and cannot be sold, even when projects reach their full carbon capacity.***

The Manjarisoa project has a **risk rating of A**. Our risk assessment matrix measures the probability of the project being undisturbed over its lifetime and efficiently absorbing carbon and protecting wildlife. We evaluate geopolitical stability, socioeconomic situation, vulnerability to climate change, as well as additionality, leakage, and project durability. Each criterion is evaluated on a scale from 1 to 5.

To guarantee that each ton issued ex-ante will meet its 20-year durability standard, we are setting aside an insurance pool of **23,190 credits, equivalent to 20% of the project's total additionality.** Those credits represent a contribution to our insurance pool that backs every ton of carbon sold by Wildsense, in case this project or other Wildense certified projects do not sequester the initial carbon estimation.

Please note that all of our internal processes will be audited by a third party regularly and we will aim to have our project reviewed by a carbon rating platform.

See Appendix 6 for a detailed view of our risk rating.

➜ Issuance mechanism

The Wildsense Standard enables the pre-financing of projects through the sale of carbon credits in the voluntary carbon market. Once the project is certified, Wildsense will issue 115,951 Projected Restoration Units (PRUs) that represent future carbon sequestration. Projected Restoration Units cannot be retired. PRUs are transferred into Verified Restoration Units (VRUs) according to the Carbon Sequestration Curve, disclosed in the Carbon Calculation Sheet. However, if the project fails to pass a verification, PRUs are not transferred into VRUs. If the verification fails due to a natural disturbance, PRUs will be replaced using the buffer pool. If the verification fails due to other causes, PRUs can either be delayed if the project timeline can be postponed, or cancelled if the project fails entirely.

4. APPENDICES

➜ Appendix 1: Our partner: ForestCalling

ForestCalling Action was founded in 2020 by John Galloula to safeguard tropical forests and stop deforestation. Their model focuses on the acquisition of threatened forest ecosystems to create natural reserves, and to protect biodiversity and ecosystems. 4 main principles guide this model: carbon sequestration, biodiversity restoration, climate mitigation and soil health. In 2021, they restored over 25 ha of the Rabesoa forest in Madagascar with the help of locals, protecting an estimated 200 lemurs which are an endangered species. ForestCalling Action hopes to expand their impact by protecting more tropical forests and creating local employment. Their passionate team is mainly composed of Malagasy scientists, managers and forest rangers, all committed to protecting threatened territories. So far, their main source of funding came from ForestCalling Label, a clothing brand that they launched using 100% organic and recycled fabric, which helped them finance the restoration of the first 25 hectares of the Rabesoa forest. Their goal is to restore 10,000 ha of terrestrial ecosystems by 2030.

➜ Appendix 2: List of tree species planted in the project area

During phase 1 of the project, the following species will be planted: Aramy (*Canarium madagascariense*), Harongana (*Harungana madagascariensis*), Mantaly (*Terminalia mantaly*), Tavolo (*Cryptocarya crassifolia*) et Vintanona (*Calophyllum chapelieri*). All of which are native to Madagascar.

	Ambora	Aramy	Harongana	Mantaly	Molanga	Rotra	Tafononana	Tavolo	Vintanona	Voara		
D (cm)	17	30	20	28	19	27	17	25	28	16		
H (m)	15	30	20	17	15	16	15	20	25	15		
p	1	1	0.44	1	0	1	1	1	1	0.4		
AGB (ton)	0.13	0.80	0.19	0.40	0.14	0.44	0.13	0.40	0.70	0.09		
BGB (ton)	0.05	0.29	0.07	0.15	0.05	0.16	0.05	0.15	0.26	0.03		
C02 (ton)	0.32	1.88	0.46	0.94	0.32	1.03	0.32	0.95	1.65	0.20		
% of trees	0%	35%	20%	5%	0%	0%	0%	15%	25%	0%	**100.00%**	
Wood density	0.65	0.60	0.60	0.65		0.82	0.65	0.70	0.64	0.46		
Spacing (m)	4.47	5	2.5	5	4.47	3.5	4.47	4.5	5	4.47		
Incubation time (month)		4	5	6		6		4	6	5		
Planting density (arb/Ha)	500	400	1600	400	500	816	500	494	400	500	**611**	

➜ Appendix 3: List of species that the project will strive to protect and/or reintroduce

- ***Eulemur fulvus***
  Also known as the Brown Lemur, it is assessed as Vulnerable by the IUCN Red List of Threatened Species since 2018. They are native to Madagascar but have also been found to reside in Mayotte where they were introduced by human agency. In the East side of Madagascar, they live in tropical moist lowlands and montane forests. They sometimes eat fruit from cultivated trees which drives them in conflicting situations with farmers. Their population trend is decreasing, with an estimated 30% continuing decline of mature individuals over the past 30 years. The major causes are decline in area, extent and quality of habitat through agriculture and aquaculture logging and wood harvesting and unsustainable hunting practices causing habitat fragmentation.

- ***Hapalemur griseus***
  Also known as the Eastern Lesser Bamboo Lemur, this primate species is currently Vulnerable according to the IUCN Red List of Threatened Species and has been since 2018. Easter Lesser Bamboo Lemurs are native to Madagascar and typically live in dense bamboo forests, as bamboos constitute approximately 80% of their diet. Their population trend is decreasing, with an estimated 30% continuing decline of the mature population in the past three generations. The major causes are decline in area, extent and quality of habitat through agriculture and aquaculture logging and wood harvesting as well as unsustainable hunting practices causing habitat fragmentation.

- ***Microcebus murinus***
  Also known as the Gray mouse lemur, it was assessed as Least Concern by the IUCN Red List of Threatened Species in 2020. Native to Madagascar, they are adaptable, widespread, and abundant, making them one of the least threatened lemurs in Madagascar. Despite being categorised as Least Concern, their population is declining and is expected to keep declining in the next 60 years. Indeed, an estimated 37% reduction in the species' range is likely to occur from 2000 to 2080 due to climate change alone.

Please find below the full list of species identified on the site, as provided by ForestCalling Action:

Scientific name	#	Microhabitat	IUCN Status	Geographic distribution	Note
AMPHIBIANS					
Gephiromantis aff. *blanci*	5	Rock	Near Extinct	Endemic	Observed
Heterixalus sp	1	Leaf	Near Extinct	Endemic	Observed
Mantidactylus aff. *betsileanus*	1	Rock	Near Extinct	Endemic	Observed
Mantidactylus aff. *grandidieri*	1	Soil	Near Extinct	Endemic	Observed
Plethodontohyla aff. *notostica*	1	Soil	Least Concern	Endemic	Observed
Ptychadena mascariensis	1	Paddy field	Least Concern	Common	Observed
REPTILES					
Dromycodrias bernieri	2	Forest litter	Least Concern	Endemic	Observed
Liophidium torquatum	1	Crevasse	Least Concern	Endemic	Observed
Lygodactylus sp	1	Shrub	Near Extinct	Endemic	Observed
Phelsuma sp	5	Ravenala	Near Extinct	Endemic	Observed
BIRDS					
Buteo buteo	1	Air	Least Concern	Common	Observed
Corythornis vintsioides	2	Shrub	Least Concern	Endemic	Observed
Falco newtoni	1	Tree	Least Concern	Endemic	Observed
Foudia Madagascariensis	1	Tree	Least Concern	Endemic	Observed
Ipsidina Madagascariensis	2	Tree	Least Concern	Endemic	Observed
Terpsiphone Mutate	1	Shrub	Least Concern	Endemic	Observed
SMALL MAMMALS					
Hemicentetes spp.	+	-	Near Extinct	Endemic	Testimony
Rattus rattus	1	Shrub	Least Concern	Introduced	Observed
Setifer setosus	+	-	Least Concern	Endemic	Testimony

➜ Appendix 4: Additionality and baseline calculations [9]

To calculate the baseline for our project, we extracted the average AGB for the project area from two AGB models: ESA Biomass Climate Change Initiative, Global Aboveground[10] and Belowground Biomass Carbon Density Maps[11]. The BGB is calculated on the basis of the IPCC equation using the root-shoot ratio. All of the calculations below are based on the IPCC's standard equations that we refine with on-the-ground data or country specific peer-reviewed literature.

Estimation for carbon stock at the beginning of the project

$$C_{TREE\_BSL} = 44/12 \times CF_{TREE} \times b_{FOREST} \times (1 + R_{TREE}) \times A_i$$
$$C_{TREE\_BSL} = 44/12 \times 0.5 \times 110 \times (1 + 0.1) \times 230$$
$$\mathbf{C_{TREE\_BSL} \approx 51{,}021\ t\ CO_2e}$$

Where

C_{TREE_BSL} = Carbon stock in pre-project tree biomass; t CO2e

CF_{TREE} = Carbon fraction of tree biomass; t C (t.d.m.)$^{-1}$. A default value of 0.5 t C (t.d.m.)$^{-1}$ is used.

b_{FOREST} = Mean above-ground biomass in the forest in the region or country where the A/R CDM project is located; t d.m. ha^{-1}.

R_{TREE} = Root-shoot ratio for trees in the baseline; dimensionless.

A_i = Area of baseline stratum i, delineated on the basis of tree crown cover at the start of the A/R CDM project activity; ha.

Estimation for carbon stock in trees at the end of the project

$$C_{TREE\_PROJECT} = A \times \Sigma\, C_{S,i} \times P_{trees,i} \times D_{trees,i}$$
$$C_{TREE\_PROJECT} = A \times \Sigma\, C_{S,i} \times P_{trees,i} \times D_{trees,i}$$
$$C_{TREE\_PROJECT} \approx 150 \times [(1.88*0.35*400) + (0.46*0.2*1600) + (0.94*0.05*400) + (0.95*0.15*494) + (1.65*0.25*400)]$$
$$C_{TREE\_PROJECT} \approx 150 \times (112.8 + 73.5 + 26.3 + 193.3 + 93.8 + 164.7)$$

[9] All baseline calculations are based on the A/R methodological tool developed by the UN Framework Convention on Climate Change as well as the A/R Methodological Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities

[10] Santoro, M.; Cartus, O. (2021): ESA Biomass Climate Change Initiative (Biomass_cci): Global datasets of forest above-ground biomass for the years 2010, 2017 and 2018, v3. NERC EDS Centre for Environmental Data Analysis, 26 November 2021.

[11] Spawn, S.A., and H.K. Gibbs. 2020. Global Aboveground and Belowground Biomass Carbon Density Maps for the Year 2010. ORNL DAAC, Oak Ridge, Tennessee, USA.

$$C_{TREE\_PROJECT} \approx 152{,}856 \text{ t } CO_2e$$

Where

$C_{S,i}$ = Carbon sequestration potential for each tree species planted on the site based on tree height, tree diameter, above-ground biomass and below-ground biomass (t CO2e / tree)

$P_{trees,i}$ = Percentage of each tree species planted on the site

$D_{trees,i}$ = Planting density for each species

Estimation for natural regeneration during the project

$$C_{NATURAL\_REGENERATION} = A \times [(44/12 \times CF_{TREE} \times b_{NATURAL\_FOREST} \times (1 + R_{TREE})) - (44/12 \times CF_{TREE} \times b_{PROJECT} \times (1 + R_{TREE}))]$$

$$C_{NATURAL\_REGENERATION} = 70 \times [(44/12 \times 0.5x\ 210 \times (1 + 0.1)) - (44/12 \times 0.5 \times 110 \times (1 + 0.1))]$$

$$C_{NATURAL\_REGENERATION} \approx 14{,}116 \text{ t } CO_2e$$

Where

A_i = Area where natural regeneration occurs; ha.

CF_{TREE} = Carbon fraction of tree biomass; t C $(t.d.m.)^{-1}$. A default value of 0.5 t C $(t.d.m.)^{-1}$ is used.

$b_{NATURAL\_FOREST}$ = Mean above-ground biomass in the natural forest in the region or country where the A/R CDM project is located; t d.m. ha^{-1}.

R_{TREE} = Root-shoot ratio for trees in the baseline; dimensionless.

$b_{PROJECT}$ = Mean above-ground biomass on the project area; t d.m. ha^{-1}

Total emission reduction by trees and shrubs on the project:

$$C_{Captured} = C_{TREE\_PROJECT} - C_{TOTAL,B} + C_{NATURAL\_REGENERATION}$$

$$C_{Captured} = 152{,}856 - 51{,}021 + 14{,}116 = \mathbf{115{,}951 \text{ t } CO_2e}$$

You will find our precise additionality and baseline estimations for the project through this link.

➜ Appendix 5: Risk assessment matrix for carbon criteria

	1	2	3	4	5
Additionality We ensure that the project is generating a greenhouse gas emission reduction that would not occur otherwise.	The additionality claim is completely erroneous. It is likely that it was based on false data or no data at all. No remote sensing data can be used to monitor the evolution of the project.	There is some additionality to the project but it is unsure how much. The data on which the analysis was based is likely to be flawed and not a perfect representation of reality.	The projects should live up to their additionality promises in the long-run but more accurate data and better remote sensing estimates should be used to validate it.	Remote sensing models and on-the-ground data regarding biomass absorption and co-benefits validated with certainty the fact that the project is additional.	Our technologies have proven that the project is absorbing even more carbon than originally planned for.
Durability We ensure that emissions are kept out of the atmosphere for the entire duration of the project.	Emissions will not be kept out of the atmosphere due to a poorly managed project with a very high likelihood of fire or deforestation for agricultural purposes. No buffer zone.	There is not enough data to guarantee permanence which requires assuming the worst and being conservative. Emissions are unlikely to be kept out for the duration of the project and beyond. No buffer zone.	Without unexpected events and based on the available data, the project is likely to absorb carbon according to predictions for the entirety of the project.	Low disturbance allows saying with confidence that the project will absorb emissions beyond the project duration. If the project is negatively impacted, a guarantee is attributed to each ton of carbon to compensate for the potential loss of emission reduction.	Low disturbance allows saying with confidence that the project will absorb emissions across multiple generations. If the project is negatively impacted, a guarantee is attributed to each ton of carbon to compensate for the potential loss of emission reduction.
Leakage We ensure that emissions avoided	The area protected for reforestation is mostly	Deforestation activities are not displaced to another	Deforestation is not displaced and reforestation is	Trees are planted efficiently and death rates are	Reforestation efforts were so promising and beneficial that

through our projects are not displaced, nor occur elsewhere.	inefficient (i.e. carbon is not absorbed) AND deforestation activities are displaced.	location but reforestation efforts are not optimal and agricultural projects remain in place for subsistence.	conducted as planned. Emissions are not displaced as a consequence and carbon is taken out of the atmosphere.	low which allows the project to expand beyond its original delimitations. If leakage occurs, a guarantee will make up for each lost ton of carbon emission reduction.	they sparked new initiatives in the region or elsewhere. If leakage occurs, a guarantee will make up for each lost ton of carbon emission reduction.

➜ Appendix 6: Factors potentially affecting the durability of our project's carbon sequestration over the full project's duration (see *Appendix 10* for the risk assessment matrix)

- **Geopolitical**

Since its independence from France in 1960, Madagascar has experienced political unrest and instability through multiple coups and disputed elections. After the last coup in 2009, the self-proclaimed High Transitional Authority (HAT) governed the country until elections took place following international pressure. This agitated period was accompanied by negative economic growth and poor government revenues, limiting political, social, and economic stability and development. In 2019, the first democratic elections took place and Andry Rajoelina was elected President, which was accepted as free and fair.[12]

As for the specific region of Atsinanana where our project is located, it is considered to be the second economic lung of Madagascar after the Analamanga province where the capital city is located. The region is both politically stable and economically dynamic thanks notably to Toamasina's port, the most important one in Madagascar, as well as its mining, cattle ranching, fishing, agricultural, and touristic activities. Such features allow us to be quite confident

[12] Madagascar political and economic environment

regarding the low probability of our project being disturbed by social and political turmoil in the coming years.[13]

- **Climate Change**

Madagascar is highly vulnerable to climate change. Since 1974, temperatures have been steadily increasing, going from an average of 21.72°C in 1974 to 22.9°C in 2020, with a projected increase in temperature of 2.5°C to 3°C. Between 1961 and 2005, 17 of the 21 weather stations recorded statistically significant increases in daily minimum temperatures across all seasons, and several stations showed increased daily maximum temperature trends. This rapid change in temperature is causing a disturbance in natural processes in a country already highly vulnerable to natural variability. A steady decline in rainfall has been noticed between 1961 and 2005 with a below average rainfall in the past 5 years and an increase in the length of dry periods. Other climate-related risks include increases in intensity of extreme weather events, including droughts, cyclones intensification and disturbances and floods.

These extreme weather events have a major impact on local populations. Between 1990 and 2013, Madagascar recorded 63 major natural disasters, affecting at least 13 million people. However, the East side of the island, where Manjarisoa is located, is less affected by climate change than the West side of Madagascar. The maximum temperature recorded between 1991 and 2020 in the region of Atsinanana where our project is located, was 26.47°C whereas the maximum temperature recorded on the west coast during that same period of time reached 30.97°C.

Despite its vulnerability, Madagascar is taking legal action to fight climate risks. To limit temperature increase below 2 degrees celsius, Madagascar signed the Paris Agreement in 2016. They released their Intended Nationally Determined Contributions defining their mitigation and adaptation goals to reduce climate change vulnerability. Indeed, by 2030, the country aims to reduce a total of 32% of greenhouse gas emissions. Among other strategies they plan on having an ecosystem based adaptation approach by leveraging forests, mangroves, biodiversity and water resources to mitigate climate risks. Their reforestation program includes planting 270,000 ha of indigenous forests.

- **Socio-economic**[14,15]

[13] La Région Atsinanana à Madagascar
[14] Gini coefficient by country in 2022
[15] Madagascar GDP and economy

Despite boasting significant natural resources, Madagascar has one of the highest poverty rates in Africa, with 81% of the population living on less than $1.25 per day and 70% living below the poverty line. The country's economy is mainly reliant on agriculture (shrimps, spices, coffee, cacao, cotton, tobacco etc.), ecotourism and mining (graphite, chrome). Climate variability negatively impacts local populations whose food security is based on predominantly rainfed agriculture. As mentioned in the climate change factor, below average rainfalls and extended droughts therefore increase food insecurity in the country, leaving the country fourth highest rate of chronic malnutrition.

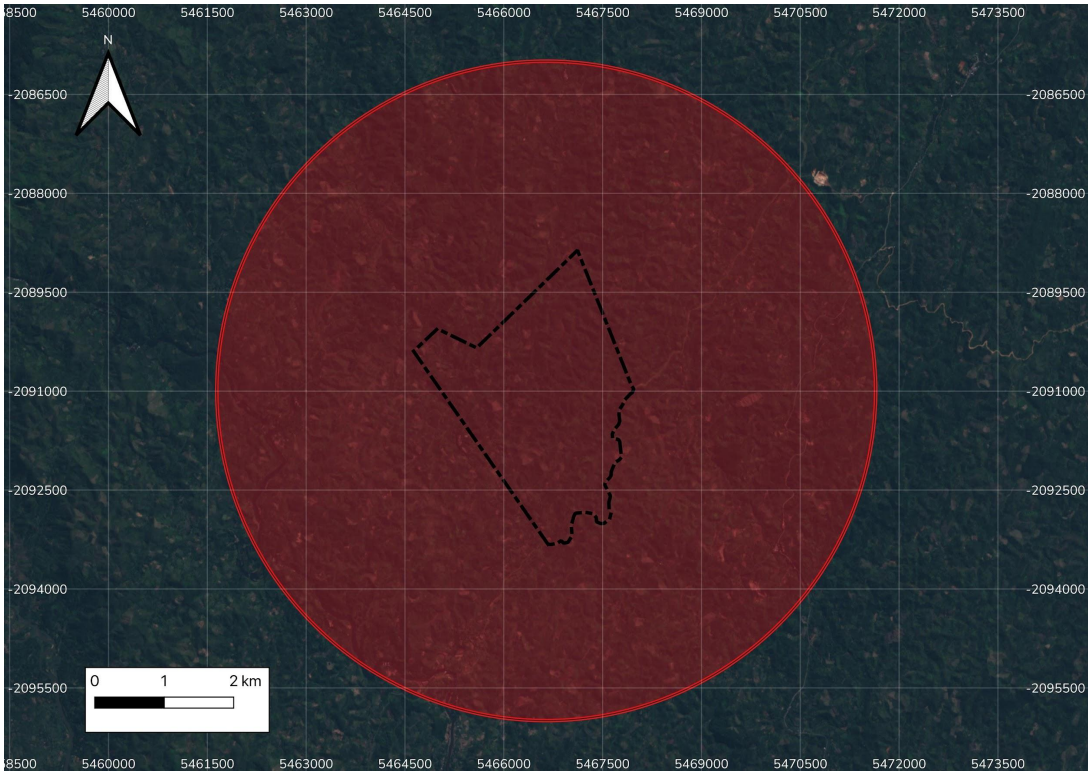
In terms of inequality assessment, Madagascar's Gini coefficient was 37.20% in 2018 according to the World Data Atlas. The Gini coefficient is the most commonly used measure of income distribution across the world. The higher it is, the greater the income gap is between a country's richest and poorest. Madagascar therefore lies in the "adequate equality" category. As for economic development, Madagascar experienced a steady economic growth from 2013 to 2019 with a real GDP growth of 4.4% in 2019, but the COVID-19 outbreak forced the country into a recession, notably because of the various lockdowns and the effects on the tourism industry. Creating local employment at living wages is therefore crucial to keep the region of Atsinanana economically dynamic. That being said, as mentioned above, the region of Atsinanana is one of the most dynamic in the country with 63% of its population being less than 25 years old and a schooling rate of 79%.[16]

- **Land ownership and management**

Prior to 2021, land use of the Manjarisoa Forest was detrimental to the forest, mainly because of slash-and-burn agriculture. In February 2021, ForestCalling Action signed a commitment to purchase the northern parcel of the forest that is a private property, enabling them to legally manage reforestation by local communities. In June 2022, ForestCalling will have full ownership[17] of the 680 hectares of the Manjarisoa forest. Gaining ownership of the area enables them to fully control the forest, stop its degradation and start restoring the local ecosystem.

➜ Appendix 7: Map of the leakage prevention area

[16] L'accès à l'éducation à Madagascar
[17] 99-year lease, extendable



Leakage area - 5km - EPSG:3857 WGS 84

➜ Appendix 9: Project timeline and costs

- **Project timeline**

Activity	2022							2023								
	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
Lease signature of Manjarisoa part 1																
Social diagnostic and social plan design,																

validated by INSUCO																
Nursery construction																
Seedlings growth																
Planting																

- **Project costs**

Please find a breakdown of all the costs involved in the project through this link.

➜ Appendix 10: Risk assessment matrix for external factors

This matrix was created to evaluate risks associated with ex-ante projects, based on a scale from 1 to 5. The goal is to give an indication of the likelihood of carbon to be absorbed in the long run based on external factors.

	1	2	3	4	5
Geopolitical Stability We evaluate the risk associated with the level of governance according to previous conflicts and government intervention in the location of the project and the probability of the project failing.	Very poor governance. A considerable amount of corruption, ethnic conflicts and wars. Extreme poverty and inequalities.	Poor governance. A significant amount of conflicts. No Government plan to address sustainability efforts.	Decent governance. Low amount of conflicts. Government intervention (subsidised health coverage, public education etc.) and government plan to address sustainability efforts.	Good governance. Peace, justice and strong institutions. Low poverty. Government intervention (subsidised and universal health coverage, quality public	Excellent governance. Peace, justice and strong institutions. Very little to no poverty. Government intervention (subsidised and universal health coverage, quality public schools, decent work and economic

				schools, decent work and economic growth, reduced inequalities etc.) and government plan to address sustainability efforts.	growth, gender equality, reduced inequalities, affordable and clean energy, and government plan to address sustainability efforts, and have met their previous statements.
Climate change vulnerability We evaluate the risk associated with climate change according to the estimated impact of future temperature increases and the ability of trees and vegetation to adapt to such changes.	Extremely vulnerable territory to climate change. Estimates predict climate change will heavily affect the success of the project.	Very vulnerable territory to climate change. Estimates predict climate change will affect the success of the project.	Vulnerable territory to climate change. Estimates predict climate change might affect the success of the project if the country does not take serious action.	Relatively resilient to climate change. The project is likely to adapt to an increase in temperature in the next decades. Estimates predict climate change will not affect the success of the project.	Very resilient to climate change. The project will surely adapt to an increase in temperature in the next decades, Estimates predict climate change will not affect the success of the project.
Socio-economic factor We evaluate the risk associated with socio-economic factors according to the ability of	Local communities are all smallholder farmers and solely reliant on intensive crop farming, detrimental to	Local communities are mostly smallholder farmers and heavily reliant on crop farming. They typically have	Local communities have larger farming plots and make a fair living out of their crop yields. There are other	Local communities have diverse sources of economic income and do not need to rely on farming for	Local communities are completely independent of farming and can engage in reforestation

local communities to rely on non-forest resources to live decently.	the soil but essential to their livelihoods. There is no other option for income in the area.	just enough to send the next generation to school and get out of the cycle but nothing else.	options for income but this is still the best option and is a choice.	their livelihood.	projects as leisure.
<u>Land ownership & management</u> We evaluate the risk associated with land ownership and management by assessing the success/failure of previous projects.	No record of ownership or management. The land has been abandoned or destroyed by anthropogenic activities. The land is considered unproductive and unexploitable.	Previous projects were poorly managed, leading to leakage and/or deforestation.	Previous projects were fairly well handled, leading to little leakage and/or deforestation.	Previous projects were well managed.	Fully managed and owned by local communities with a sustainable management plan.

Rating the Manjarisoa Project according to our metrics:

	1	**2**	**3**	**4**	**5**	TOTAL
Additionality				X		4
Durability			X			3
Leakage				X		4
Geopolitical			X			3
Climate Change				X		4
Socio-economic			X			3
Land ownership					X	5
						26/35

Total points	Score
30 - 35	A+
25 -30	A
20 - 25	B
15 - 20	C
7 - 15	D