ASES ON-CHAIN PROTOCOL

# BASELINE REPORT

Verified Carbon Credits (VCCs)

## Santa Isabel Water and Soil Credits

LT-012-MEX-210823 CHIHUAHUA, MÉXICO
Stichting Life Terra
Type B Project


**August 1, 2024**

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On-Chain Protocol

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## EXECUTIVE SUMMARY

The baseline report of the plantation project is a necessary activity for their certification since it will allow for establishing the initial parameter of biomass generation and therefore the carbon sequestration in each of the projects. The report will consist of the generation of NDVI and biomass indexes, which are generated through a specific methodology and with the use of satellite images and high-resolution ortho mosaics.

The ecological restoration of a plot devoid of vegetation due to overgrazing in Santa Isabel, Chihuahua (Mexico) entailed planting a total of 4,232 *Prosopis glandulosa* (honey mesquite) plants, mainly native to the region and well-suited for adverse environmental conditions. The project area, situated in the limits of the Santa Isabel community, municipality of Chihuahua, covered 79,118.08 square meters.

The moderate-density technique was employed, providing numerous benefits such as improved yield and efficient resource utilization. The average planting density within the plot was one tree per 19.2 square meters, equivalent to an average of 521 trees per hectare in the plot.

The total $CO_2$ capture for the entire project area was calculated to be between 549.67 and 901.10 $TCO_2$-eq considering survival scenarios of 61.02% and 100.00% respectively at the end of the 40 years of the project’s lifetime. These figures underscore the project's contribution to carbon sequestration and overall environmental restoration.

The successful reforestation endeavor in Santa Isabel, Chihuahua demonstrates the positive impact of employing moderate-density planting techniques and strategically selecting native species to reclaim and revitalize degraded landscapes, providing ecological, economic, and social benefits for the region and its communities.

# I. PROJECT DESIGN

This section is based on the information compiled in the PSF Format - Project Submission Form prepared by the project developer.

## I.1. PROJECT LOCATION

The project is located in the Santa Isabel community, municipality of Chihuahua, (Mexico). The afforested plot lies close to adjoining Grassland and Shrubland areas. A project location map is illustrated in Figure 1. Table 1 shows the coordinates of the reforested Plots.

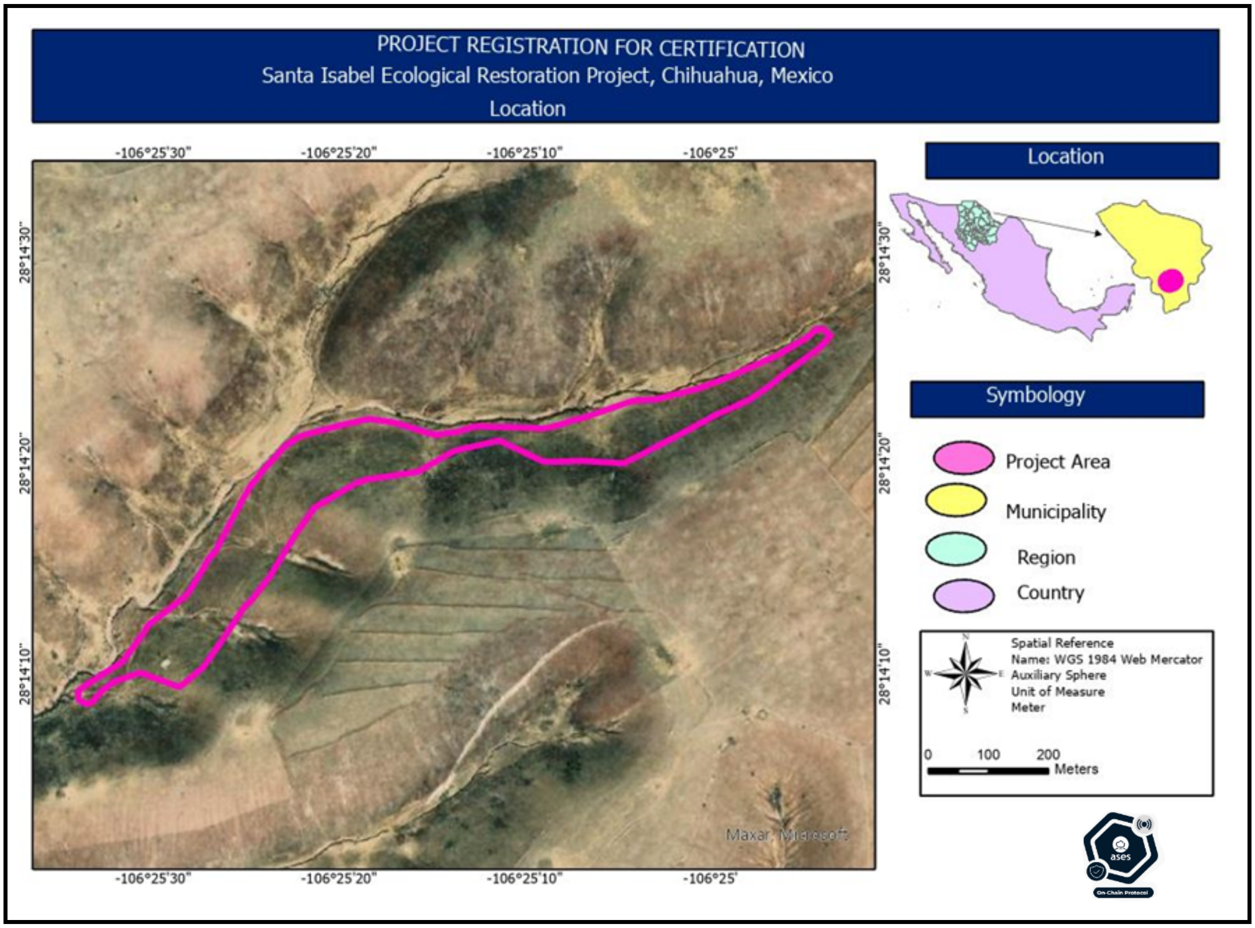



**FIGURE 1 PROJECT LOCATION**

**TABLE 1 LOCATION OF PROJECT PLOT**

| Plot | Coordinates | |
|---|---|---|
| | Latitude | Longitude |
| 1 | 28.2384364°N | 106.4214020°W |

## I.2. Administrative Specifications

This section introduces the project developer, outlines the project type, and specifies the nature-based credits for which the proponent is applying.

### I.2.1. Project Developer

| | |
|---|---|
| **Key project** | **LT-012-MEX-210823 CHIHUAHUA, MÉXICO** |
| **Name of project** | Santa Isabel Water and Soil Credits |
| **Company** | Stichting Life Terra |
| **Person responsible** | Sven Kallen |
| **Fiscal address** | 1043 CR Ámsterdam – The Netherlands |
| **Telephone** | +31.20 2620240 |
| **Mail of the person authorized to receive notifications** | sven@lifeterra.eu |

### I.2.2. Type of Project

| | |
|---|---|
| **Type** | ☒ Forest management<br>☐ Regenerative agriculture<br>☐ Silvopastoral management<br>☐ Individual tree-based climate action / urban forest<br>☒ Water flow restoration<br>☐ Biochar |

### I.2.3. VNPCs the Project Is Applying To

| | |
|---|---|
| **Type of VNPCs the project is applying for** | ☒ Carbon Removals (VCC)<br>☐ Biodiversity Based Credit (VBBC)<br>☒ Water Credits (VWC)<br>☒ Soil Credits (VSC) |

| | |
|---|---|
| | ☐ Climate action bond |

## II. PROJECT AREA BASELINE

An evaluation of the ESA-worldcover-v200 for 2021, focusing on land use and land cover, revealed that the project site was situated within a predominantly Grassland area. Adjoining land covers include Shrubland and Grassland areas extending a few kilometers from the site. To further ascertain the project's potential contributions to biodiversity, a survey was conducted to count and identify the plant species present in the vicinity of the project area. This will be further elaborated in the biodiversity section of this report.

### II.1. SPECTRAL RESPONSE

When solar radiation interacts with an object, one of three situations can occur, either individually or in combination:

- **Reflection:** The radiation can bounce off the object partially or entirely, resulting in reflection.
- **Absorption:** The object can absorb the radiation, taking in its energy.
- **Transmission:** Radiation can pass through one object and reach another, known as transmission.

The extent to which radiation is reflected, absorbed, or transmitted depends on the specific physicochemical characteristics of the objects involved. However, for object identification purposes, our primary interest lies in the reflected light or radiation at different wavelengths. For instance, vegetation exhibits low reflectance in the visible range, but the presence of chlorophyll in plants increases reflectance in the green channel. On the other hand, plants demonstrate the highest reflectance in the near infrared region of the electromagnetic spectrum.

#### II.1.1. INDEX

Vegetation indices (VI) are extensively employed for monitoring and detecting changes in vegetation and land cover. These indices are created by considering the contrasting absorption, transmittance, and reflectance of energy by vegetation across the red and near-infrared portions of the electromagnetic spectrum. Numerous studies have demonstrated that the Normalized Difference Vegetation Index (NDVI) is particularly resilient against the influence of topographic factors. NDVI is commonly utilized as a broad indicator of photosynthetic activity in plants and the corresponding aboveground primary production.

The calculation of NDVI was performed using Sentinel-2 satellite images in the Google Earth Engine platform. Images with less than 20% cloud cover were selected for each month. The assessment focused on the average monthly NDVI time series spanning from January 2019 to July 2024. The findings are presented in Figure 2, which covers both pre- and post-project implementation periods. To delineate the pre- and post-project implementation periods, it is important to note that the reforestation activities took place between July and September 2021. Consequently, all months prior to these dates are considered the pre-project implementation period, while months after are regarded as the post-project implementation period for the purpose of this analysis. Analyzing the values within the plot reveals an average monthly NDVI spectrum ranging from 0.2 to 0.4 before the project's initiation. Annual seasonal trends following rainfall patterns were observed in which NDVI values increased from July to November and decreased from January to June. Any sporadic fluctuations can likely be attributed to sudden seasonal changes or the impact of cloud cover on spectral signals. Conversely, following the post-project phase in late 2021, a gradual increase in NDVI compared to the pre-project era becomes evident, indicating growth of vegetation in this area.

Given the known information that a healthy, dense vegetation canopy typically exhibits NDVI values above 0.5, while sparse vegetation generally falls within the range of 0.2 to 0.5, the current assessment indicates that the afforestation project has potential to foster an ascending trend in the plot's NDVI as it transitions to a dense forest area. With the project in place, it is anticipated that the NDVI will continue to rise further, indicating a healthy and thriving vegetation cover.

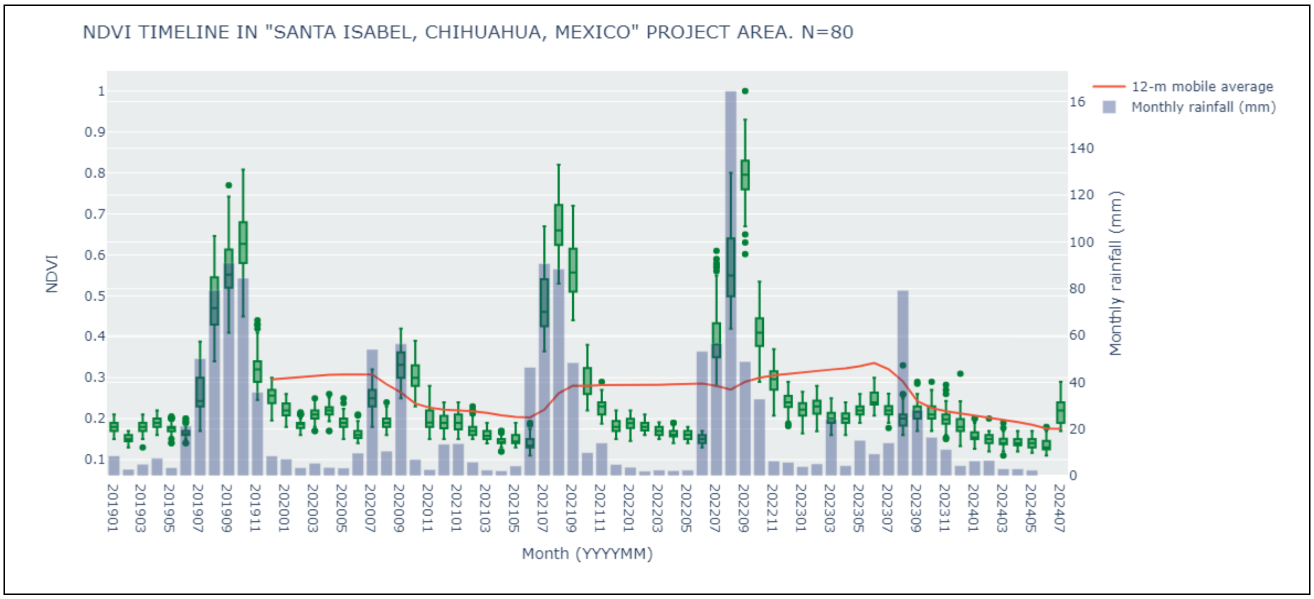



**FIGURE 2 NDVI TIMESERIES IN THE AREA OF INTEREST**

## II.2. IMPACT ON THE LANDSCAPE

The project site had experienced decreased biodiversity, and reduced ecosystem services prior to undergoing reforestation efforts. However, this ecological restoration initiative plays a pivotal role in safeguarding various plant and animal species by establishing new habitats and reinstating wildlife corridors as healthy vegetation is crucial for the survival of many species. Furthermore, reforestation contributes to the re-establishment of natural hydrological cycles, by slowing down runoff, enhancing water infiltration, and reducing soil erosion. This helps regulate water flow, improve water quality, and mitigate the impacts of flooding.

An added advantage is the reforested landscapes offering aesthetic beauty and recreational opportunities. They can provide green spaces for leisure activities, such as hiking, wildlife observation, and eco-tourism, enhancing the well-being of local communities and visitors. The implemented project is therefore poised to amplify the effectiveness of these endeavors. Figure 3 shows a satellite aerial view of the project area before project implementation.

| January 2017 | March 2023 |
|---|---|
|  |  |

FIGURE 3 SATELLITE AERIAL VIEW OF PROJECT AREA (PRE- PROJECT IMPLEMENTATION)

# III. TECHNICAL SPECIFICATIONS

## III.1. CARBON REMOVAL

This section analyzes the estimated carbon sequestration expected from the reforestation efforts implemented by the project.

### III.1.1. REFORESTED AREA

The project encompasses a plot with a total area measuring 79,118.08 $m^2$ situated in Santa-Isabel municipality, in Chihuahua (Mexico). The demarcated plot is shown in Figure 5.

### III.1.2. SPECIES

The reforestation project successfully planted a total of 4,232 *Prosopis glandulosa* (sweet mesquite) plants. The selection of species was based on a preliminary assessment of the region, considering available bibliographic information, as well as the prevailing climatic, vegetational, and meteorological conditions. The specie chosen is indigenous to the area and well-suited to the local climate and environmental conditions. The information of the specie is presented in Table 2.

**TABLE 2 NUMBER OF TRESS BY SPECIES**

| Species | Number of trees | Percentage (%) | Origin |
|---|---|---|---|
| *Prosopis glandulosa* | 4,232 | 100 | Native |
| **Total** | **4,232** | **100%** | |

**FIGURE 4. *PROSOPIS GLANDULOSA***

#### III.1.2.1. Distribution of the species selected for reforestation

The distribution of plant species is influenced by a variety of abiotic and biotic factors, including:

- Climate
- Soil
- Topography
- Hydrology
- Competition between plants for resources
- Seed dispersal

These factors interact in complex ways to determine the distribution of plant species across a landscape.

Understanding and knowing the distribution of the flora species that have been selected for reforestation is important to ensure the adaptation of the new trees and their survival, to secure the long-term benefits of the project, and to avoid altering the ecosystem balance by introducing non-adapted species.

To achieve this, each species was consulted in the Global Biodiversity Information Facility GBIF (https://www.gbif.org). This database allows you to know the species classified as introduced in each country, their EUNIS habitat, their native range, and observation records.

**The Global Register of Introduced and Invasive Species (GRIIS)** presents validated lists of introduced (alien) and invasive alien species at the country, territory, and associated island level. The International Union for Conservation of Nature (IUCN) describes an introduced/alien and invasive alien species as follows:

- **Introduced/alien species:** A species, subspecies, or lower taxon occurring outside of its natural range (past or present) and dispersal potential (i.e., outside the area, it could occupy without human intervention) and which has been transported by human activity; this includes any parts, gametes, seeds, eggs, or propagules of such species that might survive and subsequently reproduce.
- **Invasive alien species:** A species that becomes established in natural or semi-natural ecosystems or habitats, is an agent of change, and threatens native biological diversity. This includes widespread species, rapidly expanding, or present in high abundance and that hurt biodiversity.

**According to the aOCP's eligibility criteria, species classified as invasive alien species cannot be counted towards the project's benefits.**

- *Prosopis glandulosa*

| | |
|---|---|
| **Recorded as introduced in Mexico** | ☐ Yes ☒ No |
| **Habitat EUNIS** | Not specified |
| **Native range** | • Northern Mexico<br>• Southwestern United States |
| **Georeferenced records** |  |

The specie *Prosopis glandulosa* with the taxon identifier number 5358457, **is not classified as an invasive alien species** according to the GRIIS database of Mexico: https://www.gbif.org/species/5358457 Therefore, its integration and counting in the project is accepted.

The specie planted is classified as native for Mexico, hence their inclusion in the project is accepted.

The technical data sheets providing detailed information about the species utilized for the reforestation project are included below, in Table 3. These sheets offer comprehensive insights into the characteristics, growth patterns, environmental requirements, and other relevant details of the selected plant species. These data sheets serve as valuable references for understanding the specific attributes and suitability of each species for the reforestation efforts.

**TABLE 3 TECHNICAL DATA SHEETS OF SPECIES USED FOR REFORESTATION**

| | |
|---|---|
| ***Prosopis glandulosa***<br>• Commonly known as honey mesquite, is a species of small to medium-sized, thorny shrub or tree in the legume family (Fabaceae).<br>• The plant is primarily native to the Southwestern United States and Northern Mexico.<br>• This tree normally reaches 6.1–9.1 meters but can grow as tall as 15 meters and it is considered to have a medium growth rate.<br>• Prosopis glandulosa shrubs and trees provide shelter and nest building material for wildlife, and produce seed pods in abundance containing beans that are a seasonal food for diverse birds and small mammal species.<br>• Honey mesquite is a honey plant that supports native pollinator species of bees and other insects, and cultivated honey bees. | <br> |

### III.1.3. REFORESTATION TECHNIQUE

The reforestation technique implemented is the moderate-density Planting technique. This refers to a method of crop cultivation where plants are spaced closely together in order to maximize productivity and yield. Instead of the traditional practice of leaving significant spaces between plants, moderately dense planting involves reducing the interplant spacing, resulting in a higher number of plants per unit area. The goal of this technique is to optimize the use of available resources, such as sunlight, water, and nutrients, by creating a more efficient growing environment. By reducing the space between plants, several benefits can be achieved which include enhanced resource utilization, weed suppression, and increased yield. Nonetheless, it is important to note that the success of dense planting depends on various factors, such as the specific plants being grown, local climate conditions, soil fertility, and management practices. Adequate irrigation, nutrient management, and careful monitoring of tree health are crucial to ensure optimal growth and prevent issues such as overcrowding, nutrient deficiencies, or increased disease susceptibility.

The assessment revealed an average planting density of 410 trees per hectare in the plot. This density approach offers several ecological, environmental, and economic advantages. The increased tree density, combined with the implementation of various tree species, will foster biodiversity and enhance ecological resilience within the restored ecosystem. Moreover, the high density will expedite canopy closure, creating a continuous cover as the tree canopies interlock. This canopy closure plays a crucial role in weed suppression, creating improved microclimates, and moisture retention, and reducing soil erosion. However, it's important to note that high planting densities can also lead to competition for resources among trees, which may result in stunted growth, reduced health, and increased mortality of some trees. In addition, the proximity between trees can facilitate the rapid spread of diseases and pests. Controlling and managing these issues becomes more complex in densely planted areas.

As a result of this moderate-density with “wide spacing" planting strategy, the reforestation project is well-positioned to maximize carbon sequestration potential, promote wildlife habitat, and provide essential ecosystem services. The management of this densely planted plot will be critical to ensure the continued success and long-term sustainability of the reforestation efforts. Figure 4 shows the mapped planting density of the geolocalized trees within the plots with the location of each tree represented by dot symbols.

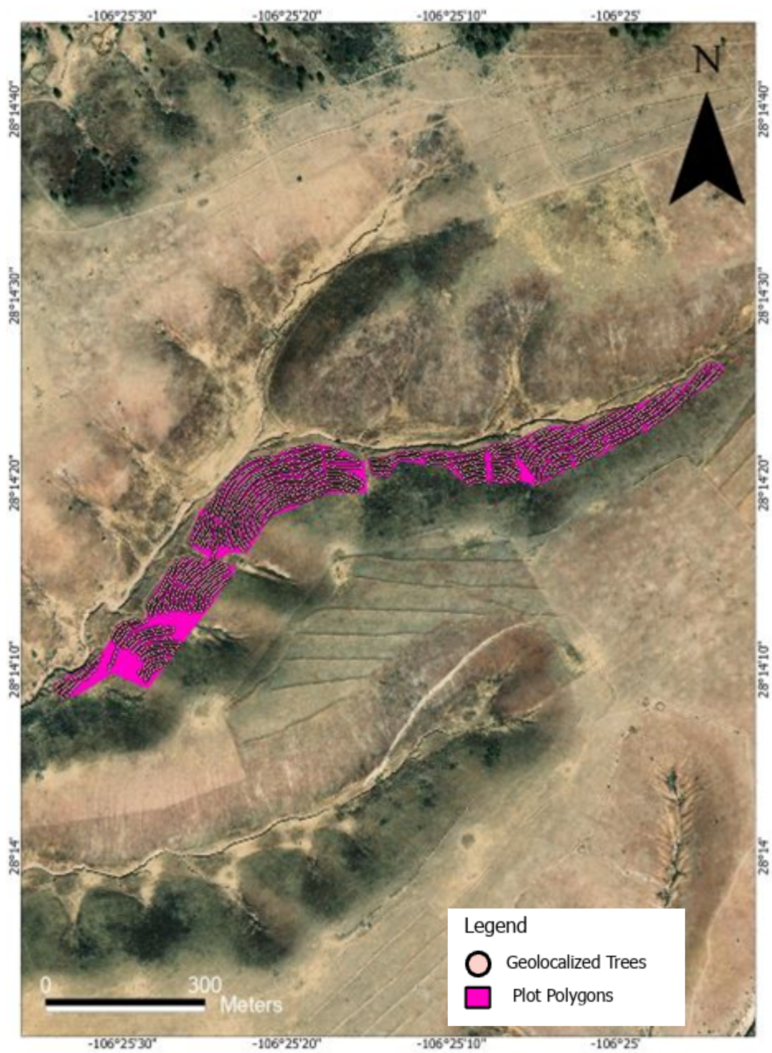



**FIGURE 5 TREE PLANTING DISTRIBUTION**

### III.1.3.1. Methodological process

The afforestation process involved a well-defined series of steps. Firstly, a thorough evaluation was conducted to select the most suitable reforestation area, considering restoration needs, climatic and soil feasibility, permit requirements, and cost considerations. It ensured that the chosen location was conducive to successful afforestation. To preserve the ecological integrity of the region, afforestation was not carried out on scarified ground. This approach aimed to leverage the existing ecosystem to facilitate the growth and development of the newly planted trees, promoting biodiversity and increasing the chances of successful reforestation. Local community stakeholders were actively involved in the process, fostering a sense of ownership and sustainability in the reforestation initiative.

### III.1.4. GEOLOCALIZATION OF PLANTED TREES

Using Spatial Analyst tools in ArcGIS Pro environment, a detailed count of geolocalized trees was conducted within the project plot. The results indicate the distribution of 4,232 trees within the afforested plot spaced at approximately 3 meters intervals and about 6 meters between rows as illustrated in Figure 4 above.

This analysis provides valuable insights into the spatial relative abundance of trees within each plot. The distribution percentages highlight the varying densities and concentrations of trees, indicating areas with higher and lower tree populations in cases where the reforested plots are segmented. These findings help understand tree distribution and estimate the project's carbon absorption capacity. The number of trees and their carbon sequestration capacity are crucial for the estimation of the Project's carbon sequestration potential. The count of geolocalized trees provides an overall measure, serving as a basis for estimating carbon sequestration. Combining tree count with species-specific data allows the estimation of biomass and carbon capture potential. This provides a quantitative assessment of the project's capacity to absorb and sequester $CO_2$.

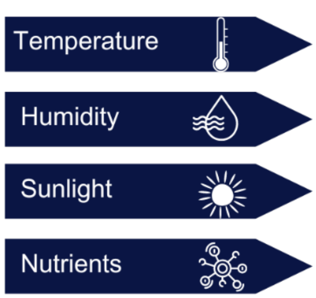
### III.1.5. PROJECT CAPACITY

This section determines the project's and the area's capacity to absorb $CO_2$ using Net Primary Productivity (NPP) as a reference parameter. Then, the amount of $CO_2$ that can be captured is estimated with allometric equations considering the age and height of each species.

#### III.1.5.1. Net Primary Productivity (NPP)

Net Primary Productivity (NPP) is the result of organic matter production through the process of photosynthesis. However, primary productivity involves more than photosynthesis; it also encompasses the uptake of inorganic nutrients and the assimilation of diverse organic compounds into protoplasm, which are vital for all photosynthetic organisms. Among various ecosystem processes, NPP is extensively measured due to its ability to reflect carbon accumulation in ecosystems. The calculation of NPP is based on the increase in biomass per unit area over a specified time period.

NPP is influenced by several factors, including:




Hence, the net primary productivity (NPP) can be expressed as the difference between the carbon absorbed by vegetation through photosynthesis (referred to as Gross Primary Production or GPP) and the carbon lost through respiration. Temperature and precipitation are key limiting factors for

NPP, and it is generally assumed that NPP increases with both temperature and precipitation. However, it is important to note that the NPP cannot exceed the saturation value of 3000 $gDM/m^2/year$ (DM stands for dry matter).

For the calculation of NPP in the Larz Ecological Restoration project, the Miami methodology outlined in section “IV.1. aOCP Methodology for carbon removal and storage in vegetation” was employed. This methodology incorporates the following equations to determine NPP:

$$\mathbf{NPP} = \mathbf{min}\,(\mathbf{NPP_T}, \mathbf{NPP_P})$$

Where:

$$NPP_T = 3000(1 + exp(1.315 - 0.119\ x\ T))^{-1}$$

$$NPP_P = 3000(1 - \exp(-0.000664\ x\ P))$$

Where:

**T:** average annual temperature

**P:** accumulated precipitation

Carbon capture capacity was calculated using the conversion factor 0.47 (IPCC, 2006), using the following equation:

$$\boldsymbol{NPP_c} = NPP_{dm}\ x\ 0.47$$

Where:

**$NPP_c$**: Net primary productivity, gC m² yr-1

**$NPP_{dm}$**: Net primary productivity, gDM m² yr-1

Then, the equivalence to carbon dioxide was calculated using the conversion factor of 3.67. This factor represents the molar mass ratio of $CO_2$:C. $CO_2$ molar mass is 44 and C is 12, therefore, 44/12 = 3.67. The conversion was done using the following equation:

$$\boldsymbol{CO_2\ capture\ capacity} = 3.67\ (NPP_c)$$

Finally, the maximal $CO_2$ capture capacity for the Project area was computed by multiplying the previous result by the Project area surface. The calculation was repeated for each scenario (present with real data, present with CMIP data, and future with CMIP data). Real data is privileged over modeled data for the present scenario. To estimate future NPP, the percent change was calculated between present and future estimates done with CMIP6 data. This percent change was then applied to the present estimate done with real data, this way we obtain a future NPP estimate based on present real data.

The results (**Erreur ! Source du renvoi introuvable.**4) indicate that the project area currently has an NPP of 399.66 gDM $m^{-2}$ $yr^{-1}$, which, due to the climatic conditions, will decrease to 375.20 gDM $m^{-2}$ $yr^{-1}$ in 2062. This change, of -24.46 gDM $m^{-2}$ $yr^{-1}$, represents a decrease of -6.12%. In terms of $CO_2$, **the Project restoration area (7.91 ha) is currently capable of capturing 54,614.50 kg$CO_2$ $yr^{-1}$ and is expected to capture around 51,272.05 kg$CO_2$ $yr^{-1}$ by 2062**.

Based on these results, it has been determined that **51.27 $TCO_2$-eq/year** will serve as the base parameter for the estimation of maximum achievable annual $CO_2$ capture. For the 40 years of the project, it equals **2,050.80 $TCO_2$-eq.**

**TABLE 4 MAXIMUM ATTAINABLE NPP AND BIOMASS WITHIN PROJECT SITE**

| NPP | Present Real Data | Present CMIP | 2062 CIMP | CMIP Change | CMIP % Change | 2062 Based On Real Data | Real Data Change |
|---|---|---|---|---|---|---|---|
| gDM/m²/yr | 399.66 | 680.28 | 638.65 | -41.63 | -6.12 | 375.20 | -24.46 |
| $gCO_2$/m²/yr | 689.38 | 1173.42 | 1101.61 | -71.81 | -6.12 | 647.19 | -42.19 |
| gC/m²/yr | 187.84 | 319.73 | 300.17 | -19.57 | -6.12 | 176.35 | -11.50 |
| $KgCO_2$/plot/yr | 54,614.50 | 92,961.69 | 87,272.38 | -5,689.31 | -6.12 | 51,272.05 | -3,342.44 |

### III.1.5.2. Allometric Equations

Allometric equations are mathematical formulas used to estimate the amount of CO2 that can be captured and stored in certain types of vegetation, such as trees or shrubs, depending on their morphometry. Table 5 shows the allometric equations used for each species planted.

**TABLE 5 ALLOMETRIC EQUATIONS USED FOR EACH SPECIES**

| Species | Allometric Equation $CO_2$ absorbed (Kg) | Reference |
|---|---|---|
| *Prosopis glandulosa* | Biomass=0.1142*(DBH)^(2)+0.8472*(DBH)-1.0051 | FSI. 2001. Carbon stocks in Indias forest. |

Carbon stocks in planted trees and shrubs at year 40 were calculated by applying these allometric equations to the tree dimensions expected at age 40. The total carbon storage at year 40 for the 4,232 trees and shrubs is estimated to be 901.11 Tons of $CO_2$.

Due to natural ecological processes, a fraction of the planted trees and shrubs will die. The survival/mortality percentages were computed with two different approaches, as described in the following subsection.

### III.1.5.3. $CO_2$ Capture

In reforestations carried out in degraded areas, a planting density of 1 tree every four meters is considered, since distributing the trees in this way allows each tree to have enough space to grow and develop adequately, avoiding excessive competition for resources such as sunlight, water, and soil nutrients. The reference density for this scenario is 16 square meters per tree. At present, the project has achieved a density of 24.41 square meters per tree, which is fairly close to the targeted reference density. This planting density will have significant implications for the success of reforestation efforts. By providing adequate space for individual tree growth, the chances of survival and healthy development are increased. However, in this case, proper management practices will be essential to ensure the optimal utilization of resources, especially as the trees grow and compete for sunlight, water, and nutrients. Maintaining the appropriate balance between tree density and resource availability is crucial to sustaining the health and productivity of the reforested ecosystem over time.

The avoidance of resource competition promotes optimal access to sunlight for photosynthesis, sufficient water uptake, and efficient nutrient absorption from the soil as defined by the Net Primary Productivity (NPP). These factors are crucial for the establishment of a sustainable and resilient forest ecosystem.

#### III.1.5.3.1 Survival rate based on forest tree density

***Tree density as a function of mean DBH and latitude***

The estimation of survival rate is based on the results from Madrigal-González et al. (2023). These authors established the relationship between mean Diameter at Breast Height (DBH) and latitude in determining forests' tree density (Figure 6).

According to this reference, the predicted tree density for an area located at latitude 28.2°N, and with a mean tree diameter of 34.9 cm is around 250 trees per hectare. Considering that 4,232 trees and shrubs were planted in the restoration area (7.91 ha), i.e. 410 trees per hectare, a survival of 61.02% would lead to the density of 250 trees ha-1, proposed by Madrigal-González et al. (2023).

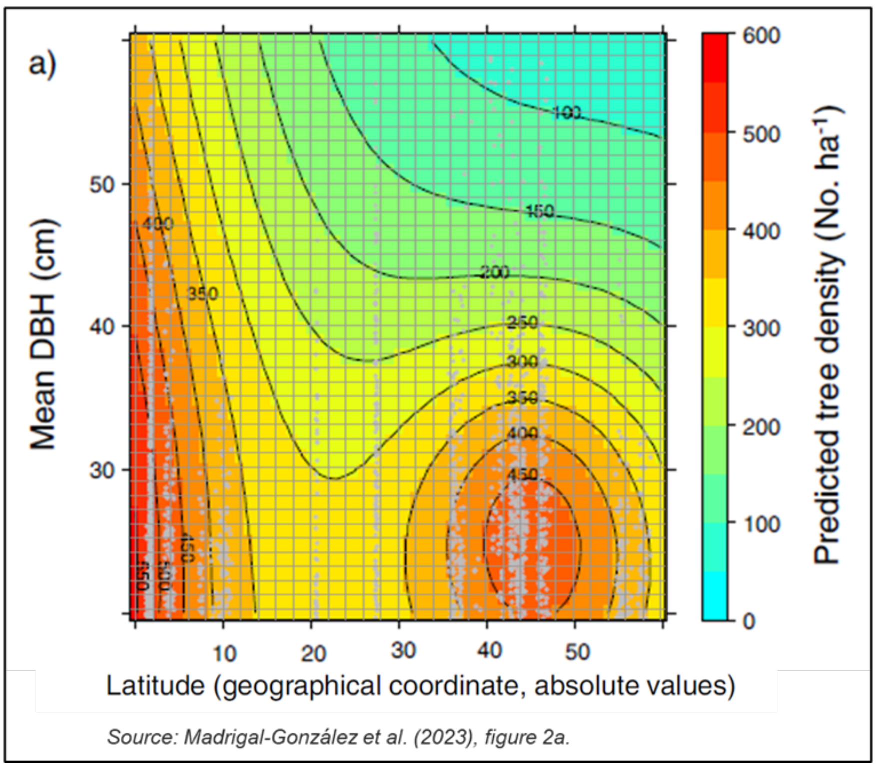



**FIGURE 6. PREDICTED TREE DENSITY AS A FUNCTION OF MEAN DBH AND LATITUDE. SOURCE: MADRIGAL-GONZÁLEZ ET AL. (2023).**

***Tree density according to timber plantation tables***

Cienciala *et al.* (2022) provided estimated survival rates considering tree mortality and management interventions across various biogeographic regions and species groups. For Continental Broadleaves, they reported a stand density of 1,579 trees per hectare at year 40 post-plantation. Given the restoration area's initial planting density of 410 trees per hectare, a survival rate of over 100% (ie. 385.43%) would achieve the density reported by the authors.

In summary, the project currently has a density of 410 trees and shrubs per hectare, which is far less density than what is recommended by the authors. However, as typical with reforestation projects, the expected mortality will reduce this planting density over time. The surviving trees will then have increased access to resources such as water, sunlight, and nutrients, allowing them to continue growing.

Based on the two density references, the project's survival rate at year 40 can be estimated under two scenarios: one with a 61.02% survival rate and the other with a 100% survival rate.

#### III.1.5.3.2. Carbon capture in vegetation

The carbon removal potential, calculated using the allometric equations, was adjusted to account for survival/mortality, as follows. Survival scenario 1, calculated from tree density predicted by Madrigal-González et al. (2023), results in survival of 61.02% of planted trees and shrubs. Therefore, 61.02% of the carbon removal potential equals 549.67 T CO2-eq over the 40 years of the project. Survival scenario 2, calculated from tree density predicted by Cienciala et al. (2022), results in survival of over 100% of planted trees and shrubs. Therefore, 100% of the carbon removal potential equals 901.11 T CO2-eq over the 40 years of the project.

Considering these 2 scenarios, the amount of carbon removals the project can generate attributable to the planted trees and shrubs lies between 549.67 and 901.11 T CO2-eq. However, it is important to note that this ex-ante estimation excludes carbon removals from vegetation that develops in the project area natural regeneration, triggered by Project activities. As the reforestation matures, it is expected that monitoring campaigns reveal carbon stocks higher than those estimated ex-ante. These estimates were and will continue to be cross-referenced with the maximum carbon removal determined through Net Primary Productivity (NPP), which for this project equals 2,050.80 TCO2-eq, to ensure adherence to biophysical ecological limits, thus avoiding overestimates.

### III.1.5.4. Carbon Removal Credits

According to the *aOCP Methodology for carbon removal and storage in vegetation V2.0,* this ecological restoration project in Santa- Isabel, Chihuahua (Mexico) spanning an area of 7.91 hectares with 4,232 trees planted, has the potential to generate between 549 and 901 Verified Carbon Credits (VCC) from removals. This range considers survival scenarios of 61.02% and 100%, as elaborated above. However, the inclusion of carbon capture calculations conducted by the project developers will further refine these estimates and provide a more comprehensive assessment of the project's environmental impact.

The project developer indicated in the PSF a survival rate of 50% for year 40. Applying this survival rate to the carbon sequestration initially determined by aOCP yields 450 TCO2-eq. Table 6 presents a summary of the above considerations.

Therefore, based on the information and considerations outlined above, the estimated carbon capture of this project ranges from 450 to 549 TCO2-eq using the aOCP methodology considering a survival of 50% and 61.02%.

**TABLE 6 ESTIMATED CARBON CAPTURE OF ECOLOGICAL RESTORATION PROJECT AT YEAR 40.**

| Survival Scenarios | | | Carbon Capture ($TCO_2$-eq) | Verified Carbon Credits (VCC) |
|---|---|---|---|---|
| aOCP Determined | Total Derived | 100.00% | 901.10 | 901 |
| | Madrigal-González et al. (2023). | 61.02% | 549.67 | 549 |
| | Plantation Tables | 100.00% | 901.10 | 901 |
| | **Project Developer expected survival** | **50.00%** | **450.55** | **450** |

### III.1.5.4. Contingent table of Verified Carbon Credits VCC

According to the Nat5 Scoring classification, the present Project is **type "A"** with an overall **score of 0.82** (for more information see the Nat5 Scoring document).

As outlined in section III.1.5 of the Procedures document, version 2.3, for Type A projects, 25% of the generated credits (450 credits) will be retired to the buffer pool as a measure to ensure the permanence of the project's benefits, amounting to 112 credits. This results in a total of **338 Verified Carbon Credits** to be issued for project **LT-012-MEX-210823 CHIHUAHUA, MÉXICO,** as per the following Contingency Table:

**TABLE 7. CARBON REMOVAL CREDITS ISSUED ANNUALLY**

| Carbon removal credits issued annually | | |
|---|---|---|
| **Year** | **Percentage of VCCs issued on each year (%)** | **Number of VCCs issued each year** |
| After project implementation | 25% | 84 |
| 2025 | 5% | 17 |
| 2026 | 5% | 17 |
| 2027 | 3% | 10 |
| 2028 | 3% | 10 |
| 2029 | 3% | 10 |
| 2030 | 3% | 10 |
| 2031 | 3% | 10 |
| 2032 | 3% | 10 |

| Carbon removal credits issued annually | | |
|---|---|---|
| **Year** | **Percentage of VCCs issued on each year (%)** | **Number of VCCs issued each year** |
| 2033 | 3% | 10 |
| 2034 | 3% | 10 |
| 2035 | 3% | 10 |
| 2036 | 2% | 7 |
| 2037 | 2% | 7 |
| 2038 | 2% | 7 |
| 2039 | 2% | 7 |
| 2040 | 2% | 7 |
| 2041 | 2% | 7 |
| 2042 | 2% | 7 |
| 2043 | 2% | 7 |
| 2044 | 2% | 7 |
| 2045 | 2% | 7 |
| 2046 | 2% | 7 |
| 2047 | 2% | 7 |
| 2048 | 2% | 7 |
| 2049 | 2% | 7 |
| 2050 | 2% | 7 |
| 2051 | 2% | 7 |
| 2052 | 2% | 7 |
| 2053 | 2% | 7 |
| 2054 | 2% | 7 |
| **Total** | **100%** | **338** |

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