CredibleCarbon

PROJECT IDEA NOTE

Project name:

Grootbos Carbon Project

Project Developer:
Grootbos Foundation
A registered Section 21, non-profit company (#2003/014519/08)

Project proponent:
Econologic (Sole Proprietorship)

Carbon Registry and Standard:
Credible Carbon (Pty) Ltd
Registration number: 2016/027710/07

PIN prepared by:
Peter Atkins: peter@crediblecarbon.com
Anton Cartwright: anton@carbon.org.za
With inputs from Julie Cheatham, Rebecca Dames, Lily Upton, Sean Privett

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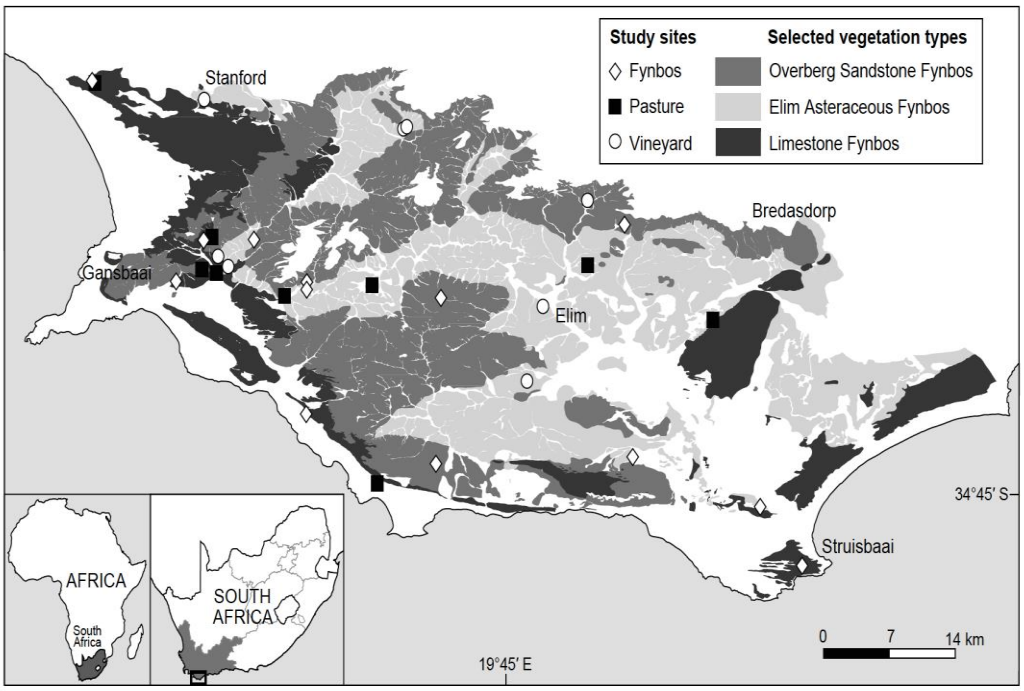
1. Description of Project

The **Grootbos Carbon Project** involves a combination of efforts introduced at the Grootbos Private Nature Reserve to reduce greenhouse gas emissions. These include land-use practices that restore biomass and soil carbon, renewable energy production and solid waste management. The site is situated on the Agulhas Plain, north of De Kelders in the Overberg, South Africa.

The Grootbos Foundation is the project developer and legal owner of any carbon credits generated by the project, as described in the Registration Agreement between Grootbos Foundation and Credible Carbon Pty Ltd.

Figure 1: Location of the Grootbos Carbon Project, Overberg Municipality, South Africa

Figure 2: Reference region showing types of vegetation and farming in the project area



Source: Mills et al., (2012).

The Grootbos Project was started in 1991 with the purchase of the original 121-hectare Grootbos farm. The land had previously been used for livestock grazing, flower production and grain farming. The farming process required regular burning and some ploughing and ripping of the land. Hardwood timber was harvested from indigenous forests for firewood. The purchase of the farm saw the discontinuation of all farming and active measures taken to restore the natural vegetation and sequestrate carbon.

Subsequently Grootbos has grown, with the last property being purchased in 2017. Grootbos now encompasses 2 560 hectares of fynbos and forest ecosystems securing land for conservation from agriculture. The Grootbos Foundation is in the process of facilitating an additional 10 000 hectares of agricultural land to conservation land, in collaboration with the respective land-owners who are creating a statutory Protected Area network of nature reserves and Protected Environment properties, thus creating a formalised conservation footprint of 12 500 hectares in the Walker Bay area.

The **Grootbos Carbon Project** aims to generate carbon credits through the Foundation's conservation, renewable energy generation, waste management (and possibly grey water in the future) interventions. These carbon credits will be sold through the Credible Carbon registry, either on the open market or to guests at Grootbos facilities wishing to offset the emissions resulting from their stay, to generate funds for continued conservation and low-carbon community development in the surrounding area.

Grootbos is committed to the supply of credits that align with internationally approved methodologies. All traded credits should relate to greenhouse gas savings that are measurable, permanent and additional to business as usual, and attributable to deliberate project interventions

on the project site at Grootbos. The manner in which the Grootbos Foundation manages land under its ownership, recycles solid waste and has invested in renewable energy generation is distinctly different to the norm on surrounding agricultural land, and the basis for 'additionality' in this project.

2. Project boundary

Spatial boundaries

The project involves parcels of land comprising 2 560 hectares under the ownership of Grootbos. The project boundary may be expanded in 2021, to include an additional 10 000 hectares of adjacent land managed as the Greater Walker Bay Protected Area network.

Temporal boundaries

Accounting period:

- Start date: 1 January 2018
- End date: The project will run for an initial period of 10 years after which the baseline will be reassessed.

Trading period:

- Starting date (first vintage): January 2021
- End date: December 2030

3. Methodologies:

The **Grootbos Carbon Project** accounts for the saving in greenhouse gases attributed to changed land use cover, the introduction of renewable energy, and solid waste recycling on site as part of a conservation and tourist accommodation enterprise. In time Grootbos hopes to secure carbon credits for grey water recycling, but no suitable methodology exists for this at the time of project commencement (Matos et al. 2014).

The estimates of greenhouse gas savings at the Grootbos Carbon Project, to be verified by a third party auditor, are based on the following methodologies:

1. **VM0006 v 2.2 (VCS) Methodology for Carbon Accounting in Project Activities that Reduce Emissions from Mosaic Deforestation and Degradation.**

The activities generating carbon credits under this methodology involve enhanced woody biomass, leaf litter and soil carbon that results when land is converted from agriculture to conservation (including improved management of indigenous forests). The actual carbon savings can be divided into carbon sinks above ground, in the leaf litter and in the soil. These include:

- The planting and nurturing (through prevention of firewood harvesting) of 7 324 indigenous trees *(Sideroxylon inerme, Celtis africana, Kiggelaria africana, Olea africana* and similar) between 2008 and end of 2020. Most of these trees were planted after the 2006 fire, but 1 066 trees were added in 2020. Each tree has been geo-tagged. These are slow growing, fire-resistant, hardwood trees that are being added to the indigenous forest areas that had become depleted by wood harvesting. It is estimated, when sequestered carbon is levelized over the

tree lifespan, that every 1 000 trees planted accounts for 12 tCO_2 sequestered per year for a period of 20 years. The location of these plantings has been selected to complement existing forests and planting are not evenly distributed. For the sake of comparison with other carbon sinks in this project, the CO_2 sequestrated in these trees can be converted to 29.4 kg of CO_2 per hectare across all 2 560 hectares owned by Grootbos, and 34.1 kg CO_2 per hectare per year after the additional plantings in 2020.

- Grootbos' stewardship programme involves land management to reduce the risk of fire across the full extent of the 2 560 hectares. This involves controlled low intensity burns of the fynbos biome and removal of invasive alien plants that would otherwise provide a heavy fuel load for natural fires and result in more intense burns. The result is not only fewer natural fires but much-reduced intensity of the fires (natural and induced) that do pass through the fynbos biome in the region. The result is an effective carbon sink in the mosaic forests comprised of milkwood, white stinkwood, wild peach and common spike thorn species. This is complemented by a carbon sink made up of soil carbon, leaf litter and grasslands.

  Forest fires elsewhere have been associated with 1% - 9% losses of soil carbon, with the range ascribed to the intensity of the fire (Page-Dumroese et al., 2002). Mills et al., (2012) estimated that fynbos biomes on the Agulhas Plain contain the equivalent of 47 tCO_2e per hectare. If this is accepted as the norm then based on the range for soil carbon, a fire in the Agulhas Plain might remove between 0.5 tCO_2e – 4 tCO_2e of soil carbon per hectare (1% to 9%), depending on its intensity. While low intensity fires can actually fertilise the soil and can increase carbon levels, high intensity fires cause a loss of soil microbes, soil sterilisation and the burning of organic material in the soil and humus layers (González-Pérez et al., 2004).

  Relative to high intensity fires, low intensity burns that are induced by Grootbos' stewardship programme, result in less soil carbon loss, less leaf litter loss and reduced fire penetration of indigenous forests and may increase soil carbon (González-Pérez et al., 2004). Low intensity fires also lead to quicker recovery of above and below ground carbon stocks. The 2006 fire at Grootbos represents an illustrative example. Due to Grootbos' land stewardship, the fire intensity was reduced and did not decimate the milkwood forests. Only 15%-20% of the indigenous forests burnt in that fire and both the forests and the fynbos quickly regenerated, suggesting only small and temporary losses in carbon.

  We assume that the altered fire intensity at Grootbos shifts the carbon losses caused by fire from 4% down to 2% if the difference is averaged over the fire period. Between fires, vegetation and soil carbon replenishes itself but this replenishment takes place more quickly and off a higher base after a low-intensity burn. The difference in burn intensity results in a permanent increase of 0.95 tCO_2 of sequestrated carbon per hectare above and below the surface, and across all of Grootbos' 2 560 hectares. The land management changes have been secured through agreements with farmers and are evident in aerial photographs.

- Grootbos has implemented reduced ploughing when land is converted from agriculture to conservation for the purpose of building climate resilience. This practice has increased the leaf litter and soil humus layer and the extent of woody biomass. This can be verified through

existing aerial photographs. Reduced ploughing activities have been applied to 175.4 hectares of land at Grootbos. However, in this project this carbon is **not counted** due to the risk of double counting the soil carbon that is preserved through the fire regime.

Activity	**Assumption**	**2018 tons CO_2e**	**2019 tons CO_2e**	**2020 tons CO_2e**
Reduced burning	0.95 tCO_2 per year over 2 560 hectares	2 406	2 406	2 406
No-till (not counted due to the risk of double counting)	2 tCO_2 over 175 hectares	350	350	350
Reforestation		74.61 (6 218trees)	74.61 (6 218 trees)	87.41 (7 284 trees)

2. AMS-I.F. v 01 (CDM) Renewable electricity generation for captive use from a mini-grid

Installed photovoltaic array generates displaces 50 000 kWh per year, which is between 3% and 5% of the total electricity used by Grootbos. Intention is to increase photovoltaic capacity over time. It is assumed that each kilowatt hour of electricity is responsible for 928 gCO_2.[1]

Baseline emissions in year y = Net energy displaced by the PV in year y X Grid Emission Factor in year y			
Description	**2018**	**2019**	**2020**
PV generated energy per year (kWh/year)	51 454	53 255	50 989
Grid Emission Factor (kg CO_2e/kWh)	0.93	0.93	0.93
Avoided CO_2 emissions (tCO_2/yr)	47.85	49.53	47.42

3. AMS III.F v. 5 (CDM) Avoidance of methane production from biomass decay through composting.

Relating to the composting of 34.43 tons per year of greenwaste and food waste on site that would have otherwise gone to landfill. This activity has been measured since 2020. Landfilled non-meat food waste generates 0.76 tCO_2 per ton of waste; meat only food waste generates 15.10 tCO_2 per ton of waste; typical "mixed" food waste generates 3.66 tCO_2e per ton of waste.[2] There are, however, no precedents for the use of these emission factors to generate carbon credits in South Africa. For this reason, we apply the more conservative emissions factor of 1.7t CO_2e per ton of green waste composted, that has been verified in the South African context.[3] This may be adjusted should more local evidence become available.

The food/ green waste composting programme been in operation since 2019

[1] https://www.climate-transparency.org/wp-content/uploads/2019/11/B2G_2019_South_Africa.pdf
[2] https://www.epa.gov/sites/production/files/2016-03/documents/warm_v14_organic_materials.pdf
[3] https://www.crediblecarbon.com/wp-content/uploads/2019/12/Reliance-Compost-2018-Verification-Report-Final.pdf

Material	Co-efficient $kgCO_2$/ ton	2018 tons	2019 tons	2020 tons
Greenwaste (tonnes per annum)		Note measured	Not measured	8.96
GHG saving (tCO_2e per annum)	1 700			15.23

4. **AMS-III.AJ (CDM) Recovery and recycling solid waste that would otherwise have ended up in landfill, using DEFRA 2018 conversion factors.**

20 326 kilograms of solid waste (cans, bottles, plastics and cardboards) have been recycled annually at Grootbos, and this waste has been weighed since 2020. DEFRA coefficients are used to estimate the emissions savings that result from diverting this waste from landfill and towards recycling enterprises. Solid waste is weighted but not sorted at Grootbos. As a result a "mixed waste" co-efficient of 0.85 tCO_2e savings per ton of waste has been applied.

Material	Co-efficient $kgCO_2$/ ton	2018 tons	2019 tons	2020 tons
Mixed waste (tonnes per annum)		Not measured	16.32	4.00
(based on DEFRA mixed plastics 850 $kgCO_2$/ tonne)	850 (estimated factor)		13.87	3.40

4. Estimated total CO_2e sequestration and reduction schedule

Units: tonnes CO_2 equivalent

	2018	2019	2020
GHG saving per year			
Land			
Controlled burning	2 406.40	2 406.40	2 406.40
No-till (soil carbon)	Not counted	Not counted	Not counted
Reforestation	74.62	74.62	87.41
Solar PV generation	47.85	49.53	47.42
Solid Waste recycling		13.87	3.4
Green waste composting			15.23
Total tCO_2e savings	**2 528.87**	**2 544.42**	**2 585.46**

5. Poverty alleviation impacts:

The Grootbos Foundation has over 11 000 beneficiaries and supports a number of development initiatives in the local community. These include:

- Future Trees Reforestation Project: Creates employment and carries out on the job training in propagation and care for indigenous species
- Green Futures Education Programme: Runs nationally accredited courses, provides training in alien vegetation clearing and working with indigenous plants, and offers a six month eco-tourism and hospitality training course
- Football Foundation The Football Foundation runs football, netball, hockey and athletics training sessions in Gansbaai, Stanford and Hermanus, which engage approximately 2 000 youths each week. In addition to these sessions, we also run programmes centred on HIV education, female empowerment, environmental education, proper nutrition, enterprise development and integration.
- Siyakhula: Employment and enterprise development programmes, including organic farming, artisanal skills and ecotourism initiatives for sustainable livelihoods.

6. Leakages

Leakages at Grootbos relate to the consumption of conservation vehicle fuel and fuel for tree clearing activities associated with conservation. The well-to-tank greenhouse gas emissions from these fuels uses the SAPVIA estimates for the Western Cape (0.6kg CO_2e per kilogram of petrol and 0.47 kgCO_2e per kilogram of diesel). The emissions associated with leakages are deducted from the sum of carbon credits that Grootbos is able to offer for sale.

Research in the Grootbos region by Mills et al. (2012) suggest that the restoration of Agulhas fynbos restores 84 tCO_2 per hectare in above ground and root carbon, but that some of these gains are offset by a net loss of soil carbon. The same appears true for the restoration of fynbos from pastures. For this reason the shift in actual land use is not recorded in as a methodology in this project. Rather the focus is on land-use management once that change in land-use has been affected.

7. Monitoring plan

Third party audits are to be conducted annually at Grootbos. Estimated carbon savings are based on documented data kept by the Grootbos Foundation. The onus is on the project to provide the documentation that supports the estimates made in this document. This documentation includes:

- Record of invasive alien plant clearing and controlled burns.
- Photovoltaic generation capacity (kWh) on site, and total electricity purchased from the local municipality.
- Total solid waste by mass (kg) that has been diverted from landfill.
- Total organic/ food waste by mass (kg) composted.

- The use of aerial photographs, Google Earth and documented records with land owners to establish the extent of land that would have been tilled, burned and subjected to fuel wood harvesting and the change in vegetation cover. These records are kept by Grootbos or will be collated by Grootbos.
- An inventory of trees planted with geo-referencing of the trees.

Leakages are recorded as the mass of conservation vehicle fuel and chainsaw fuel purchased. The well-to-tank greenhouse gas emissions from these fuels uses the published SAPIA estimates for the Western Cape.

Greenhouse gas coefficients are based on South Africa's annually reported electricity grid co-efficient. Material and activity-based coefficients are sourced from EcoInvent (where these are in the public domain) and from DEFRA for the estimation of greenhouse gas savings from solid waste recycling.

8. References:

Matos et al (2014) Grey water emission reductions see: https://www.researchgate.net/publication/263354614_Wastewater_and_greywater_reuse_on_irrigation_in_centralized_and_decentralized_systems_-Reduced harvesting of indigenous forest _An_integrated_approach_on_water_quality_energy_consumption_and_CO2_emissions

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