EASTERN CAPE RESTORATION PROJECT, SOUTH AFRICA – SOMERSET EAST

Document Prepared by EcoPlanet Bamboo Group, LLC

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1 PROJECT DETAILS

1.1 Summary Description of the Project

The Eastern Cape Restoration Project is an AFOLU project, aimed at utilizing carbon finance to restore extremely degraded ex grazing lands in the Eastern Cape region of South Africa. The project includes the planting of native *Portulacaria afra*, commonly known as spekboom, as an ecological pioneer. When combined with the subsequent protection of the planted lands from grazing, this species is known to trigger the further regeneration of additional sub-canopy species as well as restore micro-climates and healthy soils. The project is located on lands that were cleared of the native Subtropical Thicket ecosystem, of which *Portulacaria afra* is typically the dominant species, decades before the project start date. The project targets degraded private farms that have been grazed by livestock for commercial production for multiple decades prior to the project start date. No forests or native thicket ecosystems have been present on the land targeted for planting for the last 10 year period before the project start date, and no forests or native ecosystems are cleared for the proposed planting activities.

Specifically, the project is a revegetation project, targeting the planting, management and long term protection as conservation areas on ex grazing lands that are no longer economically viable.

Subtropical Thicket, under the right management, represents an effective mechanism for biological carbon removals and represents a long term carbon sink if conserved and adequately protected from grazing through clear ownership and management frameworks. As the *Portulacaria afra* plants grows and develop into a thicket ecosystem they sequester atmospheric carbon, which is stored in the dense woody material, auxiliary material (branches and leafy material) as well as both underground and in the soil organic carbon pool. These thickets do not grow to great height, typically a maximum of 4-5 meters, but the denseness of the woody biomass represents an efficient ecosystem for carbon removals and storage. The project is a pure environmental / conservation project. There are no other revenue streams or financial returns associated with the project.

The project proponent has a decade of experience in the successful restoration of degraded lands within the project region, on which the project builds. The project is aiming to restore large areas of degraded lands into conservation areas, to create a vital habitat within this biodiversity hotspot.

Planting is targeted to occur over an eight year period with an initial targeted planting area of 20,000 hectares. This initial project area at the time of validation represents total potential GHG emission removals of 8,468,837 tCO_2e over the thirty year project period. This represents an average annual GHG emission removal of 211,721 tCO_2e.

1.2 Sectoral Scope and Project Type

The project is a grouped project that falls within the sectoral scope of Agriculture, Forestry and Other Land Use (AFOLU), within the Afforestation, Revegetation and Revegetation (ARR) project category. The project is planting woody biomass, however it does not meet the VCS definition of Reforestation, due to the fact that the native ecosystems are classified as "thickets" rather than forests, due to them typically being under 5m in height. As a result, the project meets the VCS definition of revegetation[1]

The project manually plants truncheons (cuttings) of *Portulacaria afra* on degraded livestock grazing lands. Such land areas were cleared of the native Subtropical Thicket ecosystem more than 10 years prior to the project start date. The land undergoing such planting activities is currently classified as non-forested land and has no woody vegetation cover.

1.3 Project Eligibility

The proposed project activities have been designed to meet the eligibility requirements of the VCS framework, as described in the VCS Standard v4.3. The project activities result in GHG emission removals from project activities in the forestry sector, and under the rules and requirements of the VCS Program. This VCS Program defines eligible activities in the Afforestation, Revegetation and Revegetation category as " activities that increase carbon stocks in woody biomass (and in some cases soils) by establishing, increasing and/or restoring vegetative cover through planting, sowing and/or the human assisted natural regeneration of woody vegetation". The proposed project activities specifically aims to plant native *Portulacaria afra* at a high density of 2,500 plants per hectare, with the specific purpose of increasing the carbon stock and associated GHG emission removals.

The project uses a CDM methodology, as approved under the scope of the VCS for ARR projects and follows the eligibility requirements as specified by this methodology.

The project activities do not result in any clearance or conversion of native ecosystems, nor do they include any draining of native ecosystems or degradation of ecological functions. In contrast, the project has been designed according to the VCS Program Definitions v4.1 whereby the land on which project activities are occurring was once densely vegetated, but whereby clearing of this native vegetation occurred more than ten years prior to the project start date. Evidence for this eligibility requirement is provided in Section 1.13 below.

[1] Verified Carbon Standard Program Definitions v4.1, January 2022

The project proponent is also the implementation partner, and is responsible for all activities related to the implementation, management, monitoring and reporting of the project over the length of the project crediting period.

1.4 Project Design

The project area has been chosen due to its ecological importance, globally, regionally and locally, combined with the high potential for successful restoration activities and associated positive impacts. The area falls within one of the 36 recognized "biodiversity hotspots" spread across the planet. Specifically, it is located within the Maputaland-Pondoland-Albany biodiversity hotspot which has undergone extreme historical degradation, primarily due to pastoral activities (grazing by livestock) which typically occur on large (> 1,000 hectare) private farms. The project is specifically targeting areas that have been identified as being highly degraded following the indicators detailed in the A/R "Tool for the identification of degraded or degrading lands for consideration in implementing CDM A/R project activities".

The project is located in an area already defined as semi-arid. During the seven years prior to the project start date, the project area has suffered from an extended drought, which, combined with the extreme degradation of soils, has resulted in a situation of economic deterioration. As a result, many of these commercial grazing farms have been taken out of production and have been on the market for extended periods. This scenario poses an opportunity for the restoration of one of the planet's most biodiverse ecosystems, through the keystone activity of sequestering and storing large volumes of atmospheric carbon dioxide, which represents the goal of the project.

The proposed project activities are occurring on degraded grazing lands where the native thicket ecosystems were cleared more than 10 years prior to the project start date. These farms have been under private ownership, primarily used for grazing activities (for exotic and indigenous herbivores), often for more than a century. The project aims to restore such degraded lands into the native Subtropical Thicket biome that represents the original ecosystem for the area, using *Portulacaria afra* planted at a high density, as an "ecological engineer". This particular plant is one of the few species native to the Subtropical Thicket ecosystem that has the ability to survive and thrive on the transformed degraded lands. It is classified as an "engineer" due to its ability to change the conditions of the soil and microclimates, thereby facilitating the return of the original moist, shaded environment, allowing for the subsequent introduction (through natural seeding) of additional biodiversity.

This carbon financed project is designed to take individual farms, and use this dense planting of *Portulacaria afra* to create a canopy cover in the shortest possible time. This initial matrix of *Portulacaria afra* allows for the rapid regeneration of soil conditions, moisture and temperature that subsequently allow the natural regeneration of a wide range of additional species native to the thicket

ecosystem. In this manner a network of degraded farms across the project area will be restored, with the ultimate goal of creating connected biodiversity corridors within this hotspot.

Table 1 Planned Revegetation Activity Timeline at Time of Validation

Year	Number of Planted Hectares
2023	2,500
2024	3,500
2025	3,500
2026	3,500
2027	3,500
2028	3,500
Total	**20,000**

Where small patches of intact Subtropical Thicket remains, such areas are identified and removed from the planting area and protected as part of the project activities. Pre-project mapping identifies such areas.

The grouped project activity includes only a single project activity, which is human assisted revegetation with truncheons (cuttings) of *Portulacaria afra*. All future project activity instances will include only this project activity.

The total scale of the project is limited only by the original extent of the Subtropical Thicket biome, as shown in Figure 1, and the availability of degraded lands that meet the project proponent's requirements with the same baseline scenario.

At the time of validation the first project instance represents a total area of 6,164 hectares, and an effective restoration area off 5,673 hectares.

Figure 1 Extent of the Subtropical (Albany) Thicket Biome

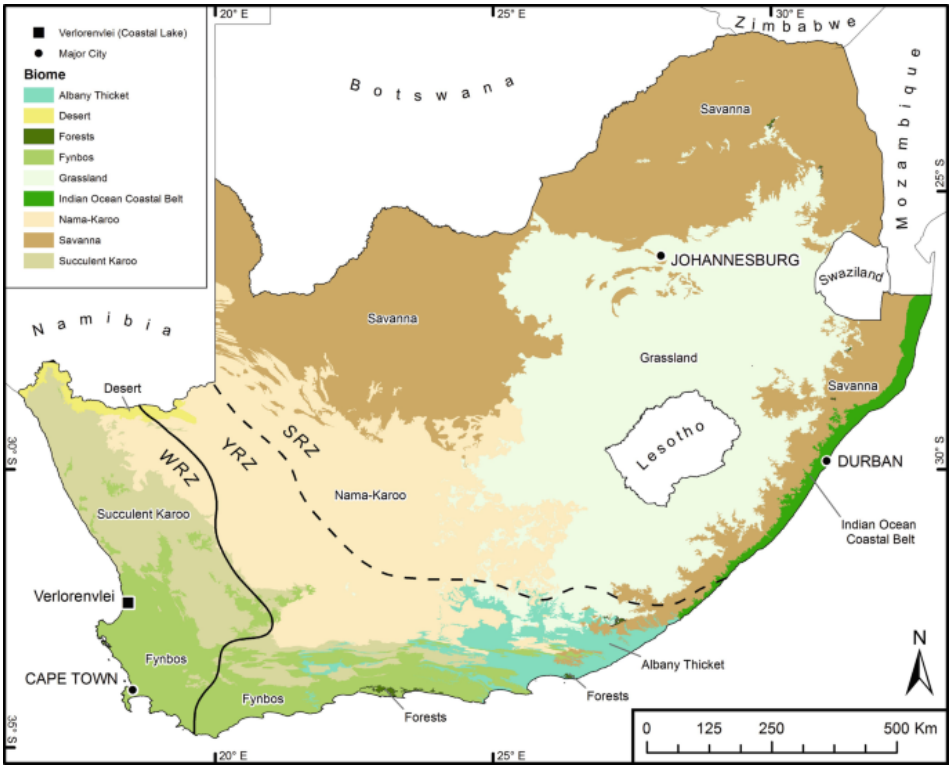
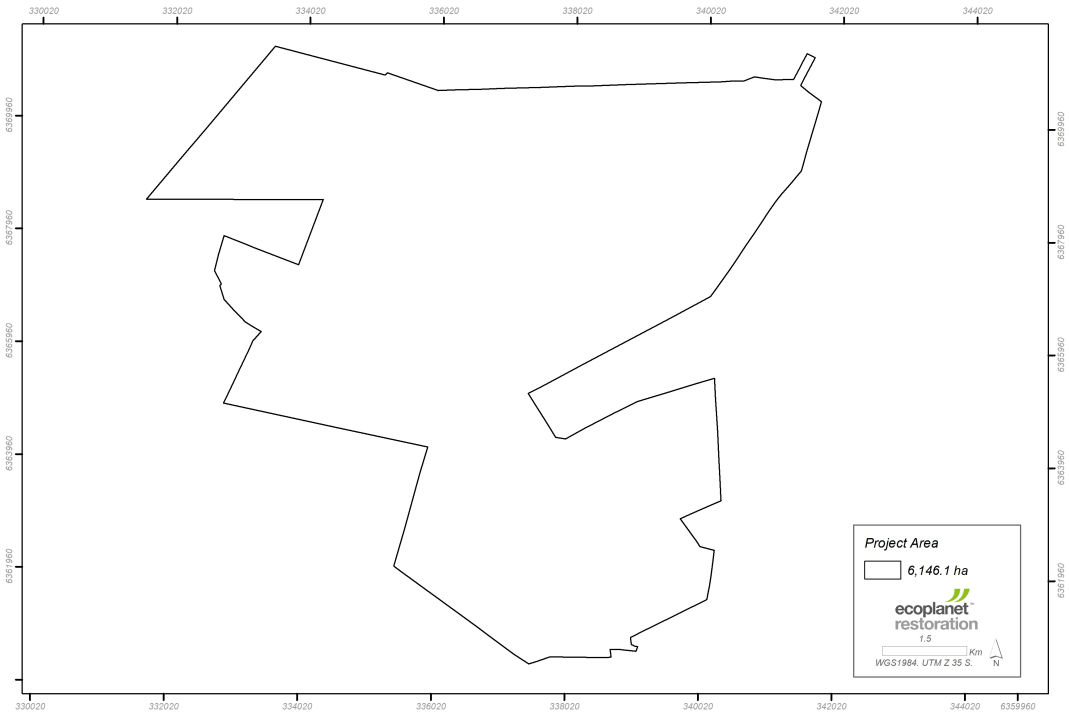


Figure 2 First Project Instance



Eligibility Criteria

The project is a grouped project.

Individual project areas will be added to the grouped project. All areas will be identical to those already included, and will adhere to the same eligibility criteria, defined as:

All new project activity instances will meet the applicability conditions as defined by the methodology used by the project, AR-ACM0003 "Afforestation and revegetation of lands except wetlands" version 2.0.

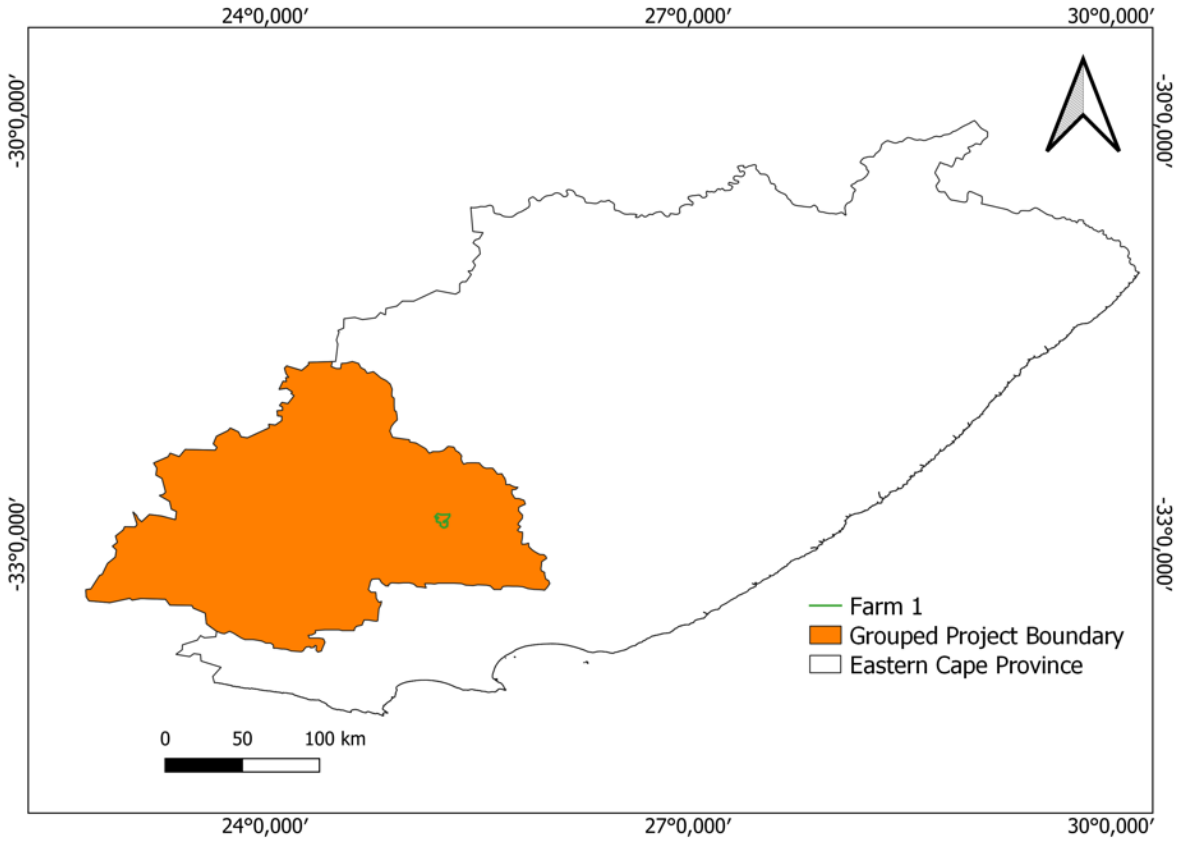
1. No project activities will be implemented on any land designated as a wetland;
2. Soil disturbance as the result of project activities will not cover more than 10% of the area on either of the following types of land:
    a. Lands containing organic soils;
    b. Land which, in the baseline, are subjected to any of the land use and management practices, or received inputs as detailed in the appendices of this methodology.
3. All future project activity instances will follow the same technologies for land preparation, planting, maintenance and monitoring as detailed within this project document.
4. All future project instances will use only *Portulacaria afra* as a pioneer species for restoration activities.
5. The baseline for all future project activity instances will undertake a baseline approach identical to the approach taken in this project document, described as the pre-project scenario of highly degraded grazing lands.
6. All future project activity instances face the identical barriers to implementation as have been detailed within the Tool for the Demonstration and Assessment of Additionality within this project document.

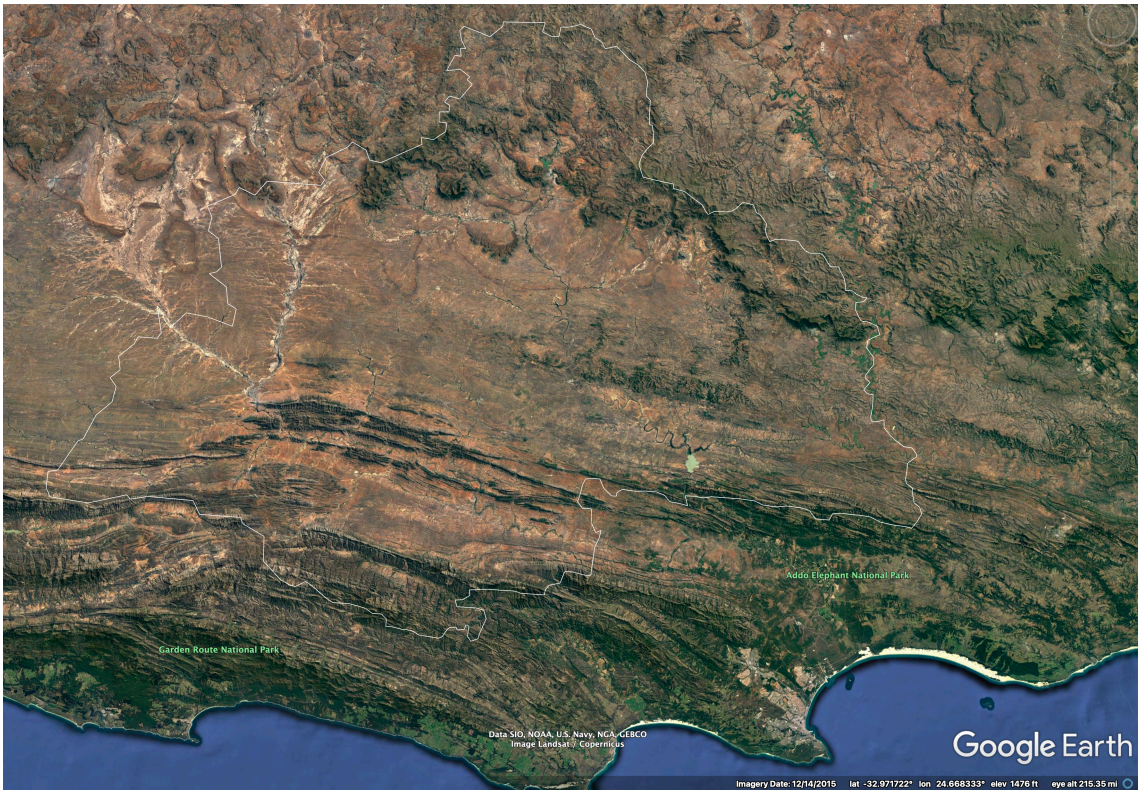
In addition, the land tenure of all farms to be included within the grouped project will be the same as the initial project instance, described in Section 1.7 below.

The project is located in the Sarah Bartmaan Municipality of South Africa's Eastern Cape. The grouped project boundary has been defined to cover two local (sub) municipalities, the Blue Crane Route Local Municipality and Dr Bayers Naude Local Municipality.

This grouped project boundary does not prevent any other 3rd party projects from occurring within the grouped project boundary, given that within these two local municipalities, all project instances will have clearly defined project boundaries.

Figure 3 Grouped Project Location and Boundary





1.5 Project Proponent

Organization name	EcoPlanet Bamboo Group, LLC
Contact person	Camille Rebelo
Title	Chief Operating Officer
Address	4023 Kennett Pike, Wilmington DE 19807, USA
Telephone	+44.7801.999.862
Email	crebelo@ecoplanetbamboo.com

1.6 Other Entities Involved in the Project

Organization name	EcoPlanet Bamboo Southern Africa, Pty
Role in the project	Wholly owned subsidiary of EcoPlanet Bamboo Group, LLC which is responsible for management of the daily activities of the project. This entity trades as EcoPlanet Restoration
Contact person	Terence Newton
Title	Managing Director
Address	Kowie Bamboo Farm, Martindale Road, Bathurst, South Africa
Telephone	+27.46.622.3540
Email	tnewton@ecoplanetbamboo.com

1.7 Ownership

The project proponent meets the ownership requirements of the VCS Program specifications as detailed in section 3.6 of the VCS Standard v4.2 Specifically, the project is being carried out on privately held land, and the project proponent has the legal right to control and operate all project activities for the duration of the crediting period.

Specifically, ownership is demonstrated according to Clause 4 of the VCS Program Standard:

"Project ownership arising by virtue of a statutory, property or contractual right in the land, vegetation or conservational or management process that generated GHG emission reductions and/or removals (where the project proponent has not been divested of such project ownership)."

The project is being carried out on land that is under private ownership. The project proponent has the sole right to the land, vegetation, conservational and management process that is generating GHG emission reductions and/or removals.

1.8 Project Start Date

October 1st 2022

This date corresponds to the date of first planting.

1.9 Project Crediting Period

The proposed project crediting period is 40 years and is a fixed crediting period.

Start date: October 1st 2022

End date: September 30th 2062

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	x
Large project	

Year	Estimated Cumulative GHG emission removals (tCO_2e)
10.2022 - 09.2023	-
10.2023 - 09.2024	34,594.41
10.2024 - 09.2025	166,053.18
10.2025 - 09.2026	297,511.95
10.2026 - 09.2027	477,402.90
10.2027 - 09.2028	705,726.03
10.2028 - 09.2029	982,481.34
10.2029 - 09.2030	1,259,236.64
10.2030 - 09.2031	1,535,991.95
10.2031 - 09.2032	1,812,747.25
10.2032 - 09.2033	2,089,502.56
10.2033 - 09.2034	2,366,257.87
10.2034 - 09.2035	2,643,013.17
10.2035 - 09.2036	2,919,768.48
10.2036 - 09.2037	3,196,523.78
10.2037 - 09.2038	3,473,279.09
10.2038 - 09.2039	3,750,034.40
10.2039 - 09.2040	4,026,789.70
10.2040 - 09.2041	4,303,545.01
10.2041 - 09.2042	4,580,300.31
10.2042 - 09.2043	4,857,055.62
10.2043 - 09.2044	5,133,810.93
10.2044 - 09.2045	5,410,566.23
10.2045 - 09.2046	5,687,321.54
10.2046 - 09.2047	5,964,076.84
10.2047 - 09.2048	6,240,832.15
10.2048 - 09.2049	6,517,587.46
10.2049 - 09.2050	6,794,342.76
10.2050 - 09.2051	7,071,098.07
10.2051 - 09.2052	7,347,853.37
10.2052 - 09.2053	7,559,182.09
10.2053 - 09.2054	7,770,510.80
10.2054 - 09.2055	7,943,674.00
10.2055 - 09.2056	8,078,671.69
10.2056 - 09.2057	8,175,503.87
10.2057 - 09.2058	8,234,170.54

10.2058 - 09.2059	8,292,837.20
10.2059 - 09.2060	8,351,503.87
10.2060 - 09.2061	8,410,170.54
10.2061 - 09.2062	8,468,837.20
TOTAL ESTIMATED ERs	**8,468,837**
TOTAL NUMBER OF CREDITING YEARS	**40**
AVERAGE ANNUAL ERS	**211,721**

1.11 Description of the Project Activity

Jurisdictional REDD+

The AFOLU project activity is carried out on privately held land and does not fall within a jurisdiction that is covered by a jurisdictional REDD program.

Species Choice

The original Albany Thicket Biome Is described in more detail in Section 1.13 below. *Portulacaria afra* is the most characteristic of the tall woody succulents that dominate this native ecosystem. This species can grow up to 4-5 meters in height and its unique growth pattern creates a dense and sprawling matric. This species can survive all types of topography, soil types and the wide range of altitudes founds within the project area. However, the most important characteristic of this species, and the reason it is chosen as a keystone species for thicket restoration, is its ability to transform degraded landscapes. *Portulacaria afra* can not only survive and thrive in the transformed and harsh environment of the project location, but its unique ecology allow it to restore the original ecosystem conditions, in terms of soils, shade cover, and microclimates. As a result, *Portulacaria afra* facilitates the recruitment of other Subtropical Thicket canopy species. Physiologically the species has the capacity to shift from C_3 to CAM photosynthetic pathway in response to water stress[2] making it one of

[2] Ting & Hanscom, 1997 Induction of acid metabolism in Portulacaria afra. *Plant Physiology 59:* 511–514

the most effective plants for semi-arid areas such as the project area. It can also increase the photoperiod and temperature irrespective of moisture status[3,4]. In addition, even young cuttings of *Portulacaria afra* are able to retain their leaves and conserve enzymes even when severely water stressed for up to 140 days and can respond rapidly to improved soil moisture after prolonged droughts. All these factors contribute to the plants ability to act as an ecological engineer and be the catalyst for successful restoration and associated carbon removals at scale.

Nursery Development

For each new farm to be added to the project, dedicated nurseries are developed. These nurseries operate in a dual manner:

- Rooted planting material is developed 2-6 months prior to the planting season in planting trays. These planting trays use a potting mix, combined with soils from the project area and are weeded, watered and cared for in a controlled nursery environment. Planting trays are reusable.
- In field hedgerows of *Portulacaria afra* are created, to supply a sustainable source of long-term planting material to be planted as direct cuttings.

This dual approach is taken due to the high costs associated with the development of planting material for the targeted high density, and to maximize the benefits of *Portulacaria afra's* ability to grow from directly transplanted cuttings.

Fencing

The most significant risk for the newly planted *Portulacaria afra,* is grazing by herbivores. Wildlife occurs across the project region, with the majority of farms unfenced. Therefore, protection activities, in the form of temporary fencing, occurs in advance of planting for any targeted planting area where herbivores might occur. The extent and type of fencing is designed specifically in line with the occurrence and risk of herbivores within each management unit.

Planting Activities

3 Guralnick et al. 1984a Influence of photoperiod and leaf age on Crassulacean Acid Metabolism in Portulacaria afra (L.) Jacq. *Plant Physiology* 75: 454–457

4 Guralnick *et al.* 1984b Seasonal shifts of photosynthesis in Portulacaria afra (L) Jacq. *Plant Physiology 76:* 643–646

The project involves the direct planting of the project area with truncheons of *Portulacaria afra*, planted at a spacing of 2m by 2m, representing 2,500 plantings per hectare. The project includes the following activities all of which are carried out manually:

- Unskilled workers from the communities surrounding each project instance are trained in the correct techniques for land preparation and pitting over the course of a number of months. These workers are provided with correct PPE.
- The project team marks the planting pits at the correct spacing of 2m intervals.
- Pitting to a depth of 30cm occurs, with planting occurring simultaneously, at the onset of summer rainfall. Planting activities continue through the main rainfall months (between September – February depending on exact location).
- All land preparation and planting activities are carried out in teams, with each team under the supervision of a team leader. Supervisors are in place to oversee multiple teams.

Post Planting Maintenance Activities

The planted *Portulacaria afra* are actively maintained until they are established. Given the resilience of the particular species being planted, the activities for the successful establishment are limited to ensuring that the areas directly surrounding each plant are clear, to allow for the maximum rate of establishment, as well as a strong focus on protection activities. All activities are carried out manually using trained workers from the surrounding communities that are given the appropriate PPE for the activities being carried out.

- Management of grasses where required through manual slashing.
- Due to the degraded nature of the soils low levels of fertilization might be necessary in the months directly after planting in order to ensure the successful establishment of the plants. Fertilization occurs on a selective basis, only where plants show signs of nutritional deficiency.
- Fire protection occurs through a combination of managed fire breaks, and having trained teams and associated equipment on standby during any period of high risk.
- Fixing, maintenance and movement of temporary fencing, to ensure that newly planted areas are protected, and that as the plants become fully established, such fencing is removed to assist in the return of biodiversity to the area.

Mortality Monitoring and Plant Replacement Activities

Mortality monitoring occurs twice.

- Once shortly after planting, as transplanting mortality typically occurs relatively quickly after planting, and given the succulent nature of the species, is easy to detect. Such areas are replanted prior to the end of the dry season. During this phase, any individual plants that are found to be dead are replaced.
- Once at the end of year 1, which targets only patches or potential larger areas of mortality. Where this occurs, the underlying cause of mortality is determined and addressed prior to replanting activities.
- As the project design focuses on creating a dense habitat of *Portulacaria afra*, mortality of individual plants is not considered to be significant. However continuous monitoring to locate areas where such establishment has not occurred continues by the project's full time maintenance team.

Standard Operating Procedures

EcoPlanet has a comprehensive set of Standard Operating Procedures (SOPs) for all restoration activities described above. These include the following SOPs: nursery; land preparation; planting; maintenance. All SOPs have associated data collection and monitoring templates. All SOPs are available to auditors during validation and future verification events. In addition, EcoPlanet operates a full suite of Environmental Health and Safety (EH&S) standard operations procedures.

MicroForest Software

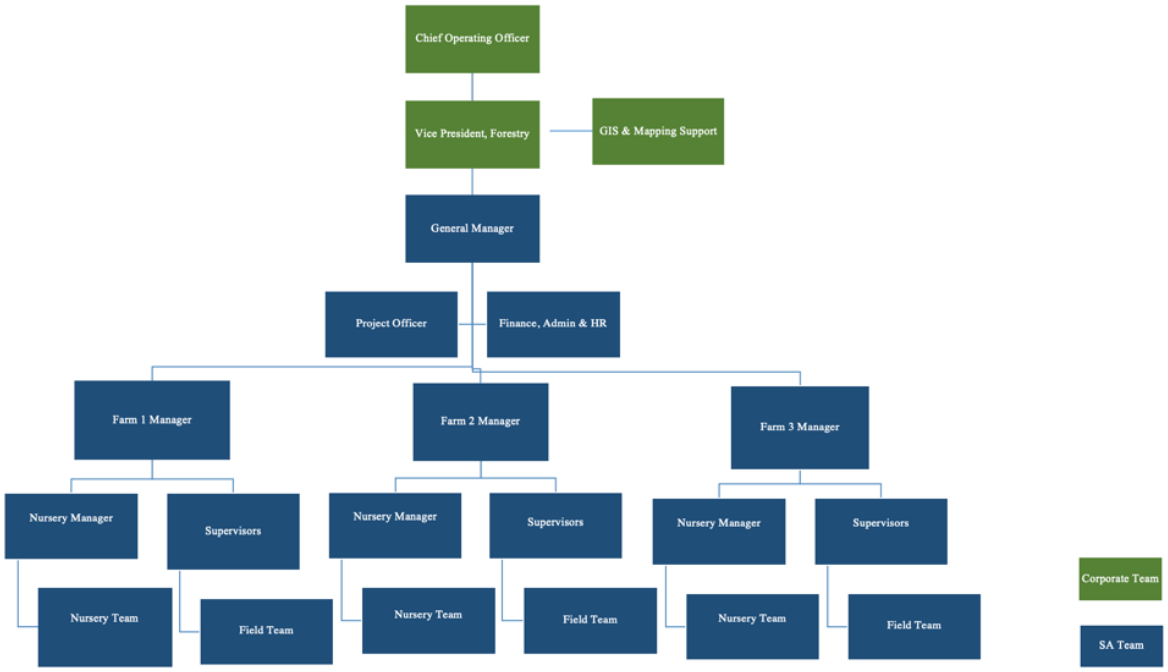
The restoration areas are split into management units called compartments, of approximately 25 hectares in size. These management units are designed according to natural features and allow for the detailed logistical planning required to manage the large number of plants involved.

The project utilizes MicroForest- a software specifically designed to manage and monitor forestry activities by forest management unit. This software tracks planting and maintenance activities against planned annual operational plans, as well as against annual budgets, to allow for the daily and year to date tracking of achieved activities against spatial management units.

Entities Involved

All project activities are carried out by the project proponent by a full operating team that is based within the proximity of the project boundaries. The structure of such involvement is provided in the organizational chart below.

Figure 4 Eastern Cape Restoration Project Organizational Chart



1.12 Project Location

Figure 5 Project Location Within South Africa

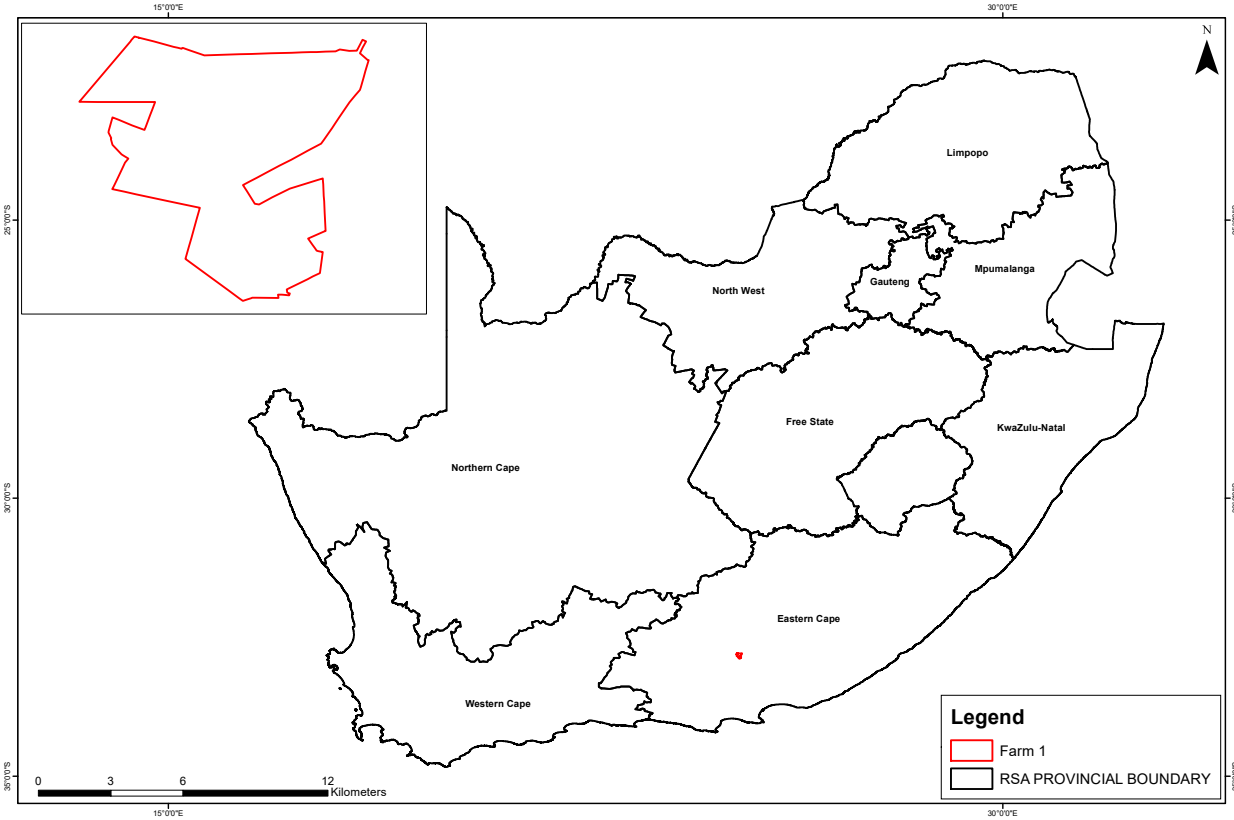
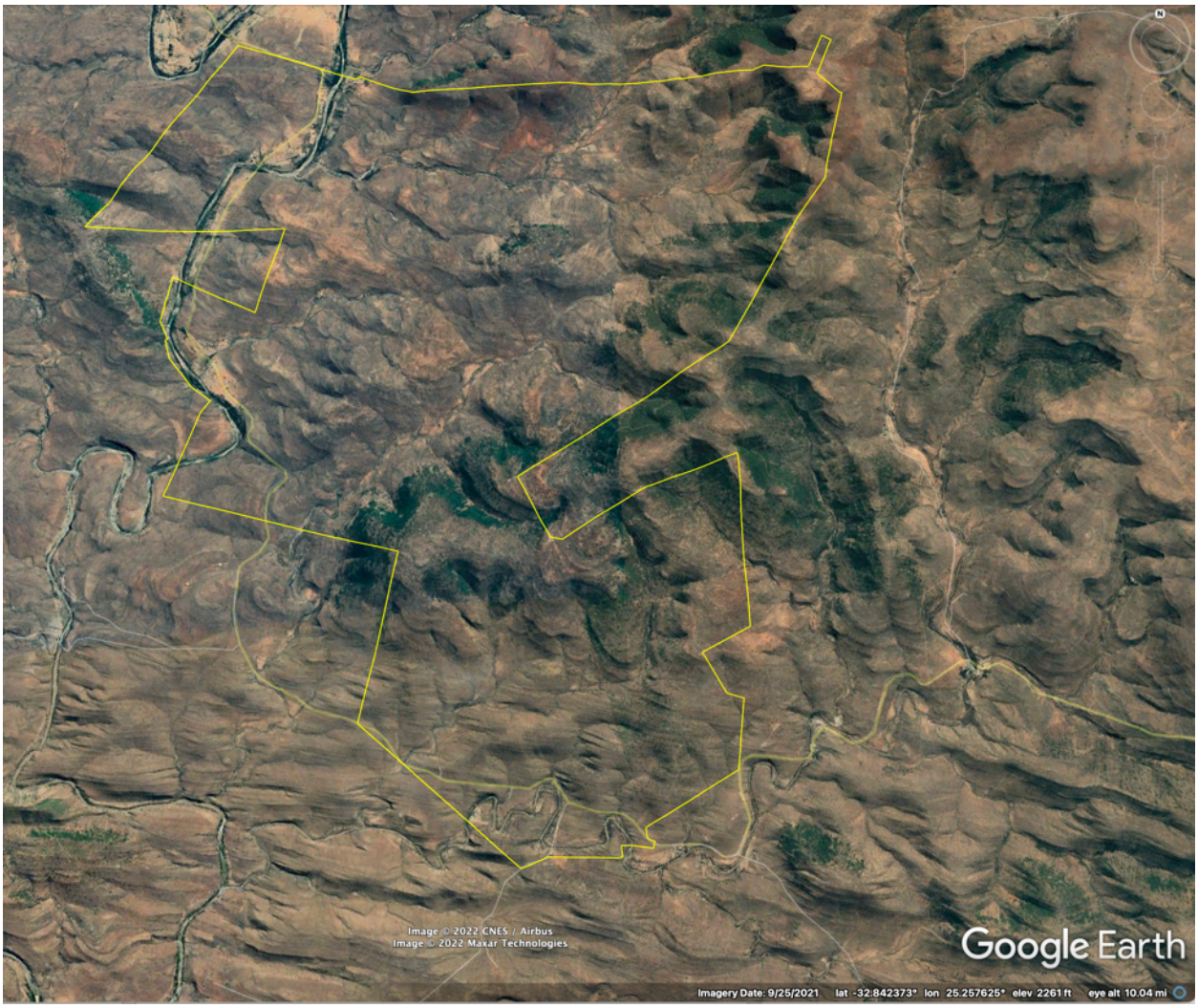


Figure 6 KMZ Image of First Project Instance



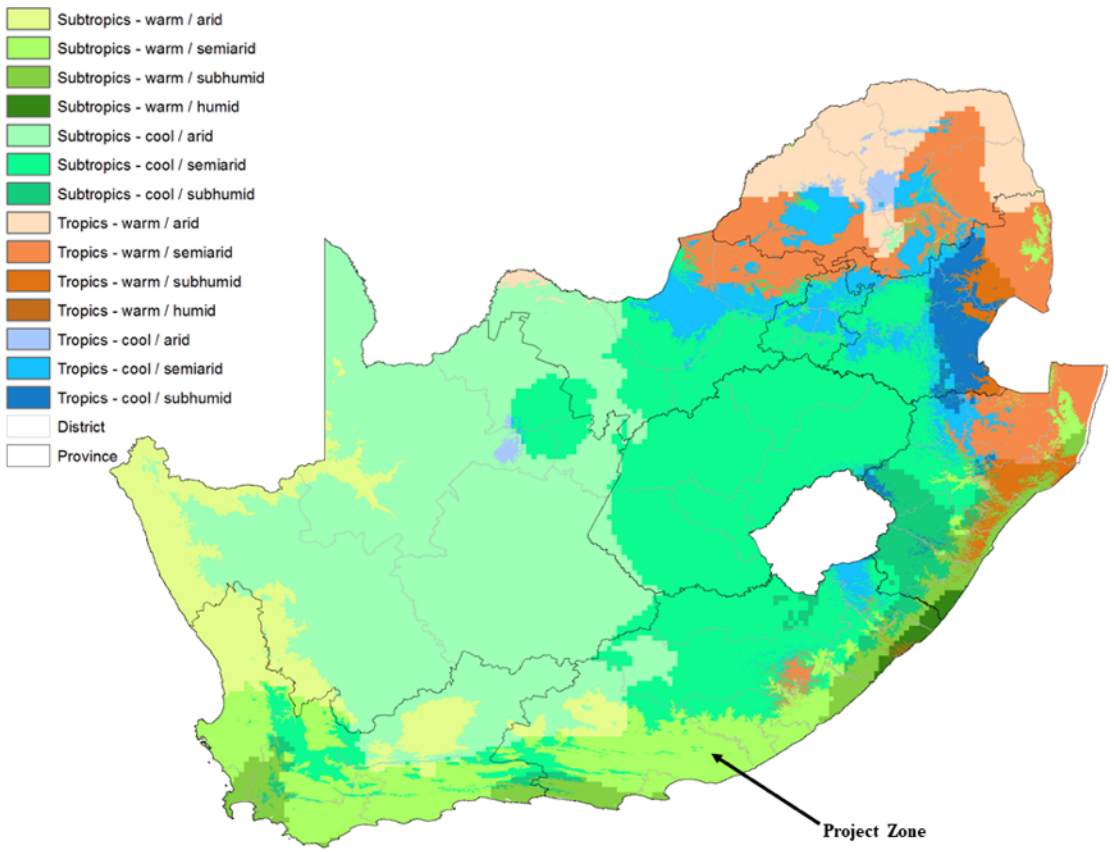
1.13 Conditions Prior to Project Initiation

The baseline scenario is the same as the conditions that exist prior to the project initiation and therefore readers should reference Section 3.4 Baseline Scenario. However, the detailed environmental conditions of the project area have been presented below.

Climatic Conditions

The project area falls within a region of South Africa that is classified as subtropical, and then further detailed as being warm, and semi-arid, meaning that the region receives precipitation levels below the potential evapotranspiration levels.

Figure 7 Climatic Zones of South Africa

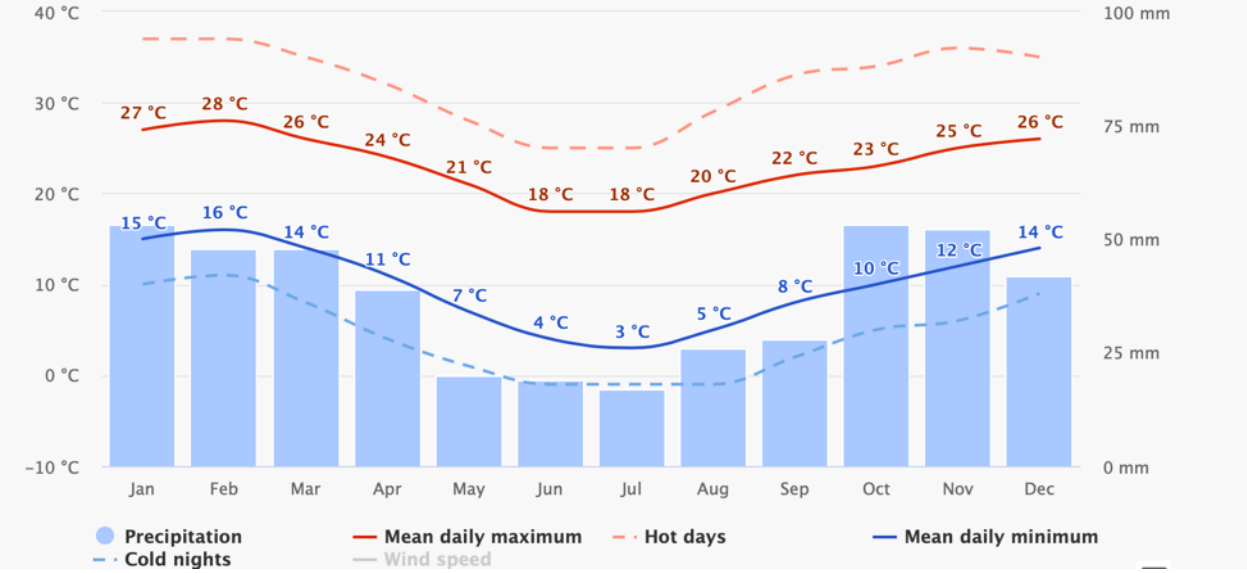


The project area falls within a subtropical classification and is within the warm/semiarid region of South Africa's Eastern Cape.

The proposed target area receives highly variable rainfall that is affected by the overall rainfall gradient of the country. The north eastern part of South Africa receives summer rainfall, the south western part of the country receives winter rainfall. The targeted area falls at the interface of these two rainfall patterns. As a result, the project area is characterized by highly variable and non-seasonal rainfall in the range of 350 – 450mm/year.

The temperature patterns fall under the subtropical climatic zone are characterized by warm summers and cool winters, with frost being unusual. Summer temperatures vary from an average maximum of 28 °C to an average minimum of 18 °C. Winter temperatures vary from an average maximum of 16 °C to an average minimum of 5 °C. The prevailing wind direction is from the west and south west.

Figure 8 Mean Monthly Rainfall & Temperature Data, Somerset East



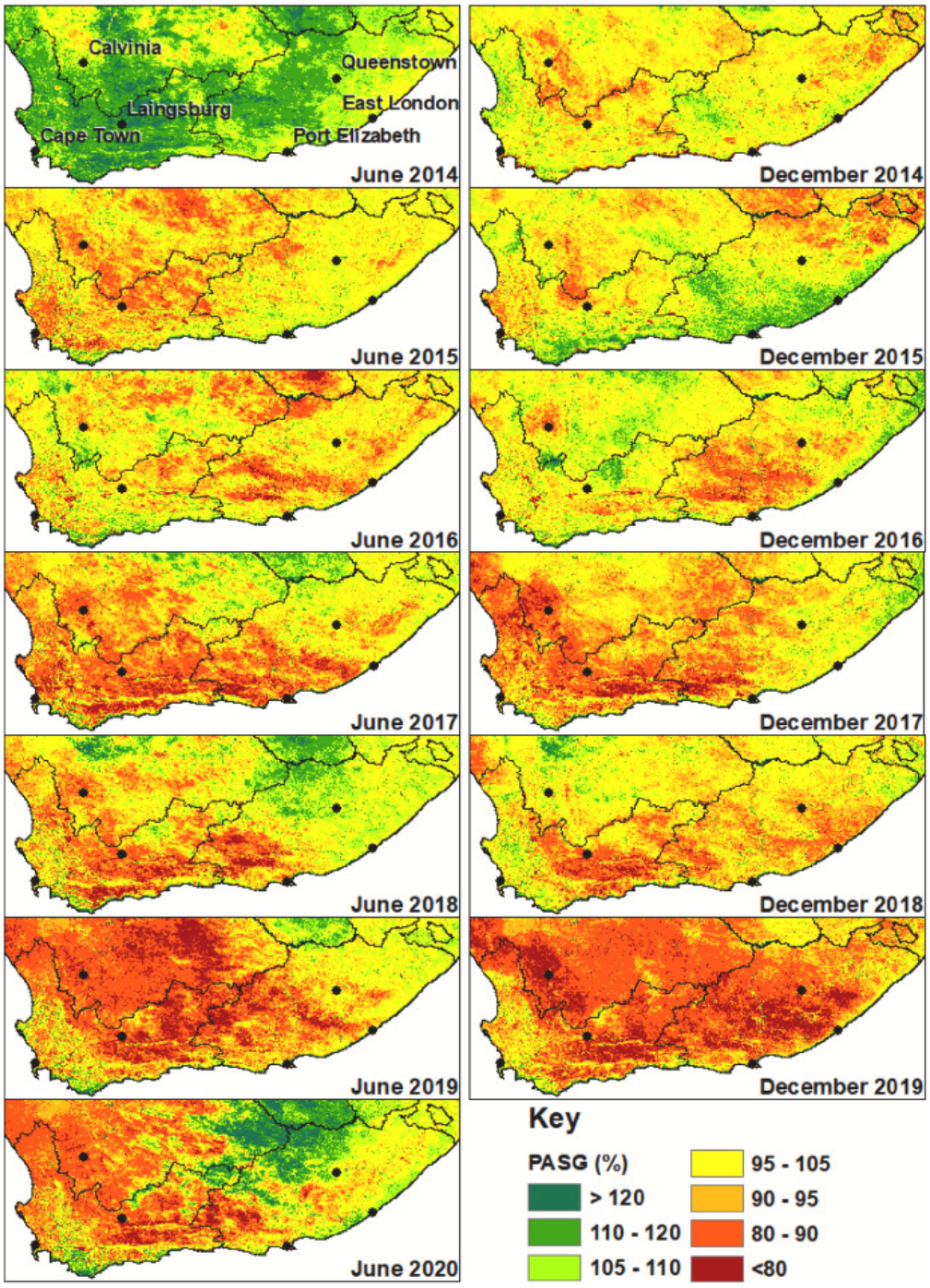
Source: *ClimateData*

The 2015 Onward Multi Year Drought

The Eastern Cape suffered from a severe 7-year drought in the period prior to the project start date and has been heavily publicised as being the worst in the region's records. The figure below[5] shows the impact of this drought on the Eastern Cape, with the project location being in-between the highlighted towns of East London and Port Elizabeth.

[5] Archer et al. 2021; *The 2015-2019 multi year drought in the Eastern Cape, South Africa; it's evolution and impacts on agriculture.* Journal of Arid Environments.

Figure 9 Vegetation Cover of the Eastern Cape During the 2015-2020 Drought

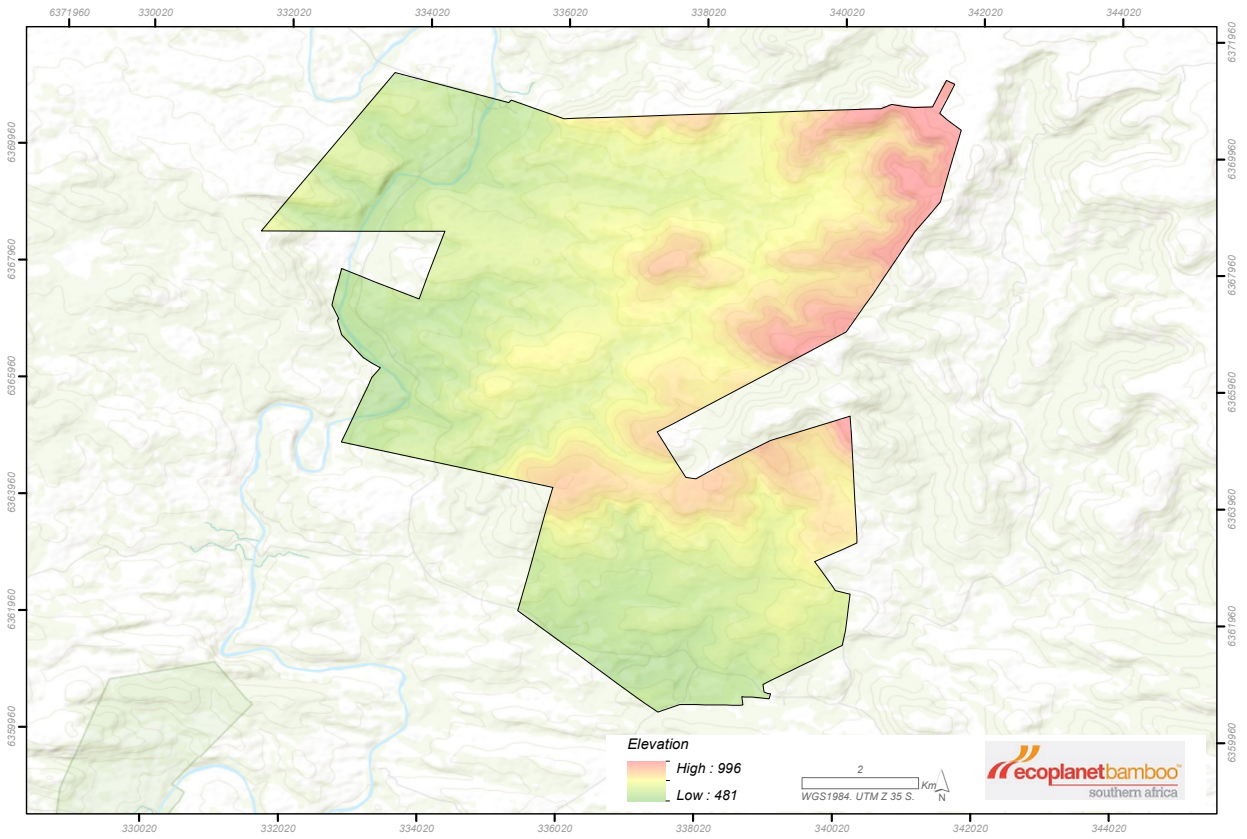


Although marginally higher rainfall occurred in the northern part of the Eastern Cape in 2020, as shown in the figure above, the drought in the project area is only considered to have ended in early 2022 with some areas still suffering from severe water shortages.

Topography & Geology

The topography of the project area varies moving from lowlands in the western portion of below 500 m.a.s.l. towards elevated flat mountain tops that occur in the western portion of the project area, that have elevations of up to 996 m.a.s.l. The remaining areas of intact thicket, representing 140 hectares at the project start dates, are those at the higher altitudes, assumingly due to inaccessibility.

Figure 10 Topography of the Project Area

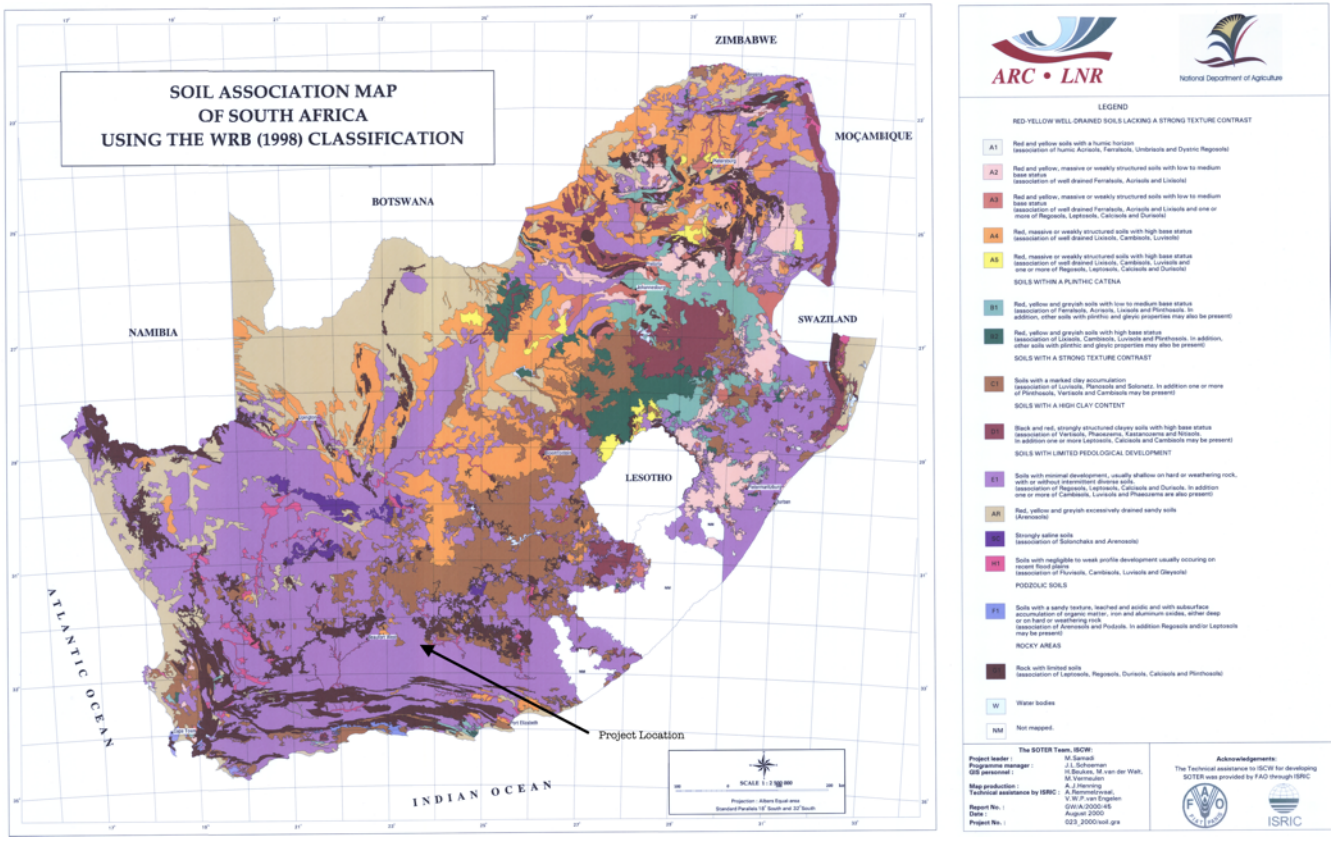


The geology of project area is dominated by shale and sandstone rocks derived from Beaufort series. The sharply folded mountain ranges are characterized by Wittenberg series which consists of course-textured rocks.

Soils

The geology of the project area results in a wide variety of soils that usually closely track the underlying rock formations and topography. Shales and sandstones give rise to deep, well-structured soils; while the course textured rocks of the Wittenberg series give rise to course, unstructured soils that are shallow and nutrient poor.

Figure 11 Soil Map of South Africa



The above soil map indicates that the project are is predominantly defined – according to the WRB classification – as "soils with minimal development, usually on hard or weathering rock, with or without intermittent diverse soils" – highlighting the wide variation of soil types that occurs within the area. The definition further goes on to identify "Regosols, Leptosols, Calcisols, and Durasols" along with one or more Cambisols, Luvisols and Phaeozems being present.

The topography therefore has a clear influence on the formation of soils in the area. Steep hills sides are characterized by shallow, nutrient poor, sandy and acid soils. Valley bottoms are dominated by deep, nutrient rich, clayey and alkaline soils. Soils in mid-slopes are usually intermediate in terms of nutrients[6].

[6] Becker, C. H. 2013. *The influence of soil properties on the growth and distribution of Portulacaria afra in Subtropical Thicket,* South Africa Doctoral dissertation, Nelson Mandela Metropolitan University.

Ecosystem

This critical ecosystem is part of the Maputaland-Pondoland-Albany biodiversity hotspot which extends along the eastern coast of southern Africa, covering an area of nearly 275,000 km^2 across three countries, Mozambique, Lesotho and South Africa. It represents the second richest floristic ecosystem in South Africa, as well as on the African continent. An estimated 8,100 species occur within the hotspot of which at least 1,900 (23%) species are endemic to the region. In total, there are 615 species of special conservation concern within the Maputaland-Pondoland-Albany Hotspot listed on the IUCN Red List of Threatened Species as Vulnerable (364), Endangered (162) and Critically Endangered (89)[7].

This unique ecosystem is the amalgamation of three centers of endemism (Maputaland, Pondoland and Albany) and is also the meeting point of six of South Africa's nine biomes. At a habitat level, this biodiversity hotspot includes one type of forest, three types of thicket, six types of bushveld and five types of grassland, all unique to this ecosystem. EcoPlanet's proposed restoration project falls within the thicket ecosystems of this biodiversity hotspot.

Figure 12 The Maputaland-Pondoland Biodiversity Hotspot[8]

[7] Victor, J. E., & Dold, A. P. 2003. *Threatened plants of the Albany Centre of floristic endemism, South Africa*. South African Journal of Science, 99(9), 437-446.

[8] http://www.cept.net/our-work/biodiversity-hotspots/maputaland-pondoland-albany

The original vegetation in the project area is classified as Subtropical or Albany Thicket Biome, an ecosystem that consists of densely vegetated and almost impenetrable mass of low to tall trees combined with large succulent and evergreen shrubs that are often thorny.

Vegetation Type – The Subtropical or Albany Thicket Biome

The project is located at the southern end of the above-described hotspot, and falls within a vegetation classification known as the subtropical thicket biome, intermittently used with the Albany Thicket Biome. The Subtropical Thicket biome was recognized as a distinct South African biome in the mid 90's. This classification was based on its unique vegetation[9]. It is an extremely unusual ecosystem that represents a condensed forest of thorny trees, succulents, shrubs and vines.

The Subtropical Thicket Biome is thought to be the most species-rich formation of woody plants within Southern Africa. It is characterized by a unique suite of plant forms which is most commonly dominated by tall woody succulents, mixed with evergreen shrubs and a mix of climbers. The biome hosts very little if any grass, in contrast to the surrounding biome types.

Subtropical Thicket is renowned for the high plant species richness and levels of endemism. Vlok & Euston-Brown (2002a) provide a tally of 1,588 plant species found to occur within this biome, with 322 of these species, representing an incredible 20% being endemic to this small geographic area of South Africa's Eastern Cape**Error! Bookmark not defined.**. Most of these endemics are succulents associated with the vygie, euphorbia, crassula, aloe and stapeliad plant groups.

The biome hosts very little if any grass, in contrast to the surrounding biome types. The most characteristic of these tall woody succulents is *Portulacaria afra*, commonly known as spekboom, which can grow up to 4-5 m in height and forms a dense matrix which creates a suitable micro-climate that facilitates the growth of other woody and succulent canopy species[10,11].

9 Low, A. B. & Rebelo, A. G. 1998. *Vegetation of South Africa, Lesotho and Swaziland*. Department of Environmental Affairs and Tourism, Pretoria.

10 Hoare, D. B., Mucina, L., Rutherford, M. C., Vlok, J. H., Euston-Brown, D. I., Palmer, A. R., & Ward, R. A. 2006. *Albany thicket biome. The vegetation of South Africa, Lesotho and Swaziland*. Strelitzia, 19, 541-567.

11 Vlok, J.H.J. & Euston-Brown, D.I.W. 2002. *Subtropical Thicket Ecosystem Planning Project (STEP). Biological Survey Report (plants and birds).* Terrestrial Ecology Research Unit Report, University of Port Elizabeth.

Portulacaria afra thrives on a wide range of highly variable, non-seasonal rainfall of levels down to 200 mm/year. The plant is found to dominate a wide range of geologies, from steep mountain slopes to valley bottoms and across variable altitudes, ranging from sea level to 1,500 meters above sea level.

Thickets dominated by Spekboom are typically characterized by a dense matrix of this species with individual plants often indistinguishable. This matrix in turn supports other wood and succulent canopy species.

Figure 13 Original Extent of the Subtropical Thicket Biome, South Africa

Historic Conditions

The project area is in a historically important location, and to understand the changes in the historic conditions of the original Subtropical Thicket ecosystems, it is important to have the context of the social context of the area, particularly from a land tenure and stakeholder perspective.

After the Napoleonic wars, Britain experienced a serious unemployment problem. One solution they used to address such unemployment was to encourage individuals and families to immigrate to South Africa, what was then the Cape colony, where they were then sent further north.

Lord Somerset, the then British governor in South Africa, encouraged the immigrants to settle in the frontier area of what is now the Eastern Cape. This was in order to consolidate and defend the eastern

frontier against the neighboring Xhosa people, and to provide a boost to the English-speaking population.

This period saw one of the largest stages of British settlement in Africa, with approximately 4,000 Settlers arriving in the area. The Fish River formed the boundary of the colonized lands, with the areas directly south being controlled by the British, and the areas north remaining under the traditional ownership of the indigenous Xhosa tribes.

The settlers were given title to farms, resulting in the context of the project area today, where the majority of farms in the project region have been under private ownership since around 1820, more than 200 years ago.

Prior to the arrival of colonial settlers in 1820, the lands covered by the Subtropical Thicket biome were sparsely populated with the few inhabitants concentrated along the Sundays River Valley. Settlers introduced domestic livestock which resulted in the opening up of large areas of the thicket ecosystem[12], which then in turn opened up the region for large scale raising of livestock. With the introduced livestock and found that goats were the most successful and the most destructive because they could use the high woody content of the thicket biomass that was abundant in the region. After the second world war the area saw a wool boom, driven particularly by mohair goats. Farmers raising mohair goats were heavily subsidized by the nationalist government at the time.

Severe browsing by goats and sheep reduced canopy cover and the dominant perennial species were gradually replaced with annuals. As more farm land was opened up and browsing vegetation reduced, farmers replaced goats and sheep with cattle, who in turn transitioned many of the lands from open thickets to degraded grass lands.

The early farmers also cleared vast areas of the original Subtropical Thicket for cropland and commercial agriculture. Pineapples, chicory, citrus and cash crops such as sweet peppers and cabbages are the most common commercial crops in the region.

The loss of canopy cover changes soil properties and water interactions linked to water-related ecosystem services such as local erosion prevention, top soil maintenance, catchment-scale flood

[12] Mucina, L., & Rutherford, M. C. 2006. *The vegetation of South Africa, Lesotho and Swaziland*. South African National Biodiversity Institute.

prevention and maintenance of the river base flow[13], eventually resulting in naturally irreversible degradation of the Subtropical Thicket system. At the same time the cycle of degradation leads to localized drought, which impacts farming activities putting land out of agricultural production.

The original extent of Spekboom Thickets is estimated to have covered approximately 31,492 km^{2,} or 3,149,200 hectares. However, approximately half (16,942 km^2 or 1,694,200 hectares,) of the original vegetation has been transformed/lost due to over browsing by domestic herbivores and clearing for cropland[14].

The current ecosystem today is highly transformed and shows high levels of degradation[15]. Of the untransformed Subtropical Thicket, only 11% is still in pristine condition and 60% is severely degraded[16]. Approximately 7.3% has been entirely transformed for other purposes. Of the 16,000 km2 (1.6 million hectares) that represent Spekboom dominated Subtropical Thicket vegetation, more than 46 % has undergone severe degradation with an additional 34 % having undergone moderate disturbance.

Today the project area is at the end of the afore mentioned 7 year drought that ran from 2015 to 2022 and many farmers in the areas slaughtered or simply did not replace their livestock, leaving the farmlands unused. However, the state of degradation means that regeneration will not occur without human intervention.

Most thicket species do not germinate in exposed conditions but require the favorable under-storey micro-environment in which to reproduce[17]. As a result, these species are not suitable for direct regeneration activities due to young seedlings being intolerant to the high sun and exposed soils but are expected to return to regenerated lands once *Portulacaria afra* has been established and provided a conducive ecosystem for which these additional species to survive.

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[13] Van Luijk, G., Cowling, R. M., Riksen, M. J. P. M., & Glenday, J. 2013. *Hydrological implications of desertification: Degradation of South African semi-arid Subtropical Thicket.* Journal of arid environments, 91, 14-21.

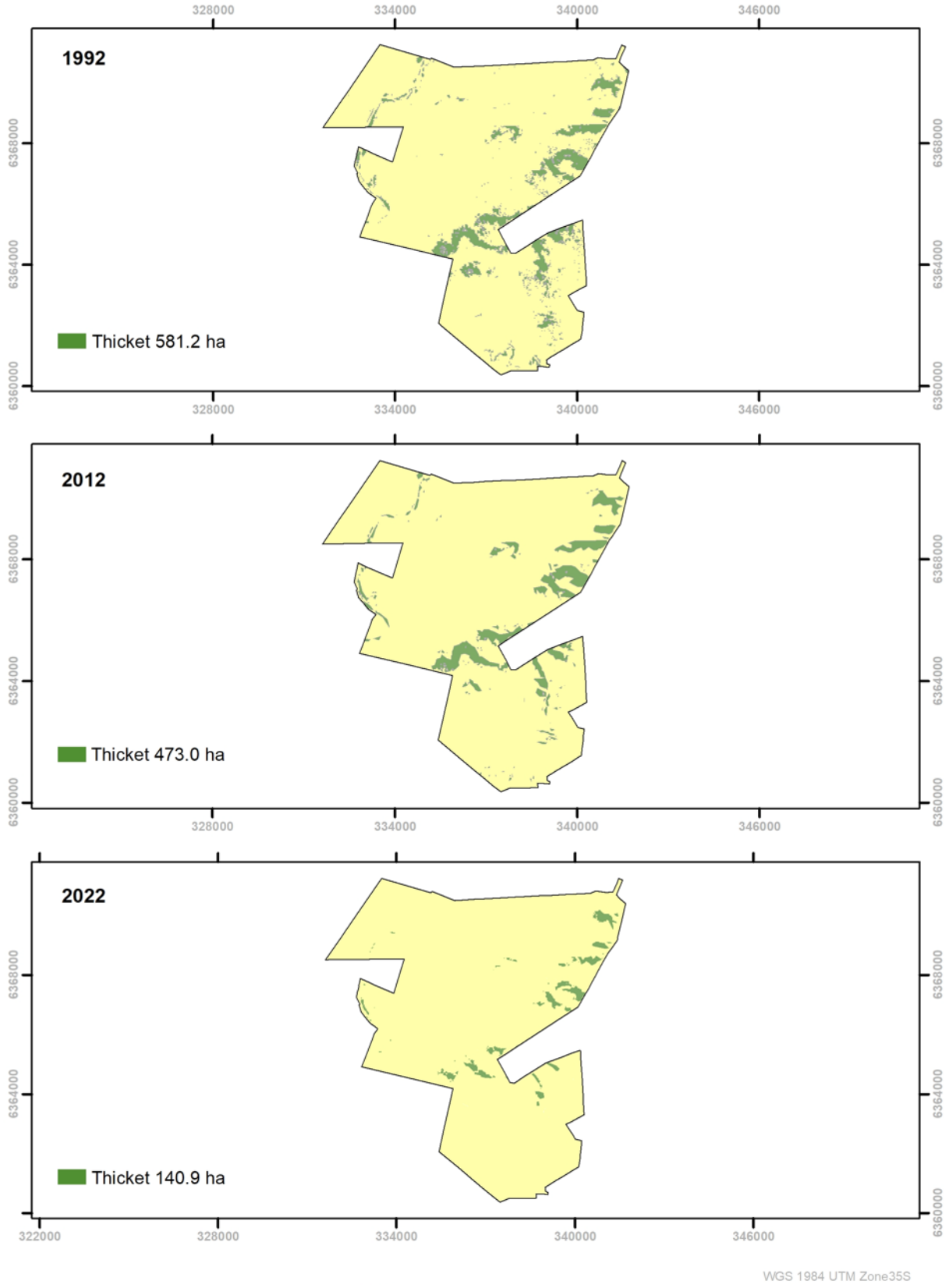
[14] Vlok, J. H. J., Euston-Brown, D. I. W. & Cowling, R. M. 2003. *Acocks' Valley Bushveld 50 years on: new perspectives on the delimitation, characterisation and origin of Subtropical Thicket vegetation*. South African Journal of Botany 69: 27-51.

[15] Palmer, T. 2004. *Vegetation of Makana*. ARC-Range and Forage Institute, Grahamstown.

[16] Lloyd, J.W., E. van den Berg, E. van Wyk and A.R. Palmer. 2002. *Patterns of degradation and degradation in the Thicket Biome*. Terrestrial Ecology Research Unit, Department of Zoology, University of Port Elizabeth, South Africa.

[17] Adie, H., & Yeaton, R. I. 2013. *Regeneration dynamics in arid Subtropical Thicket, South Africa.* South African Journal of Botany, 88, 80-85.

Figure 14 Historic Ecosystem Degradation, 1st Project Instance



1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

The following laws, statutes and other regulatory frameworks are relevant to the proposed project.

National Legislation	General Provisions	Provisions Applicable to the Project
Extension of Security of Tenure Act (No. 62 of 1997)	ESTA regulates the: 1) conditions of residence on certain land, such as farms 2) conditions and circumstances under which the right of persons to reside on land is terminated; 3) legal process which has to be followed by the land owner, before a farm worker may be evicted.	This acts protects the fundamental rights of the people if there are found to be any currently living on any farm to be included within the project. Their rights includes: 1) Constitutional rights 2) Access to water 3) May not be denied access to education or health care 4) Right to receive visitors 5) Right to family life At the time of validation there are no occupiers on any farm included within the project boundary.
National Heritage Resources Act (No. 25 of 1999)	This act protects any nationally important sites such as grave yards, historical plantings, buildings, ruins, or signs of human habitation (e.g., rock paintings.	The act protects buildings that are over 60 years old. Should the project proponent wish to demolish the house, a permit must be obtained from the relevant provincial heritage resources authority. The acts also protects grave and burial sites and site of historical significance including the rock paintings found on the farm The project proponent is committed to protecting, conserving and maintaining any and all sites of national heritage.
Prevention of Illegal Eviction and Unlawful Occupation of Land Act (No. 19 of 1998)	The act aims to provide for the prohibition of unlawful eviction; to provide for procedures for the eviction of unlawful occupiers; and to repeal the Prevention of Illegal Squatting Act, 1951, and other obsolete laws.	Should the Farm and any of the buildings have a "squatter" that needs to be evicted then the provisions of this act must be followed. This does not apply to the farm's legal occupants that are covered under ESTA. If any should occur on any farm included within the project area.

National Legislation	General Provisions	Provisions Applicable to the Project
Conservation of Agricultural Resources Act (No. 43 of 1983, Conservation of Agricultural Resources Act as amended in 2001.	This act covers invasive species within South Africa and how they should be handled by landowners. The amended regulations make provision for four groups: declared weeds (Category 1 plants), plant invaders (Category 2 and Category 3 plants) and indicators of bush encroachment. The first three groups consist of undesirable alien plants and are covered by Chapter 15. Bush encroachers, which are indigenous plants that require sound management practices to prevent them from becoming problematic, are covered separately by Chapter 16.	The project proponent will remove any category 1a, 1b and 2 weeds from the project area. While CARA was the first act to identify the invasive species for removal, the National Environmental Management: Biodiversity Act (NEMBA) of 2004's Alien and Invasive Species List 2014 is becoming the preferred method of prioritization of plants for removal.
Environment Conservation Act (No. 73 of 1989)	This act makes provision for generally applicable environmental principles against which development could be tested, such as: (1) the protection of the natural environment, (2) special nature reserves, (3) prohibition of littering, (4) Environmental Impact Assessments for activities that may have a detrimental effect on the environment. An EIA is required for the conversion of agricultural land or conservation area to any other land use.	The project proponent has a comprehensive set of environmental health & safety procedures which all employees are trained in. These procedures include environmental education and ensures that employees do not litter.
Fencing Act (No. 31 of 1963)	This act provides consolidated laws related to fences and fencing of farms and other holdings. Farm owners are liable for the cost of repairs to their boundary fences. Neighbors can request that any adjoining boundary fixes cost be split. When erecting a fence, bush along	The project proponent works with neighbouring farm owners if any external fences are required. At the time of validation all such fences around the project boundary are in place, and therefore there are no new fences required.

National Legislation	General Provisions	Provisions Applicable to the Project
	either side up to 1.5 m can be cleared.	
National Environmental Management: Biodiversity Act (No. 10 of 2004); National Environmental Management: Biodiversity Act: Alien and Invasive Species Regulation (No. 598 of 2014)	This act provides for the management and conservation of South Africa's biodiversity within the framework of NEMA, the protection of species and ecosystems that warrant national protection, the sustainable use of indigenous biological resources, fair and equitable sharing of benefits arising from bio prospecting involving indigenous biological resources. The 2014 amendment outlines the alien and invasive species regulations as well as the invasive species and their categories for removal.	The project does not make use of traditional knowledge or indigenous plants as part of its operations or finance and therefore is not involved in bio prospecting of indigenous biological resources. However, will have to comply with the removal of invasive species provisions in line with the 2014 Amendment and Regulation.
National Environmental Management Act (No. 107 of 1998)	This act provides for co-operative, environmental governance by establishing principles for decision making on matters affecting the environment, institutions that will promote co-operative governance and procedures for coordinating environmental functions exercised by organs of state. NEMA also regulates the Environmental Impact Assessment Regulations, 2014.	The proposed project activities do not include any that might trigger an EIA.
Basic Conditions of Employment Act (No. 75 of 1997), Basic Conditions of Employment Amendment Act (No. 20 of 2013) and Sectorial Determination 13: Farm Worker Sector	This act applies to all employers and workers and regulates leave, working hours, employment contracts, deductions, pay slips, and termination. The Sectorial Determination 13 governs the specific minimum wage, working hours, number of leave days and termination rules for farm workers. The minimum wage is updated and announced annually.	The project works with an HR consultant to ensure that all aspects of employment legislation are adhered to. In addition the project has an HR manual, and as part of its on-boarding process ensures that all workers are aware of their rights. Such training continues on an annual basis.
Compensation for Occupational Injuries and Diseases Act (No. 130 of 1993)	This act provides for compensation for disablement caused by occupational injuries or diseases sustained or contracted by employees in the course of their employment, or for death	The project's HR and health and safety systems, including its HR Manual and EHS Manual, have been established in line with the regulations established in this act. The project proponent has

National Legislation	General Provisions	Provisions Applicable to the Project
	resulting from such injuries or diseases; and to provide for matters connected therewith.	been actively employing workers in the project area since 2012 and has adhered to all requirements around workers compensation.
Unemployment Insurance Act (No. 63 of 2001) & Unemployment Insurance Act Amendment (No. 32 of 2003) , Unemployment Insurance Contributions Act (No. 4 of 2002)	The Unemployment Insurance Act established the Unemployment Insurance Fund (UIF) to provide for the payment of unemployment benefits such as illness, maternity, adoption, and dependent's benefits.	Contributions to the fund come directly from employee's remuneration. For each pay period the payroll administrator calculates contributions to the UIF using an EMP-201 form.
Occupational Health & Safety Act (No. 85 of 1993)	This act provides for the health and safety of persons at work and for the health and safety of persons in connection with the use of plant and machinery; the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with the activities of persons at work; to establish an advisory council for occupational health and safety. Furthermore, the act requires that any employer with more than 20 employees must have health and safety representatives, and there must be 1 health and safety representatives for every 50 employees (on farm settings).	Legislation requires the employer to do everything ''reasonably practicable'' to protect people from harm. The Project's HR and health and safety systems, including its HR Manual and EHS Manual, have been established in line with the regulations established in this act. The project employees health and safety representatives in line with the number of employees.
Employment Equity Act (No. 47 of 2013)	The purpose of this Act is to achieve equity in the workplace by - a) promoting equal opportunity and fair treatment in employment through the elimination of unfair discrimination; and b) implementing affirmative action measures to redress the disadvantages in employment	All HR practices need to align with this act as well as submit annual employment equity reports. Eastern Cape Restoration Project's HR systems, including its HR Manual, have been established in line with the regulations established in this act. Every designated employer must implement affirmative action

National Legislation	General Provisions	Provisions Applicable to the Project
	experience by designated groups. **Designated group** means black people, women, and people with disabilities; **Designated employer** means: 1) a person who employs 50 or more employees; 2) a person that employs less than 50 people but has an annual turnover (i.e. revenue) greater than R 2-million (specific to Agriculture);	measures for people from designated groups of this Act. An employer must a) consult with employees as required by section 16; b) conduct an analysis as required by section 19; c) prepare an unemployment equity plan as required by section 20; and d) report to the Director-General on progress made in implementing its employment equity plan as required by section 21. (e) This act also governs equal work for equal pay.
Labor Relations Act (Act 66 of 1995), Labor Relations Amendment Act (No. 590 of 2014) & Labor Relations Amendment Bill (No. 12 of 2015)	This act aims to promote economic development, social justice, labor peace and democracy in the workplace. It applies to all employers, workers, trade unions and employers' organizations	The project's HR systems, including its HR Manual, have been established in line with the regulations established in this act.
General Safety Regulations (1986)	These regulations cover the use of personal safety equipment and facilities, intoxication, display of substituted notices and signs, admittance of persons, first aid, emergency equipment and procedures, use and storage of flammable liquids, work in confined spaces, work in elevated positions, working in danger of engulfment, stacking of articles, welding, flame cutting, soldering and similar operations, operating trains, roof work, demolition and excavation, ladders, ramps, scaffolding.	The project proponent: (1) provides workers with training and proper PPE; (2) erects safety signs; (3) havs a trained first aider for every 50 employees and first aid kits were there are over 5 employees; (4) does not allow intoxicated employees to work. The project's EHS Manual covers these requirements.

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

The project is not registered or seeking registration under any other GHG program.

1.15.2 Projects Rejected by Other GHG Programs

The project has not been rejected by another GHG program.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

The emission removals resulting from the project are not included in any emissions trading program or similar mechanism,

1.16.2 Other Forms of Environmental Credit

The project has not sought nor received another form of GHG-related environmental credit and is not eligible to participate in any such program.

1.17 Sustainable Development Contributions

No long-term restoration project can be successful without a broader focus on the positive and sustainable development of a region and ensuring that people that might be dependent upon an area benefit in the long run from project activities.

The proposed project contributes to the following nationally stated development priorities.

Reverse habitat and biodiversity loss

The proposed afforestation project aims to restore a large contiguous area of hectares of extremely degraded lands that are currently suffering from low economic or ecological productivity, back to the native Subtropical Thicket ecosystem with the ultimate objective of connecting unused, abandoned and denuded farms across the area to form a series of biodiversity corridors. This is to counter the impacts of desertification of the Subtropical Thicket ecosystem and associated threats to endangered endemic species that has resulted from unsustainable agricultural practices which have in turn led to habitat and biodiversity loss.

The targeted area is of high ecological importance as it falls within the Maputaland-Pondoland biodiversity hotspot which is one of the 36 recognized biodiversity hotspot across the planet. Biodiversity hotspots represent the most biologically rich regions on earth that are under critical levels of threat. The Subtropical Thicket biome provides critical habitat for indigenous herbivores ranging from a 15 kg duiker to a 1000 kg elephant. It also hosts three Important Bird Areas (IBA) with 421 recorded bird species. However, these populations are declining due to habitat loss.

This is activity is aligned with goal 15 of the 2030 United Nations Sustainable Development Goals named ‘Life on Land’(SDG 15) which calls for urgent action to reduce the loss of natural habitats and

biodiversity to prevent extinction of threatened species. It also seeks to combat desertification, restore degraded lands. This goal is motivated in part by the persistent degradation of dry lands that has led to the desertification of 3.6 billion hectares across the planet. This project activity will certainly reverse the impacts of Subtropical Thicket degradation and will result in the formation of an intact and restored thicket ecosystem that will be able to once again support the original biodiversity.

National Development Plan (NDP) 2030

At a national scale this project is in line with South Africa's National Development Plan 2030 (NDP) which in part is aimed at transitioning South Africa into an environmentally sustainable and climate change resilient society. One of the policies that have stemmed from the NDP is the National Framework for Sustainable Development (NFSD) which recognizes that keeping South Africa's biodiversity intact is vital for the provision of key ecosystem services. In addition, the framework identifies sustaining ecosystems and using natural resources efficiently as one of the five priority areas for strategic intervention.

In response to the United Nations Convention to Combat Desertification (UCCD) and recognizing that 91% of South Africa is dry lands that are prone to land degradation and droughts, the country developed Land Degradation Neutrality (LDN) targets for South Africa. One of these targets is to rehabilitate and sustainably manage a minimum of 87,631 hectares of the Thicket by 2030, however progress has been extremely slow, in part due to the private nature of the land suitable for such restoration activities, and the high associated cost of managing grazing activities.

This project therefore has the potential to contribute directly and significantly to specific targets within the NDP.

Climate Change Action

The projects intends to use *Portulacaria afra,* as a pioneering species for the restoration project and as an effective carbon sequester. This is due to the ability of this plant to switch from C_3 photosynthesis to CAM (Crassulacean Acid Metabolism) which enables the plant to photosynthesize and grow even during dry conditions. In essence, the chosen species has the ability to continue with photosynthesis and remove carbon dioxide from the air under conditions where growth cannot occur for other plants.

This activity is aligned with goal 13 of the United Nations Sustainable Development Goals, 'Climate Action' (SDG 13) which calls for countries to take urgent action to reduce greenhouse emissions with a particular emphasis on carbon dioxide. This contribution is not just to the Sustainable Development Goals, but a key national priority for a country that has suffered from extreme weather patterns, both drought and floods during recent years.

The current South African President, Cyril Ramaphosa, has attributed the recent floods in April 2022 that occurred in Durban, the third largest city in the country, to climate change. Prior to this South Africa has made significant strides in fighting climate change and has developed a number of policies and frameworks in this regard, however implementation could be improved. The country has a gazetted National Climate Change Response Policy (NCCRP), in which the country aims to make a fair contribution to the global effort to stabilize greenhouse gas emissions.

The National Development Plan (NDP), National Framework for Sustainable Development (NFSD) and the recent Climate Change Bill 2022 all cite the country's commitment to reduce greenhouse emission. Therefore, the carbon removals proposed by the project is in line with South Africa's goal to transition into a climate change resilient society.

Decent employment and Economic Growth

In the project region, 78% of the households generate their income through working in farms that have been owned by the original settler families for decades. Unfortunately, due to landscape degradation, drought and associated desertification, some farms are no longer economically viable and others have been abandoned. This has resulted in high levels of unemployment and poverty in the region. This project has a potential to hire over 300 people most of which will most likely be sole bread winners in their homes. The employment force will also include woman and youth in the ages of 24-36.

This activity is aligned with SDG 8, 'Decent work and Economic growth' which promotes sustained, inclusive and sustainable economic growth and productive employment for all. This is also linked to SDG 1 and SDG 2 which seek to eliminate poverty and hunger respectively. These goals were motivated by the fact that many people still lack food, clean water and sanitation. Their target is to help the most vulnerable groups fight against extreme and hunger malnutrition which remains a significant challenge in most countries. In South Africa the most vulnerable people to hunger, poverty and unemployment are people in the rural areas, especially in the proposed target region and therefore this project has the potential to provide an escape for the people who will be given a chance to work and earn decent income.

South Africa is currently facing an unemployment crisis, the unemployment rate is sitting at 35.3%; when we expand the definition to cover discouraged job seekers the percentage rises to 46.3%. Youth unemployment is currently 68.5%. As a response to the economic downturn in 2008, government launched a New Growth Path (NGP) with an ambition to create 5 million jobs and to reduce unemployment to 15% by 2020. Majority of these jobs were expected to come from the private sector and interestingly, 300 000 of those jobs were expected to come from the green economy. The National Development Plan also identifies jobs creation and economic growth as essential to the sustainable development goal.

Therefore, this project is aligned with the country's goal of solving the unemployment crisis especially in the marginalized rural areas.

Developing the rural economy

The proposed project target area covers the deep rural areas of the Eastern Cape province of South Africa. Historically, the apartheid government through the Group Areas Act of 1930 reserved towns and cities for the whites, Indians and colored. In contrast, the black people, who represented the majority of the population, were moved to the economically underdeveloped rural areas and into "townships" where they had to travel to work in towns and cities or work in the nearby farms. When the Group Areas Act was abolished in 1994, black people began to flock to towns and cities in order to minimize transport costs of getting to work and to seek better employment opportunities. This has led to unsustainable urbanization and the creation of slums. Currently, 60% of South Africa is urban, this is slightly more than the global average. This percentage is expected to increase to 70% by 2030.

This project aims at contributing in the development of the rural economy by creating jobs in the targeted rural areas which will slow down the rate at which people are migrating to towns and cities.

This is aligned SDG 11, 'Sustainable cities and communities', which in part is aimed at reducing the rate of unstainable urbanization and the creation of slums.

Nationally, the National Framework for Sustainable Development identifies the development of sustainable rural economies as one of the five priority areas of strategic intervention with the focus of building rural economies via soil rejuvenation strategies to support increased food production. The National Development Plan also outlines 'integrated and inclusive rural economies; as one of the key priorities of the country with a vision of ensuring that South African rural communities have better opportunities to participate fully in the economic, social and political life of the country.

Specifically, the project aims to have a positive impact on the following Sustainable Development Goals.

SDG 1: No Poverty: the project aims to provide secure, attractive and longterm employment in an area that is currently suffering from high levels of poverty, due in part to the levels of land degradation. Providing individuals and communities with secure income, while ensuring that they become integrated within formal systems (for banking, health care and social security) is the first step in achieving a world with out poverty. Indirect benefits include the provision of training and education opportunities, and the multitude of community development projects carried out in fringe communities each year.

SDG 5: Gender Equality: Gender inequality remains a major challenge across much of the developing world, and integrates itself in unique ways across different cultures. EcoPlanet not only provides equal opportunity employment but actively encourages the participation of women on all plantations. Radio programs, community days, continuous stakeholder engagement are in use in order to educate and encourage women. EcoPlanet Bamboo has a company wide policy of a minimum of 35% female employment on all operations, including within supervisory and management positions.

SDG 8: Decent Work & Economic Growth Secure employment goes hand in hand with sustainable land and resource management and is the key to ensuring that development can occur in a linear and continuous fashion. EcoPlanet strives to provide employment opportunities that are attractive, fair, and most importantly secure, not for a year or two, but for a generation. Secure livelihoods and steady income drives economic growth in rural areas. This mechanism of development has been proven to be far more successful than aid or charity, which is short term.

SDG 10: Reduced Inequalities: EcoPlanet directly reduces gender and wealth inequality within all communities and regions of operation. All individuals are provided the opportunity to continue to rise, while a focus on the overall sustainable development of a community reduces inherent inequality.

SDG 11: Sustainable Cities & Communities: The townships surrounding the project area have low levels of sustainability, with few households having the ability to provide their own foodsource. The project aims to develop regenerative farms as a direct benefit, to provide all workers and where feasible, fringe communities, with a sustainable and healthy source of food.

SDG 13: Climate Action: Deforestation and land use change contribute more than 25% of global annual greenhouse gas emissions. In the project area the loss of the native thicket ecosystem, which represents a significant carbon source, is having a negative effect across a multitude of sectors, including agricultural productivity and associated employment. The project's restoration activities sequester significant volumes of atmospheric carbon dioxide, and store it in permanent carbon sinks. Such restored ecosystems provide additional adaptation benefits, creating micro climates that can better regulate local weather patterns and rainfall. The sustainable development of involved communities and the provision of secure income allows them increased ability to adapt to short term

climate change. As such the project is assisting in the mitigation of global climate change and providing direct and indirect adaptation benefits.

SDG 15: Life on Land: EcoPlanet is restoring and regenerating landscapes at scale and restoring the key functions – soil, water, climate, biodiversity – of ecosystems. Healthy ecosystems and increased biodiversity improves the quality of life for all living organisms.

EcoPlanet reports annually on its contribution to these aspects as part of its United Nation's Global Compact: Communication on Progress.

1.18 Additional Information Relevant to the Project

Leakage Management

The project is a revegetation activity carried out on privately owned land. Each individual farm included within the grouped project has been secured from long term private owners with clear land tenure. No movement of people or communities occurs, and the project is not claiming GHG emission reduction / removals from any activity which might result in leakage.

Therefore, no leakage management is necessary.

Commercially Sensitive Information

No commercially sensitive information has been excluded.

2 SAFEGUARDS

2.1 No Net Harm

Environmental Impact: the project is carrying out native restoration of a critical ecosystem, on privately owned land that has been specifically chosen due to its extreme levels of degradation. The activities are limited to the planting of a keystone native species and the subsequent protection of the ecosystem allowing for the regeneration of healthy soils, climate functions, rainfall patterns and biodiversity.

The benefits of planting *Portulacaria afra* have been well documented, with such environmental benefits including the potential for combating desertification in arid environments, its ability to withstand fire, and its economic water use[18].

The project therefore does not have any potential negative environmental impacts that require risk mitigation activities. In contrast the project has been conceptualized and designed specifically to have maximum positive impact in a region that has suffered from extreme environmental degradation with those positive impacts summarized as:

- Drought mitigation: the chosen area has suffered an extended 7 year drought, immediately prior to the proposed project activities. Such periods of drought are believed to be exacerbated by continued loss of the native canopy cover that plays a critical role in the water cycle;
- Climate change: the project is aimed at having positive impacts on both climate mitigation and adaptation, through the restoration of key ecosystem functions;
- Biodiversity: the project area has been chosen due to its location within a critical biodiversity hotspot and the high level of threat to the remaining areas of intact habitat. The project activities are specifically designed to allow for the return of biodiversity within a controlled environment over a multiple-decade timeframe;
- Scale: the project has been designed at a scale large enough to allow for the above environmental benefits to have both a localized and a wider geographic impact.

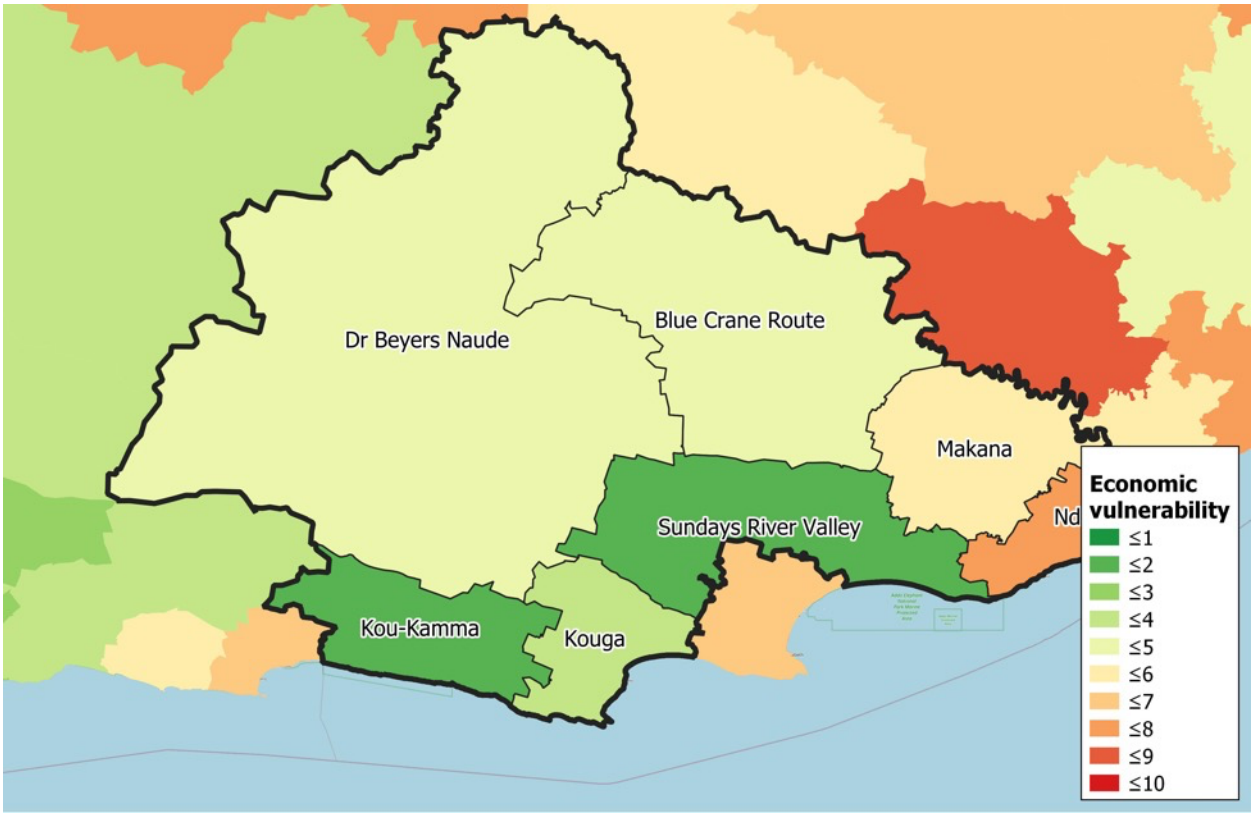
[18] Paviour, S.2014; *Carbon sequestration and trading potential in semi-arid South Africa: a karoo case study*. University of Stellenbosch.

Socio-Economic Impact:

The project area is comprised of large scale farms that have been under private ownership for over a century. There are no individuals or communities within the project boundaries, and the closest communities are located more than 25km from the project boundaries. The project has no involved communities, and no stakeholders, as described further in sections 2.2 and 2.5 below. Therefore, there is no potential for any negative social impact.

At the same time the project is located in an area of extreme poverty, where unemployment rates are high. Economic vulnerability of the communities within the project district are high.

Figure 15 Economic Vulnerability Rating of the Project Area[19]



Such economic vulnerability has been attributed in part towards the decline of agricultural activities within the project area, as a result of drought, climate change, and severe levels of land degradation.

[19] GIZ, International Climate Initiative, Sarah Bartmaan, available at https://letsrespondtoolkit.org

The Province of the Eastern Cape, Office of Rural Development and Agrarian Reform reported that the effects of the recent drought on livestock farming in the province is expected to account for some 5,600 jobs lost.[20] Local newspapers reported the effect on the economic situation of the province as a humanitarian crisis.

The project proponents aim to utilize carbon markets and associated carbon financing not only to the environmental benefit, but to the integrated and holistic development of the project area and surrounding communities. Such positive social impact is determined as:

- Provision of secure and attractive job creation: unemployment in the district in which the project is located is one of the highest in South Africa. At the same time the recent drought and decline of agriculture in the region is resulting in exacerbated unemployment. The project aims to create attractive and long term employment opportunities that are combined with skills development, training, and the platform for individuals to rise.
- Female empowerment, targeting a minimum of 35% female workforce, including in management positions.
- Development of a dedicated sustainable development fund. The project structure allows for a portion of carbon financing to be dedicated specifically towards key development activities in the area. An annual development plan occurs, designed by a representative committee from targeted regions of impact. Projects vary year on year, but are aimed at providing long term development and associated economic diversification opportunities for the nearest townships and communities.

2.2 Local Stakeholder Consultation

As described in the legal framework section above, the project activities aimed at restoring and protecting private land for the purpose of conservation, fall into a definition of “Private Land Conservation Areas (PLCAs)” and sub-categorization Conservancies and Conservation areas.

Conservancies and Conservation areas are not regulated and protected by any Act. They receive their protection from respective landowners without legally binding contracts.

[20] Eastern Cape Status of Drought, It’s Effects and State of Readiness for Cropping; 2019

This structure, land tenure and associated legal framework that governs the proposed project activities results in a scenario where the AFOLU project does not have any local stakeholders, and therefore as per the VCS Standard requirements, no local stakeholder consultation is required.

2.3 Environmental Impact

An EIA is not a requirement for the project activities, given that there are no activities being undertaken that would trigger such a requirement.

2.4 Public Comments

Any public comments received during the relevant period will be incorporated into the project design, or evidence provided to demonstrate insignificance or irrelevance.

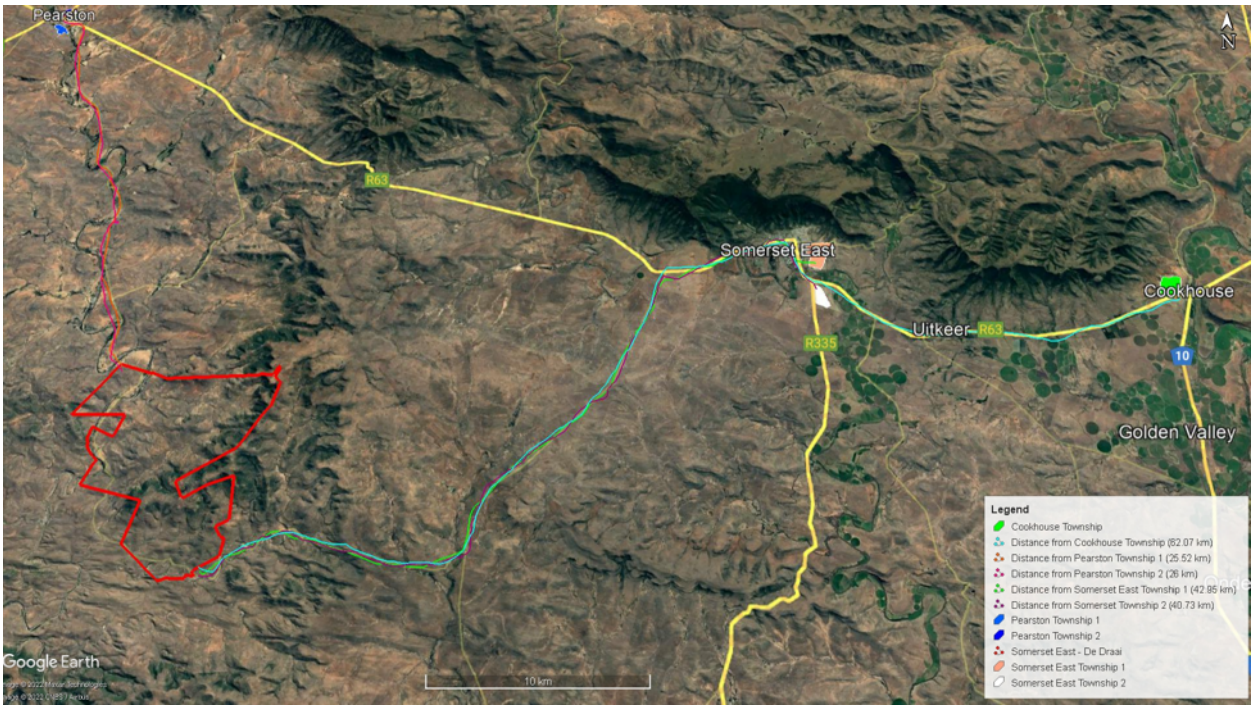
2.5 AFOLU-Specific Safeguards

Stakeholder Identification: A stakeholder is commonly defined as "a person or party that has an interest in a company and can either affect or be affected by the business". In this case stakeholders would be people or parties that have an interest in the project activities and can either affect or be affected by the project.

Given the private nature of the land to be restored, and the fact that the project proponent is also the owner and implementing entity, there are no local nor international organizations that can be considered stakeholders to the project as there are no further organizations that have any interest in the project, nor can they be affected by or have an effect on the project activities. Furthermore, the activities are privately governed, with no impact or effect on any individual or community outside of the project boundary.

The closest communities are located more than 25km from the project boundary, and are in no way influenced by the project activities, other than through direct and voluntary employment.

Map 1 Location of Communities in Proximity to the Project Area



Therefore, it can be concluded that the proposed project does not have any external stakeholders. The VCS Standard states:

Where AFOLU project activities do not impact local stakeholders, projects are not required to meet the requirements set out in Sections 2.17.11-3.17.18.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

The project is utilizing the below approved CDM methodology:

AR-ACM0003 A/R Large-scale Consolidated Methodology: Afforestation and revegetation of lands except wetlands Version 02.0

The methodology requires the use of a number of tools. The following A/R methodological tools are applicable to the project activity and the carbon sinks under development:

- "Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities";
- Tool for the "Estimation of Carbon Stocks and Change in Carbon Stocks of Trees and Shrubs in A/R CDM Project Activities" UNFCC/CCNUCC 2011a
- Tool for "Estimation of Change in Soil Organic Carbon Stocks due to the Implementation of Project Activities" UNFCC/CCNUCC 2010a;
- Tool for the "Estimation of Carbon Stocks and Changes in Carbon Stocks of Dead Wood and Litter in A/R CDM Project Activities" UNFCC/CCNUCC 2010;
- Tool for the "Estimation of non-CO_2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity" UNFCC/CCNUCC 2011;
- Tool for the "Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in the A/R project activity" UNFCC/CCNUCC 2011;
- Tool for "Demonstrating Appropriateness of Allometric Equations for Estimation of Aboveground Tree Biomass in A/R CDM Project Activities" UNFCC/CCNUCC 2011;
- Tool for the "Calculation of the Number of Sample Plots for Measurements within A/R CDM Project Activities" UNFCC/CCNUCC 2009;
- Tool for the "Identification of degraded or degrading lands for consideration in implementing CDM A/R project activities" UNFCC/CCNUCC 2010;

3.2 Applicability of Methodology

The VCS allows for the use of accepted CDM methodologies.

The project activities meet the following required eligibility requirements, as described in Section 2.2 of the methodology:

Applicability Condition: The land subject to the project activity does not fall in wetland category.

Project Justification: As per the IPCC GPG LULUCF 2003, wetlands are defined as lands that are covered or saturated by water for all or part of the year (e.g., peatland) and that does not fall into the forest land, crop land, grass land or settlements categories including reservoirs, natural rivers and lakes. The project site consists of land defined as riparian buffer zones, and represent areas that are not subject to being covered or saturated by water for all or part of the year.

Applicability Condition: Soil disturbance attributable to the project activity does not cover more than 10 per cent of the area in each of the following types of land, when these lands are included within the project boundary":

i. "Land containing organic soils"

ii. "Land which, in the baseline, is subjected to land-use and management practices and receives inputs listed in appendices 1 and 2 to this methodology" - the baseline prior to the project start date was degraded transitional forest lands, which had no active management or inputs, as described in section 3.4.

Project Justifications

i. The soils in the project area are classified as shale and sandstones as described in Section 1.13.

ii. The lands of Appendix 1 refer to cropland in which soil disturbance is restricted. The project activities are not occurring on cropland. Therefore, the project area does not classify as land listed in Appendix 1.

   The lands of Appendix 2 refer to grassland in which soil disturbance is restricted. There are no grasslands in the project area with the use of any inputs. Therefore, the project area does not classify as land listed in Appendix 2.

The methodology requires the use of a number of tools, as detailed in Section 3.1 above. The applicability conditions and associated project justifications of each tool is detailed in the table below.

Table 2 Tool Applicability Conditions and Associated Justifications

Tool: Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities	
Applicability Condition	**Justification**
a) Forestation of the land within the proposed project boundary performed with or without being registered as the A/R CDM project activity shall not lead to violation of any applicable law even if the law is not enforced.	a) The project is in compliance with applicable legal and regulatory requirements. (See section 1.14)
b) This tool is not applicable to small - scale afforestation and reforestation project activities	b) This project is not a small-scale project, as it does not fulfil the small-scale conditions as defined by VCS (VCS Program Definition Booklet).
Tool: Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities.	
Applicability Condition	**Justification**
No applicability conditions	No justifications required
Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities	
Applicability Condition	**Justification**
This tool is applicable when the areas of land, the baseline scenario, and the project activity meet the following conditions: a) The areas of land to which this tool is applied: i. Do not fall into wetland category; or ii. Do not contain organic soils as defined in "Annex A: glossary" of the IPCC GPG LULUCF 2003. iii. Are not subject to any of the land management practices and application of inputs as listed in the Tables 1 and 2.	a) Project lands are not wetlands. The project area is characterized as highly transformed and degraded subtropical thicket, that, in the baseline scenario is under livestock farming. The lands within the project area do not include an organic soils. In contrast they are highly weathered shale and sandstone derived soils that are low in nutrients. The lands of Table 1 refer to cropland in which soil disturbance is restricted. There are no croplands included within the project boundary. The lands of Table 2 refer to grassland in which soil disturbance is restricted. There are no grasslands in the project area with the use of any inputs. Therefore, the project area does not classify as land listed in Table 2.

b) The A/R CDM project activity meets the following conditions: i. Litter remains on site and is not removed in the A/R CDM project activity; and ii. Soil disturbance attributable to the A/R CDM project activity, if any, is: • In accordance with appropriate conservation practices, e.g., follows the land contours. • Limited to soil disturbance for site preparation before planting and such disturbance is not repeated in less than twenty years.	b) Soil disturbance associated with the project activities are limited to those during site preparation (digging of holes to plant seedlings) with no subsequent disturbance.

Tool for the estimation of carbon stocks and changes in carbon stocks of dead wood and litter in A/R CDM project activities

Applicability Condition	Justification
This tool is not applicable if the displacement of agricultural activities is expected to cause, directly or indirectly, any drainage of wetlands or peat lands.	The project is carried out in an arid area of South Africa. There are no wetlands or peatlands within the project region.
Applicable to all occurrence of fire within the project boundary.	Fire has a low occurrence within the project boundary, but where fire is managed for accordingly.
Applicable when an area greater than the minimum threshold area reported by the host Party for the purpose of defining forest, provided that the accumulated area affected by such fires in a given year is ≥5% of the project area.	No justifications required, measured ex ante.

Tool for the estimation of non-CO_2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity

Applicability Condition	Justification
No applicability conditions	The project activities do not include the burning of woody biomass for the purpose of site preparation, or as part of forest management.

Tool for the estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activities

Applicability Condition	Justification
This tool is not applicable if the displacement of agricultural activities is expected to cause, directly or indirectly, any drainage of wetlands or peat lands.	The project is carried out in an arid area of South Africa. There are no wetlands or peatlands within the project area or surroundings.

Tool for demonstrating appropriateness of allometric equations for estimation of aboveground tree biomass in A/R CDM project activities

Applicability Condition	Justification
No applicability conditions	No justifications required
Tool for the calculation of the number of sample plots for measurements within in A/R CDM project activities	
Applicability Condition	**Justification**
No applicability conditions	No justifications required
Tool for the identification of degraded or degrading lands for consideration in implementing CDM A/R project activities	
Applicability Condition	**Justification**
No applicability conditions	No justifications required

Project Boundary

The carbon pools and GHG included in the baseline and project scenarios are described in the table below.

Table 3 Project Carbon Pools & Included GHG in the Baseline (Top) and Project (Bottom) Scenario

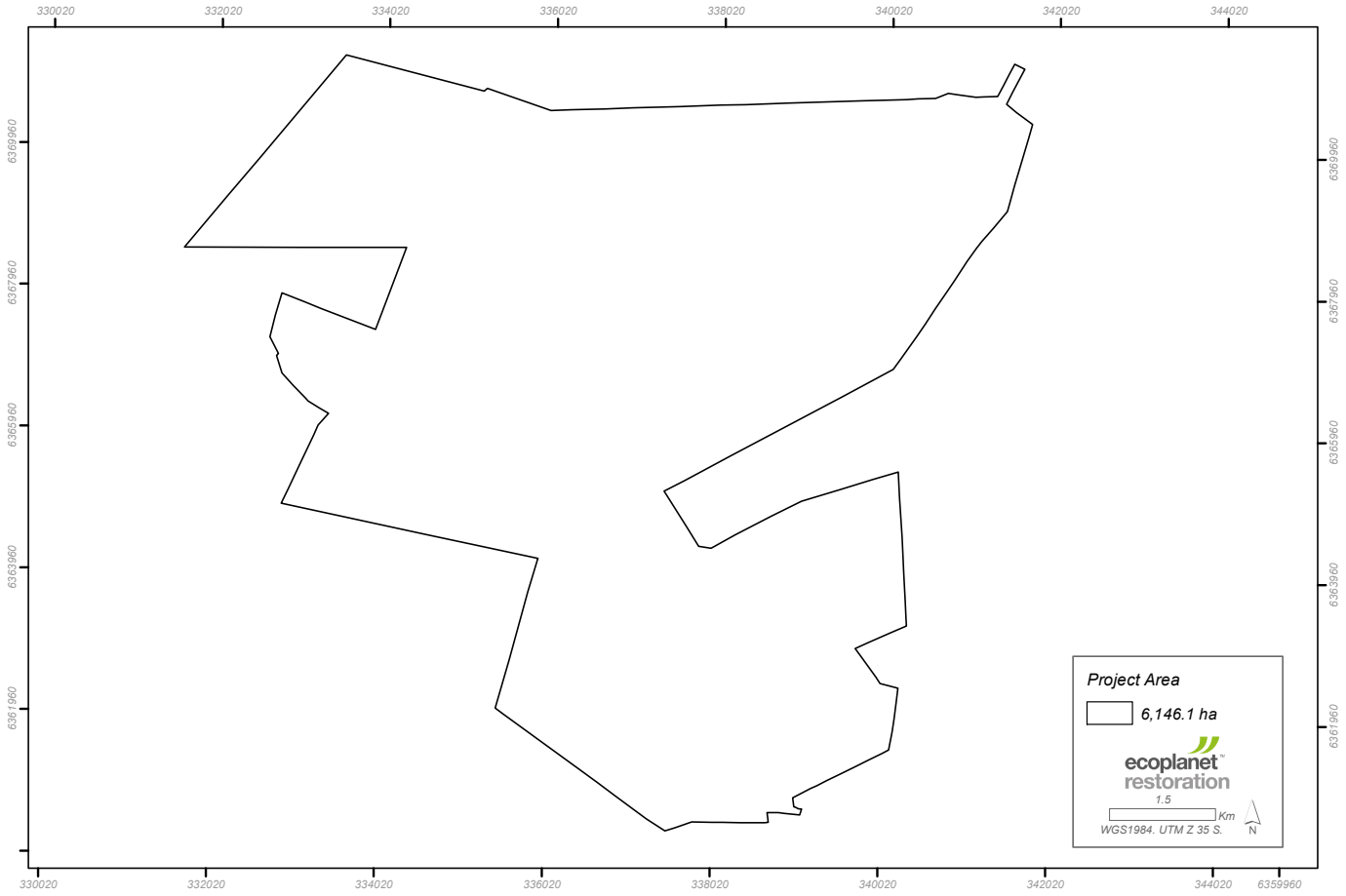
Source		Gas	Included?	Justification/Explanation
Baseline	Above and Below Ground Biomass	CO_2	Yes	These are the major carbon pools for both the baseline and project scenario.
		CH_4	No	Excluded as per the requirements of the methodology
		N_2O	No	Excluded as per the requirements of the methodology
		Other	No	There are no other GHG sources relevant for the chosen baseline scenario.
	Soil Organic Carbon (SOC)	CO_2	Yes	The increase in SOC over the 30 year project period is estimated as an annual increase, following the applicable tool. Therefore, this carbon pool is not included in the baseline, but is included within the project scenario.
		CH_4	No	Excluded as per the requirements of the methodology
		N_2O	No	Excluded as per the requirements of the methodology
		Other	No	There are no other GHG sources relevant for the chosen baseline scenario.
	Dead Wood	CO_2	Yes	Given the trend of vegetation loss and ecosystem degradation within the project boundary, the project activities are expected to result in an increase in dead wood in comparison to the baseline scenario. Excluding this carbon pool from the baseline scenario is therefore considered to be conservative.
		CH_4	No	Excluded as per the requirements of the methodology
		N_2O	No	Excluded as per the requirements of the methodology
		Other	No	There are no other GHG sources relevant for the chosen baseline scenario.
	Litter	CO_2	Yes	Given the trend of vegetation loss and ecosystem degradation within the project boundary, the project activities are expected to result in an increase in litter in comparison to the baseline scenario. Excluding this carbon pool from the baseline scenario is therefore considered to be conservative.
		CH_4	No	Excluded as per the requirements of the methodology
		N_2O	No	Excluded as per the requirements of the methodology
		Other	No	There are no other GHG sources relevant for the chosen baseline scenario.

Source		Gas	Included?	Justification/Explanation
Project	Above and Below Ground Biomass	CO_2	Yes	These are the major carbon pools for both the baseline and project scenario.
		CH_4	No	Excluded as per the requirements of the methodology
		N_2O	No	Excluded as per the requirements of the methodology
		Other	No	There are no other GHG sources relevant for the chosen baseline scenario.
	Soil Organic Carbon (SOC)	CO_2	Yes	The project activities are expected to trigger an increase in SOC over time as assessed using the applicable tool.
		CH_4	No	Excluded as per the requirements of the methodology
		N_2O	No	Excluded as per the requirements of the methodology
		Other	No	There are no other GHG sources relevant for the chosen baseline scenario.
	Dead Wood	CO_2	Yes	The growth pattern of Portulacaria afra results in a constant cycle of growth and the dying back of older stems. All material is left to die naturally on site, therefore resulting in an increase in this carbon pool in the project scenario.
		CH_4	No	Excluded as per the requirements of the methodology
		N_2O	No	Excluded as per the requirements of the methodology
		Other	No	There are no other GHG sources relevant for the chosen baseline scenario.
	Litter	CO_2	Yes	The Portulacaria afra plants drop large volumes of leaves, thereby rapidly regenerating litter levels where plants are planted at a high density.
		CH_4	No	Excluded as per the requirements of the methodology
		N_2O	No	Excluded as per the requirements of the methodology
		Other	No	There are no other GHG sources relevant for the chosen baseline scenario.

Table 4 Emission Sources and GHGs Selected for Accounting

Source		Gas	Included?	Justification/Explanation
	Burning of Woody Biomass	CO_2	No	As per the terms of the methodology, CO_2 emissions due to burning of biomass are accounted as a change in carbon stock.
	Burning of Woody Biomass	CH_4	No	The project activities do not include the burning of woody biomass for the purpose of site preparation, or as part of forest management.
	Burning of Woody Biomass	N_2O	No	The project activities do not include the burning of woody biomass for the purpose of site preparation, or as part of forest management.

Figure 16 Project Boundary – 1st Instance



3.3 Baseline Scenario

The chosen methodology requires the use of the following tool for the demonstration of *the baseline scenario: "*A/R Methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities" (Version 01").

The project proponent has used the VCS adapted version of this tool: "*Tool for the demonstration and assessment of additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) project activities" (Version 3.0, 2012).*

This tool includes a 4 step process, which is undertaken below. Step 1 of the aforementioned tool refers to the identification of the Baseline Scenario.

STEP 1. Identification of alternative land use scenarios to the proposed VCS AFOLU project activity

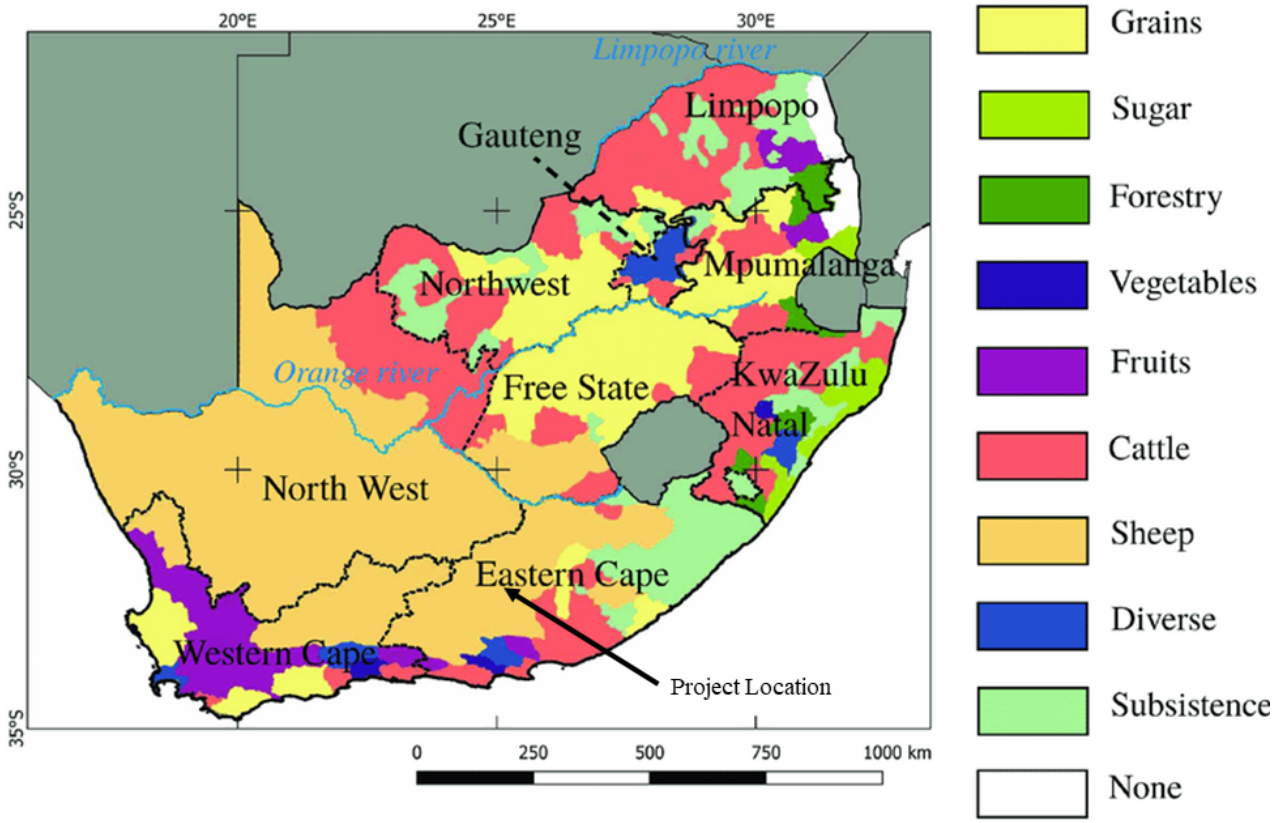
Sub-step 1a. Identify credible alternative land use scenarios to the AFOLU project activity

The proposed project activities are occurring within a semi-arid area of South Africa's Eastern Cape. As described within the assessment of historic conditions in Section 1.13 above, this area has been a key location within the country and the continent for the production of livestock, for both meat and supplementary products. In fact, more than 64%[21] of the total land area of the Eastern Cape is dedicated to stock farming, including beef, cattle, sheep, goats and game.

The below map shows the suitability of commercial land use options for the whole country. The project location falls within the region of the Eastern Cape where the most common and suitable land use is livestock farming for sheep. However, cattle and game farming are also common.

[21] National Review of Land Degradation: Provincial Fact Sheet – Land Degradation in the Eastern Cape; available at www.nbi.ac.za/landdeg

Figure 17 Agricultural regions of South Africa[22]



The entire Eastern Cape province has recently emerged from a seven year drought, as shown by the figures presented in Section 1.13 above.

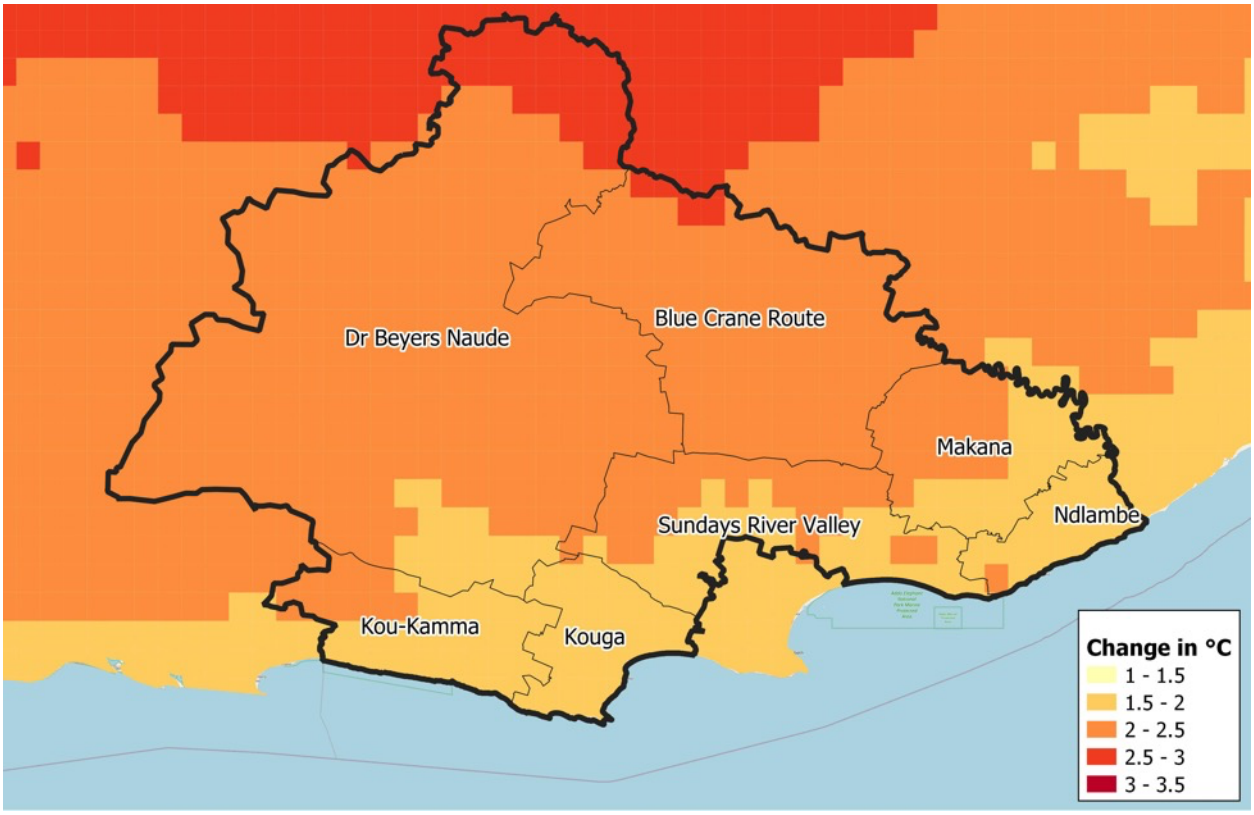
At the same time government warnings show that the Sarah Bartmaan municipality, within which the project is located, is projected to face increased temperatures and reduced rainfall as a direct and immediate result of climate change[23].

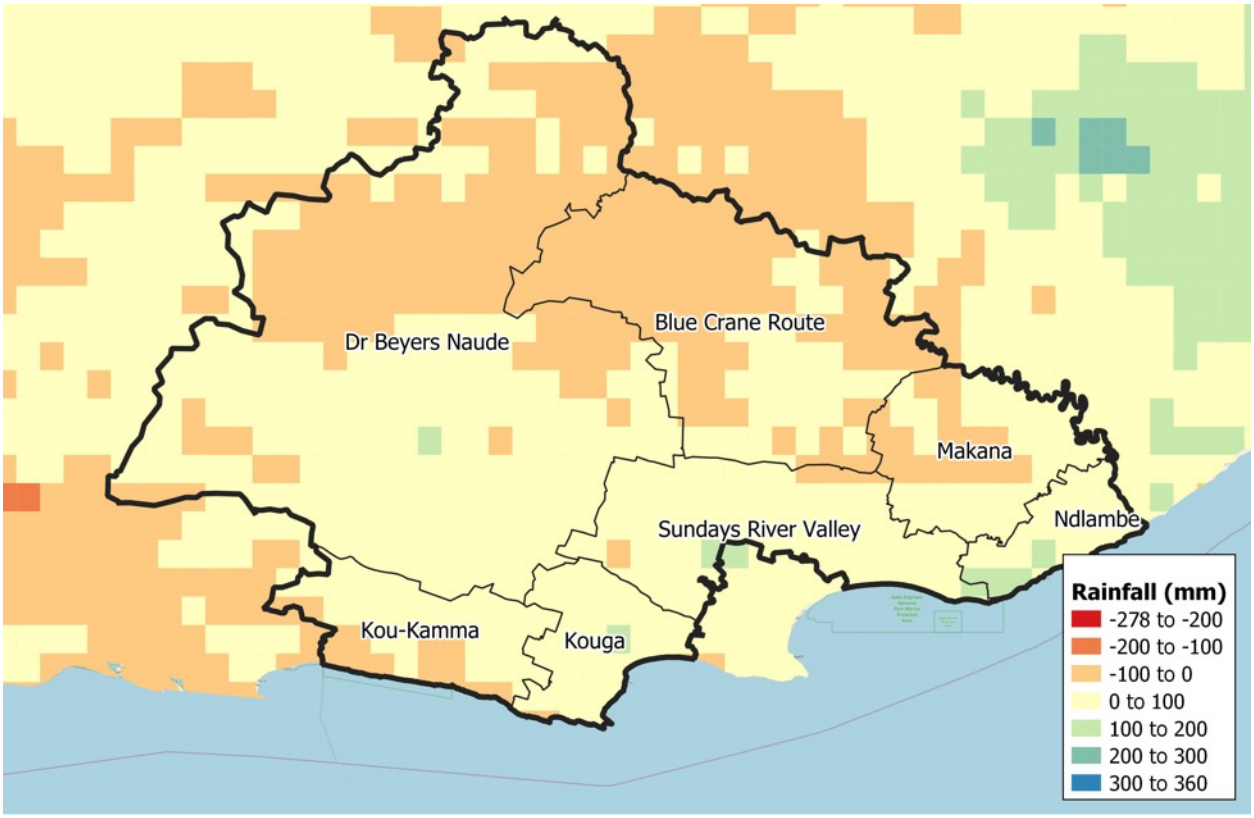
Crop farming, with a focus on citrus, pineapples, maize and vegetables, occurs on 20% of the total land area of the Eastern Cape. However, such activities are limited to the coastal belt of the Eastern Cape, where rainfall levels are higher.

[22] Sustainable Agriculture 2020 Market Intelligence Report

[23] GIZ, International Climate Initiative, Sarah Bartmaan, available at https://letsrespondtoolkit.org

Figure 18 Projected Changes in Temperature & Annual Rainfall, 2021-2050





The project location is already in a water scarce semi- arid area, with land use limited by a combination of terrain and climate. The long history of livestock farming has resulted in a scenario of year on year degradation, and associated desertification.

The figure below above shows the typical sequence of degradation and loss of vegetation cover in the project area, typical of the baseline scenario.

The first image provides an example of intact subtropical thicket, taken from a protected area within the vicinity of the project area. This intact thicket is fenced and has not been exposed to grazing by livestock.

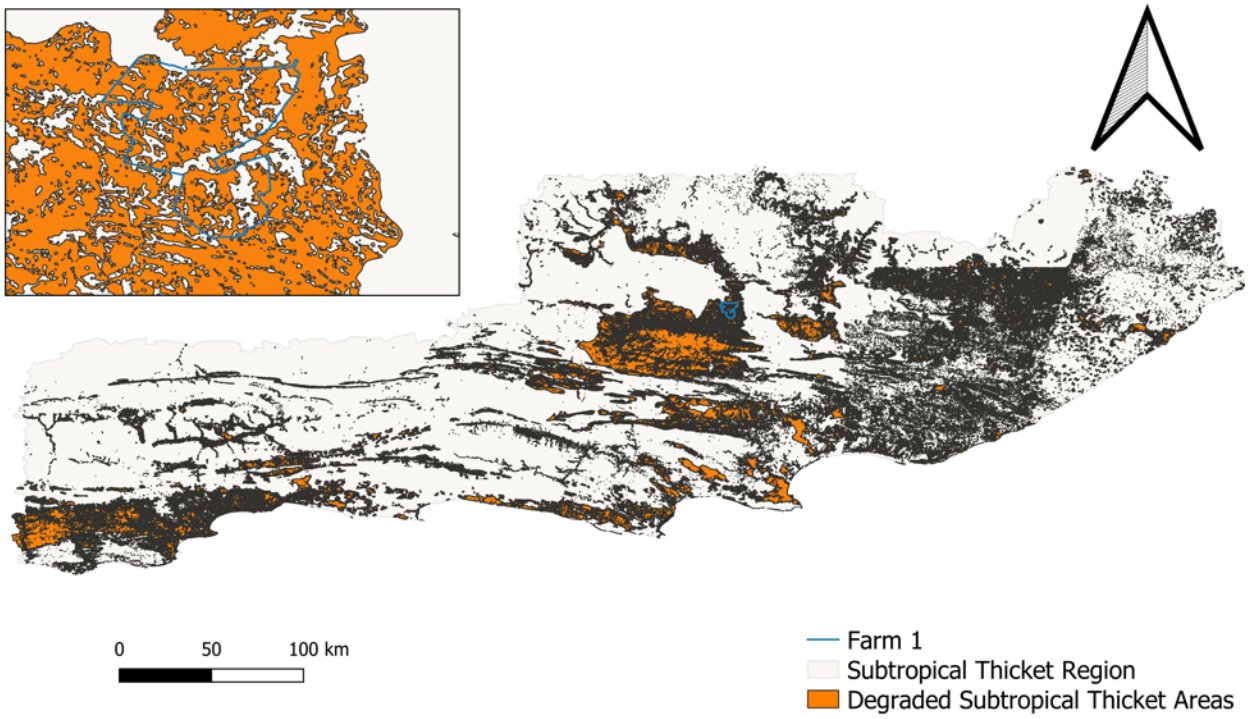
The second image is from the inaccessible mountainous areas 20km northeast of the project boundary, adjacent to the town of Somerset East. Grazing activities have opened up the thicket with only the more inaccessible areas of steeper topography having intact thicket remaining.

The final image is taken from within the project boundaries, on an area that was once dense intact thicket, but has been exposed to grazing by livestock for many decades.

Figure 19 Various Stages of the Subtropical Thicket Ecosystem, Intact to Degraded

For the specific area within the project boundary, the Subtropical Thicket Ecosystem Planning (STEP) research assessment highlighted the project area as being highly degraded.

Figure 20 Degradation of Project Area



As a result, and within the context of this land classification, as well as evidenced from these lands, the alternative land use scenarios have therefore been identified:

i. Alternative Scenario 1: Continuation of the pre-project land use; livestock farming[24] and associated desertification.

Within the project boundaries, a GIS and remote sensing analysis of the period between 1998 to 2012, representing 10 years before the project start date, shows that the pre-project scenario reflected this national trend. The following steps were undertaken:

[24] In the South African context livestock includes the farming of game for commercial purpose.

1. Pre Processing of Satellite Images

Satellite images from 2022, 2002 and 1992 without cloud cover were identified for the first project instance. The images are courtesy of the U.S. Geological Survey[25].

Table 5 Summary of Analyzed Images

Sensor/Mission Date	Spectral Resolution (µm)	Spatial Resolution Pixel Size	Radiometric Resolution
Thematic Mapper ™/ Landsat 5 **1992-04-16** "https://doi.org/10.5066/P918R0HC"	Visible: Blue (0.45-0.52), Green (0.52-0.60) Red (0.63-0.69) NIR Near Infrared (0.76-0.90), MIR Medium Infrared (1.55-1.75)	30 meters	8 bits
Landsat 8 OLI **2012-05-12** "https://doi.org/10.5066/P975CC9B"	Visible: Blue (0.45-0.51), Green (0.53-0.59), Red (0.63-0.67) NIR 1 (0.87-0.97) Panchromatic (0.50-0.67)	Multispectral: 30 meters Panchromatic: 15 meters	14 bits.
Landsat 9 OLI **2022-05-13** "https://doi.org/10.5066/P975CC9B"	Visible: Blue (0.45-0.51), Green (0.53-0.59), Red (0.63-0.67) NIR 1 (0.87-0.97) Panchromatic (0.50-0.67)	Multispectral: 30 meters Panchromatic: 15 meters	14 bits.

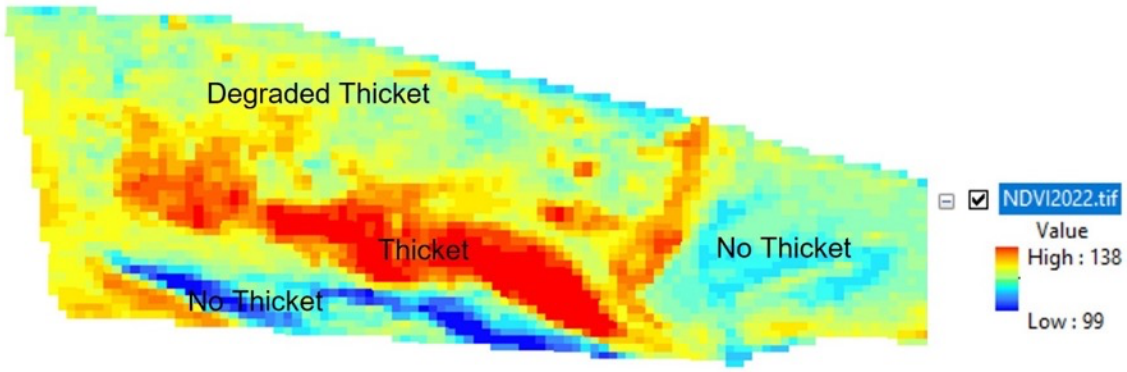
Preprocessing consists of prior image calibration to eliminate alterations in the registration of it for weather conditions & illumination in addition to providing a common analysis scale by obtaining values of reflectance allowing the result comparison between images from different dates/sensor/radiometric resolution. The lighting adjustment was made using a digital elevation model of 15 meters (ASTER). The parameters of visibility and reflectance of the terrain were established for rural type aerosol in tropical conditions, with constant visibility of 30 km. The preprocessing was performed through the ATCOR algorithm of Focus PCI Software, whose result generates images in reflectance values capable of being compared.

[25] https://earthexplorer.usgs.gov/.

2. Digital Processing

Pan sharpening: pan sharpening is a fusion technique to combine a panchromatic image of high spatial resolution with multispectral image data of lower spatial resolution to obtain a high-resolution multispectral image. During this process, the significant spectral characteristics of the multispectral data should be preserved while the sharpen increase, allowing a more detailed visualization & analysis.

Normalized Difference Vegetation Index analysis: the NDVI for each image was obtained, this is a dimensionless index that describes the difference between visible and near-infrared reflectance of vegetation cover and can be used to estimate the density of green on an area of land, values higher than 120 & up to 138 correspond to the presence of thicket and values lower than 120 & close to 90 to absence or no thicket.



Supervised classification: a supervised classification is a form of pixel-based classification and is essentially computer-automated classification for classes/land cover, and the spectral classes are created solely based on the numerical information in the data. the visual inspection of classification results and NDVI ranges allows identification and reclassification of misclassified areas. The classification was performed through the method of maximum likelihood.

3. Visual Processing

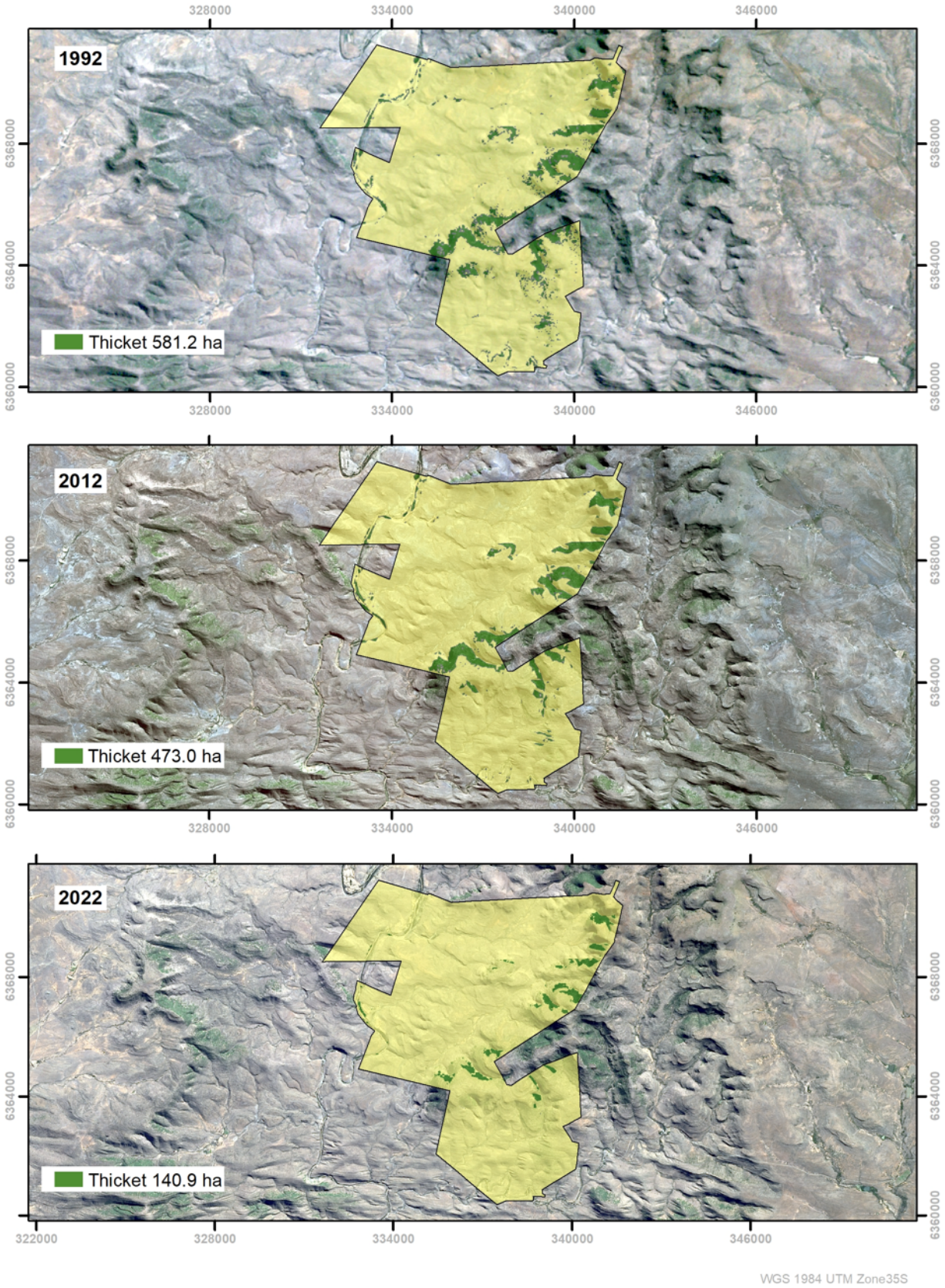
Consists in the visual comparison of images with areas with confirmed presence of Thicket and other land uses to delimit training areas and establish visual differences between thicket and degraded

thicket. Thicket is considered a dense, but generally small, growth of shrubs, bushes or small trees. And degraded thicket is considered a non-dense group of small trees as shown below. Thicket is defined by the presence of trees and the absence of other predominant land uses. The trees should be able to reach a minimum height of 3 m. given from the sample areas on the ground. with a tree canopy cover of more than 10 percent and area of more than 0.09 ha (pixel size of 30 m). The trees height determination of minimum 3 meters was reached through shadow length calculation H which can be calculated quite simply using trigonometry. All that is needed is the trees shade length L (measured on the image) and the suns altitude e (from the image metadata).

The results of the historical trend for the first project instance is provided below. This analysis shows that the project area had lost the majority of the native subtropical thicket ecosystem cover prior to 1992 with the 581.2 hectares of remaining thicket cover occurring only on highest elevation and most inaccessible areas.

Between 1992 and 2022 75.8% of this remaining thicket, leaving only sparse areas totaling 140.9 hectares. This trend is indicative of a baseline scenario of continued loss of vegetation cover, and associated increases in the level of land degradation.

Figure 21 Pre Project Loss of Thicket Ecosystem



ii. Alternative Scenario 2: The current project activity without being registered as an AFOLU project.

It is possible that the restoration activity would occur without being registered as an AFOLU project.

Outcome of Sub-step 1a:

The following alternative land use scenarios have therefore been identified as being credible:

- Continuation of the pre-project land use of livestock farming and associated desertification;
- The current project activity without being registered as an AFOLU project.

Sub-step 1b. Consistency of credible alternative land use scenarios with enforced mandatory applicable laws and regulations

The above alternative land use scenarios were selected as those that represent the most plausible activities for the given project under, under the context of the climate and structure of land tenure.

Both scenarios are in compliance with mandatory applicable laws and regulations.

Outcome of Sub-step 1b:

a) Continuation of the pre-project land use of livestock farming;
b) The current project activity without being registered as an AFOLU project.

Sub-step 1c. Selection of the baseline scenario

The proposed project is occurring on privately owned land in an arid region, which significantly limits the type of activities that could realistically occur in the absence of the project. Although there has been significant interest from government entities and non-governmental organizations, there are no successful examples of large scale subtropical thicket restoration projects, utilizing *Portulacaria afra* as a keystone species and ecological engineer. Furthermore, aside from carbon financing, no financing opportunities exist for such projects, particularly if they are to occur on private land.

Such barriers to implementation are limited to alternative scenario b from the outcome of sub-step 1 above – i.e., they would limit the current project activity without being registered as an AFOLU project.

It can therefore be concluded that the most plausible baseline scenario is "Continuation of the pre-project land use of livestock farming and associated desertification".

Additionality

Adhering to the: "*Tool for the demonstration and assessment of additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) project activities" (Version 3.0, 2012),* the subsequent steps for the determination of additionality are carried out below.

STEP 2. Investment analysis

The proposed project activity is for environmental protection purposes. There is no harvesting of the planted material and no economic returns expected. There are no active tourism facilities on the chosen project areas and no other potential sources of revenue. The project is carried out purely for its high environmental impact, and the potential to restore an original ecosystem and return biodiversity to the project area.

Without carbon financing in return for the future stream of GHG credits, this project would not be able to occur. In order to overcome the challenges faced by attempted thicket restoration projects, these activities carry a high cost, particularly given the high density of plantings required to create the microclimate and trigger ecological succession. Costs incurred include the cost of securing land tenure to ensure project success, developing vast numbers of *Portulacaria afra* truncheons for planting, land preparation and transport to planting sites, the high cost fencing required to prevent the detrimental grazing by herbivores during the early stages of restoration, post planting maintenance, and the on-going care and maintenance of the plants and project area as a whole, until maturity.

As a result, it can be concluded that the project activity is less economically attractive than the baseline scenario, which is the continuation of continued degradation of these lands due to livestock farming, given that such an activity carries a positive return.

It can further be concluded that the proposed VCS project produces no financial benefits other than VCS related income and therefore additionality is clear.

STEP 3. Barrier analysis

In alignment with the tool, given that the results of the investment analysis are clear, and there are no financial benefits other than those derived from the VCS project activity, no barrier analysis is required.

STEP 4. Common practice analysis

There exists a single project similar in scope and scale to the proposed project activity, focused on the use of Portulacaria afra as a restoration strategy within the Eastern Cape. This project is a registered VCS project (ID 1343). As per the requirements of the tool, other registered VCS project activities shall be excluded. There are no other restoration projects similar to the proposed project activity.

3.4 Methodology Deviations

There are no methodology deviations.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

The procedure for the calculation of *ex ante* baseline net GHG removals by sinks is as per the applied methodology (AR-ACM0003 v2), section 5.4 "Baseline net GHG removals by sinks".

The baseline emissions for the project areas are those associated with negative land use change as the project areas undergo continued degradation and associated loss of remaining thicket cover, as indicated in the historical mapping in Section 3 above.

The baseline net GHG removals by sinks is the sum of the changes in carbon stocks of the selected carbon pools within the project boundary that would have occurred in the absence of the project activity. Under the conditions of the applied methodology, changes in carbon stock of above-ground and below-ground biomass of non-tree vegetation, dead wood, litter and soil organic pools may be conservatively assumed to be zero for all strata in the baseline scenario.

Therefore, the baseline net GHG removals by sinks will be determined as:

$$\Delta C_{BSL,t} = \Delta C_{TREE\_BSL,t} + \Delta C_{SHRUB\_BSL,t} + \Delta C_{DW\_BSL,t} + \Delta C_{LI\_BSL,t} \quad \text{Equation 1}$$

Where:

$\Delta C_{BSL,t}$ = Baseline net GHG removals by sinks in year t; tCO_2-e

$\Delta C_{TREE\_BSL,t}$ = Change in carbon stock in baseline tree biomass within the project boundary in year *t*, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; t CO2-e

$\Delta C_{SHRUB\_BSL,t}$ = Change in carbon stock in baseline shrub biomass within the project boundary in year *t*, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities; t CO2-e

$\Delta C_{DW\_BSL,t}$ = Change in carbon stock in baseline dead wood biomass within the project boundary in year *t*, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities; t CO2-e

Section 3.4 above determines the baseline scenario – or the most likely scenario in the absence of the project activity – as the continuation of the pre-project land use of grazing for livestock and associated desertification. A comparison of land cover within the first project instance was carried out showing the change in land cover of remaining thicket, using historical satellite data from 1992, satellite data from ten years prior to the project start date (August 2012) and from the most recent available data, taken from March 2022, representing the most recent available data prior to the project start date.

This analysis, shown in the figures below, indicates that there is an on-going trend of decrease in areas of intact thicket vegetation, and associated increases in land degradation. The 140 hectares of remaining thicket will continue to become smaller in area, and more open in canopy and associated levels of degradation, until this remaining area is also converted to sparsely vegetated lands with no chance of recovery without human intervention.

Such loss of remaining thicket areas and the associated increase in levels of degradation of the land within the project boundary are the direct result of the grazing activities in the baseline scenario. Indeed, there exists a significant body of literature referring to the destruction to the thicket ecosystem caused by the combined grazing by non-indigenous herbivores (goats, sheep and cattle).

The project area has no tree cover. Individual bushes that occur infrequently throughout the project area represent, in the without project scenario, the only remaining grazing for livestock and indigenous herbivores. These individual bushes have been heavily grazed.

This trend of continued land degradation can be expected to continue in the without project or baseline scenario. There is no reasonable likelihood of these individual bushes representing any additional growth, and in contrast the likelihood of them continuing to be over-grazed and therefore reduced in standing biomass is extremely likely.

Therefore, in the baseline scenario the change in carbon stock in the baseline biomass within the project boundary will be a negative value due to the associated loss of both intact and degraded thicket. In the baseline scenario such thicket biomass would continue the trend evidenced over the past thirty years, of continued loss of standing thicket vegetation and associated biomass.

As a result, the changes in carbon stock of above-ground and below-ground biomass of may be conservatively assumed to be zero for all strata in the baseline scenario.

Therefore:

$\Delta C_{BSL,t} = 0$

4.2 Project Emissions

Procedures for the calculation of ex ante actual net GHG removals by sinks are detailed in the applied methodology (AR-ACM0003 v2), section 5.5 "Actual net GHG removals by sinks".

Ex-Ante Stratification

The chosen methodology requires that if biomass distribution over the project area is not homogenous, that stratification should be carried out in order to improve the precision of biomass estimation. Given that the project is only planting a single species, *Portulacaria afra*, for the actual net GHG removals by sinks, the ex-ante estimations are based only on the year of planting.

Table 6 Ex-Ante Stratification of the Project Area

Year of Planting	Strata
2023	Strata 1
2024	Strata 2
2025	Strata 3
2026	Strata 4
Etc.	

If any natural or anthropogenic impacts such as topography, soil types or other factors that are to be found during the course of monitoring that significantly alter the biomass distribution within the project area, then the project proponent will revise the ex post stratification accordingly.

Actual Net GHG Removals by Sinks

The methodology states that "GHG emissions resulting from the removal of herbaceous vegetation, combustion of fuel, fertilizer application, use of wood, decomposition of litter and fine roots of N-fixing trees, construction of access roads within the project boundary and transportation attributable to the project activity shall be considered insignificant and therefore accounted as zero". As such none of these described activities are described or included in the below calculations.

Therefore, the actual net GHG removals by sinks is limited to changes in the carbon stock attributed to the planted *Portulacaria afra* truncheons within the project areas along with any additional species that may become established due to the presence of the micro-climate created by the dense network of *Portulacaria afra* once fully established.

The actual net GHG removals by the *Portulacaria afra* sinks have been calculated using empirical methods and peer reviewed literature case studies from within the vicinity of the project area in order to

establish projected values for the annual change in above and below ground biomass of the planted *Portulacaria afra*. These actual net GHG emission removals have been calculated as follows:

$$\Delta C_{ACTUAL,t} = \Delta C_{P,t} - GHG_{E,t} \quad \text{Equation 2}$$

Where:

$\Delta C_{ACTUAL,t}$	= Actual net GHG removals by sinks in year *t*; tCO_2-e
$\Delta C_{P,t}$	= Change in the carbon stocks in project, occurring in the selected carbon pools, in year *t*; tCO_2-e
$GHG_{E,t}$	= Increase in non–CO_2 GHG emissions within the project boundary as a result of the implementation of the A/R project activity, in year *t*, as estimated in the tool "Estimation of non–CO_2 GHG emissions resulting from burning of biomass attributable to an A/R project activity; tCO_2-e

The increase in non-CO_2 GHG emissions within the project boundary, as a result of the implementation of the A/R project activities $GHG_{E,t}$ is accounted as zero, due to the fact that the project activities do not include the use of fire for any of the activities highlighted in the relevant tool:

- Fire is not used as a land preparation activity;
- Fire is not used for the clearance of harvest residue prior to replanting;

Furthermore, the impact of wild fires on the project activities is estimated to be insignificant, as described within the Non Permanence Risk Assessment. Therefore:

$$GHG_{E,t} = 0$$

The change in the carbon stocks in the project, occurring in the selected carbon pools in year *t*, are calculated utilizing equation 3 of the methodology.

Therefore:

$$\Delta C_{P,t} = \Delta C_{THICKET\_PROJ,t} + \Delta C_{SHRUB\_PROJ,t} + \Delta C_{DW\_PROJ,t} + \Delta C_{LI\_PROJ,t} + \Delta SOC_{AL,t} \quad \text{Eq. 3}$$

Where:

$\Delta C_{P,t}$ = Change in the carbon stocks in project, occurring in the selected carbon pools, in year *t*; tCO_2-e

$\Delta C_{THICKET\_PROJ,t}$ = Change in carbon stock in thicket biomass in project in year *t* as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R project activities"; tCO_2-e

$\Delta C_{SHRUB\_PROJ,t}$ = Change in carbon stock in shrub biomass in project in year *t* as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R project activities"; tCO_2-e

$\Delta C_{DW\_PROJ,t}$ = Change in carbon stock in dead wood biomass in project in year *t* as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R project activities"; tCO_2-e

$\Delta C_{LI\_PROJ,t}$ = Change in carbon stock in litter biomass in project in year *t* as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R project activities"; tCO_2-e

$\Delta SOC_{AL,t}$ = Change in carbon stock in SOC in project in year *t,* in areas of land meeting the applicability conditions of the tool "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R project activities" as estimated in the same tool; tCO_2-e

Changes in Carbon Stock in Thicket Biomass due to Project Activities – Ex Ante Estimations

Portulacaria afra is a plant with an interesting growth pattern. During its early years of growth, it does follow the typical growth pattern of a tree, but rather it develops a dense network of multiple woody stems emerging from a single planted truncheon. As leaves and small branches fall off the parent plant these in turn become established and grow into their own multitude of stems, resulting in what appears to be a continuous canopy of dense woody material.

Figure 22 *Portulacaria afra* Dense Network of Woody Biomass

Following the framework of the applied methodological tool, "Estimation of carbon stocks and changes in carbon stocks of trees and shrubs in A/R CDM project activities" the ex-ante estimation utilizes existing data to simulate and predict the growth of the thicket vegetation.

Numerous peer reviewed studies have been carried out to assess the total biomass and associated carbon stock by both intact and degraded spekboom dominated Subtropical Thicket vegetation. The project proponent utilizes reference values of 51.6 and 25.4tC/ha for above and below ground biomass from studies[26] on intact spekboom dominated sub-tropical thicket from within the project region and under the same climate (350-450mm annual rainfall). These values are in line with other studies, which report that intact thicket has been found to have approximately 40tC/ha greater in intact vs

[26] Mills et al 2013; *Ecosystem carbon storage under different land uses in three semi-arid shrublands and a mesic grassland in South Africa.* South African Journal of Plant and Soil

degraded thicket, given that the land being restored represents barren lands, with lower carbon stocks than degraded thicket.

The species shows a sigmoid self-regulating growth curve[27] which reflects the slow initial growth rate of the species after planting, followed by a faster phase of growth once established. The plant is assumed to continue to increase in biomass over multiple decades achieving a steady state of above and below ground woody biomass at year 30. Therefore, the above values were utilized to represent the end result of a fully restored thicket ecosystem 30 years after planting, and associated growth curves simulated. As per the above tool, ex-ante estimation is not subjected to uncertainty control, given that it is used only for projections (at validation) whereas species specific allometric equations, along with monitoring and actual growth rates are used for all subsequent verification events.

The change in the thicket carbon stock as a direct result of the targeted project activities of high density planting of *Portulacaria afra* is estimated as follows with equation 11 from the tool:

$$\Delta C_{THICKET\_t} = (\Delta C_{THICKET,t2} - (\Delta C_{THICKET,t1}) / T \quad \text{Equation 11}$$

Where:

$\Delta C_{THICKET_t}$	= Change in the thicket carbon stocks in, in year *t*; tCO_2-e
$\Delta C_{THICKET,t2}$	= The carbon stocks in thicket biomass, in year *t2*; tCO_2-e
$\Delta C_{THICKET,t1}$	= The carbon stocks in thicket biomass, in year *t1*; tCO_2-e
T	= The time elapsed between year *t2* and year *t1*; yr

Changes in Carbon Stock in Thicket Biomass due to Project Activities – Ex Post Estimations

As per the applied methodological tool, "Estimation of carbon stocks and changes in carbon stocks of trees and shrubs in A/R CDM project activities" the estimation of carbon stock at a point in time is done using a combination of the following methods:

[27] Mills, A. J., Turpie, J. K., Cowling, R. M., Marais, C., Kerley, G. I., Lechmere-Oertel, R. G., & Powell, M. (2007). *Assessing costs, benefits, and feasibility of restoring natural capital in subtropical thicket in South Africa.* Restoring natural capital, science, business, and practice, 179-187.

a) Estimation of measurement of sample plots

b) Estimation of modelling of tree growth and stand development

During the initial phase of the project, existing species specific allometric equations from peer reviewed literature are applies, as per the parameters provided at validation in Section 5.1 below.

At a latest date of year 10, once growth is assumed to be sufficient to justify the required destructive sampling, the project proponent will develop a site and species specific allometric equation, following the associated tool Tool for "Demonstrating Appropriateness of Allometric Equations for Estimation of Aboveground Tree Biomass in A/R CDM Project Activities" UNFCC/CCNUCC 2011;

Changes in Carbon Stock in Shrub Biomass due to Project Activities

As per the terms of the methodology, changes in shrub biomass in the project can be accounted for as zero.

Changes in Carbon Stock in Deadwood and Litter due to Project Activities

The chosen methodology in requires application of the "Tool for estimation of carbon stocks and change in carbon stocks in dead wood and litter in due A/R CDM project activities" Version 03. The project proponents have chosen to make use of the default factor based methodology for the conservative calculation of changes in both deadwood and litter carbon stock as the result of the project activities.

Changes in deadwood carbon stocks are calculated using the following equation from the above described tool:

$$C_{DW,i,t} = C_{THICKET,i,t} \times DF_{DW} \qquad \text{Equation 9}$$

Where:

$C_{DW,i,t}$ = carbon stock in deadwood in stratum *i* at a given point in time in year *t;* tCO_2e

$C_{THICKET,i,t}$ = carbon stock in thicket biomass in stratum *i* at a given point in time in year

t as calculated in "estimation of carbon stocks and changes on carbon stocks of trees and shrubs in A/R CDM project activities"*;* tCO_2e

DF_{LI} = conservative default factors expressing carbon stock in litter as a percentage of carbon stock in thicket biomass;

i = 1, 2, 3,... biomass estimation strata within the project boundary

t = 1, 2, 3, ... years elapsed since the start of the A/R CDM project activity

The project area biome is described as temperate, resulting in an 8% default factor which has been applied by strata.

Changes in litter carbon stocks are calculated using the following equation from the above described tool:

$$C_{LI,i,t} = C_{THICKET,i,t} \times DF_{LI} \quad \text{Equation 10}$$

Where:

$C_{LI,i,t}$ = carbon stock in litter in stratum *i* at a given point in time in year *t;* tCO_2e

$C_{THICKET,i,t}$ = carbon stock in bamboo biomass in stratum *i* at a given point in time in year *t* as calculated in "estimation of carbon stocks and changes on carbon stocks of trees and shrubs in A/R CDM project activities"*;* tCO_2e

DF_{LI} = conservative default factors expressing carbon stock in litter as a percentage of carbon stock in thicket biomass;

i = 1, 2, 3,... biomass estimation strata within the project boundary

t = 1, 2, 3, ... years elapsed since the start of the A/R CDM project activity

The project activities do not remove any litter from the project boundary and all litter therefore remains in situ. The project area biome is described as temperate, resulting in a 4% default factor which has been applied by strata.

Changes in Carbon Stock in Soil Organic Carbon due to Project Activities

The chosen methodology requires the application of the "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities" Version 01.1.0. The project meets the required applicability conditions, as per the areas of land, the baseline scenario, and the project activity. These have been defined in Section 3.4 above and are summarized as:

a) The area of land on which the project activities are occurring:

(i) Are not wetlands;

(ii) Do not contain organic soils

(iii) Are not subject to the land management practices detailed in Tables 1 or 2 of the tool.

i. Table 1 - The baseline scenario is not cropland.

ii. Table 2 – The baseline scenario is not grassland under management.

b) The project activity meets the following applicability conditions:

(i) All litter remains on site with no removals;

(ii) Soil disturbance associated with the A/R CDM project activity is carried out to meet the following best practices:

i. All planting follows the natural contours of the land.

ii. Soil disturbance associated with site preparation is limited only to the planting pits which is carried out before planting, with no subsequent disturbance over a more than 20 year period.

Furthermore, the assumptions of the tool are in line with the project activities:

a) Site preparation and planting activities take place within a year of each other – under the project's management plan such activities occur simultaneously;

b) The litter levels of the degraded ecosystem are extremely low in the pre-project scenario. In contrast the implementation of the revegetation activity increases the SOC content of the lands from the pre-project level to a steady state, assumed to be equal to the SOC content under intact thicket ecosystems.

c) The increase in SOC content is assumed to take place at a steady and constant rate over a 20 year period.

Changes in soil organic carbon are calculated using the following equation:

$$SOC_{INITIAL,i} = SOC_{REF,i} * f_{LU,i} * f_{MG,i} * f_{IN,i}$$

Where:

$SOC_{INITIAL,i}$ = SOC stock at the beginning of the A/R CDM project activity, in stratum i of the area of land; tC ha^{-1}

$SOC_{REF,i}$ = Reference SOC stock corresponding to the reference condition in native lands (ie non degraded unimproved lands under native vegetation)by climate region and soil type, applicable to stratum i of the area of land;

$f_{LU,i}$ = Relative stock change factor for baseline land-use in stratum i of the areas of land;

$f_{MG,i}$ = Relative stock change factor for baseline management regime in stratum I of the areas of land;

$f_{IN,i}$ = Relative stock change factor for a baseline nutrient input regime (e.g. crop residues, manure) in stratum I of the areas of land;

The project area is unified from a baseline, management and input scenario, and therefore for the purpose of this tool, there is only a single stratum.

The tool allows for transparent and verifiable information as an alternative to the default factors provided in the reference tables. Multiple peer reviewed studies have analyzed the SOC content in intact thickets within the project area. The project utilizes a conservative average of these published figures.

$SOC_{REF,i}$ = 83.90

Therefore

$SOC_{INITIAL,i}$ = 58.73

The project activities that result in soil disturbance are limited to the manual digging of planting pits.

Therefore

$SOC_{LOSS,i}$ = 0

The rate of change in SOC stock in project scenario until the steady state SOC is reached is calculated with the following equation:

$$dSOC_{t,i} = \left(\frac{SOC_{REF,i} - SOC_{INITIAL,i} - SOC_{LOSS,i}}{20\ years}\right)^2 for\ t_{PREP,i} < t \leq t_{PREP,i} + 20$$

Where:

$dSOC_{t,i}$	= the rate of change of SOC stock in stratum i of the areas of land, in year t; tC ha^{-1}
$t_{PREP,i}$	= the year in which first soil disturbance takes place in stratum i of the areas of land
$SOC_{LOSS,i}$	= the loss of SOC caused by soil disturbance attributable to the A/R CDM project activity in stratum i of the areas of land;
$SOC_{REF,i}$	= Reference SOC stock corresponding to the reference condition in native lands (ie non degraded unimproved lands under native vegetation)by climate region and soil type, applicable to stratum i of the area of land;
$SOC_{INITIAL,i}$	= SOC stock at the beginning of the A/R CDM project activity, in stratum i of the area of land;
i	= 1, 2, 3,... biomass estimation strata within the project boundary
t	= 1, 2, 3, ... years elapsed since the start of the A/R CDM project activity

$dSOC_{t,i}$ = (83.9 – 58.73 – 0)/20 = 1.2585

This value is greater than 0.8 and therefore as per the tool, changes in SOC are fixed at 0.8 tC ha^{-1}

Calculation of Changes in Carbon Stock Across All Pool

Subsequently, the projected planting timelines was applied to determine to estimate the total GHG removals across the full project activity.

Table 7 GHG Emission Removals All Pools

Year	Estimated Project Removals (tCO_2e)
06.2021 - 06.2022	-
06.2022 - 06.2023	34,594.41
06.2023 - 06.2024	166,053.18
06.2024 - 06.2025	297,511.95
06.2025 - 06.2026	477,402.90
06.2026 - 06.2027	705,726.03
06.2027 - 06.2028	982,481.34
06.2028 - 06.2029	1,259,236.64
06.2029 - 06.2030	1,535,991.95
06.2030 - 06.2031	1,812,747.25
06.2031 - 06.2032	2,089,502.56
06.2032 - 06.2033	2,366,257.87
06.2033 - 06.2034	2,643,013.17
06.2034 - 06.2035	2,919,768.48
06.2035 - 06.2036	3,196,523.78
06.2036 - 06.2037	3,473,279.09
06.2037 - 06.2038	3,750,034.40
06.2038 - 06.2039	4,026,789.70
06.2039 - 06.2040	4,303,545.01
06.2039 - 06.2041	4,580,300.31
06.2039 - 06.2042	4,857,055.62
06.2039 - 06.2043	5,133,810.93
06.2039 - 06.2044	5,410,566.23
06.2039 - 06.2045	5,687,321.54
06.2039 - 06.2046	5,964,076.84
06.2039 - 06.2047	6,240,832.15
06.2039 - 06.2048	6,517,587.46
06.2039 - 06.2049	6,794,342.76
06.2039 - 06.2050	7,071,098.07
06.2039 - 06.2051	7,347,853.37
06.2039 - 06.2052	7,559,182.09
06.2039 - 06.2053	7,770,510.80
06.2039 - 06.2054	7,943,674.00
06.2039 - 06.2055	8,078,671.69
06.2039 - 06.2056	8,175,503.87

06.2039 - 06.2057	8,234,170.54
06.2039 - 06.2058	8,292,837.20
06.2039 - 06.2059	8,351,503.87
06.2039 - 06.2060	8,410,170.54
06.2039 - 06.2061	8,468,837.20
TOTAL	**8,468,837**

4.3 Leakage

The methodology requires the use of the A/R Tool for the "Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in the A/R project activity".

This tool defines such potential leakage as originating from the displacement of agricultural activities, crop cultivation and / or grazing activities, should such displacement result in an increase in GHG emissions. Leakage is calculated using equation 4 of the approved methodology:

$$LK_t = LK_{AGRIC,t} \quad \text{Equation 4}$$

Where:

LK_t = GHG emissions due to leakage, in year *t*; tCO_2-e

$LK_{AGRIC,t}$ = Leakage due to the displacement of agricultural activities in year *t* as estimated in the tool "Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R project activity"; tCO_2-e

The land included within the project boundary falls into the definition of grazing activities – human induced activities, occurring on land, that are aimed at livestock production.

The tool further defines the displacement of agriculture activities as "shifting of agricultural activities from areas of land within the project boundary to areas of land outside the project boundary" and

defines leakage emissions as "an increase in GHG emissions resulting from displacement of pre-project activities".

The project activities do not result in any displacement or no movement of grazing activities as a result of the project activity. The first project instance utilizes land that, due to the level of degradation along with the effects of the recent drought, no longer supports commercial grazing activities.

Therefore there is no displacement of any grazing activities that have the potential to result in an increase in GHG emissions resulting from the displacement of pre-project activities.

It can therefore be determined that for all project areas:

$LK_{AGRIC,t}$ = 0

Therefore:

LK_t = 0

Following the grouped project requirements, all subsequent farms will also meet a zero leakage framework.

4.4 Net GHG Emission Reductions and Removals

According to the applied methodology, the net anthropogenic GHG removals by sinks shall be calculated as follows:

$$\Delta C_{AR-CDM,t} = \Delta C_{ACTUAL,t} - \Delta C_{BSL,t} - LK_t \quad \text{Equation 5}$$

Where

$\Delta C_{AR-CDM,t}$ = Net anthropogenic GHG removals by sinks, in year *t*; t CO2-e

$\Delta C_{ACTUAL,t}$ = Actual net GHG removals by sinks; in year *t*; t CO2-e

$\Delta C_{BSL,t}$ = Baseline net GHG removals by sinks; in year *t*; t CO2-e

LK_t = GHG emissions due to leakage; in year *t*; t CO2-e

Table 8 Estimated GHG Emission Removals Over the Project Crediting Period

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
2023	0	-	0	-
2024	0	34,594.41	0	34,594.41
2025	0	166,053.18	0	166,053.18
2026	0	297,511.95	0	297,511.95
2027	0	477,402.90	0	477,402.90
2028	0	705,726.03	0	705,726.03
2029	0	982,481.34	0	982,481.34
2030	0	1,259,236.64	0	1,259,236.64
2031	0	1,535,991.95	0	1,535,991.95
2032	0	1,812,747.25	0	1,812,747.25
2033	0	2,089,502.56	0	2,089,502.56
2034	0	2,366,257.87	0	2,366,257.87
2035	0	2,643,013.17	0	2,643,013.17
2036	0	2,919,768.48	0	2,919,768.48
2037	0	3,196,523.78	0	3,196,523.78
2038	0	3,473,279.09	0	3,473,279.09
2039	0	3,750,034.40	0	3,750,034.40
2040	0	4,026,789.70	0	4,026,789.70
2041	0	4,303,545.01	0	4,303,545.01
2042	0	4,580,300.31	0	4,580,300.31
2043	0	4,857,055.62	0	4,857,055.62
2044	0	5,133,810.93	0	5,133,810.93
2045	0	5,410,566.23	0	5,410,566.23
2046	0	5,687,321.54	0	5,687,321.54
2047	0	5,964,076.84	0	5,964,076.84
2048	0	6,240,832.15	0	6,240,832.15
2049	0	6,517,587.46	0	6,517,587.46
2050	0	6,794,342.76	0	6,794,342.76
2051	0	7,071,098.07	0	7,071,098.07
2052	0	7,347,853.37	0	7,347,853.37
2053	0	7,559,182.09	0	7,559,182.09

2054	0	7,770,510.80	0	7,770,510.80
2055	0	7,943,674.00	0	7,943,674.00
2056	0	8,078,671.69	0	8,078,671.69
2057	0	8,175,503.87	0	8,175,503.87
2058	0	8,234,170.54	0	8,234,170.54
2059	0	8,292,837.20	0	8,292,837.20
2060	0	8,351,503.87	0	8,351,503.87
2061	0	8,410,170.54	0	8,410,170.54
2062	0	8,468,837.20	0	8,468,837.20
			TOTAL	**8,468,837.20**

5 MONITORING

5.1 Data and Parameters Available at Validation

The project monitoring plan has been developed according to the Monitoring Procedure included within the approved methodology, AR-ACM0003.

The following data and parameters are determined or available at validation, and remain fixed throughout the project crediting period – i.e., no monitoring of the below parameters exists. All data and parameters monitored during the project lifetime are detailed in Section 5.2 below.

Data / Parameter	AGB_ PORTULACARIA_AFRA
Data unit	tC/ha
Description	Calculation of above ground biomass of *Portulacaria afra*
Source of data	Peer reviewed literature[28]
Value applied	51.6
Justification of choice of data or description of measurement methods and procedures applied	As per the terms of the methodology, existing data can be utilized for ex ante projections.
Purpose of Data	Ex ante estimation of project emissions
Comments	This parameter is only utilized for ex ante estimations of changes in carbon stock.

[28] Van der Vyver, M. L., & Cowling, R. M. 2019. *Aboveground biomass and carbon pool estimates of Portulacaria afra (spekboom)-rich Subtropical Thicket with species-specific allometric models*. Forest Ecology and Management, 448, 11-21

Data / Parameter	BGB_ PORTULACARIA_AFRA
Data unit	tC/ha
Description	Calculation of above ground biomass of *Portulacaria afra*
Source of data	Peer reviewed literature[29]
Value applied	25.4
Justification of choice of data or description of measurement methods and procedures applied	As per the terms of the methodology, existing data can be utilized for ex ante projections.
Purpose of Data	Ex ante estimation of project emissions
Comments	This parameter is only utilized for ex ante estimations of changes in carbon stock.

Data / Parameter	Litter Carbon
Data unit	tCO_2 / ha
Description	This variable represents the tCO_2 / ha contained within the litter carbon pool within the bamboo plantation
Source of data	IPCC Guidelines
Value applied	4% of the total biomass for each strata
Justification of choice of data or description of measurement methods and procedures applied	Default factor according to the relevant tool
Purpose of Data	Calculation of project removals
Comments	NA

[29] Van der Vyver, M. L., & Cowling, R. M. 2019. *Aboveground biomass and carbon pool estimates of Portulacaria afra (spekboom)-rich Subtropical Thicket with species-specific allometric models*. Forest Ecology and Management, 448, 11-21

Data / Parameter	$CF_{Portulacaria\_Afa}$
Data unit	tC(t d.m)-1
Description	The fraction of dry thicket biomass that can be attributed to being carbon.
Source of data	IPCC Guidelines
Value applied	0.5
Justification of choice of data or description of measurement methods and procedures applied	IPCC default factor for the traction of woody biomass that represents carbon.
Purpose of Data	Calculation of project emissions
Comments	None

Data / Parameter	CO_2e
Data unit	Carbon dioxide equivalent
Description	Conversion of Carbon to Carbon Dioxide Equivalent
Source of data	IPCC
Value applied	44/12
Justification of choice of data or description of measurement methods and procedures applied	Standard conversion factor
Purpose of Data	Calculation of project emissions
Comments	None

Data / Parameter	t_{VAL}
Data unit	Dimensionless
Description	Two-sided Student's t-value, at infinite degrees of freedom, for 90% confidence level
Source of data	Tool for the "Calculation of the number of sample plots for measurements within A/R CDM project activities" (Version

	02.1.0)[30]
Value applied	1.645
Justification of choice of data or description of measurement methods and procedures applied	Confidence level of 90%, degree of freedom "infinite"
Purpose of Data	Calculation of project emissions
Comments	None

Data / Parameter	s_i
Data unit	t.d.m
Description	Estimated standard deviation of biomass stock in stratum *i.*
Source of data	Tool for the "Calculation of the number of sample plots for measurements within A/R CDM project activities" (Version 02.1.0)
Value applied	35%
Justification of choice of data or description of measurement methods and procedures applied	For areas where no pre-measurements are conducted, a conservative value of 35% of the mean biomass stock is applied.
Purpose of Data	Calculation of project emissions
Comments	None

Data / Parameter	*E*
Data unit	t.d.m
Description	Acceptable margin of error (i.e., one-half the confidence interval) in estimation of the biomass stock within the project boundary

[30] EB 58 Annex 15. Calculation of the number of sample plots for measurement within A/R CDM project activities (Version 02.1.0) https://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-03-v2.1.0.pdf/history_view

Source of data	Tool for the "Calculation of the number of sample plots for measurements within A/R CDM project activities" (Version 02.1.0)[31]
Value applied	10%
Justification of choice of data or description of measurement methods and procedures applied	A default value of 10% of the mean biomass stock within the project boundary may be used unless a different value is prescribed in the methodology.
Purpose of Data	Calculation of project emissions
Comments	None

5.2 Data and Parameters Monitored

All parameters and variables included within the monitoring plan correspond to those used specifically for assessing the growth, productivity, carbon stock and changes in carbon stock of sympodial (clumping) bamboo species, and take into account the unique growth and development patterns of this group of plants.

Data / Parameter	$Area_t$
Data unit	Hectares
Description	The total area planted with Portulacaria afra, in year t
Source of data	Project records & GIS monitoring
Description of measurement methods and procedures to be applied	The total area successfully planted with Portulacaria afra for each year of planting.
Frequency of monitoring/recording	Annually, one year after each planting season

[31] EB 58 Annex 15. Calculation of the number of sample plots for measurement within A/R CDM project activities (Version 02.1.0) https://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-03-v2.1.0.pdf/history_view

Value applied	Determined ex post
Monitoring equipment	NA
QA/QC procedures to be applied	Described in the QA/QC procedures, Standard Operating Procedure for Monitoring of Restored Area.
Purpose of data	Calculation of project emissions
Calculation method	NA
Comments	None

Data / Parameter	$H_{Portulacaria\ afra}$
Data unit	Cm
Description	The height of the planted *Portulacaria afra* within sample plots undergoing monitoring.
Source of data	Field sampling / monitoring from permanent sample plots.
Description of measurement methods and procedures to be applied	For each sample plot the height of the planted *Portulacaria afra* dominated thicket will be manually measured by trained field workers.
Frequency of monitoring/recording	During monitoring events
Value applied	Determined ex post
Monitoring equipment	Measuring tape
QA/QC procedures to be applied	As per the QA/QC Standard Operating procedures. The field monitoring team should be fully trained in an understanding of clump growth and in field data collection. Field measurements shall be checked by a qualified manager to ensure quality control and reduce technical errors.
Purpose of data	Calculation of project emissions
Calculation method	NA
Comments	None

Data / Parameter	$CD_{Portulacaria\ afra}$
Data unit	Cm
Description	The crown diameter of the planted *Portulacaria afra.*
Source of data	Field sampling / monitoring from permanent sample plots.
Description of measurement methods and procedures to be applied	For each sample plot the crown diameter of the planted Portulacaria afra dominated thicket will be manually measured by trained field workers.
Frequency of monitoring/recording	Each time a verification event occurs
Value applied	Determined ex post
Monitoring equipment	Measuring tape
QA/QC procedures to be applied	As per the QA/QC Standard Operating procedures. The field monitoring team should be fully trained in the methods to take such measurements. Field measurements shall either be taken by, or be checked by a qualified manager in order to ensure quality control and reduce technical errors.
Purpose of data	Calculation of project emissions
Calculation method	NA
Comments	None

Data / Parameter	T
Data unit	Year
Description	The time period in years between estimations of the change in carbon stock of *Portulacaria afra* dominated thicket biomass
Source of data	Monitoring records
Description of measurement methods and procedures to be applied	NA
Frequency of monitoring/recording	Annual
Value applied	NA

Monitoring equipment	NA
QA/QC procedures to be applied	NA
Purpose of data	Calculation of project emissions
Calculation method	$T = t_2 - t_1$
Comments	If calculations in the change in thicket carbon stock are carried out in different months of the year, then a fractional value (number of months / 12) is applied.

Data / Parameter	n
Data unit	Dimensionless
Description	The number of sample plots by stratum required for the estimation of biomass stocks within the project boundary.
Source of data	Calculation
Description of measurement methods and procedures to be applied	NA
Frequency of monitoring/recording	Calculated for each monitoring event.
Value applied	Determined ex post
Monitoring equipment	NA
QA/QC procedures to be applied	NA
Purpose of data	Calculation of project emissions
Calculation method	As described in the tool "Calculation of the number of sample plots for measurements within A/R CDM project activities"
Comments	None

Data / Parameter	i
Data unit	Dimensionless
Description	Ex post strata within the project boundaries

Source of data	Monitoring data
Description of measurement methods and procedures to be applied	Ex post strata are determined based upon the actual achieved project activities and the year of planting.
Frequency of monitoring/recording	Calculated for each monitoring event
Value applied	Determined ex post
Monitoring equipment	NA
QA/QC procedures to be applied	As per the QA/QC Standard Operating procedures. The project records will determine the actual number of Portulacaria afra truncheons of each targeted species, planted each year and the associated area.
Purpose of data	Calculation of project emissions
Calculation method	NA
Comments	None

5.3 Monitoring Plan

In accordance with the applied approved methodology, the monitoring plan shall provide for collection of all relevant data necessary for:

a) Verification that the applicability conditions listed under paragraphs 3 and 4 have been met;

b) Verification of changes in carbon stocks in the pools selected;

c) Verification of project emissions and leakage emissions.

The data collected shall be archived within the project proponent's database for a period of at least two years after the end of the last crediting period of the project activity.

The methodology requires that commonly accepted principles and practices of forest inventory and forest management in the host country are implemented. Given that there are no such commonly accepted practices with regards to bamboo in the host country, the project utilizes standard operating procedures (SOPs) specifically for the collection of data relevant for sympodial bamboo and utilizes quality control/quality assurance (QA/QC) procedures, including field data collection and data management.

a) Verification of Methodology Applicability Conditions

Monitoring of project boundaries: the project activities are occurring on private land with clear boundaries. These boundaries are, for the most part, fenced. As a result, monitoring of project boundaries is not considered to be a necessary part of monitoring activities.

Monitoring of *Portulacaria afra* establishment: given the large number of plantings being undertaken, it is necessary to monitor the actual Portulacaria afra establishment against planned rates. For each area that undergoes revegetation activities the exact size and number of Portulacaria afra truncheons planted is uploaded into the Micro Forest platform. Any deviation from the planned establishment will be documented.

b) Verification of Changes in Carbon Stocks in Selected Pools

The below monitoring parameters are those required for the determination of Portulacaria afra growth and therefore for the determination of changes in thicket carbon stock. These parameters will be gathered from permanent sample plots, established for each ex post strata.

All data and information collected will be stored in project databases, and the Micro Forest platform. This software allows for the gathering of spatial data via its app on cell phones or tablets during the daily operations of the revegetation project. Such data is automatically synced with the project's master database whenever individual devices come into connectivity.

Such spatial data is then used for the development of stratification maps and clear delineation of the number of planted Portulacaria afra truncheons for each Field, as the unit of revegetation.

Portulacaria afra truncheons Mortality

Portulacaria afra truncheons are most susceptible within 4-8 weeks post planting. After this initial establishment period, mortality rates are expected to be extremely low. Mortality monitoring occurs 8-12 weeks after planting for all project areas. Following mortality monitoring, re-stocking occurs.

Ex Post Stratification

If biomass distribution over the project area is not homogeneous, stratification should be carried out to improve the precision of biomass estimation. Different stratifications may be appropriate for the baseline and project scenarios in order to achieve optimal precision of estimation of net GHG removals by sinks. In the context of the project activities:

(a) For baseline net GHG removals by sinks – the project areas represent a homogenous strata as area of remaining intact thicket (for example the 140.9 hectares in the first project instance) are conserved and protected, and the remainder of the project areas undergo planting activities.

(b) For actual net GHG removals by sinks – no ex ante stratification of the project area is necessary. However, the *ex post* estimations is based on the actual implementation of the project planting and management plan. Ex post stratification is dependent upon the year of planting and the project instance.

Table 9 Ex Post Stratification By Year of Planting and Species

Year of Planting	Project Instance 1	Project Instance 2
2023	Strata 1a	-
2024	Strata 1b	Strata 2a
Etc.	Strata 1c	Strata 2 b

The changes in the biomass within the project area during the crediting period of the project will be monitored through the sampling design based on the number and area of each strata. Each strata will consist of the set of blocks in the project area based on the planting date and species of bamboo.

Allometric Equation Development

The project proponents will develop site specific allometric equations prior to the first verification using destructive sampling from intact thickets within the vicinity of the project area. Destructive sampling and associated analysis will be undertaken following the A/R Methodological Tool for "Demonstrating appropriateness of allometric equations for estimation of aboveground tree biomass in A/R CDM project activities (V01). The process for fitting of the most appropriate model will be carried out by a qualified forest statistician. Regression analyses will be utilized to determine the performance of the models considering the precision, error, and graphical analysis of residues

Sampling

Sampling is carried out in accordance with the stratification as defined above. Permanent sample plots will be developed for each project instance, with new permanent sample plots identified for teach new year of planting. The specific sampling design that was applied is stratified random sampling with new PSP locations added as per the methodology defined in the project document. The maximum allowable margin of error for the estimation of the *Portulacaria afra* biomass assessed in the monitoring plan is 10% at 90% confidence level.

Development of Permanent Sample Plots

The location of permanent sample plots will be determined through a random selection process. A grid with the size of plots will be overlaid on the digital map of the planted area, excluding areas of

conserved forest. Using Hawth's extension of the software ArcMap 9.2 randomly selected plots are defined and the co-ordinates of the center point the plot will be registered and marked.

Permanent sample plots will have a size of 10m x 10m, with each sample plot representing 25 planted truncheons. Variables to be measured are detailed in the Parameters to be Monitored section below. Height measurements will be taken at the four corners of the permanent sample plot in order to determine an average height. Canopy cover will be calculated using drone footage of each sample plot.

Calculation of Sample Size

The total number of permanent sampling plots to be monitored will be estimated in line with the tool "Calculation of the number of sample plots for measurements within A/R CDM project activities" (version 02.1.0). Sample plots will be located randomly inside each stratum and measured at least every five years, or at shorter intervals depending on the desire frequency of verification events.

The tool allows for a simplified equation for the estimation of the number of sample plots where the total sampling is less than 5% of the total project.

Application of the Tool

The maximum number of sample plots by stratum is calculated as:

$$N = \frac{A}{AP}$$

The number of sample plots for the project area is thereafter calculated using the following equation, establishing a confidence interval of 95% and a margin of error of 10%.

$$n = \frac{N * t_{VAL}^2 . \left[\sum_{i=1}^{L} Wi.S_{ti} \right]^2}{\left(N.E^2\right) + t_{VAL}^2 * \sum_{i=1}^{L} w_i.(S_{ti})^2}$$

n Number of sample plots required for estimation of biomass stocks within the project boundary; dimensionless

N Total number of possible sample plots within the project boundary being as calculated as above;

t_{VAL} Two-sided Student's t-value, at infinite degrees of freedom, for the required confidence level; calculated as 1.960

W_i Relative weight of the area of stratum i (i.e., the area of the stratum i divided by the

project area); as defined in the assumptions above

S_i Estimated standard deviation of biomass stock in stratum i; t d.m. ha-1

E Acceptable margin of error (i.e., one-half the confidence interval) in estimation of culm diameter, defined as <10%.

The tool defines that for a small sampling fraction (that is, when area sampled is less than 5% of the project area), the following simplified equation can be used for estimating the number of sample plots:

$$n = \left(\frac{t_{VAL}}{E}\right)^2 * \left(\sum_i w_i * s_i\right)^2$$

n = Number of sample plots required for estimation of biomass stocks within the project boundary; dimensionless

t_{VAL} = Two-sided Student's t-value, at infinite degrees of freedom, for the required confidence level; dimensionless

E = Acceptable margin of error (i.e., one half the confidence interval) in estimation of biomass stock within the project boundary; t d.m. (units used for s_i)

w_i = Relative weight of the stratum *i* (i.e., the number of clumps of the stratum *I* divided by the total project planted clumps; t d.m.

s_i = Estimated standard deviation of biomass stock in stratum *i*; dimensionless

i = 1a; 1b; 1c; 2a… biomass stock estimation strata within project boundary

Given that the project has multiple strata, the allocation of the total number of sample plots to different strata is calculated as:

$$n_i = n * \frac{w_i * s_i}{\sum_i w_i * s_i}$$

Where:

n_i	= Number of sample plots allocated to stratum *i*; dimensionless
n	= Number of sample plots required for estimation of biomass stocks within the project boundary; dimensionless
w_i	= Relative weight of the stratum *i* (i.e., the number of clumps of the stratum *I* divided by the total project planted clumps; t d.m.
s_i	= Estimated standard deviation of biomass stock in stratum *i*; dimensionless
i	= 1a; 1b; 1c; 2a… biomass stock estimation strata within the project boundary

The project will utilize a 90% confidence level, as prescribed by the tool, for the determination of biomass stock in A/R projects.

After calculating the sample size, the plots selected within each stratum will be permanent and monitoring shall always will be conducted out on these throughout the project life. New plots will be added for each strata as applicable.

Litter & Deadwood Carbon Pools

The changes in carbon content in the litter and soil attributable to project activities are not measured as part of the monitoring plan, as these are calculated using default factors following IPCC guidelines. This represents a conservative approach.

Soil Organic Carbon Pool

The changes in soil organic carbon content in the litter and soil attributable to project activities are not measured as part of the monitoring plan, as these are calculated using default factors following IPCC guidelines. This represents a conservative approach.

Monitoring Frequency

The monitoring of information critical for achieving the project management plan will be recorded and monitored annually. This includes the actual planted Portulacaria afra truncheons by species each year, and the subsequent determination of clump mortality.

For the estimation of changes in biomass stock in the thicket, monitoring of biomass parameters will occur either every five years, or at each verification event, depending on the frequency of such events.

Quality Assurance / Quality Control

The project provides quality assurance and quality control (QA/AC) measures through the development of standard operating procedures for all aspects of project implementation and monitoring. This includes the necessary training of all field personnel in thicket inventory.

Ensuring that the net GHG emission removals as a direct result of project activities are Monitored, Reported & Verified using best practices and as credibly and precisely as possible. Monitoring is focused on the growth rates and biomass accumulation of the planted *Portulacaria afra* truncheons and their development into a healthy and restored thicket ecosystem, and accurate reporting on such factors.

To ensure that both operational and changes in biomass and associated carbon stocks as a result of the project activities are managed professionally, the project is implementing the Micro Forest forestry software platform, which records information based on forest management units (fields) spatially and temporally.

In all aspects of project development and reporting, a conservative approach will be maintained.

Structure and Responsibility

Three levels of responsibility exist within the project proponent's team for the analysis and reporting of the monitoring event:

Camille Rebelo: EcoPlanet Bamboo Chief Operating Officer and carbon specialist, Camille has 15 years of experience in AFOLU project implementation, monitoring, reporting and verification. Camille is responsible for the development of the monitoring plan, oversight of fieldwork, analysis of all data collected during the monitoring event and the delivery of monitoring reports and documentation.

Terence Newton: EcoPlanet's General Manager in South Africa oversees all aspects of the proposed project, manages the Micro Forest platform and associated database of information. Terence is a qualified forester with more than two decades of experience in reforestation projects, including the management of worker teams, successful acquisition of FSC certification, and associated operational qualifications.

Project Manager: EcoPlanet has a Project Manager in South Africa who speaks Xhosa, and oversees all aspects of team training, monitoring, and data acquisition. The project manager is a trained environmental professional, who originates from within the project region.

Data Collection, Storage and Reporting

In order to guarantee the quality of the information collected during the monitoring event the standard operating procedures described in the monitoring plan ware adhered to. All inventory and field work is carried out in accordance with the requirements established in the IPCC GPG LULUCF guidelines.

Statistical criteria and the principals of forest inventory are utilized as a quality control / quality assurance procedure for inventory operations, including field data collection and data management.

Once the infield sampling portion of each monitoring event is completed the data will be aggregated, collated and sent to EcoPlanet's management team for analysis.

Data collected during the monitoring event has been archived electronically and shall be kept for a minimum of two years. Data is stored online in company Dropbox accounts.

The project database will include all information related to the monitoring of project activities: management unit and / or PSP identification codes and coordinates for each sampling plot, dates when sampling has been made, the person responsible for the sampling and the sampling results.

c) Verification of Project Emissions and Leakage Emissions.

Project Emissions: according to the applied methodology the only increase in GHG emissions within the project boundary that requires being accounted for is the non-CO_2 GHG emissions from burning of woody biomass for site preparation and/or forest management. The monitoring of emissions is required only if the emissions are considered significant; if insignificant, evidence should be provided (e.g., in the relative part of the monitoring plan of each project instances that the assumption for the exclusion made in the ex-ante assessment still hold in the ex post situation.

The project activities do not result in any burning of biomass, whether for land preparation or as part of the forest management. However, under the scenario where wild or uncontrolled fires occur within the project areas, the monitoring and estimation of GHG emissions associated with such an occurrence will be done in accordance with the latest version of the tool "Estimation of non-CO2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity".

Leakage Emissions: under the applicability conditions of the applied methodology, no leakage emissions are expected.

Procedure for Addressing Non Conformities: any non-conformities associated with documentation and reporting are dealt with by EcoPlanet's management team, while non conformities in the field are dealt with by instruction to the General Manager.

APPENDIX