



**Verified Carbon
Standard**

MONITORING REPORT

REFORESTATION IN GRASSLAND AREAS OF UCHINDILE, KILOMBERO, TANZANIA & MAPANDA, MUFINDI, TANZANIA



Document Prepared by ForestFinest Consulting GmbH

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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The project is located in the Southern Highlands of Tanzania. Reforestation activities occur in degraded grasslands in two separate areas: Uchindile Forest Project (UFP) and Mapanda Forest Project (MFP).

Green Resources Limited (GRL) has been granted title to a total of 18,379 ha of land split between UFP of 12,121 ha and MFP of 6,258 ha. The land is held on a 99-year lease title that has been issued to the company by the Ministry of Lands and Human Settlements of Tanzania. The project started in 1997 when the company developed a commercially viable reforestation project that combined revenues from carbon and timber. The species that have been planted are various genera of Pine and Eucalyptus (see carbon calculation excel sheet) where *Pinus patula* and *Eucalyptus saligna* make up the dominant species.

In the baseline scenario, the land would remain as degraded grassland, which has over a period of many years been degraded as a result of regular frequent fire regimes forcing the original natural miombo woodland back to the moister gullies and valley bottoms. The grasslands have remained in a steady-state for several decades. Areas where the natural woodland remains are kept as natural woodland with buffer zones between them and the reforestation activity to ensure biodiversity protection. The conservation areas will help preserve natural hydrology and promote the protection of biodiversity and wildlife in the area. The company is seeking no carbon benefits for the protection of these areas.

The exotic species being grown in the plantation areas are on a rotation that creates a permanent carbon sink, which is established with sustainable harvesting. GRL plans on maintaining such sustainable forestry and harvesting activities at the project sites on a long-term basis – beyond the 99-year crediting period. The harvested wood is used to provide high-quality raw materials to local markets for the production of utility poles, furniture and sawn timber. An added benefit of this is that it will reduce deforestation pressure for timber from the native forest as it provides an alternative, sustainable source of timber.

The plantation follows best practice in forest establishment, management techniques, stakeholder consultation and environmental protection; and received FSC certification on the 8th of August 2008. Since then, the FSC certification has been retained through annual FSC auditing process.

The VCS monitoring report covers from 28th December 2013 to 27th October 2020. The total GHG emission reductions generated in this monitoring period is 1,672,266 tCO₂ in 5,624.73 ha. The available VERs are 532,089 tCO₂.

1.2 Sectoral Scope and Project Type

Sectoral scope: 14. Agriculture, Forestry and Other Land Use.

AFOLU Project Category: Afforestation, Reforestation and Revegetation (ARR).

The project is not a grouped project.

1.3 Project Proponent

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1.4 Other Entities Involved in the Project

Community participation

The village governments of Uchindile, Kitete, Mapanda and Chogo are the most important stakeholders within the project. The project land has been given to GRL from these villages. They receive 10% of the carbon revenues generated from the sale of the VCU from the project – the community carbon revenues are used for additional community development projects.

Carbon project developer

Organization name	ForestFinest Consulting GmbH
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1.5 Project Start Date

1st January 1997.

1.6 Project Crediting Period

The project crediting period is 99 years.

Crediting period start date: 1st January 2002.

Crediting period end date: 31st December 2101.

1.7 Project Location

The ARR VCS project activity is located in East Africa, in the United Republic of Tanzania. The discrete project areas of land are found in the country's southern highlands (Figure 1). UFP lies in Kilombero district, Morogoro Region (Figure 3) and MFP is in Mufindi District, Iringa Region (Figure 2). UFP is found at longitude 35°28'13"E and latitude 8°42'11"S, whilst Mapanda Forest Project is found at Longitudes 35039'49"E to 35044'52"E and Latitudes 8024'30"S to 8033'19"S.

The altitude of the areas varies between 1,200 m and 2,000 m above sea level. The site is characterized by relatively flat to gentle landscape with a few ridges and gently rising terrain from river valleys. Some slopes are generally steep with gradients as high as 60% or more.

The mean annual precipitation is about 1,050 mm, most of it falling between December and April/May, but with drizzles (showers) extending to June and sometimes July. The mean temperature is about 16°C with occasional frost, the coldest months being May to July (with mean temperature 12°C) and warmest months are December-January with mean temperatures of 20°C. Winds typically blow from the south-east.

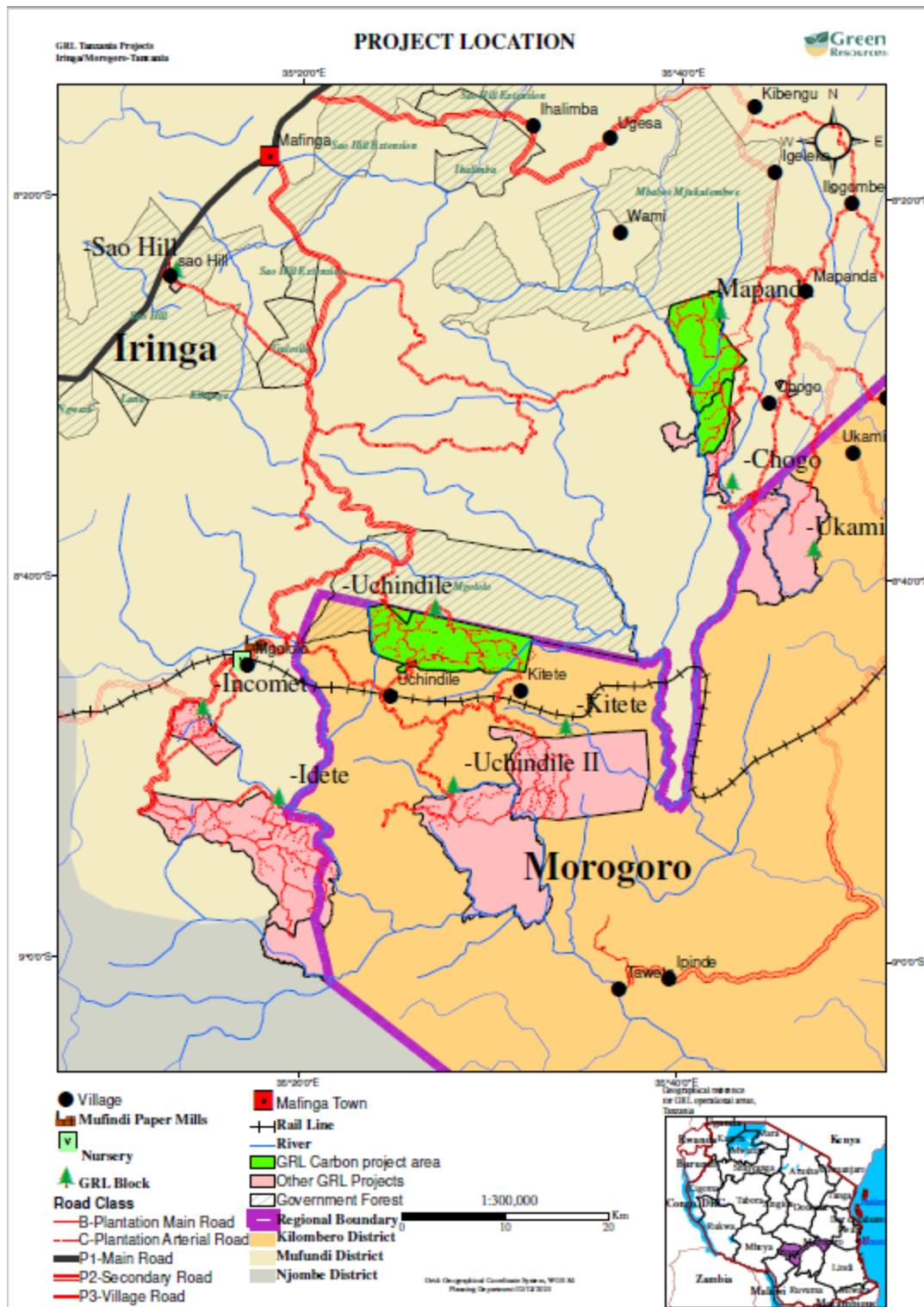


Figure 1. VCS ARR project location

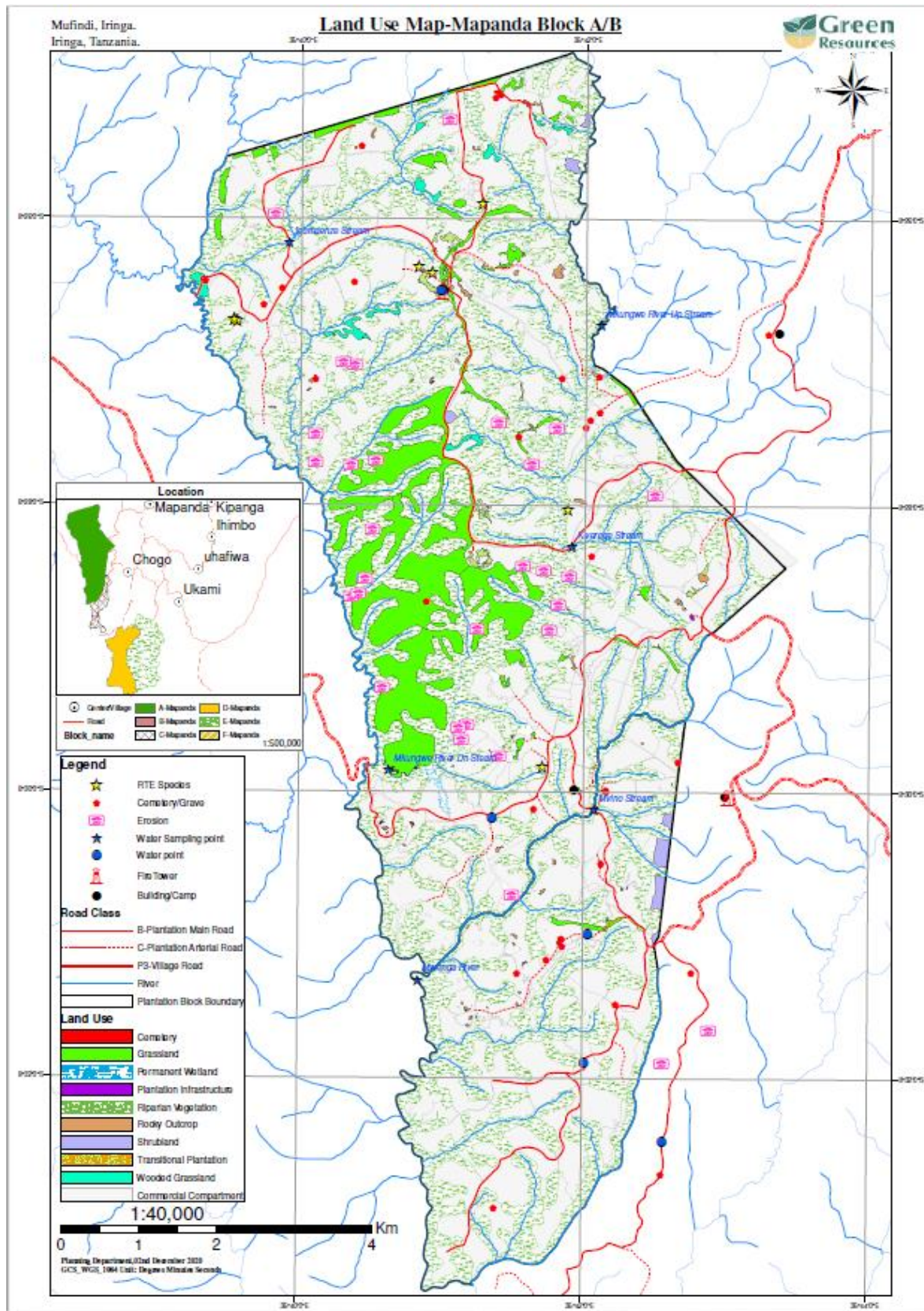


Figure 2. Mapanda landuse map.

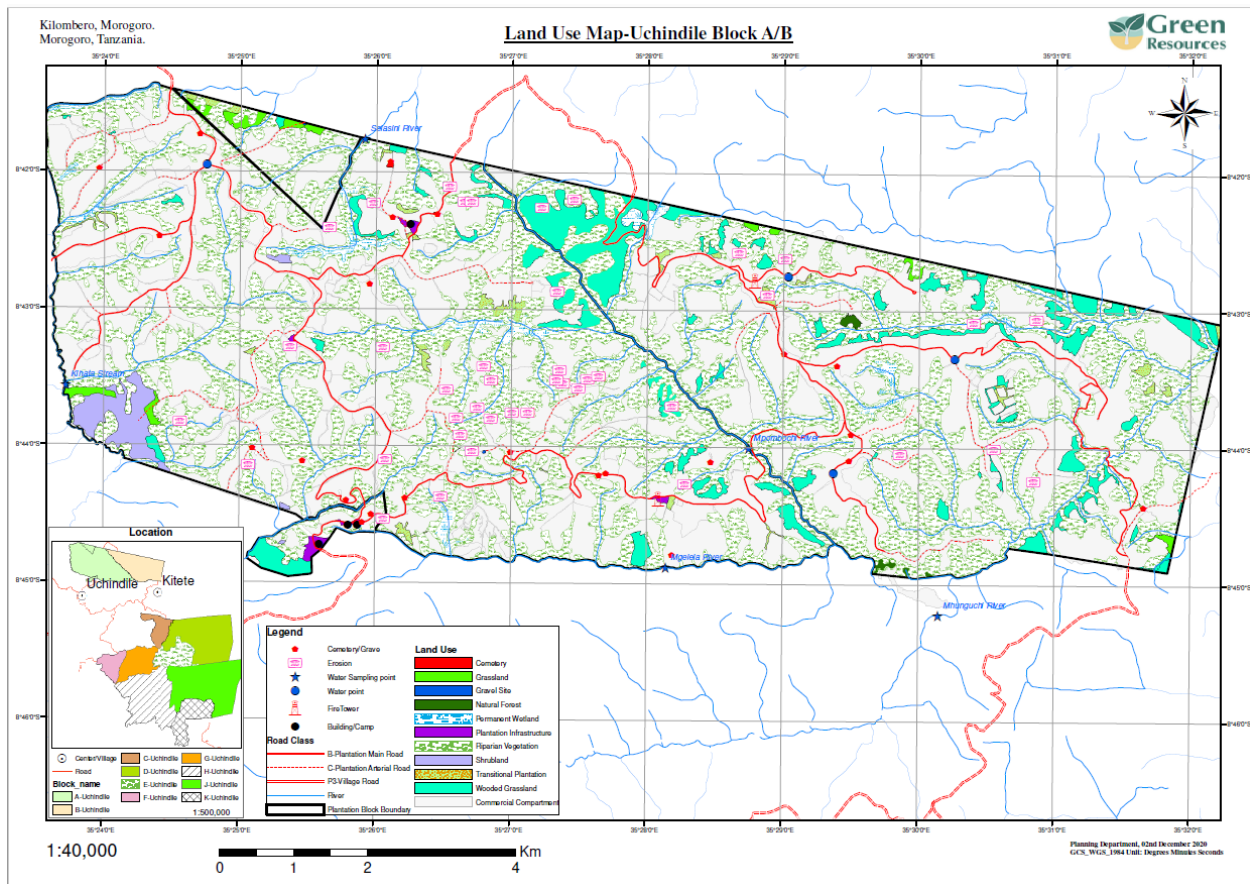


Figure 3. Uchindile landuse map.

1.8 Title and Reference of Methodology

The selected approved baseline and monitoring methodology is the CDM's AR-AM0005: "Afforestation and Reforestation project activities implemented for industrial and/or commercial use" - Version 04.

1.9 Participation under other GHG Programs

Not applicable. The project does not participate in any other GHG program.

1.10 Other Forms of Credit

Not applicable. The project does not participate in any other forms of credit.

1.11 Sustainable Development

Tanzania's climate change mitigation measures include enhancing carbon sinks through forest conservation, afforestation and reforestation under sustainable forest management¹.

Before GRL started its operations and implementing the proposed interventions there were number of challenges identified by the company. These challenges are: i) poor infrastructure around the areas (road and bridges), ii) poor public services (e.g., Health, Education, Water), iii) lack of tree planting knowledge, iv) lack of community awareness in community developments in general and lastly v) lack of knowledge in conservation management. Due to the identified challenges GRL planned to implement the following interventions to villages based on priority of the particular village in its development plans. These interventions are: i) improve infrastructure (road grading and bridge constructions), ii) improve education by providing schools desk and construction of classrooms, toilets and teachers' houses, iii) improve community health by constructing dispensaries and maternity wards and nurses' or doctors' houses, iv) improve water availability, v) construction of village offices, vi) provision of solar panel and vii) provision of seedlings (Socio-Economic Assessment Report, 2018).

Activities in the Management Plan are aligned with company objectives to comply with the National policies, laws and plans in areas of socio-economic development, conservation of the environment, the supply of wood products and revenue earnings to the country. These activities also help meet the strategic objective of the Tanzania forest policy of promoting private-sector involvement in forest management for increased the sector contribution to the national economy. Further, it is also in line with the following global Sustainable Development Goals (SDG):



SDG1 - No Poverty: the project activities contribute to reducing poverty by creating local jobs. Local people around the forest are hired for all activities related to the forest plantation. All employees and contractors are paid a fair wage and other benefits, which meet or exceed all legal requirements for the forestry industry.

Between the 11th and 20th of June 2019, a total of 345 women from community groups around GRL operations were trained on making soap, detergent and Batiki clothes to contribute to their household income. The training was organized and paid for by GRL and was conducted by the Mwalimu Group. GRL interventions have transformed livelihood conditions in all the villages through improvement of cash circulation and thriving small scale businesses. Improved cash circulation has led to a major growth in entrepreneurship groups which provide loan supports with interests to its members through their contributions. Due to improved income within the villages, small scale businesses have employed more people within villages who are engaging in kiosks, restaurants,

¹ Intended Nationally Determined Contributions (INDs) Tanzania. Available at <https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/The%20United%20Republic%20of%20Tanzania%20First%20NDC/The%20United%20Republic%20of%20Tanzania%20First%20NDC.pdf>

shops, milling machines and provision of transport services using motor cycles. Provision of tree seedlings to villagers which go together with training on tree planting and firefighting techniques has increased the involvement of local people in tree plantation, which improves their income.



SDG2 – Zero Hunger: Through creating jobs opportunities for the local population, project beneficiaries have an alternative (or the only) source of income for securing food provision. Most community members were able to pay for the children's school contributions for food and other expenses. Additionally, to alleviate hunger, GRL provides food allowance to all its employees and the service providers also provide food to their employees.



Tanzania 2020

**Construction of
teacher house**
at Kitete village

**Renovation of
teacher house**
using carbon fund at
Chogo village

**Clean
water project**
at Kitete village

Provision of
**60,000 improved
seedlings**
to the communities

SDG3 – Good health and well-being: GRL has installed solar panels for lighting the health center building and a renewable energy system at primary school and village office. It has built a maternity ward and a doctor's house through the carbon funds to improve health services. Further, all workers have medical aid from the company and can visit the clinics. GRL has provided 50 desks which were distributed equally to two primary schools (Mapanda).

GRL invited the Director General of Tanzania Commission for AIDS (TACAIDS) and his team to provide training to the appointed GRL's HIV/AIDS focal point, and to connect the company with the TACAIDS electronic database system of which GRL will be sending data on HIV/AIDS patients. This will facilitate support to the victims in terms of counseling and provision of ARV drugs. In addition, the management met with the HIV/AIDS coordinator for Mufindi District to arrange for awareness training and the provision of condoms during the company's new financial year, 2020/2021 (Sustainable Report, 2020).

SDG4 – Quality education: project activities involve capacity training, enhancing

employee development in areas of skills and competence for the different functions. GRL has constructed classrooms, teachers' houses, and provided desks for students enrolling in primary and secondary school. GRL has also established partnership with local universities. In Uchindile, GRL constructed two toilet blocks and 4 classrooms in the primary school. GRL has also conducted firefighting trainings in 2013, 2015 and 2016 to ten village members. Provision of



firefighting trainings was done hand in hand with provision of equipment which are 5 fire beater, 5 overalls, 5 pairs of boots and five helmets. GRL also conducted training on entrepreneurship to four people in 2017. GRL has also provided awareness training and has implemented the protection of rare, threatened and endangered species. Trainings in 2019 and until June 2020 is shown below.

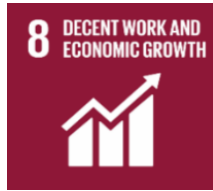
Training/Awareness Programs 2020 Jan-Jun	Trainees		
	Total	Female	Male
TANZANIA			
Preventative and Pandemic Training and Awareness	201	39	162
Health and Safety Training and Awareness	186	36	150
IMS Training and Awareness	9	1	8
Technical Skills	0	0	0
Business Skills	11	1	10
Environmental Management Training	184	38	146
Total number of staff trained	591	115	476

Training/Awareness Programs held in 2019	Trainees		
	Total	Female	Male
TANZANIA			
Business Skills	56	14	42
Environmental Training	205	155	49
Health and Safety Training	95	3	92
Health Training	33	8	25
Technical Skills	0	0	0
Other Skills and Knowledge	24	24	0
Total number of staff trained	413	204	208



SDG5 – Gender equality: GRL promotes equal and non-discrimination employment opportunities irrespective of gender, sexuality, race or religion. GRL or nor any of its subcontractor are discriminating any of its workers with regard to race, color, gender, language, political or other opinion, caste, national or social origin, property, birth, union affiliation, sexual orientation, health status, age, disability, or other distinguishing characteristics (FSC, 2020). FSC external annual certification interviews with staff and workers and field observations revealed that opportunities from GRL are given on merit without any gender discrimination². The percentage of women employed by GRL is 21% for permanent employees and 19% for contractors by 2020. The number of women contracted varies according to the silvicultural management plan and the type of work performed in the plantation. During planting season, when planting and nursery activities takes place, there is a growing number of women hired, where the percentage can be doubled. The number of contractor employees depends on the planned activity and the planting season. The company promotes fair opportunities to its employees with a focus on female participation. All employees are given a chance to participate fairly in all programs including training and development opportunities, women's participation is encouraged and prioritized. On the 8th March 2020, in celebration of International Women's Day, a group of women from GRL and SHI (Sao Hill Industries) visited Makalala-Mchanganyiko Primary School located about 15kms from Mafinga town, to donate various items to disabled children and at the same time raise awareness on the role of women in society.

² FSC annual report. Available at <http://fsc.force.com/servlet/servlet.FileDownload?file=00P4y000017rGD6EAM>



SDG8- Decent work and economic growth: project activities enable decent work for women and men and follow ILO principles. 80% of workers are employed from the communities in which GRL operates. All employees at Green Resources are paid in excess of the National Minimum Wages of the country. Workers on the Forest Management Units (FMU) earn about TZ Shs 6,100/day (US\$ 2.65) for casual workers. Government scale for plantation workers is 100,000 TZS/month (FSC report 2019). More than US\$ 4m paid in salaries and compensation. Approximately US\$ 5m paid taxes, duties, fees, royalties and levies to national and regional governments where GRAS is located.



SDG 12 – Responsible consumption and production: the company meets the strategic objective of the Tanzania forest policy of promoting private-sector involvement in sustainable forest management to increase the sector contribution to the national economy. The prime objective of the industrial operations is to add value to the forest. Green Resources' main industrial operations, Sao Hill Industries (SHI), operates two sawmills, a pole treatment plant and joinery facilities. The company's products include sawn timber, pallets, electricity poles, charcoal, and other wood products. The company reaches out to local communities to establish farm forest schemes, maintaining a focus on sustainable environmental and social development, and trying to adhere to high standards of corporate social responsibility. Lastly, GRL conduct annually its carbon emissions and footprint monitoring and has committed to reduce its GHG emissions from direct and indirect sources.



SDG 13 – Climate action: The project activities reduce GHG emissions during the project lifetime. GRL is growing trees to generate carbon offsets and raw material for manufacturing of solid wood products. The long-term average for the project is 819,735 tCO₂. A minimum of 10% of the revenues generated from GRL's Carbon Offset sales goes to community development projects as acknowledge by communities (see supporting documentation).



SDG 15 – Life on land: The project activities focus on restoring land degradation, promoting reforestation, and protecting the natural forest. GRL's goal is to conserve and expand natural forest and other valuable vegetation within its areas of operation. The organization only plants on grassland or land that has not been in use and was considered as "Mbuga" by villagers. For continuous protection of biodiversity within GRL's operational areas, a total of 6,560 ha of conservation areas (natural forests, wetlands, grasslands, riverine etc.) were remapped and classified according to Biodiversity studies in 2019. For continuous environmental monitoring, GRL conducted training on monitoring invasive species in the conservation areas as well as maintenance of Areas of special interest (ASIs) such as grave yards and cultural sites. The control of invasive species was conducted on a total of 250 ha of conservation areas and 72 man-days were used for the maintenance of ASIs.

Therefore, the project development contribute towards meeting the SDG 2030 targets. Skilled personnel will transfer knowledge and skills to local workers through formal training, on-the-job learning, and apprenticeships. The company will also include gender considerations to ensure that there is a representation of both men and women in forest management. Competitive salaries will be paid to workers, including other social benefits and professional training. Overall, GRL operations have significantly improved social economic conditions of villages (Figure 4); specifically, in the areas of education, health, income, governance, environment and training (Socio-Economic Assessment Report, 2018).

Lastly, the monitoring of activities is done every year by GRL following the Global Reporting Initiative (GRI) and the Environmental, Social and corporate Governance (ESG) guidelines. The disclosure of the results on socio-economic activities, communities, stakeholder engagement, environmental management, and Forest Management Plan are publicly available in GRL website³. Furthermore, every year as well GRL is audited by an independent third-party to assess the operation of GRL against the requirements of the Forest Stewardship Council (FSC) certification including criteria such as forest management systems, socio-economic and environmental assessment, administration practices, field assessment and stakeholder interviews. The yearly report is also available online at FSC website⁴.

³ GRL Sustainability report. Available at <http://greenresources.no/media/reports/>

⁴ FSC GRL report. Available at <http://fsc.force.com/servlet/servlet.FileDownload?file=00P4y000017rGD6EAM>

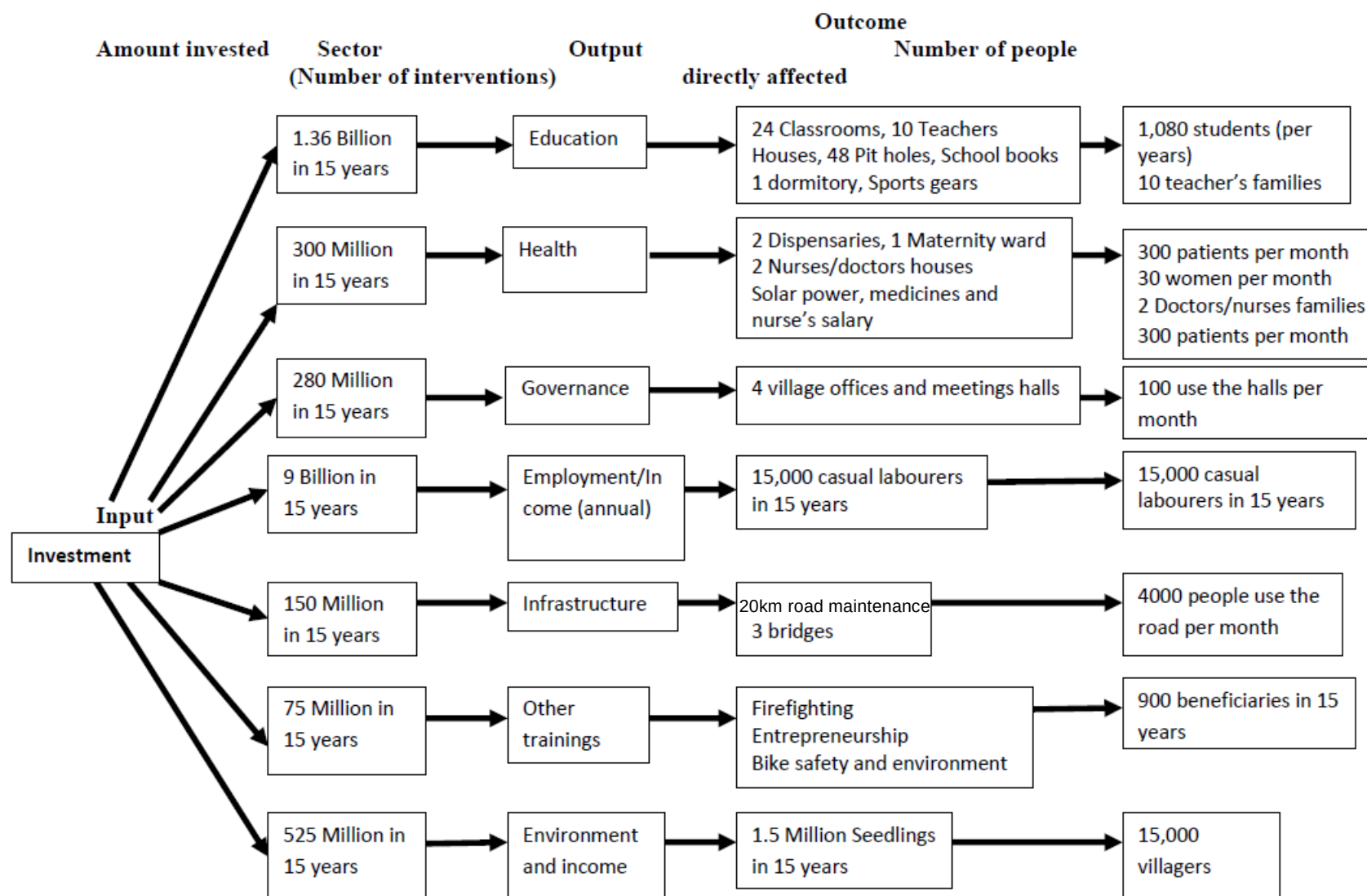


Figure 4. Overall GRL investment in Tanzania for the past 15 years (2002 - 2018).

Most relevant impacts for monitoring period

Construction of school blocks and offices, community halls and offices, seedling distribution to communities, women entrepreneurship training, timber and financial donations, among others done. Indirect jobs created including 81 contractor's employees, 8 transport employees, 23 security guards, 4 suppliers with 18 contractor's employees, 1 supplier being women. 30 smallholder tree grower farmers supported.



Maternity Ward in Uchindile Village



Teachers office in Uchindile



Women Entrepreneurship Training - Batiki Making



Mapanda nursery



Timber Donations for Schools Infrastructure building/construction



Construction Community members training on silviculture practices



Safe Drinking Water Provision

2 SAFEGUARDS

2.1 No Net Harm

GRL, a private company registered in Tanzania, is a subsidiary of Green Resources AS of Norway. As such, GRL comply with all national and international laws, international best practices, national legislation, guidelines and standards. The company is not involved in any form of discrimination or sexual harassment. The organization and project activities are audited yearly by FSC, which is a control measure of the organization. Further, FSC yearly report and GRL yearly sustainability report public available provide a full disclosure of the project⁵.

Risks to local stakeholders

Table 1 and Table 2 summarized potential negative environmental and socio-economic impacts to local stakeholders during the project lifetime and outline measures taken by GRL to mitigate these risks⁶.

Table 1. Environmental Mitigation measures for Mapanda and Uchindile Plantations.

Impact	Mitigation Measures
Depletion of soil nutrient: Forest cover depletes more nutrients from the soil than grass cover. The nutrients are lost through timber harvesting although there is	After harvesting, all organic residues are left in the harvested compartments and allowed to decompose thereby adding nutrients to the soil (soil test results available for auditor).

⁵ VCS Standard 3.16.14

⁶ VCS Standard 3.16.12 and 3.16.16 (2)

Impact	Mitigation Measures
also some nutrient recycling through falling litter and other waste. The depletion of nutrients is a threat to survival of other vegetation in the plantation areas. The soil will have insufficient nitrates, phosphates and boron which are key nutrients required by plants. The insufficiency of these nutrients will be more pronounced after the first harvest.	The company conducts soil nutrient analysis on harvested areas before reestablishment to monitor nutrient development. The report from the analysis provides soil nutrient level and recommendations on fertilizer application.
Alteration of biological processes due to change of land use. Restricted growth of other types of vegetation particularly shrubs and grasses. Loss of indigenous species used by local people as sources of medicinal plants, firewood, poles, fruits, water conserving species and rare species. Destruction of the natural habitat of the potential wildlife. Decomposition rate of organic residues might decrease because the litter produced by the planted trees will not favor the growth of a diverse number of micro-organisms. As a result, there will be a low rate of organic matter decomposition Grasses and leaves of shrubs decompose much faster than the litter from pines and eucalyptus, hence the rate of nutrient cycling will be reduced. Decrease in diversity of soil biota will reduce the production of organic materials, which play a big role in stabilization of soil aggregates, hence soil structure will be affected.	- GRL has set aside areas for conservation purposes and promote growth and maintain the existence of the natural vegetation. These include: natural forests (Miombo), grasslands, wetlands, riverine etc. - To enhance the protection of the above areas, the following measures have been implemented: - Creating buffer zones (minimum 30m) around and along the sites. - Removal of alien/invasive species from conservation areas. - GRL has conducted 23 site specific EIA in the current monitoring period regarding harvesting activities. Supporting document available to auditor.
Decrease of water levels: Exotic tree species have deep roots which take much water from the soils and may decrease water tables in the areas adjacent to the plantation with the consequences of gradually lowering and/or drying of river	- The riverine and wetland areas are left intact and protected with a buffer zone of 30m to 60m. - The company also conducts conservation slashing whereby all exotic species are

Impact	Mitigation Measures
tributaries, downstream wetlands and swamps thus affecting the entire ecosystem of the surrounding areas.	uprooted/removed from riverine and wetlands.
Riverine and valley vegetation: Implementation of the project will bring a burden in the ecosystem, threatening the survival of rare species known for conserving water, sources of fire-wood, fruits, poles and sanctuary for wildlife.	The riverine and valley vegetation are left intact to offer refuge to wildlife, to improve biodiversity and protect the areas from erosion. The vegetation will also protect the rivers and streams.
Spread of tree diseases: The project aims at large scale planting of <i>Eucalyptus Saligna</i> and other species including indigenous species on the flat areas and <i>Pinus patula</i> on the sloping gradients. Establishment of exotic species have of recent witness attack by exotic pests free from natural enemies in East Africa which have caused serious outbreak of diseases.	- The company has collaborated with Government institutions such as the Tanzania Forest Research Institute (TAFORI) and Forest Development Trust (FDT) in monitoring the outbreak of pests and diseases in the plantations. - The company has also engaged Forestry and Agricultural Biotechnology Institute (FABI) from South Africa on conducting a workshop on pests and diseases.
Spread of fungal flora: The decaying fallen leaves of <i>Pinus patula</i> may cause growth of deadly poisonous fungi <i>amanita muscaria</i> which local people confuse for edible mushroom species.	The company creates awareness through regular community meetings.
Climate Change: The forest cover will contribute to reduction of greenhouses emissions through storage of carbon in trees thus leading to stabilization of climate changes.	The company is planting high quality stock generated from genetically superior quality adopted to the prevailing site conditions and broadened within and between species so as to ensure sustainability of the plantations against pests, diseases and climatic fluctuations.
Air pollution due to outbreak of fire: Most of the areas are vulnerable to fire, caused by hunters, honey collectors and farming methods. Outbreak of fires will pollute air by smoke and suspended particulate matter causing health hazard to workers and surrounding community. The fires will destroy habitation of fauna of the area and will result	GRL has put in place a fire management plan. The company ensures that fire lines/belts are prepared timely, firefighting resources are in place and fire crews are trained on handling forest fires.

Impact	Mitigation Measures
loss of biodiversity besides economic loss to the project. The endangered wildlife species of swallows (birds) faces extinction and required protection measures.	
Spray of Chemicals/pesticides: Spray of chemicals (pesticides) during nursery and planting operations is a health hazard to workers and public. The chemical spray will destroy other important insects of the area such as bees, butterflies and other living organisms valuable to the ecosystem. Despite spillage will contaminate soil and surface water.	• The company provides suitable PPEs (Personal Protective Equipment) to all employees working with chemicals. • The company only uses the FSC recommended chemicals in all its operations. • Water quality monitoring is conducted annually to assess the adverse impacts of forest operations including the use chemicals on the environment. • The company also establishes compartments 60m away from water sources to minimize the adverse effects of chemicals.
Water pollution: Part of fertilizers used from nursery and tending operations can be washed by rain water to water receiving bodies causing increments of phosphates, nitrates and sulphates to unwarranted levels for human beings and marine life.	• The company only uses FSC recommended chemicals. • Water quality monitoring is conducted annually to assess the impact of forest operations on water resources. • The company also establishes compartments 60m away from water sources to minimize the adverse effects of fertilizers.

Research and Development

The success of the forest plantation projects depends mainly on the knowledge of species, their growth rates, performance, and management techniques to maximize future returns. Therefore, Research and Development (R&D) Programs are being developed and implemented in collaboration with the relevant organizations and research institutions. The research will focus on tree improvement, species-site matching, fertilization, chemical usage and soil content. The results of the R&D program will be served to increase the use of good forestry practices, information dissemination and the promotion of activities geared to the mitigation of greenhouse gases.

Table 2 summarizes identified risks for local stakeholders. However, the project is design to avoid trade-off, therefore, it has implemented mitigation measures for every potential risk identified⁷.

Table 2. Social-Economic Mitigation measures for Mapanda and Uchindile Plantations.

Affected Area	Mitigation Measures
Cultural sites: One site at Chogo range and three graveyards at Mapanda ranges	All cultural and graveyards have been identified, mapped and marked in the field and are protected from all forest operations.
Change of Land Use: The change of land use from grassland to forest cover may deny local community access to pastoral areas and land for agricultural activities.	- The area received from the villages remained idle and together does not constitute more than 30% of the total landholdings of the village. - The commissioner of Lands oversees that the villages are left with enough alternative land for now and future development so as not to run short. - The company provides employment opportunities to the local communities as alternative source of income.
Increase in traffic accidents: Increase of haulage trucks and personnel cars connecting the TANZAM Highway and project areas through the village roads of Mapanda, and Uchindile will cause accidents to the rural community involving people, animals and loss in properties.	- GRL improves the road network in the plantation as well outside the project areas. Road signs have been installed throughout the plantations, and only licensed drivers are allowed drive/operate company vehicles. - All employees who drive/operate company vehicles have undergone defensive driving course facilitated by the company. - The company also uses the car tracking system to monitor company vehicle movement and the behavior of the drivers.
Cultural sites: There are identified graves and grave yard in some few places within the project boundaries. Non removal of the graves and protection of	The graves and sites for ritual ceremonies have been mapped and integrated in the management planning. Appropriate measures have been put in place to protect the sites, the customs of the local

⁷ VCS Standard 3.16.13

Affected Area	Mitigation Measures
the graveyards in accordance to customary norms will antagonize the local community with the project implementers. Some areas in Chogo are used for ritual ceremonies by local people and graveyards.	communities, the graves and the environment of the sites and graves.
Public health: The villagers surrounding the project area lack health facilities and have no accessibility to clean waters. Implementation of the project will bring in additional people and overburden the existing health facilities and utilities.	The company improved the local health facilities by constructing accommodation for health staff, dispensaries and providing clean and safe drinking water.
The influx of immigrant workers: The influx of immigrant workers, vendors and service providers with higher income will increase communicable diseases e.g., Cholera, typhoid, TB HIV/AIDS and STDs.	- GRL provides accommodation to non-resident workers in the plantation away from the villages. - The company also provides awareness trainings to the workers regarding communicable diseases such as HIV/AIDS, cholera and typhoid.
Unattended Forest Cover: The unattended may be hideout for criminal and endanger the public.	The company will retain key personnel to attend and patrol the forests until the areas have been harvested.
Unattended buildings, equipment and Infrastructure: Unattended buildings can be hideout for criminal and vermin.	- In the unlikely case of decommissioning, the buildings can be retained for community use or availed to private developers. - The machinery and equipment will be deposited off in an agreeable manner such as public auction and the unusable equipment to be sold.
Mushrooming of economic activities. Service providers and vendors during planting and harvesting operations may result in unplanned human settlements and illegal traders disrupting local community norms and polluting the surrounding environment.	- GRL provides accommodation to contractors during the planting and harvesting activities. - Contractors and customers are also allowed to temporarily pitch tents within the plantation boundaries; however, this is done under strict company supervision.

Changes on Monitoring

Table 3 shows the changes on monitoring regarding the identified social impacts from the Project Design Document to the current monitoring period.

Table 3. Clarification on not applicable social impacts.

Affected Area	Clarification
Resettlement compensation GRL has followed legal procedures in acquiring the areas for tree plantation from the villages.	This is no longer applicable because during the monitoring period, no new areas were acquired for expansion. Additionally, there are no future plans to expand to new areas outside the current acquired land. Further, villagers were never resettled/moved from their territories. GRL compensation was in relation to the planting activity. For example, if there was an area used for other activities that are not forestry, GRL compensated the valuation of the area according to Tanzania law and regulations. The compensation areas occurred in areas outside of the carbon project scope. Lastly, FSC yearly report also verifies that there is no evidence of unresolved disputes relating to tenure and land use rights⁸.
Conflict over shared resources. The nursery activities especially at Mapanda are carried close to water sources used by pastoralists as the water is believed to be rich in minerals required by animals. The nursery activities have blocked the accessibility of the water sources by pastoralists. Domestic water in the area surrounding the plantations is scarce, obtainable in temporary ponds and streams. Community enlargement due to manpower requirement by the project will overburden the water sources.	GRL has removed the nursery that was in Mapanda plantation. A semi-mechanized and centralized nursery has been constructed outside the forest plantations (photos and GPS location available to auditor).

⁸ Available report in FSC website: <http://fsc.force.com/servlet/servlet.FileDownload?file=00P4y000017rGD6EAM>

2.2 Local Stakeholder Consultation⁹

GRL is aware that the success of its plantations is largely dependent on the relation with stakeholders particularly the local communities living in and around its plantation areas. As part of its efforts to maintain our social license to operate, GRL continue the efforts of regular engagement with all stakeholders including neighboring communities with a focus on community development and continuing to implement corporate social investment programs. For an overview of positive impact of the project activities in the stakeholders, please refer to Section 1.11 and Figure 4.

The management team involved in local stakeholders has vast experience with community engagement. First, GRL has an ESG Manager (please see Figure 10) who is in charge of the community relations. The land management and project activities are overseen by the General Manager and the Planning and Land division. The carbon expertise is complemented by ForestFinest Consulting, who are expert in carbon project develop¹⁰.

Step 1: Stakeholder identification, management and background

- Identify any areas of concern and/or interest for the various stakeholder group.
- Focus on the areas of concern, or possible benefit, and identify possible ways to engage with the key issues for mutual benefit between the stakeholder group and the company.
- Understand the views, needs, perceptions and expectations associated with identified areas of concern/interest in relation to both the local and the global environment.

GRL' internal stakeholders include shareholders, management and employees while its external stakeholders include governments and authorities, communities, customers, suppliers, media, NGOs and lobby groups. Identification of stakeholders is achieved through a process of assessing (mapping) how they directly or indirectly impact the company or how the company impacts them. To identify its material issues, GRL uses a wide range of criteria and processes.

Furthermore, GRL has a Stakeholder and Community Relations Policy dated May 2019 where is committed to maintaining good working communication with the neighboring communities through meetings and consultations. GRL holds regular formal and informal meetings with different stakeholders. Regular meetings are set to discuss and promote awareness on the project implementation and other potential positive and negative effects, ensuring that community members are happy with the plantation's existence.

GRL has created its mechanism for consultation and information dissemination to local communities and other stakeholders. There is no new stakeholders for the current monitoring period.

⁹ VCS Standard 3.16.11

¹⁰ VCS Standard 3.16.15

Step 2: Procedure used for engaging local stakeholder

Local stakeholder consultation takes place every year since Green Resources forest plantation is certified with the Forest Stewardship Council (FSC) label that verified sustainable forest management while conserving biological diversity and benefits the lives of local people and workers. An external third-party is a control measure of the stakeholder relations. The list of stakeholders include:

- environmental interest groups,
- local government agencies and forestry authorities,
- forest user groups,
- and workers' unions (see FSC certification report for comments and responses).

Step 3: Local meetings and consultation

Local meetings and consultations follow the steps below:

- Invitations for meetings are done through letters or phone calls and this is communicated at least a week before the meeting, providing sufficient time to stakeholders to prepare for the meeting.
- GRL has yearly planned meetings, but also performed ad hoc meetings (when necessary) as mentioned in Sustainability Report (2020).
- The participation of stakeholder depends on the meeting agenda. Some meetings are with the complete community, but most meetings are held with the village counsel leaders/members which is comprised of 25 members elected by the community to be their representatives.
- Meetings usually take place in the Village Meeting Halls giving facilities to the local stakeholders to assist.
- The meetings are chaired by the meeting organizer and an agenda is prepared before the meeting.
- The Village Executive Officer takes the minutes for the villages and the Community Development Officer takes the minutes for GRL. The Village Executive Officer shares the minutes with the stakeholders.

Outcomes: A brief reporting on the meeting is created and shared between the participating stakeholders. The meetings report include: Location, date and time, N° attendees, agenda, key points raised, and agreed action to be taken and timeline (see Supporting documents).

The summary of the management plan is publicly available and has been distributed to the District village officials.

Step 4: On-going communication

Apart from community meetings, the community may raise their concerns through writing letters to the management or uses suggestion boxes that are available in the village offices and in the plantations (available photos to auditor). During the monitoring period, GRL held 30 community meetings.

Year	Number of Meetings
2015	2
2016	2
2017	7
2018	7
2019	3
2020	9
Total	30

Current monitoring report communication and consultation¹¹

Information letters on the 4th verification were sent to the District Commissioner, District Council, and District Executive Director from Mufindi and Kilombero districts on March 12th, 2020. The letters informed about the project design and implementation, the start of the verification as well as the company conducting the external auditing process (Supporting documentation). Further, GRL informed continuously to the communities Mapanda, Uchindile and Kitete on the costs and benefits of the project, relevant laws and workers right, and the distribution of carbon revenues where 10% is available for community development (communication letter in Swahili available to auditor).

During the monitoring report there was no changes in relevant laws and regulations covering workers' right in Tanzania. Moreover, GRL is committed to comply with both international best practices, national legislation, guidelines and standards including International Labor Organization (ILO)'s declaration on Fundamental Principles and Rights at Work. There was also no relevant changes in risks and costs that the project may bring to local stakeholders. Potential social impacts have mitigation measures as reported in section 2.1.

GRAS E&S Activities Expenditure 2019	Expenditure (US\$)		
US X 1.000	Mozambique	Tanzania	Uganda
Certifications and Inspections - FSC, Statutory and Others	9.1	16.4	72.3
Community Development Projects/Funding	43.0	74.9	63.1
Stakeholder Engagement/Community Meetings	11.2	3.7	6.2
Total	63.3	94.9	141.6

The project invest 94,900 US\$ in Community Development, Stakeholder engagement and meetings, and certifications in 2019. During the monitoring period GRL started a program to develop a Social Development Fund (SDF) approach in Uganda and Tanzania which is to become operational in 20/21. The

¹¹ VCS Standard 3.16.17

SDF is designed to provide continuous support to communities given the nature of the long-term investment. The SDF will allow for the decentralization of powers to the communities where GRL becomes a facilitator while communities become the decision makers on what development project is needed in each community.

There was no input received during the monitoring report period that modified the project activities. GRL invest in research and development for successful plantation and what it has changed is the planting hole design (larger dimensions) (see Meeting Uchindile 2018) in order to improve the trees growth. Workers and communities were informed about the changed.

2.3 AFOLU-Specific Safeguards

Respect for Local Stakeholder Resources¹²

Property and Land use rights

GRL has followed all the policy and legal requirements in acquiring its land areas, factor which has maintained the good relationship with the villagers (see PDD for land ownership). GRL has acquired a 99 year lease of lands from the Government of Tanzania in Mufindi district, Iringa region and Kilombero district, Morogoro region. Control over the land is in a threefold agreement between the communities, the government and the company. Land is negotiated with the community, but the actual lease is with government on behalf of the community. GRL do not plan to acquire or expand activities to new areas outside the current acquired land. Therefore, there is no update to land use rights of local stakeholders. On the other hand, GRL contribute with 10% of the carbon credits sale to the community development.

Additional, there is no evidence of unresolved disputes relating to tenure and use rights in the forest. This was verified by the yearly FSC verification event through interviews with Forest Managers and consultation with representatives of local communities i.e., village development committee (Report FSC 2020¹³). Further, as part of the FSC certification, the project follows and complies with the FSC Guidelines for the Implementation of the right to free, prior and informed consent (FPIC). As mentioned in section 2.1, any potential risk has been considered and correspondingly mitigation measures and actions are in place.

Nevertheless, concerns and disputes may arise during the implementation of project activities. Stakeholders are free to complain and contribute to the success of GRL project activities. Anyone inside or outside GRL, can disagree and make objection actions on documents, activities undertaken by the company, the certification process and even on the forest management operations. There are different ways in which objections, disputes, claims and/or complaints can be submitted to the company management including the writing of letters to the manager of the plantation or the use of

¹² VCS Standard 3.16.16 (1), 3.16.11.

¹³ Report available at <http://fsc.force.com/servlet/servlet.FileDownload?file=00P4y000017rGD6EAM>

complaints box that should be made available in the project areas. Activities implemented to mitigate risks local stakeholders due to project implementation is the grievance mechanism.

Grievance mechanism¹⁴

The aim of the grievance mechanism is to provide people or communities fearing or suffering adverse impacts from a project with the assurance that they will be heard and assisted in a timely manner. GRL informed all relevant project stakeholders of the existence of Green Resources grievance mechanism. This was done during the stakeholder engagement and consultation processes. The information was delivered in a culturally appropriate form assuring that all relevant groups are reached, including women, indigenous peoples and vulnerable groups.

The summary procedure is (for detailed procedure see External Grievance Resolution and Management Procedure):

- A complaint can be submitted in any language to the Green Resources Corporate Office in several ways: (1) by post, (b) by fax, (c) by email.
- All complaints received are registered and trigger a formal review.
- Upon receipt of a complaint, the ESG (Environmental, social and Governance) Manager will, within five business days, indicate to the complainant whether the request is eligible.
 - o The best approach to resolving grievances involves operations management and the affected party reviewing the conflict and deciding together on a way forward that advances their mutual interests.
- Within 30 business days, a detailed response is submitted including a confirmation that the complaint is valid under the eligibility provision and an action plan and timetable for addressing the complaint.
- Corrective actions are developed and approved.
- Implementation of corrective actions are set and continuous monitoring is implemented.

In 2020 (Figure 5), there were 7 grievance processes raised and that were closed by GRL.

Issue	Tanzania	
	Number raised	Number closed
Staff grievances with supervisors or managers	5	5
Community grievances with supervisors or managers	2	2
Lack of required resources for staff	0	0
Issues with Community Development Projects / Funds	0	0
Illegal activities	0	0
Claims and requests for compensation from GRAS	0	0

Figure 5. Grievances reported for 2020

¹⁴ VCS Standard 3.16.18

Regarding community grievances, two issues were raised during local meetings that were addressed by GRL regarding contracted security personnel and plantation external fire line (information available to auditor).

Continuous communication¹⁵

A public summary of the management plan is always available in English and Swahili, safeguarding the confidentiality of some specific information. This summary is produced/updated upon request from any interested party and its aim is to briefly inform stakeholders of our activities and plans, so their active involvement and participation can improve GRL's planning process.

Education and extension programs and seminars are conducted so that the communities around and plantation workers are aware of their rights with regard to the plantations in according to the Tanzanian Law. The seminars will also be used as tools to educate people on different issues pertaining to plantation activities such as fire protection and environmental conservation and, where necessary, legal actions will be taken.

All stakeholder consultation is performed following the description in Section 2.2. Further, Sustainability report are available to anyone on Green Resources webpage¹⁶.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

Project Management

In order to plan the plantations operations a number of regimes will be used that determines the management based mainly on age, specie and desired final product. Pinus and Eucalyptus are the main genus to be planted. The company will operate in 2 main commercial working circles (WC). The expected mean annual increment (MAI) for Pine is 12-18 and 16-24 for Eucalyptus during the initial phase of the project. Through research and careful selection of species, clones and improved practices the average MAI is expected to increase by 30% for both Pine and Eucalyptus in the second rotation. Current rotation ages for pine saw logs is 10 – 18 years while that for eucalyptus poles and fire 6 – 12 years. The rotation ages are to be considered as an indication when the targeted product can be achieved. The decision of any harvesting activity will also always consider growth rate, wood flow normalization, logistics & quality of the stand.

¹⁵ VCS Standard 3.16.19

¹⁶ Green Resources' Sustainability Reports: <http://greenresources.no/media/reports/>

Pine Regime Options

3 pine regimes are currently considered to facilitate the management hence achieve the targeted product for the Saw log Working Circle (WC). Currently there is a lot of variation in the pine stands, especially with regards to stocking and MAI in areas mainly established during the start-up phase. Therefore, the stands have been assigned to the different regimes namely: Standard, No Thin and No Thin +. Going forward the No Thin+ and No Thin regime will be converted to the Standard in the 2nd rotation.

Eucalyptus Regime Options

All Eucalyptus stands are being managed for fiber and poles with 3 different regimes, one pole regime with 1 thinning and a shorter rotation age with the objective of primary producing poles and a no thin regime and no thin+ generating mainly fibre and some poles at a longer rotation. Fibre includes all products such as; peeler logs, fuelwood biomass etc. No Thin+ and No Thin regime will be converted to the Standard in the 2nd rotation.

The regime operations should be guiding but not seen as an absolute. The final decision must always be done by recommendations from the forester in field together with management considering several factors such as the stands development, budgeting, etc.

Planted areas

The total project area is 6,571.11 ha of which 3,532.8 ha belong to Uchindile and 3,038.3 ha to Mapanda. The implementation areas are detailed in Table 4 according to the monitoring period evaluated.

Table 4. Implementation areas.

Monitoring period	Uchindile planted areas	Mapanda planted areas
1 st January 2002 to 30 th November 2008 ¹⁷	2,325 ha	1,764 ha
1 st December 2008 to 1 st September 2012 ¹⁸	2,869 ha	3,007 ha
2 nd September 2012 to 27 th December 2013 ¹⁹	3,079 ha	3,035 ha

¹⁷ See Reforestation in grassland areas of Uchindile, Kilombero, Tanzania & Mapanda, Mufindi, Tanzania, VCS Monitoring Report, 1st January 2002 to November 30th 2008, Version 7, 25th May 2010

¹⁸ See Reforestation in grassland areas of Uchindile, Kilombero, Tanzania & Mapanda, Mufindi, Tanzania, VCS Monitoring Report, 1st December 2008 to 1st September 2012, version 4, 1st May 2013

¹⁹ See Reforestation in grassland areas of Uchindile, Kilombero, Tanzania & Mapanda, Mufindi, Tanzania, VCS Monitoring Report, 2nd September 2012 to 27th December 2013, version 2, 04th May 2014

28 th December 2013 to 27 th October 2020	3,348.26 ha	2,797.21 ha
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For the VCU calculations only planted areas up to 2016 were considered, which meant 1,885.5 ha for Eucalyptus and 3,739.2 ha for Pine²⁰. Table 5 shows the areas planted per year. Figure 6 and Figure 7 show land use and stratification in the project areas.

Table 5. Area planted per species and age class.

Age class	Pine	Eucalyptus	Other	Total
1997	-	19.44		19.44
1998	7.81	263.63		271.44
2002	0.56	179.81		180.37
2003	24.97	-		24.97
2004	0.34	270.03		270.37
2005	15.39	89.4		104.79
2006	78.11	19.24		97.35
2007	253.24	3.12		256.36
2008	284.3	66.99		351.29
2009	507.17	59.82		566.99
2010	930.70	159.01	1.44	1089.71
2011	810.06	206.55	0.67	1016.61
2012	202.07	309.91		511.98
2013	198.79	194.44		393.23
2014	254.09	50.39		304.48
2015	133.74	22.67		156.41
2016	62.17	50.94		113.11
2018	-	13.2		13.2
2020	310.71	112.1		422.81
TUP	284.28	121.92		406.2
Total	4,358.5	2,210.5		6,571.11

The management plan is approved for 5-year cycles. After each cycle the plan is revised. And submitted to government and the investors to the company. The company engage with experts from universities for new scientific and technical information and to monitor change on landscape level.

²⁰ Research compartments were not included for carbon accounting.

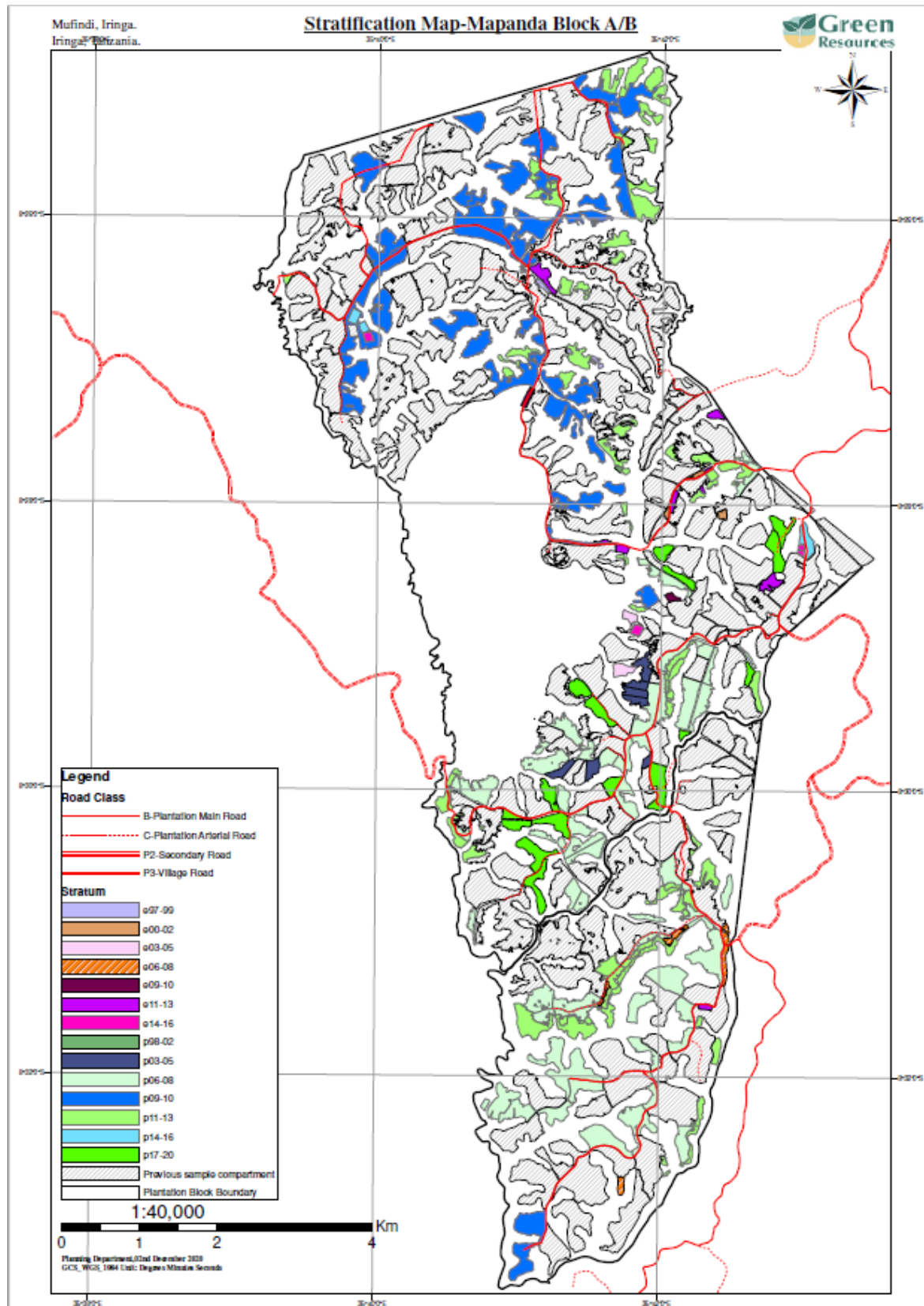


Figure 6. Stratification in Mapanda.

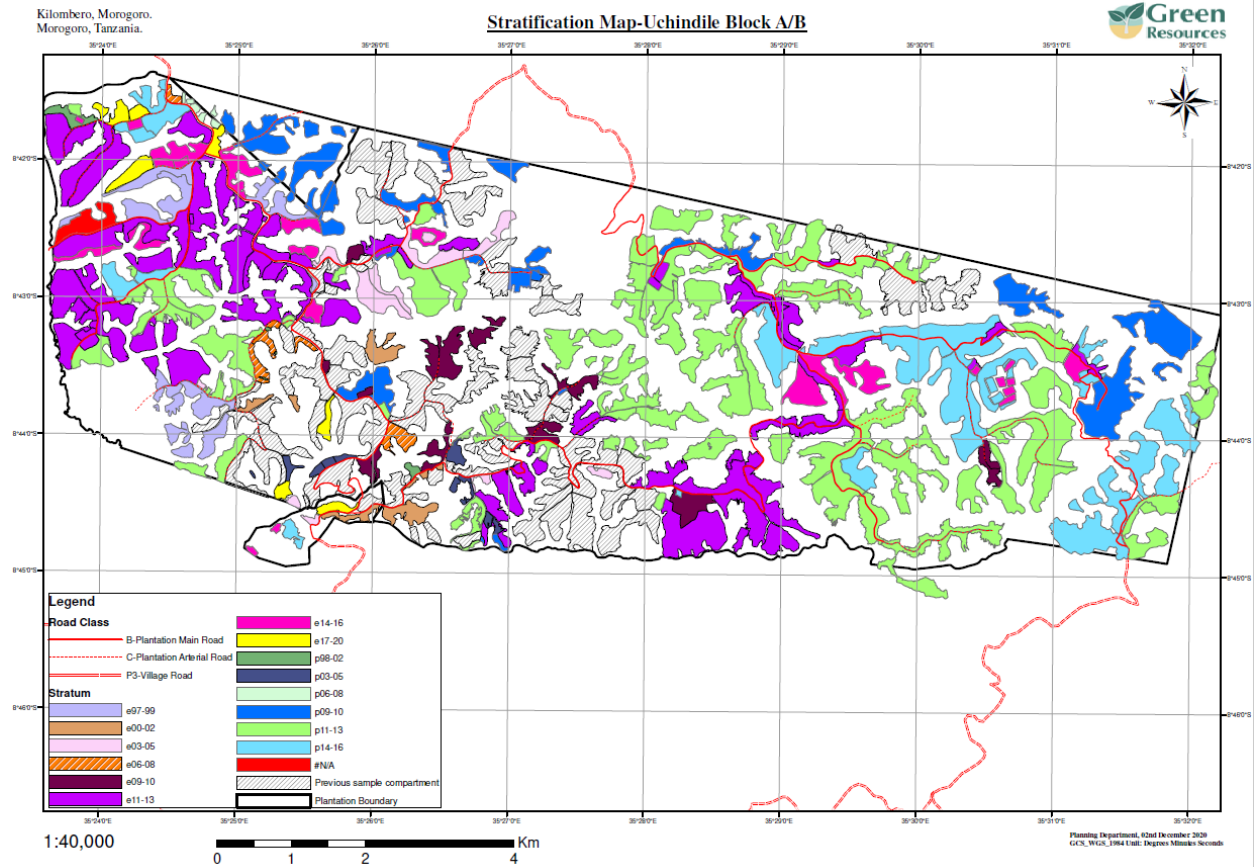


Figure 7. Stratification in Uchindile.

Forest fires

During this monitoring period GRL recorded forest fires in eucalyptus plantation in both Mapanda (Figure 8) and Uchindile (Figure 9) areas. The total burned area is 178.99 ha.

Table 6. Area affected by forest fires.

Age class/strata	e09-10	e11-13	e97-99	Total
2017	8.27	2.94		11.21
2018	2.71			2.71
2020	121.07	13.85	30.15	165.07
Total	132.05	16.79	30.15	178.99

Since no leakage was anticipated at the project in the PD (section E.5), monitoring of leakage parameters is not required in the monitoring plan. Non-permanence risk factors are monitored and managed by the appropriate teams within GRL. For example, GRL's meteorologist ensures that monitoring of weather is carried out continuously at the project sites and this data feeds in to the monitoring of extreme weather, one of the non-permanence risk factors. Fires, pest outbreaks and diseases are all monitored by the GRL inventory team in cooperation with the patrol teams, which are the teams continuously monitoring on the ground and usually the first personnel to alert management of any such issues. Other non-permanence risk factors, such as community engagement, are monitored and managed through GRL's community development team, which consists of a Community Manager and a Community Officer per village. Their roles are to sensitize the communities on GRL activities as well as provide an easy way for the communities to approach the company and provide their feedback or suggestion. They also follow up with the communities regarding development projects that GRL is implementing.

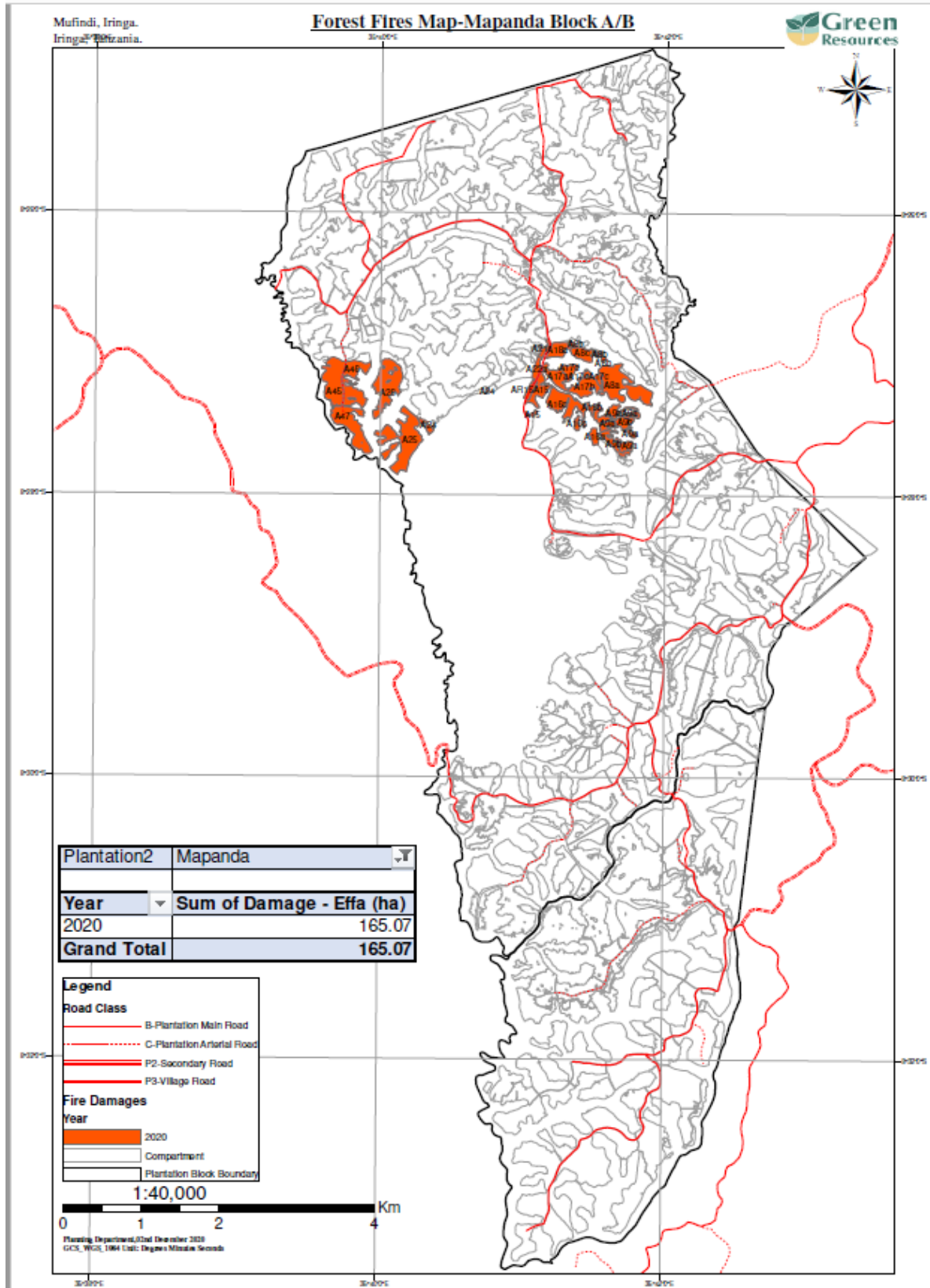


Figure 8. Fire occurrence in Mapanda.

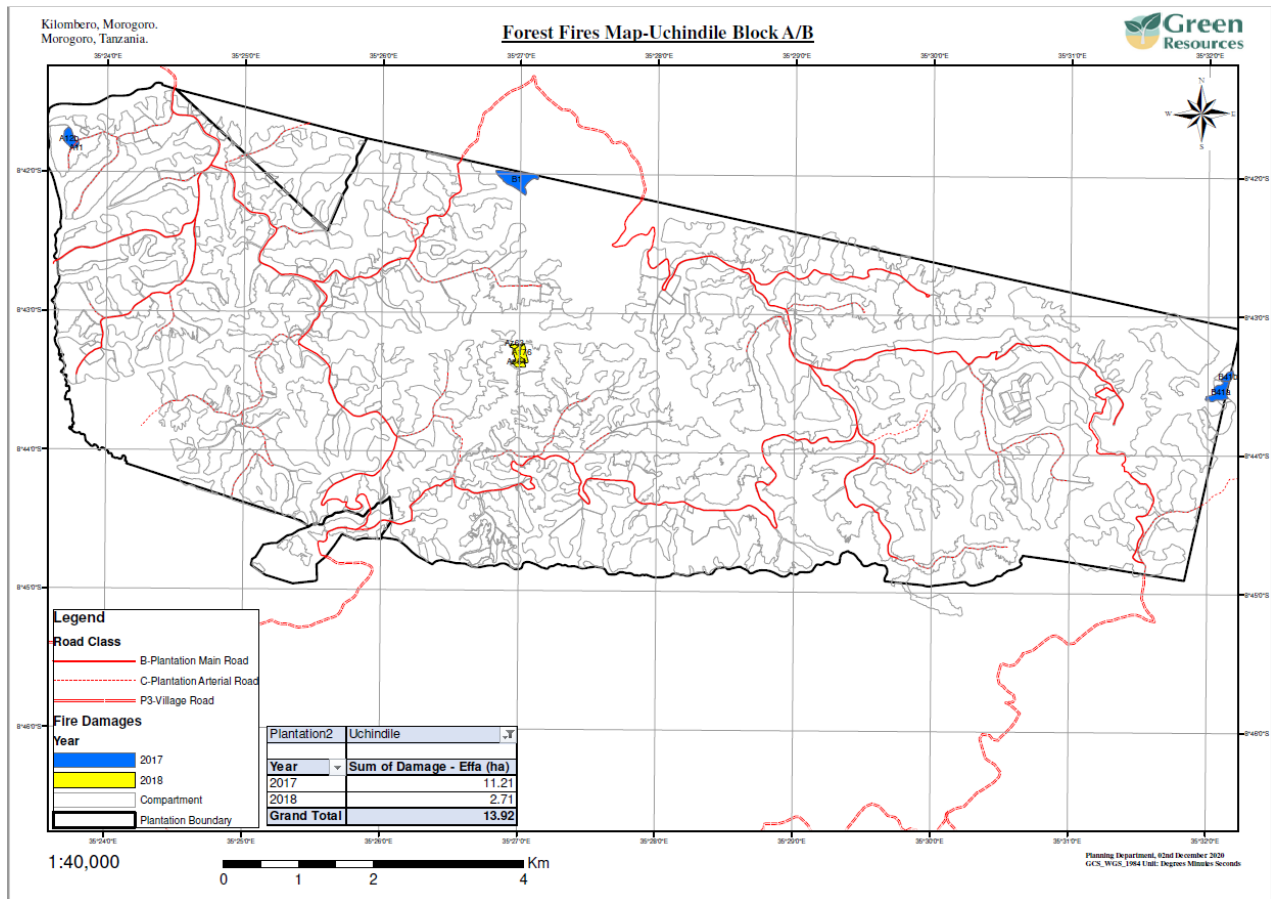


Figure 9. Fires occurrence in Uchindile.

3.2 Deviations

2.1.1 Methodology Deviations

The project has deviated in the maximum permissible error level and confidence level. In AR-AM0005 Version 3, the maximum permissible error level is $\pm 10\%$ at the 95% confidence level. However, the VCS standard allows for a maximum permissible error level of $\pm 10\%$ at the 90% confidence level or $\pm 15\%$ at the 95% confidence level, and as such, a maximum permissible error level of $\pm 10\%$ at the 90% confidence level has been applied in this monitoring report. This doesn't affect the conservativeness of the estimate of emission reductions since it is in accordance with the VCS requirements.

Additionally, and as stated in the previous monitoring report, a number of methodology deviations (Table 7) have been applied without affecting the conservativeness of the estimate of emission reductions (section 3.17 of the VCS Standard version 4.0 allows for methodology deviations related to monitoring or measurement as set out in the methodology).

Table 7. Methodology deviations - parameters not monitored.

ID number (PDD)	Name of parameter	Justification
2.1.1.05	Standard deviation of each stratum	This is calculated as an intermediary value to determine the error of each stratum; therefore, this data is not presented in the MR. This is in line with CDM EB 63, Annex 26
2.1.1.09	Tree species	This is monitored through other parameters, such as stratum area
2.1.1.13	Mean DBH	This is calculated as an intermediary value and is therefore not presented in the MR. This is in line with CDM EB 63, Annex 26
2.1.1.15	Mean tree height	This is calculated as an intermediary value to determine the error of each stratum; therefore, this data is not presented in the MR. This is in line with CDM EB 63, Annex 26
2.1.1.21	Carbon stock in aboveground biomass of plots	This is calculated as an intermediary value to determine the error of each stratum; therefore, this data is not presented in the MR. This is in line with CDM EB 63, Annex 26
2.1.1.22	Carbon stock in below-ground biomass of plots	This is calculated as an intermediary value to determine the error of each stratum; therefore, this data is not presented in the MR. This is in line with CDM EB 63, Annex 26

ID number (PDD)	Name of parameter	Justification
2.1.1.25	Mean carbon stock in aboveground biomass per unit area per compartment per species	This is calculated as an intermediary value to determine the error of each stratum; therefore, this data is not presented in the MR. This is in line with CDM EB 63, Annex 26
2.1.1.26	Mean carbon stock in belowground biomass per unit area per compartment per species	This is calculated as an intermediary value to determine the error of each stratum; therefore, this data is not presented in the MR. This is in line with CDM EB 63, Annex 26
2.1.1.27	Area of compartment	This is monitored in Microforest; however, the data is aggregated to the stratum level to present in the MR.
2.1.1.28	Carbon stock in aboveground biomass of compartment per species	This is calculated as an intermediary value to determine the error of each stratum; therefore, this data is not presented in the MR. This is in line with CDM EB 63, Annex 26
2.1.1.29	Carbon stock in belowground biomass of compartment per species	This is calculated as an intermediary value to determine the error of each stratum; therefore, this data is not presented in the MR. This is in line with CDM EB 63, Annex 26
2.1.1.30	Carbon stock change in aboveground biomass of compartment per species	This is calculated as an intermediary value to determine the error of each stratum; therefore, this data is not presented in the MR. This is in line with CDM EB 63, Annex 26
2.1.1.31	Carbon stock change in belowground biomass of compartment per species	This is calculated as an intermediary value to determine the error of each stratum; therefore, this data is not presented in the MR. This is in line with CDM EB 63, Annex 26
2.1.1.32	Total carbon stock change	This is calculated as an intermediary value to determine the error of each stratum; therefore, this data is not presented in the MR. This is in line with CDM EB 63, Annex 26
2.1.2.01	Area affected by biomass burning	This data is recorded through the parameter E.1.3.10, "Area burnt by fire"
2.1.2.02	Mean above ground biomass stock before burning	This is covered through monitoring the parameter "volume of biomass lost due to fire"
2.1.2.06	Loss of aboveground biomass carbon due to biomass burning	This is not required – the non-CO2 emissions are calculated only.

ID number (PDD)	Name of parameter	Justification
2.1.2.07	N/C ratio	Not required since non-CO2 emissions from burning deemed negligible in methodology
2.1.2.08	N2O emission from biomass burning	Not required since non-CO2 emissions from burning deemed negligible in methodology
2.1.2.09	CH4 emission from biomass burning	This is calculated as an intermediary value to determine the error of each stratum; therefore, this data is not presented in the MR. This is in line with CDM EB 63, Annex 26
2.1.2.10	Increase in non-CO2 emission as a result of biomass burning	This is calculated as an intermediary value to determine the error of each stratum; therefore, this data is not presented in the MR. This is in line with CDM EB 63, Annex 26
2.1.2.11	Total increase in GHG emissions	This is calculated as an intermediary value to determine the error of each stratum; therefore, this data is not presented in the MR. This is in line with CDM EB 63, Annex 26

2.1.2 Project Description Deviations

Table 8 shows a number of parameters that have not been monitored in this monitoring period. These parameters were reviewed and considered inadequate or not relevant for monitoring of the project and of GHG emission removals.

These parameters along with the deviations described below are in line with the VCS Standard v.4.0, section 3.18 and do not affect the conservativeness of the quantification of GHG emission reductions or removals. Furthermore, these deviations were accepted for the previous monitoring periods and are therefore considered acceptable.

Table 8. Project description deviations.

ID number (PDD)	Name of parameter	Justification
E.1.1.04	Beacon ID	Not required to be monitored since this data is another way of monitoring the project boundary.
E.1.1.05	Bearing	This is a monitoring parameter linked to the beacons – but since the Beacon IDs are not being monitored, this is not necessary.

ID number (PDD)	Name of parameter	Justification
E.1.1.06	Distance	This is a monitoring parameter linked to the beacons – but since the Beacon IDs are not being monitored, this is not necessary.
E.1.1.07	Natural ID	“Natural boundaries” of the project areas are monitored as part of the CCBS process since these areas are not technically part of the VCS project area.
E.1.2.04	Compartment composition	All the “composition” data is collected in Microforest and is presented separately for each parameter
E.1.2.05	Marking of planting spots	Not monitored
E.1.2.07	Volume of pit	Not monitored
E.1.2.08	Height of seedlings	Not monitored
E.1.2.12	Number of trees survived	A survival rate percentage is determined rather than a number count.
E.1.2.14	Stock count	Not monitored – stocking determined through survival assessments and PSPs
E.1.2.15	Stocking rate	Not monitored since not required
E.1.2.17	Biomass stock per unit area before slash and burn	Not monitored
E.1.3.03	Biomass stock lost per ha during thinning	This is not required since the biomass loss through thinning is captured in the sample plots (PSPs)
E.1.3.08	Area allowed to regenerate/ resprout	Not applicable since regeneration will not be included in the carbon inventory
E.1.3.13	Area re-growth after fire	Not monitored
E.1.3.14	Area of fire breaks	This is repeated; covered with parameter E.1.2.16 from PD and included in MR.
2.1.1.21	Carbon stock in aboveground biomass of plots	This is calculated as an intermediary value to determine the error of each stratum; therefore, this data is not presented in the MR. This is in line with CDM EB 63, Annex 26

In addition to the parameters in Table 8 above, the following parameters in Table 9, show parameters which were previously stated as being available at validation but which are now monitored.

Table 9. Additional monitored parameters.

ID number (PDD)	Name of parameter	Justification
E.1.2.06	Areas cleaned (screefed)	In the PDD it was stated that this parameter would be recorded before the project start; however, this is a parameter that is monitored as the project is implemented
E.1.2.09	Area weeded	In the PDD it was stated that this parameter would be recorded before the project start; however, this is a parameter that is monitored as the project is implemented
E.1.2.10	Area slashed	In the PDD it was stated that this parameter would be recorded before the project start; however, this is a parameter that is monitored as the project is implemented
E.1.2.11	Area planted per stratum	In the PDD it was stated that this parameter would be recorded before the project start; however, this is a parameter that is monitored as the project is implemented
E.2.1.1.01	Stratum ID	In the PDD's MP it is stated that this parameter is monitored before the planting starts; however, since the project can be restratified it will be monitored at each verification event
E.2.1.1.02	Sub-stratum ID	In the PDD's MP it is stated that this parameter is monitored before the planting starts; however, since the project can be restratified it will be monitored at each verification event
E.2.1.1.06	Number of sample plots	In the PDD the number of sample plots was stated as being monitored prior to planting; however, this is being monitored as the project is implemented since at each verification new sample plots may be introduced; thus, the number of plots needs to be continuously monitored

Another deviation is the measurement of only four tree heights in each permanent sample plot. In the PDD, it is stated that all tree heights will be measured; however, following the methods used in the studies to determine the volume equations, which the project is using, only the dominant height needs to be measured. This is done by measuring the four largest trees within each plot. This same deviation was requested and accepted at previous verifications.

Furthermore, as stated in section 5.1. below the project is deviating from the PDD in terms of accounting with baseline removals according to the guidance set out in EB 50 meeting report, annex 21. Therefore, emissions from removal of woody vegetation are set to zero.

Lastly, as stated in the previous monitoring report the project boundary of the Uchindile area has been monitored through application of the monitoring plan and reduced in size due to a land dispute in the northern half of the initial project boundary. The dispute was between the Tanzanian Government's Ministry of Natural Resources and Tourism and GRL. Green Resources had not been planting in the disputed area and no GHG benefits have been claimed from the disputed area. GRL has therefore decided to reduce the area of the project by changing the project boundary so as to exclude the disputed area²¹.

3.3 Grouped Projects

Not applicable.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Parameters were used from the last monitoring event where they have been reviewed to ensure better estimates for tree biomass and as such are described in the next section (monitored parameters); these were basic wood density (D), biomass expansion factor (BEF) and root-to-shoot ratio (R).

According to the methodology, default values should preferably be from locally-derived species-specific information. If not available, they should prefer species-specific regional or national datasets with similar soil and climatic conditions. Alternatively, information for similar species or default values from the IPCC Good Practice Guidelines can be used. The wood density values are species-specific mean values (*Pinus patula* and *Eucalyptus saligna*) from a Tanzanian study representing similar climatic conditions.

²¹ All maps shown in this report already reflect the change in the boundary.

For the BEF, since values for the same species / *genus* and project site or region were not found, data from the IPCC Guidelines was used (Table 10). For the Eucalyptus, the range of values is not for the same genus, therefore, it was deemed conservative to take a value halfway between the lower limit of the range and the mean. For Pine, since there is a BEF for tropical pine forest, the average was taken and applied without any adjustment. The root-to-shoot ratio for both species was taken from the IPCC Guidelines, which has genus-specific values. Since the different strata in the project have significant differences in mean above-ground biomass (t/ha), R values were taken considering the three ranges of above-ground biomass values in the IPCC Guidelines (<50, 50-150 and >50 t/ha).

Table 10. BEF, wood density and R values for Pine and Eucalyptus.

Specie	PD values			Updated values				
	BEF	D	R	BEF ²²	D ²³	R ²⁴		
						< 50	50 - 150	> 150
Pine	1.30 ²⁵	0.45 ²⁶	0.32 ²⁷	1.25	0.37	0.46	0.32	-
Eucalyptus	2.00	0.80 ²⁸	0.35 ²⁹	2.70	0.43	0.45	0.35	0.2

²² Taken from table 3A.1.10 of the GPG LULUCF 2003 – Tropical Pines (for pine) and Tropical Broadleaf (for eucalyptus)

²³ Taken from the book “The Commercial Timbers of Tanzania”, J.M. Bryce, revised edition of 1999.

²⁴ Taken from table 3A.1.8 of the GPG LULUCF 2003

²⁵ Taken from table 3A.1.10 of the GPG LULUCF 2003.

²⁶ Taken from table 3A.1.9 of the GPG LULUCF 2003

²⁷ Taken from table 3A.1.8 of the GPG LULUCF 2003 – mean value taken from the conifer forest/ plantation category with aboveground biomass (t/ha) of 50 - 150

²⁸ Taken from the book “The Commercial Timbers of Tanzania”, J.M. Bryce, revised edition of 1999. Although this is the maximum value for the wood density for this species, so a more accurate value is presented.

²⁹ Taken from table 3A.1.8 of the GPG LULUCF 2003 – mean value for eucalypt plantation taken for biomass of 50 – 150 t/ha

Data / Parameter	Project ID
Data unit	Alpha numeric
Description	Title of each plantation site
Source of data	Not applicable (N/a)
Value applied:	Uchindile and Mapanda
Justification of choice of data or description of measurement methods and procedures applied	N/a
Purpose of the data	Title of each plantation site
Comments	-

Data / Parameter	Project location
Data unit	Alpha numeric
Description	Project boundaries including the non plantable areas, not included in the VCS project areas
Source of data	Measured
Value applied:	See Figure 6 and Figure 7
Justification of choice of data or description of measurement methods and procedures applied	N/a
Purpose of the data	Mapping of the project boundary before project start
Comments	This parameter has been monitored after project start since there has been a change to the boundary of the Uchindile plantation.

Data / Parameter	Biomass combustion efficiency
Data unit	Dimensionless
Description	-
Source of data	IPCC default value
Value applied:	0.5
Justification of choice of data or description of	Default value

measurement methods and procedures applied	
Purpose of the data	Used in the calculation of non-CO2 emissions
Comments	-

Data / Parameter	Confidence level
Data unit	%
Description	The required confidence level at which the error level between samples must meet.
Source of data	VCS standard version 4.0
Value applied:	90%
Justification of choice of data or description of measurement methods and procedures applied	Default value provided by the VCS
Purpose of the data	Used in the calculation of project emission removal
Comments	See section 2.3.1 Methodology Deviations for the justification

Data / Parameter	Accuracy
Data unit	t d.m (or t d.m. ha ⁻¹)
Description	Acceptable margin of error in estimation of biomass stock within the project boundary
Source of data	VCS standard version 4.0
Value applied:	10%
Justification of choice of data or description of measurement methods and procedures applied	Default value provided by the VCS
Purpose of the data	Used in the calculation of project emission removal
Comments	See section 2.3.1. Methodology Deviations for the justification

Data / Parameter	Compartment location
Data unit	Geographical units
Description	The geographical coordinates of the compartment boundary.
Source of data	Measured

Value applied:	N/a
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of the data	Monitor forest establishment
Comments	-

Data / Parameter	Compartment size
Data unit	ha
Description	N/a
Source of data	Calculated
Value applied:	See compartment information file
Justification of choice of data or description of measurement methods and procedures applied	Calculated from the geographical points collected by GPS
Purpose of the data	Monitor forest establishment
Comments	-

Data / Parameter	Compartment ID
Data unit	Alpha numeric
Description	Each compartment has a particular combination of tree species and year planted. Numeric series ID is assigned to each compartment.
Source of data	Assigned in Microforest
Value applied:	See Carbon calculation excel.
Justification of choice of data or description of measurement methods and procedures applied	N/a
Purpose of data	Monitor forest establishment
Comments	This parameter is repeated in the PDD's MP

4.2 Data and Parameters Monitored

Data / Parameter	Survival rate
Data unit	%
Description	A sample survey for each compartment is performed after the planting season and the calculated figure is recorded in Microforest.
Source of data	Measured
Description of measurement methods and procedures to be applied	See Survival assessment
Frequency of monitoring/recording	After each planting season for newly planted compartments.
Value monitored:	See compartment information GIS file
Monitoring equipment	Not applicable
QA/QC procedures to be applied	Not applicable
Purpose of the data	Calculation of project emissions
Calculation method	N/a
Comments	-

Data / Parameter	Area of fireline and fire breaks
Data unit	ha
Description	Each year before the fire season, fire lines and fire breaks are created at the project sites to reduce the risk from fire.
Source of data	The mapping and inventory team carry out an internal audit each year prior to the fire season to check that the project's risk mitigation measures are in place.
Description of measurement methods and procedures to be applied	A combination of visual assessments, in addition to activity recording in our management system.
Frequency of monitoring/recording	Every year prior to the fire season.
Value monitored:	See compartment information file, fireline maps for Uchindile and Mapanda, and fire management plan
Monitoring equipment	GPS
QA/QC procedures to be applied	Not applicable
Purpose of the data	Calculation of project emissions
Calculation method	N/a
Comments	-

The following are the parameters used to monitor forest establishment:

Data / Parameter	Area weeded
Data unit	ha
Description	Weeding is conducted to minimize competition from grass three months after planting. Completion of weeding is recorded in Microforest.
Source of data	Calculated
Description of measurement methods and procedures to be applied	Geographic Information Systems
Frequency of monitoring/recording	Each time a compartment is weeded
Value monitored:	See compartment information GIS file
Monitoring equipment	Not applicable
QA/QC procedures to be applied	N/a
Purpose of the data	Calculation of project emissions
Calculation method	-
Comments	In the PDD it was stated that this parameter would be recorded before the project start; however, this is a parameter that is monitored as the project is implemented

Data / Parameter	Area slashed
Data unit	ha
Description	Slashing is conducted mainly in Eucalyptus stands preferably in the second and third years after planting
Source of data	Calculated
Description of measurement methods and procedures to be applied	Geographic Information Systems
Frequency of monitoring/recording	Each time a compartment is slashed
Value monitored:	See compartment information GIS file
Monitoring equipment	Not applicable
QA/QC procedures to be applied	N/a
Purpose of the data	Calculation of project emissions
Calculation method	-

Comments	In the PDD it was stated that this parameter would be recorded before the project start; however, this is a parameter that is monitored as the project is implemented																										
Data / Parameter	Area planted per stratum																										
Data unit	ha																										
Description	The hectares of a certain stratum or sub-stratum																										
Source of data	Calculated from data stored in Microforest																										
Description of measurement methods and procedures to be applied	The geographical coordinates of each parcel of project area that mark the corners of the polygon are used to calculate the area																										
Frequency of monitoring/recording	Re-stratification is carried out at each verification and so the areas of each stratum are calculated at this point. There will be a verification at the project at least every 5 years.																										
Value monitored:	<table border="1"> <thead> <tr> <th>Stratum</th><th>Area (ha)</th></tr> </thead> <tbody> <tr><td>p03-05</td><td>40.70</td></tr> <tr><td>p06-08</td><td>615.05</td></tr> <tr><td>p09-10</td><td>1,435.49</td></tr> <tr><td>p11-13</td><td>1,206.99</td></tr> <tr><td>p14-16</td><td>440.99</td></tr> <tr><td>e97-99</td><td>263.63</td></tr> <tr><td>e00-02</td><td>163.29</td></tr> <tr><td>e03-05</td><td>359.43</td></tr> <tr><td>e06-08</td><td>89.35</td></tr> <tr><td>e09-10</td><td>215.39</td></tr> <tr><td>e11-13</td><td>691.58</td></tr> <tr><td>e14-16</td><td>102.84</td></tr> </tbody> </table>	Stratum	Area (ha)	p03-05	40.70	p06-08	615.05	p09-10	1,435.49	p11-13	1,206.99	p14-16	440.99	e97-99	263.63	e00-02	163.29	e03-05	359.43	e06-08	89.35	e09-10	215.39	e11-13	691.58	e14-16	102.84
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e11-13	691.58																										
e14-16	102.84																										
Monitoring equipment	GPS, Arc GIS, Microforest, high resolution satellite imagery																										
QA/QC procedures to be applied	When high resolution satellite imagery is available, further analysis of the compartments is carried out to ensure that the compartment boundaries are consistent and that the total area within the compartment is homogenous.																										
Purpose of the data	Calculation of project emissions																										
Calculation method	The area is calculated by summing all the compartment areas that are included within the stratum. The areas are extracted from Microforest into the <i>ex-post</i> carbon model where the data at the compartment level is summed to give each of the strata/ sub-strata areas.																										
Comments	In the PDD it was stated that this parameter would be recorded before the project start; however, this is a parameter that is monitored as the project is implemented																										

The following are the parameters used to monitor forest management:

Data / Parameter	Area of thinning
Data unit	ha
Description	Area thinned per year
Source of data	The data is recorded and archived on a compartment level in Microforest.
Description of measurement methods and procedures to be applied	Thinning is planned through Microforest, with the plantation managers selecting which compartments will be thinned.
Frequency of monitoring/recording	This occurs each time a compartment is thinned.
Value monitored:	See compartment information GIS file
Monitoring equipment	No monitoring equipment is required.
QA/QC procedures to be applied	Not applicable
Purpose of the data	Calculation of project emissions
Calculation method	Not applicable
Comments	In the PDD it was stated that this parameter would be recorded every 5 years; however, this is a parameter that is monitored as thinning occurs

Data / Parameter	Harvesting location
Data unit	Alpha numeric
Description	Harvesting is carried out at the compartment level so the compartment IDs are used for harvesting location
Source of data	The data is recorded and stored in Microforest.
Description of measurement methods and procedures to be applied	Harvesting is planned through Microforest, with the plantation managers selecting which compartments will be harvested
Frequency of monitoring/recording	This occurs each time a compartment is harvested.
Value monitored:	See compartment information GIS file
Monitoring equipment	No monitoring equipment is required.
QA/QC procedures to be applied	Not applicable
Purpose of the data	Calculation of project emissions
Calculation method	Not applicable
Comments	In the PDD it was stated that this parameter would be recorded every 10 years; however, this is a parameter that is monitored as harvesting occurs

Data / Parameter	Area harvested
Data unit	ha
Description	Area harvested per year
Source of data	The data is recorded and stored in Microforest.
Description of measurement methods and procedures to be applied	Harvesting is planned through Microforest, with the plantation managers selecting which compartments will be harvested.
Frequency of monitoring/recording	This occurs each time a compartment is harvested.
Value monitored:	See compartment information GIS file
Monitoring equipment	No monitoring equipment is required.
QA/QC procedures to be applied	Not applicable
Purpose of the data	Calculation of project emissions
Calculation method	Not applicable
Comments	In the PDD it was stated that this parameter would be recorded every 10 years; however, this is a parameter that is monitored as harvesting occurs

Data / Parameter	Volume harvested
Data unit	m ³
Description	Volume harvested
Source of data	The data is recorded and stored in Microforest.
Description of measurement methods and procedures to be applied	Harvesting is planned through Microforest, with the plantation managers selecting which compartments will be harvested.
Frequency of monitoring/recording	Following harvest
Value monitored:	See compartment information GIS file
Monitoring equipment	No monitoring equipment is required.
QA/QC procedures to be applied	Not applicable
Purpose of the data	Calculation of project emissions
Calculation method	Not applicable
Comments	In the PDD it was stated that this parameter would be recorded every 10 years; however, this is a parameter that is monitored as harvesting occurs

Data / Parameter	Area replanted
Data unit	ha

Description	Area replanted following harvesting, fire etc.
Source of data	The data is recorded and stored in Microforest.
Description of measurement methods and procedures to be applied	-
Frequency of monitoring/recording	Every time a compartment is replanted
Value monitored:	See compartment information GIS file
Monitoring equipment	No monitoring equipment is required.
QA/QC procedures to be applied	Not applicable
Purpose of the data	Calculation of project emissions
Calculation method	Not applicable
Comments	-

Data / Parameter	Area affected by pests and/ or diseases
Data unit	ha
Description	Area affected by pests and/ or diseases
Source of data	The data is recorded and stored in Microforest
Description of measurement methods and procedures to be applied	The company's SOP 12: "Pests and diseases monitoring procedure" is applied
Frequency of monitoring/recording	Workers are advised to report any unusual signs spotted during their work
Value monitored:	0
Monitoring equipment	No monitoring equipment is required.
QA/QC procedures to be applied	Not applicable
Purpose of the data	Calculation of project emissions
Calculation method	Not applicable
Comments	In the PDD it was stated that this parameter would be recorded annually; however, this is a parameter that is monitored continuously by the patrol teams

Data / Parameter	Area burnt by fire
Data unit	Ha
Description	Area burnt by fire
Source of data	The data is recorded and stored in Microforest.

Description of measurement methods and procedures to be applied	See Fire Management plan for Tanzania plantation		
Frequency of monitoring/recording	Measured after any forest fire		
Value monitored:		Uchindile	Mapanda
	2017	11.21	-
	2018	2.71	-
	2020	-	165.07
Monitoring equipment	No monitoring equipment is required.		
QA/QC procedures to be applied	Not applicable		
Purpose of the data	Calculation of project emissions		
Calculation method	The area burnt from all forest fires in each particular year is summed		
Comments	In the PDD it was stated that this parameter would be recorded annually; however, this is a parameter that is monitored at each fire event		

Data / Parameter	Location burnt
Data unit	Geographical units
Description	Location of burnt areas
Source of data	The data is recorded and stored in Microforest.
Description of measurement methods and procedures to be applied	The area is recorded with GPS in the field after each occurrence
Frequency of monitoring/recording	Each time there is a fire
Value monitored:	A map of fire locations is presented in Section 3 of this Monitoring Report.
Monitoring equipment	GPS
QA/QC procedures to be applied	Not applicable
Purpose of the data	Calculation of project emissions
Calculation method	Not applicable
Comments	In the PDD it was stated that this parameter would be recorded annually; however, this is a parameter that is monitored at each fire event

Data / Parameter	Volume of biomass lost due to fire
Data unit	m ³
Description	Volume of biomass lost due to fire
Source of data	Calculated based on inventory data
Description of measurement methods and procedures to be applied	See Fire Management plan for Tanzania plantation
Frequency of monitoring/recording	After each event
Value monitored:	Data is calculated based on PSP
Monitoring equipment	No monitoring equipment is required.
QA/QC procedures to be applied	Not applicable
Purpose of the data	
Calculation method	Not applicable
Comments	In the PDD it was stated that this parameter would be recorded annually; however, this is a parameter that is monitored at each fire event

The following are the parameters used to monitor the actual net GHG removals by sinks:

Data / Parameter	Stratum ID						
Data unit	Alphanumeric						
Description	Each compartment has been given a different alpha numeric ID. Compartments are grouped together to form strata, which are given an alpha numeric name.						
Source of data	Determined through the assessment of PSP data which is measured in each compartment – see DBH and Height measurement parameters.						
Description of measurement methods and procedures to be applied	Each compartment has been given a different alpha numeric identity. Compartments are grouped together to form stratum, which are given an alpha numeric label. GPS is used to identify boundary coordinates.						
Frequency of monitoring/recording	Restratification is carried out at each verification and so the areas of each stratum are calculated at this point. There will be a verification at the project at least every 5 years.						
Value monitored:	<table border="1"> <thead> <tr> <th>Stratum ID</th><th>Alphanumeric</th></tr> </thead> <tbody> <tr> <td>Pine 03-05</td><td>p03-05</td></tr> <tr> <td>Pine 06-08</td><td>p06-08</td></tr> </tbody> </table>	Stratum ID	Alphanumeric	Pine 03-05	p03-05	Pine 06-08	p06-08
Stratum ID	Alphanumeric						
Pine 03-05	p03-05						
Pine 06-08	p06-08						

	Pine 09-10	p09-10
	Pine 11-13	P11-13
	Pine 14-16	P14-16
	Euc 97-99	e97-99
	Euc 00-02	e00-02
	Euc 03-05	e03-05
	Euc 06-08	e06-08
	Euc 09-10	e09-10
	Euc 11-13	e11-13
	Euc 14-16	e14-16
Monitoring equipment	Microforest, ArcGis	
QA/QC procedures to be applied	Not applicable	
Purpose of the data	Calculation of project emissions	
Calculation method	Not applicable	
Comments	These strata not include young stands from 2017 to 2020. In the PDD's MP it is stated that this parameter is monitored before the planting starts; however, since the project can be re-stratified it will be monitored at each verification event	

Data / Parameter	Sub-stratum ID
Data unit	Alpha numeric
Description	Each compartment has been given a different alpha numeric ID. Compartments are grouped together to form strata, which are given an alpha numeric name.
Source of data	Determined through the assessment of PSP data which is measured in each compartment – see DBH and Height measurement parameters.
Description of measurement methods and procedures to be applied	Each sub-stratum is given a different alpha numeric identity. GPS is used to identify boundary coordinates of the sub-stratum.
Frequency of monitoring/recording	Re-stratification is carried out at each verification and so the areas of each stratum are calculated at this point. There will be a verification at the project at least every 5 years.
Value monitored:	Area of each compartment is provided in the GIS files
Monitoring equipment	Microforest, ArcGis
QA/QC procedures to be applied	Not applicable
Purpose of the data	Calculation of project emissions
Calculation method	Not applicable

Comments	In the PDD's MP it is stated that this parameter is monitored before the planting starts; however, since the project can be re-stratified it will be monitored at each verification event																										
Data / Parameter	Number of sample plots																										
Data unit	Numeric																										
Description	The number of sample plots in each stratum is recorded.																										
Source of data	Measured																										
Description of measurement methods and procedures to be applied	Field forms are filled out for each sample plot that is implemented in the field. These are the scanned and data inputted into Excel.																										
Frequency of monitoring/recording	Sample plots will be measured at each verification event. There will be a verification at the project at least every 5 years.																										
Value monitored:	<table border="1"> <thead> <tr> <th>Stratum</th><th>Number</th></tr> </thead> <tbody> <tr><td>p03-05</td><td>2</td></tr> <tr><td>p06-08</td><td>23</td></tr> <tr><td>p09-10</td><td>58</td></tr> <tr><td>p11-13</td><td>44</td></tr> <tr><td>p14-16</td><td>24</td></tr> <tr><td>e97-99</td><td>67</td></tr> <tr><td>e00-02</td><td>41</td></tr> <tr><td>e03-05</td><td>130</td></tr> <tr><td>e06-08</td><td>16</td></tr> <tr><td>e09-10</td><td>11</td></tr> <tr><td>e11-13</td><td>28</td></tr> <tr><td>e14-16</td><td>3</td></tr> </tbody> </table>	Stratum	Number	p03-05	2	p06-08	23	p09-10	58	p11-13	44	p14-16	24	e97-99	67	e00-02	41	e03-05	130	e06-08	16	e09-10	11	e11-13	28	e14-16	3
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e06-08	16																										
e09-10	11																										
e11-13	28																										
e14-16	3																										
Monitoring equipment	Microforest, ArcGis, GPS																										
QA/QC procedures to be applied	10% of the PSPs are re-measured as part of the QA/ QC process – see Section 4.3, Monitoring Plan, of this Monitoring Report for the QA/ QC report.																										
Purpose of the data	Calculation of project emissions																										
Calculation method	Not applicable																										
Comments	In the PDD the number of sample plots was stated as being monitored prior to planting; however, this is being monitored as the project is implemented since at each verification new sample plots may be introduced; thus, the number of plots needs to be continuously monitored																										

Data / Parameter	Sample Plot ID
Data unit	Alphanumeric
Description	Each sample plot has been given a different alpha numeric ID.
Source of data	Measured
Description of measurement methods and procedures to be applied	Each sample plot is given a different alpha numeric identity. GPS is used to identify the coordinates of the sample plot.
Frequency of monitoring/recording	Each time there is a verification
Value monitored:	See carbon model for the list of sample plots
Monitoring equipment	Not applicable
QA/QC procedures to be applied	Not applicable
Purpose of the data	Calculation of project emissions
Calculation method	Not applicable
Comments	In the PDD's MP it is stated that this parameter will be recorded annually; however, for the purposes of the VCS, it will be recorded at each verification event

Data / Parameter	Plot location
Data unit	Coordinates
Description	In this monitoring period, a combination of previously established permanent sample plots were measured as well as newly established plots. For both of these, plot locations were recorded using a GPS in the field and recorded in the field forms. All plots have been established systematically but with a random start.
Source of data	Measured
Description of measurement methods and procedures to be applied	The center point of each permanent sample plot is recorded with a GPS
Frequency of monitoring/recording	Sample plots will be measured at each verification event. There will be a verification at the project at least every 5 years.
Value monitored:	See Section 4.3, Description of the Monitoring Plan in this Monitoring Report for a map of the PSP locations.
Monitoring equipment	GPS

QA/QC procedures to be applied	10% of the PSPs are remeasured as part of the QA/ QC process – see Section 4.3, Monitoring Plan, of this Monitoring Report for the QA/ QC report.
Purpose of the data	Calculation of project emissions
Calculation method	Not applicable
Comments	In the PDD's MP it is stated that this parameter will be recorded annually; however, for the purposes of the VCS, it will be recorded at each verification event

Data / Parameter	Age of plantation
Data unit	Years
Description	Recorded when plantation is established
Source of data	Recorded in Microforest
Description of measurement methods and procedures to be applied	Recorded since planting year
Frequency of monitoring/recording	Annually
Value monitored:	This is included in the file with compartment information
Monitoring equipment	Not applicable
QA/QC procedures to be applied	Not applicable
Purpose of the data	Calculation of project emissions
Calculation method	Not applicable
Comments	-

Data / Parameter	Number of trees
Data unit	dimensionless
Description	Number of trees in a sample plot
Source of data	Measured
Description of measurement methods and procedures to be applied	The company SOP for measuring PSPs was followed
Frequency of monitoring/recording	Sample plots will be measured at each verification event. There will be a verification at the project at least every 5 years.
Value monitored:	See <i>ex-post</i> carbon model for all raw data and carbon calculations.
Monitoring equipment	Not applicable

QA/QC procedures to be applied	10% of the PSPs are remeasured as part of the QA/ QC process – see Section 4.3, Monitoring Plan, of this Monitoring Report for the QA/ QC report.
Purpose of the data	Calculation of project emissions
Calculation method	Not applicable
Comments	In the PDD's MP it is stated that this parameter will be recorded every 5 years; however, for the purposes of the VCS, it will be recorded at each verification event

Data / Parameter	Diameter at Breast Height (DBH)
Data unit	cm
Description	DBH of each tree in with DBH > 2cm located in each permanent sample plot measured to calculate accumulated biomass
Source of data	Measured
Description of measurement methods and procedures to be applied	The company SOP for measuring PSPs was followed
Frequency of monitoring/recording	Sample plots will be measured at each verification event. There will be a verification at the project at least every 5 years.
Value monitored:	See <i>ex-post</i> carbon model for all raw data and carbon calculations.
Monitoring equipment	Calipers
QA/QC procedures to be applied	10% of the PSPs are remeasured as part of the QA/ QC process – see Section 4.3, Monitoring Plan, of this Monitoring Report for the QA/ QC report.
Purpose of the data	Calculation of project emissions
Calculation method	Not applicable
Comments	In the PDD's MP it is stated that this parameter will be recorded annually; however, for the purposes of the VCS, it will be recorded at each verification event

Data / Parameter	Tree height
Data unit	m
Description	Heights of the four tallest trees in each PSP were measured to calculate the accumulated biomass
Source of data	Measured

Description of measurement methods and procedures to be applied	The company SOP for measuring PSPs was followed
Frequency of monitoring/recording	Sample plots will be measured at each verification event. There will be a verification at the project at least every 5 years.
Value monitored:	See <i>ex-post</i> carbon model for all raw data and carbon calculations.
Monitoring equipment	Vertex CE4 - 04634 Vertex CE4 - 00639 Transponder 19085 Transponder 12926 2 x Calipers N/A 2 x Tape measures N/A Coleman - Lensatic Compass N/A Suunto MC -2
QA/QC procedures to be applied	10% of the PSPs are re-measured as part of the QA/ QC process – see Section 4.3, Monitoring Plan, of this Monitoring Report for the QA/ QC report.
Purpose of the data	Calculation of project emissions
Calculation method	Not applicable
Comments	In the PDD's MP it is stated that this parameter will be recorded annually; however, for the purposes of the VCS, it will be recorded at each verification event

Data / Parameter	Merchantable (Standing) Volume
Data unit	m ³ ha ⁻¹
Description	Volume equations based on DBH and Height functions for Eucalyptus and Pine are used to calculate the standing volume
Source of data	Indufor, May 2008
Description of measurement methods and procedures to be applied	N/A
Frequency of monitoring/recording	At every verification
Value monitored:	Eucalyptus: $\ln(V) = -10.7304 + 1.1837 \cdot \ln(H_{dom}) + 1.0151 \cdot \ln(N) + 1.8757 \cdot \ln(D)$ Pine: $\ln(V) = -10.6938 + 1.0579 \cdot \ln(H_{dom}) + 1.0382 \cdot \ln(N) + 1.9841 \cdot \ln(D)$

	V = Mean volume, m^3ha^{-1} Hdom = Dominant height, m N = Stocking in terms of trees per ha D = Mean Diameter, cm
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of the data	Calculation of project emissions
Calculation method	N/A
Comments	In the first monitoring report (2002 – 2008) and verification, the project used the Malimbwi 1998 pine and eucalyptus volume equations, which were developed based on the nearby Sao Hill Plantation stands. However, the application of these equations in the second monitoring period 2008 – 2012 showed that the Malimbwi equations were overestimating the volume for this period. This was indicated by the form factor of the trees: many of the trees had a form factor >1, which clearly shows that the volume equations are not correct. Therefore alternative volume equations were sought, with the Indufor study and volume equations being deemed suitable. The Indufor volume equations were developed from data from temporal sample plot measurements carried out in late 2007 and early 2008. A total of 140 plots were used for <i>Pinus patula</i> and 127 plots for <i>Eucalyptus grandis</i>. Pine plots were measured in Sao Hill, Meru and Rongai plantations, Tanzania and eucalypt plots in Sao Hill and Meru, Tanzania. The Indufor volume equations were used as well for this verification. In the PDD's MP it is stated that this parameter will be recorded annually; however, for the purposes of the VCS, it will be recorded at each verification event.

Data / Parameter	Basic wood density (D)
Data unit	t d.m./ m^3
Description	The basic wood densities of the tree species planted for this project - <i>Pinus patula</i> and eucalyptus species were obtained from literature. These were used to convert tree volume to tree biomass.
Source of data	Bryce J.M., <i>The Commercial Timbers of Tanzania</i> , revised edition of 1999. Species-specific from national studies
Description of measurement methods	Literature review will be carried out at each verification

and procedures to be applied							
Frequency of monitoring/recording	At each verification event						
Value monitored:	<table border="1"> <tr> <td></td><td>D, t d.m./m3</td></tr> <tr> <td>Pine</td><td>0.366 (15y)</td></tr> <tr> <td>Eucalyptus</td><td>0.428 (14y)</td></tr> </table>		D, t d.m./m3	Pine	0.366 (15y)	Eucalyptus	0.428 (14y)
	D, t d.m./m3						
Pine	0.366 (15y)						
Eucalyptus	0.428 (14y)						
Monitoring equipment	N/A						
QA/QC procedures to be applied	N/A						
Purpose of the data	Calculation of project emissions						
Calculation method	Not applicable						
Comments	In the PDD's MP it is stated that this parameter will be recorded every 5 years; however, for the purposes of the VCS, it will be monitored at each verification event						

Data / Parameter	Biomass Expansion Factor (BEF)						
Data unit	Dimensionless						
Description	The biomass expansion factor is used to calculate whole tree above ground biomass from merchantable volume						
Source of data	In the absence of species-specific values for BEF for the project site and the region, default value from GPG LULUCF 2003 was used, as presented in Table 10						
Description of measurement methods and procedures to be applied	Literature review will be carried out at each verification						
Frequency of monitoring/recording	At each verification event						
Value monitored:	<table border="1"> <tr> <td></td><td>BEF</td></tr> <tr> <td>Pine</td><td>1.25</td></tr> <tr> <td>Eucalyptus</td><td>2.7</td></tr> </table>		BEF	Pine	1.25	Eucalyptus	2.7
	BEF						
Pine	1.25						
Eucalyptus	2.7						
Monitoring equipment	N/A						
QA/QC procedures to be applied	N/A						
Purpose of the data	Calculation of project emissions						
Calculation method	For Eucalyptus, since no species-specific or genus specific data was available data was taken from the IPCC GPG LULUCF 2003 literature for broadleaf forest type in the same climatic zone (tropical). Since the data available was						

	not from the same genus, a conservative value was determined by taking the value which fell half way between the mean and the lower limit of the range Since for Pine there is IPCC GPG LULUCF 2003 data available for the same genus (tropical pines), the average was taken.
Comments	In the PDD's MP it is stated that this parameter will be recorded every 5 years; however, for the purposes of the VCS, it will be monitored at each verification event.

Data / Parameter	Root-Shoot Ratio																
Data unit	Dimensionless																
Description	It is used to calculate below ground biomass of tree from the aboveground biomass of standing tree.																
Source of data	IPCC GPG LULUCF 2003																
Description of measurement methods and procedures to be applied	Literature review will be carried out at each verification																
Frequency of monitoring/recording	At each verification event																
Value monitored:	<table><tr><td></td><td colspan="3">R</td></tr><tr><td>Above ground biomass t/ha</td><td>< 50</td><td>50 - 150</td><td>> 150</td></tr><tr><td>Pine</td><td>0.46</td><td>0.32</td><td>-</td></tr><tr><td>Eucalyptus</td><td>0.45</td><td>0.35</td><td>0.2</td></tr></table>		R			Above ground biomass t/ha	< 50	50 - 150	> 150	Pine	0.46	0.32	-	Eucalyptus	0.45	0.35	0.2
	R																
Above ground biomass t/ha	< 50	50 - 150	> 150														
Pine	0.46	0.32	-														
Eucalyptus	0.45	0.35	0.2														
Monitoring equipment	N/A																
QA/QC procedures to be applied	N/A																
Purpose of the data	Calculation of project emissions																
Calculation method	Values taken from table 3A.18 of the IPCC Guidelines, which are genus specific for both species. Different R values were taken considering significant different mean above ground biomass (t/ha) per strata in the project; according to IPCC Guidelines the three ranges of above ground biomass values are <50, 50-150 and >50 t/ha.																
Comments	In the PDD's MP it is stated that this parameter will be recorded every 5 years; however, for the purposes of the VCS, it will be monitored at each verification event																

Data / Parameter	Carbon Fraction
Data unit	tC /t d.m
Description	It is used to convert biomass to carbon
Source of data	IPCC default value
Description of measurement methods and procedures to be applied	Literature review will be carried out at each verification
Frequency of monitoring/recording	At each verification
Value monitored:	0.5
Monitoring equipment	Not applicable
QA/QC procedures to be applied	Not applicable
Purpose of the data	Calculation of project emissions
Calculation method	Not applicable
Comments	In the PDD's MP it is stated that this parameter will be recorded every 5 years; however, for the purposes of the VCS, it will be monitored at each verification event

Data / Parameter	Proportion of biomass burned
Data unit	%
Description	Estimate of how much biomass in the compartment was burnt following each fire
Source of data	Estimated
Description of measurement methods and procedures to be applied	-
Frequency of monitoring/recording	Following each fire
Value monitored:	0.5
Monitoring equipment	Not applicable
QA/QC procedures to be applied	Not applicable
Purpose of the data	Calculation of project emissions
Calculation method	Not applicable
Comments	In the PDD's MP it is stated that this parameter will be recorded annually; however, it will be monitored following each fire event

4.3 Monitoring Plan

Forest assessments on performance of a compartment, block, plantation and overall level should be carried out with a given interval to enable revision/updates of silvicultural and or management plans. Forest silvicultural treatments and processes are dependent on up-to-date forest inventory information that describes forest resources, quantity and quality.

Organizational structure, responsibilities and competences

Green Resources Ltd has a main administrative structure with the General Manager Director that over sees the planning and management of forest resources (Figure 10). It is supported by 5 departments comprising forestry, ESG, planning and lands, finance, and HR. The monitoring activities are planned and implemented by Planning and Lands department assisted in the field by the forest inventory team. Figure 10 shows the organizational structure followed for this monitoring report.

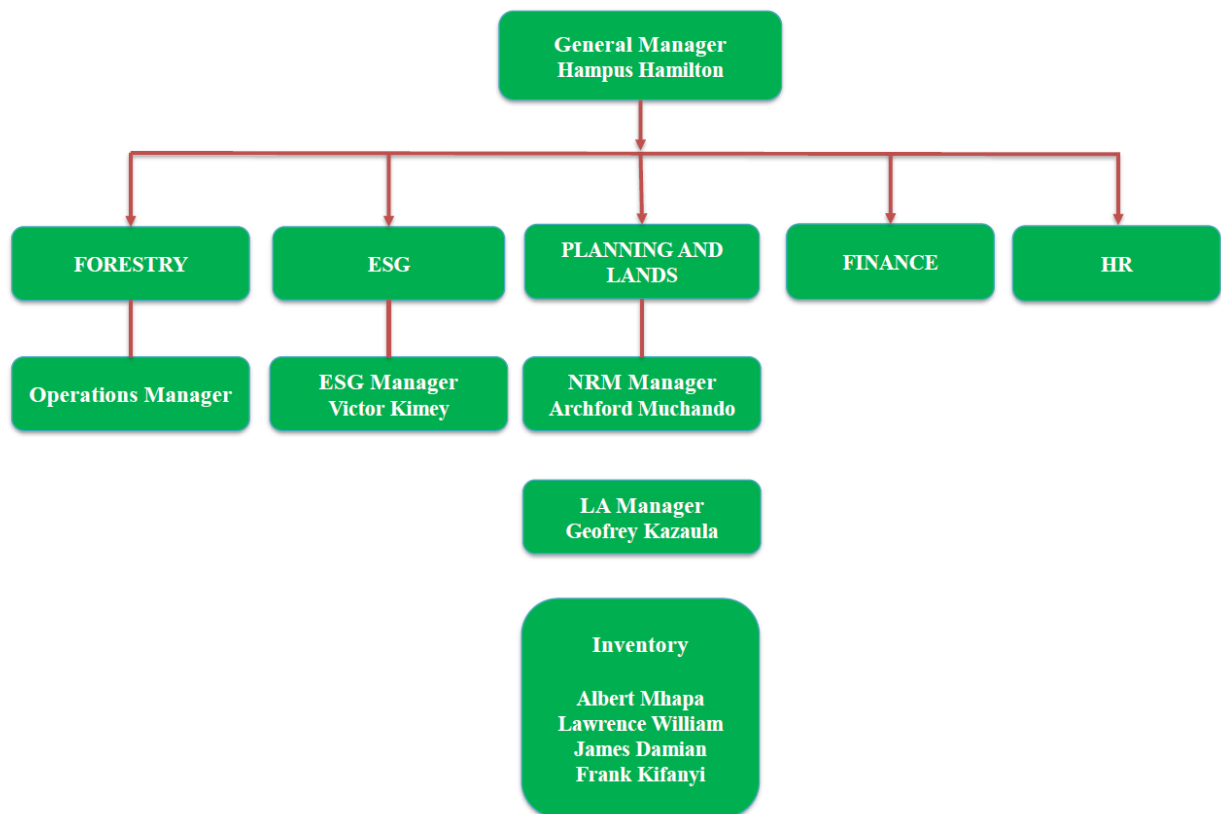


Figure 10. Organizational structure.

An overall annual monitoring report, covering a 12-month period between July and June will be issued every year comprising all aspects of the management. A summary of the monitoring results is also prepared and made available upon request by interested stakeholders. The monitoring of plantation establishment and development (maintenance, growth and performance) is conducted, by the planning department, using as the basis the guidelines for forest inventories which describe the methods, frequency and procedures for the plantations monitoring.

Field inventory guidelines

GRL inventory members have worked previously on successful carbon validations and verifications either on the Uchindile and Mapanda Reforestation Project or on other carbon projects within Green Resources, and has a wealth of first-hand forestry experience in Tanzania.

During data collection in the field, the team is placed into at least two groups collecting data for the same parameters at different locations. Each group will have a supervisor, and the groups would check one another's work through random sample re-measurement and checking of recorded data in the field. On returning to the office, the inventory manager and another senior staff will also do quality check on collected and entered data.

PSP establishment and sampling procedure

PSPs are to be clearly marked on the ground so that they can be retraced for re-measurements. The following must be clearly and accurately captured to be able to find these PSPs in future;

- The plot centre
- The coordinates of the plot centre must be captured with a GPS by averaging the position
- The distance of every tree from the plot centre and the bearing of each tree from the plot centre must be measured and recorded on the tally sheet
- Every tree on the plot must have a number which will only be recorded on the tally sheet
- The numbers of the first tree (closest to bearing 0'), the most eastern tree (closest to bearing 90'), the most southern tree (closest to bearing 180'), the most western tree (closest to bearing 270') and the closest tree to the plot centre will be printed on the trees.

Sampling intensity, distribution and location of plots

The Permanent Sample Plots (PSPs) shall be distributed systematically throughout the planted area with the aim of achieving representatives across species, age classes and sites in the forest.

It is most important to ensure that the sample of trees being measured in a plot is an efficient statistical representative of a cross-section of the whole area. This shall be done by measuring trees (or plots of trees) situated systematically throughout the plantation, covering the various site characteristics (e.g., lower slopes, mid slopes and upper slopes), age groups and the different species planted. The number of plots shall be based on a combination of growth and yield.

Therefore,

- The sites for permanent sample plots should be selected on a stratified random system extending to all planted areas
- Sampling must be restricted to pure even-aged crops of the main plantation species.

To estimate the number of PSPs, the CDM A/R Methodological Tool for “Calculation of the number of sample plots for measurement within A/R CDM Project activities” should be used.

Sampling procedure

The measurement of the PSPs began on the week of 16th July 2020. For the strata accounted in this monitoring report, 447 PSPs were measured.

Different teams from GRAS’ Planning and Land department established and measured the PSPs in the GRL plantations of Uchindile and Mapanda. There were different team members from different plantations. Each team had a skilled worker as a team leader that has undergone training and has done this work for years.

In line with the PDD and the SOP, QC of the measurements from the PSPs had to be undertaken on at least 10% of the plots to ensure that the measurements were within an acceptable error range.

Inventory collection data including QC PSPs finished in mid-November 2020. Figure 11 and Figure 12 shows the PSPs location for Mapanda and Uchindile areas.

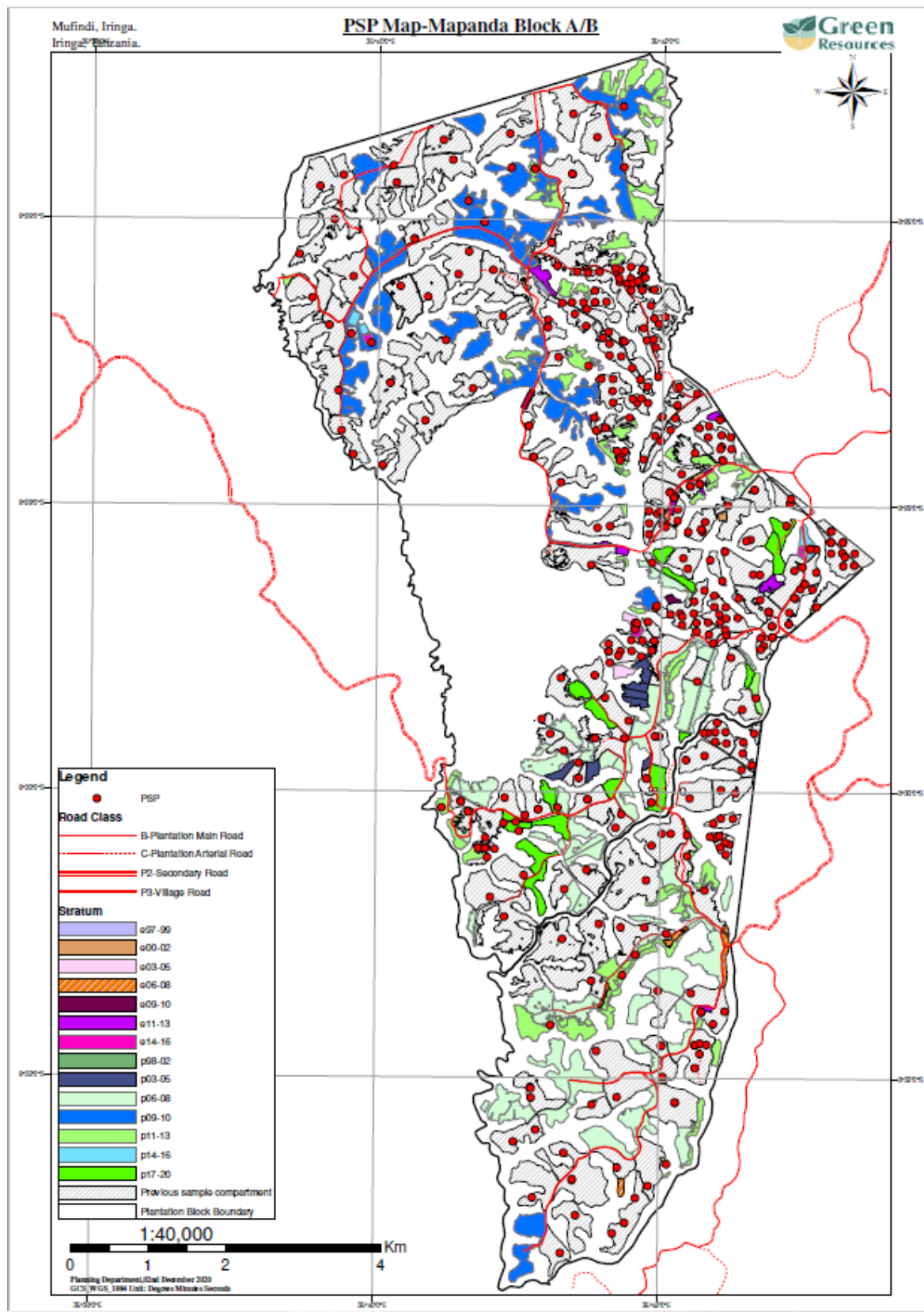


Figure 11. Permanent Sample Plots location for Mapanda.

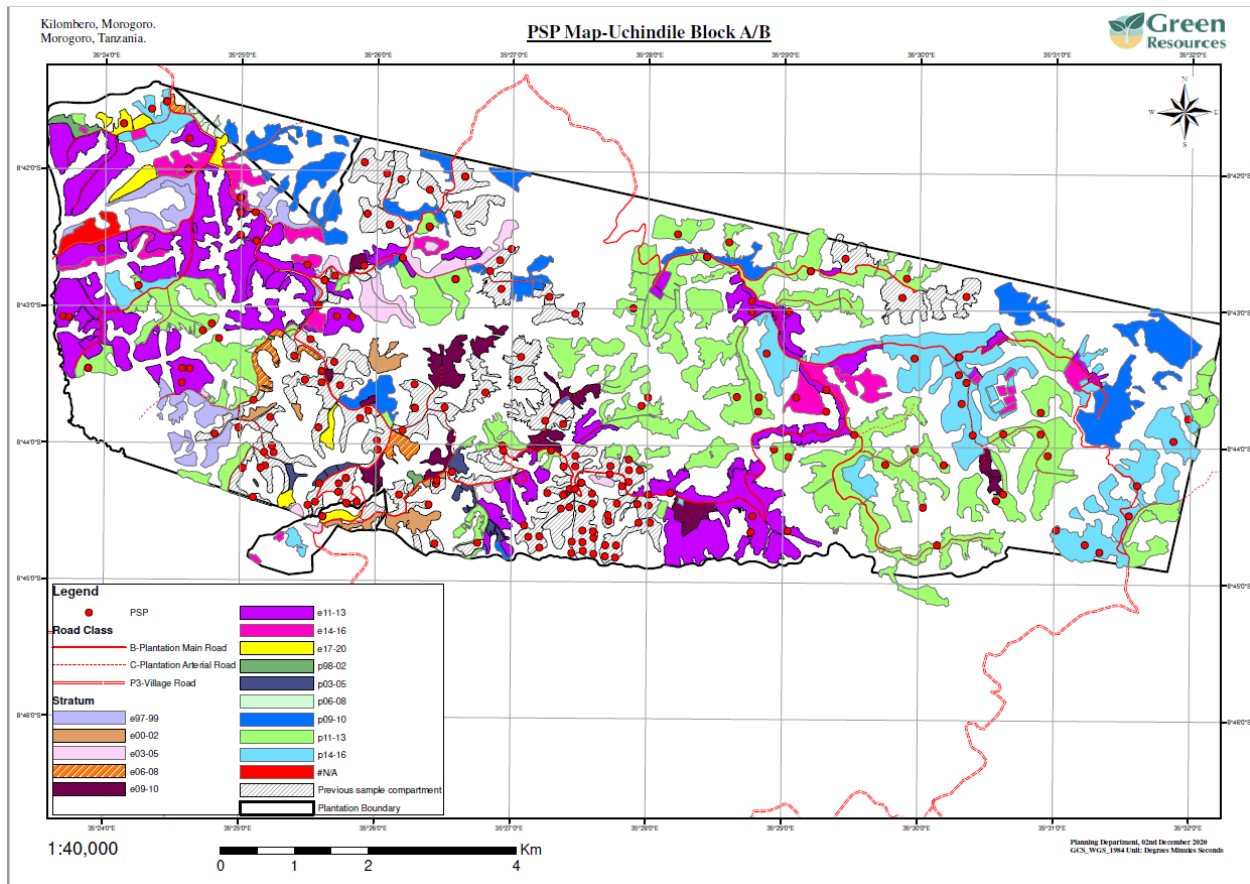
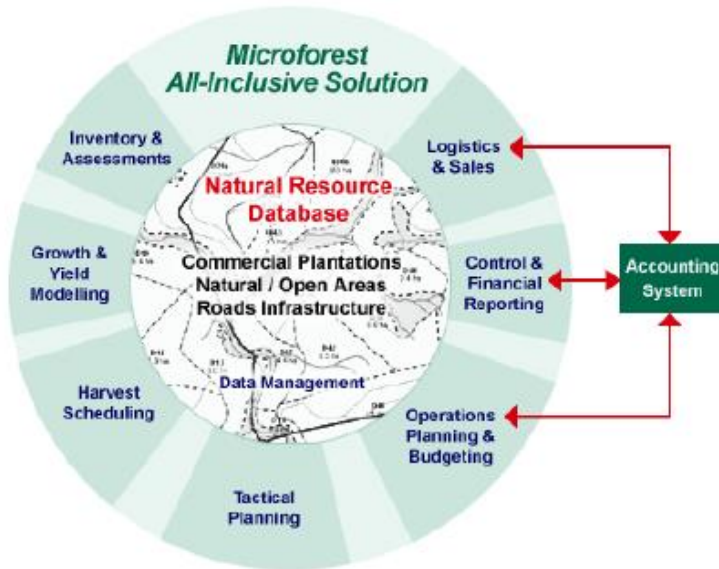


Figure 12. Permanent Sample Plots location for Uchindile.

Data management

GRL has put in place a system for monitoring and reporting the project activities. Since the first monitoring period, Green Resources has used a monitoring and inventory management system called Microforest, which is the company's principle archiving platform. Microforest is an integrated plantation and natural resource management system³⁰. It encompasses the entire life cycle of forestry operations and includes modules that manage inventory, modeling, planning, scheduling, operations, logistics and financials. This software will be the support tool for monitoring and evaluating operations. It details the responsibilities, information flows and levels of control.

³⁰ See Microforest website: <https://www.microforest.co.za/#/forest/home>



Quality control and quality assurance

- Data processing

Data processing needs to be planned at the outset, with proper provision for tools and software. The software will be customized to best fit the needs of the inventory team, so it is desirable that members of the team develop and test suitable software for entering and processing plantation PSP data. If this is done using an open source approach with Excel, we should be able to progress with the evolution of the software, using our team members.

- Data Entry

The data which has been collected in the field must be transferred to excel either the same day as the data is collected or as soon as possible. This is to avoid unnecessary data entry error. The data should be entered by a single person and not as a group, so as to avoid errors. When entering the data, use database entry forms (see inventory guidelines for GRAS_appendix 3). The hard copy must be stored at an appropriate place. In addition, one of the senior staff must review the data that has been entered to check if there is big difference between this year's measurement and last year's measurement.

- PSP - database

After data has been punched and stored in excel, the excel sheet should include the data from the previous years so as to make a database. The data will be stored and the database will be backed up on the company server. It is important that the data is entered in the same format as the database so that it is easy to analyze.

All raw data on survival counts must be safely kept and digitally preserved. Both paper and digital copies of the data should be sent to the Inventory and Monitoring unit where the data will finally be stored in the main inventory database for further analysis and backup.

- Re-measuring - field work

Since we are only measuring a small part of the forest, it is utterly important that we eliminate biased errors and minimize the random error as much as possible. Therefore, after inventory is done, another team/senior manager must check 10-20 % of plots. Whether we decide on 10 or 20 % at a given location should depend on the team and supervision in place there. In addition, the inventory team as a whole must check each other. There is nothing wrong with pointing out errors or making suggestions for improvement, even to senior staff. Those who are doing the re-measure must be someone different to those who originally measured the PSP (i.e. does the PSP measurement again entirely, and fills a form out for this). This form shall be clearly labelled "PSP x, QC re-measure". The Mapping and Inventory Manager shall review this re-measure to ensure the results are in acceptable error range. Any deviation between measurement and re-measurement below 10% is accepted, and error above 10% shall be defined, corrected and recorded. Any errors discovered should be expressed as a percentage of all plots that have been rechecked to provide an estimate of the measurement error. If not, and if there is more than the permissible error in DBH and height measurement that is outlined in this inventory guideline, all PSPs where the error occurs must be re-measured. If the error is in DBH and/or height, this has to be re-measured. The Inventory and Mapping Manager shall randomly select the PSPs controlled.

All of the following criteria should be satisfied if the PSP has been established according to the inventory guidelines. The most important thing here is to make sure that the error is not biased. Another team/senior manager when establishing a new PSP during field visit should check the following:

Critical levels/tolerance level:

- The DBH of all trees in the plot (± 2 cm)
- If the marking is at the correct height 1.3 meter. (± 10 cm)
- Check that all marked trees are inside the plot. (± 1 cm)
- Height of the trees measured in the plot. (± 1 m)
- If the location of the PSP is random.
- Trees inside the PSP should be treated the same as trees in the rest of stand. For example, if thinning is conducted inside the stand but not inside the PSP, the plot is a failure because it gives the wrong impression of the stand. So if during marking for thinning, one of the trees inside the PSP is marked to be thinned, that tree shall be thinned too.
- Check that the numbering of the trees is correct.
- Check that the GPS location is correct. If error, check datum. If datum is wrong, it can give an error of almost 300 meters.

Analyses of PSP data

All plots were analyzed using R and Excel to identify any outliers or any other clear errors. Some errors were discovered and corrected accordingly. Both age vs. height, dbh vs. height and dbh vs. age were plotted to see if any abnormalities were observed. All plots were compared to last year's measurements. Figure 13 shows dbh vs height raw data related to species, to see if any outliers where observed.

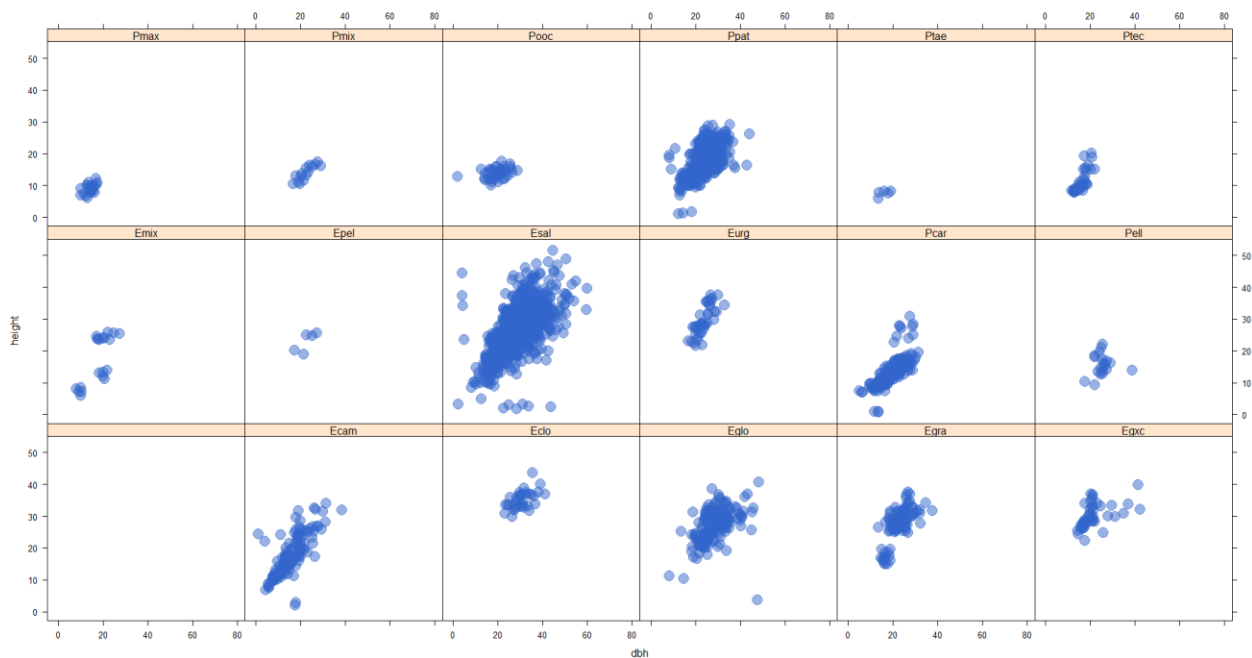


Figure 13. DBH vs height PSP measurements.

QC and Error sampling

QC plots were randomly selected using ArcGIS random selection tool. 50 PSPs were selected, but only 45 were re-measured due to 5 were on harvested compartments. The error was below 10% for each plot, except for one which was thinned between the regular field inventory and the QC field data collection (See excel QC data file).

These values indicated that the measurements done in the PSPs are satisfactory and that they provide good estimates of the total volume in the forest, and thus allow a continuing with calculation of the total carbon stocks.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

As described in the PD (Section E.3), the baseline net GHG removal by sink prior to start of the proposed ARR VCS project activity are set to zero for lands without growing trees in accordance with the recommendation of the AR methodology applied. For woody vegetation cleared as part of site preparation it is assumed the deviation from the PDD as stated in the 1st monitoring report, which is that GHG emissions from removal of existing vegetation due to site preparation are insignificant and therefore accounted as zero³¹. According to the methodology the baseline is fixed ex-ante for the whole crediting period and as such is not monitored.

5.2 Project Emissions

As per AR-AM005 version 03 only non-CO2 emissions from biomass burning are considered applicable in this project. Both leakage and baseline emissions are not applicable in this project for reasons explained in the PD. Uchindile and Mapanda Forest Projects both encountered small fires during this monitoring period. In the case of areas that were affected by fire at UFP/MFP they were either cleared completely following fire and replanted with pine or eucalyptus, or they were left following fire and they recovered. The non-CO2 emissions resulting from incomplete combustion of biomass as a result of fire are calculated following equations M.23, M.24 and M.25.

$$E_{\text{Non-CO2, BiomassBurn}, t} = E_{\text{BiomassBurn, CH4}, t} \quad (M.23)$$

$$E_{\text{BiomassBurn, CH4}, t} = E_{\text{BiomassBurn, C}, t} * EF_{\text{CH4}} * GWP_{\text{CH4}} * 16/12 \quad (M.24)$$

Where:

$E_{\text{Non-CO2, BiomassBurn}, t}$ Non-CO2 emission as a result of biomass burning within the project boundary; tonnes CO2-e yr-1 in year t

$E_{\text{BiomassBurn, CH4}, t}$ CH4 emission from biomass burning; tonnes CO2-e yr⁻¹ in year t

³¹ As per the “Guidelines on conditions under which GHG emissions from removal of existing vegetation due to site preparation are insignificant”, version 01, EB 50 report, annex 21.

$E_{BiomassBurn,C,t}$	Loss of carbon stock in above-ground biomass due to burning; tonnes C yr ⁻¹ in year t
EF_{CH_4}	IPCC default emission ratio for CH ₄ of biomass burning (IPCC default: 0.012); tC as CH ₄ (t C burned) ⁻¹
GWP_{CH_4}	Global warming potential for CH ₄ (IPCC default for the first commitment period: 21); t CO ₂ -e (t CH ₄) ⁻¹
16/12	Ratio of molecular weights of CH ₄ and carbon; dimensionless

$$E_{BiomassBurn,C,t} = \sum_{i=1}^I \sum_{j=1}^J \sum_{k=1}^K A_{burn,ijk,t} * B_{ijk,t} * PP_{ijk,t} * CE * CF \quad (M.25)$$

Where:

$E_{BiomassBurn,C,t}$	Loss of carbon stock in above-ground biomass due to burning; tonnes C yr ⁻¹ in year t
$A_{burn,ijk,t}$	Annual area affected by biomass burning in stratum i , species j , substratum k ; ha yr ⁻¹ in year t
$B_{ijk,t}$	Average above-ground biomass before burning for stratum i , species j , substratum k ; tonnes d.m. ha ⁻¹

Note: if the burning occurs during site preparation, $B_{ijk,t}$ indicates the above-ground biomass on grassland before burning. Otherwise it indicates the above-ground biomass of established forest in year t

$PP_{ijk,t}$	Proportion of biomass burned, dimensionless
CE	Combustion efficiency; dimensionless (IPCC default =0.5)
CF	Carbon fraction of dry matter; tonnes C (tonne d.m.) ⁻¹
i	Stratum i (I = total number of strata)
j	Species j (J = total number of species)
k	Substratum k (K = total number of substrata)

Project removals were calculated using the data from the 2020 inventory at UFP and MFP³². This was first used to calculate volume of trees and carbon stocks (above and below ground) at plot level for each species. Carbon stock was then converted to stratum level and to project level.

Living biomass in the project was calculated using biomass expansion factors (BEF) and root-shoot ratios (R) following equations M.15 and M.16 in the methodology.

$$TB_{AB, ijk, tree, m} = V_{ijk, m} * D * BEF_{jk} \quad (M.15)$$

$$TB_{BB, ijk, tree, m} = TB_{AB, ijk, tree, m} * R_j \quad (M.16)$$

Where:

$TB_{AB, ijk, tree, m}$ Above-ground biomass per tree of stratum i , species j , sub-stratum k ; tonnes d.m. tree⁻¹ at monitoring time m

$TB_{BB, ijk, tree, m}$ Below-ground biomass per tree of stratum i , species j , sub-stratum k ; tonnes d.m. tree⁻¹ at monitoring time m

$V_{ijk, m}$ Merchantable volume in stratum i , species j , sub-stratum k (age class); m³ ha⁻¹ at monitoring time m

Note: the volume in each plot was calculated using Indufor volume equations for both species, as shown below.

Eucalyptus:

$$\ln(V) = -10.7304 + 1.1837 * \ln(H_{dom}) + 1.0151 * \ln(N) + 1.8757 * \ln(DBH)$$

Pine:

$$\ln(V) = -10.6938 + 1.0579 * \ln(H_{dom}) + 1.0382 * \ln(N) + 1.9841 * \ln(DBH)$$

H_{dom} = Dominant height, m

N = Stocking in terms of trees per ha

DBH = Mean Diameter, cm

³² Excel file available to auditor.

D_j	Basic wood density for species j ; tonnes d.m. m^{-3} merchantable volume
BEF_{jk}	Biomass expansion factor for conversion of merchantable volume to aboveground tree biomass for species j , sub-stratum k ; dimensionless
R_j	Root-to-shoot ratio appropriate for species j ; dimensionless

Carbon stocks were estimated using equations M.17 and M.18 of the methodology, which give plot level above and below ground carbon stock, respectively.

$$PC_{AB,ijk,plot,m} = \sum_{t=1}^T TB_{AB,ijk,tree,m} * CF_j \quad (M.17)$$

$$PC_{BB,ijk,plot,m} = \sum_{t=1}^T TB_{BB,ijk,tree,m} * CF_j \quad (M.18)$$

Where:

$PC_{AB,ijk,plot,m}$	Plot level carbon stock in above-ground biomass for stratum i , species j , substratum k ; tonnes $C\ ha^{-1}$ at monitoring time m
$PC_{BB,ijk,plot,m}$	Plot level carbon stock in below-ground biomass for stratum i , species j , substratum k ; tonnes $C\ ha^{-1}$ at monitoring time m
$TB_{AB,ijk,tree,m}$	Above-ground biomass per tree of stratum i , species j , sub-stratum k ; tonnes d.m. $tree^{-1}$ at monitoring time m
$TB_{BB,ijk,tree,m}$	Below-ground biomass per tree of stratum i , species j , sub-stratum k ; tonnes d.m. $tree^{-1}$ at monitoring time m

Mean carbon stock in each stratum was calculated with equations M.11 (above ground) and M.12 (below ground) of the methodology.

$$MC_{AB,ijk,m} = \frac{\sum_{p_{ijk}=1}^{P_{ijk}} PC_{AB,ijk,plot,m}}{P_{ijk}} \quad (M.11)$$

$$MC_{BB,ijk,m} = \frac{\sum_{p_{ijk}=1}^{P_{ijk}} PC_{BB,ijk,plot,m}}{P_{ijk}} \quad (M.12)$$

Where:

$MC_{AB,ijk,m}$	Mean carbon stock in above-ground biomass for stratum i , species j , substratum k ; tonnes $C\ ha^{-1}$ at monitoring time m
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$MC_{BB,ijk,m}$	Mean carbon stock in below-ground biomass for stratum i, species j, substratum k; tonnes C ha ⁻¹ at monitoring time m
$PC_{AB,ijk,plot,m}$	Plot level carbon stock in above-ground biomass for stratum i, species j, substratum k; tonnes C ha ⁻¹ at monitoring time m
$PC_{BB,ijk,plot,m}$	Plot level carbon stock in below-ground biomass for stratum i, species j, substratum k; tonnes C ha ⁻¹ at monitoring time m
P_{ijk}	Plot in stratum i, species j, sub-stratum k (P_{ijk} = total number of plots in stratum i, species j, sub-stratum k); dimensionless

Carbon stock in each stratum is then calculated taking the mean carbon stock and the area of each stratum (equations M.13 and M.14 of methodology). Table 11 summarizes the steps and values obtained for this monitoring period.

$$C_{AB,ijk,m} = A_{ijk,m} * MC_{AB,ijk,m}$$

$$C_{BB,ijk,m} = A_{ijk,m} * MC_{BB,ijk,m}$$

Where:

$C_{AB,ijk,m}$	Changes in carbon stock in above-ground biomass for stratum i, species j, substratum k; tonnes C at monitoring time m
$C_{BB,ijk,m}$	Changes in carbon stock in below-ground biomass for stratum i, species j, substratum k; tonnes C at monitoring time m
$A_{ijk,m}$	Area of stratum i, species j, sub-stratum k; hectare (ha) at monitoring time m
$MC_{AB,ijk,m}$	Mean carbon stock in above-ground biomass for stratum i, species j, substratum k; tonnes C ha ⁻¹ at monitoring time m
$MC_{BB,ijk,m}$	Mean carbon stock in below-ground biomass for stratum i, species j, substratum k; tonnes C ha ⁻¹ at monitoring time m

Carbon stock changes are given by equations M.3, M.4 and M.5:

$$\Delta C_{ijk,t} = (\Delta C_{AB,ijk,t} + \Delta C_{BB,ijk,t}) * \frac{44}{12} \quad (M.3)$$

$$\Delta C_{AB,ijk,t} = \frac{C_{AB,ijk,m2} - C_{AB,ijk,m1}}{T} \quad (M.4)$$

$$\Delta C_{BB,ijk,t} = \frac{C_{BB,ijk,m2} - C_{BB,ijk,m1}}{T} \quad (M.5)$$

Where:

$\Delta C_{ijk,t}$	Verifiable changes in carbon stock in living biomass of trees for stratum i, species j, sub-stratum k; tonnes CO ₂ yr ⁻¹ in year t
$\Delta C_{AB,ijk,t}$	Changes in carbon stock in above-ground biomass of trees for stratum i, species j, sub-stratum k; tonnes CO ₂ yr ⁻¹ in year t
$\Delta C_{BB,ijk,t}$	Changes in carbon stock in below-ground biomass of trees for stratum i, species j, sub-stratum k; tonnes CO ₂ yr ⁻¹ in year t
C_{AB,ijk,m_2}	Carbon stock in above-ground biomass of trees for stratum i, species j, substratum k calculated at monitoring point m ₂ ; tonnes C
C_{AB,ijk,m_1}	Carbon stock in above-ground biomass of trees for stratum i, species j, substratum k calculated at monitoring point m ₁ ; tonnes C
C_{BB,ijk,m_2}	Carbon stock in below-ground biomass of trees for stratum i, species j, substratum k calculated at monitoring point m ₂ ; tonnes C
C_{BB,ijk,m_1}	Carbon stock in below-ground biomass of trees for stratum i, species j, substratum k calculated at monitoring point m ₁ ; tonnes C
T	Number of years between monitoring point m ₂ and m ₁
$\frac{44}{12}$	Ratio of molecular weights of CO ₂ and carbon; dimensionless

Actual net GHG emission removals by sinks represent the sum of changes in carbon stocks for this monitoring period minus the non-CO₂ emissions from biomass burning and are given by equation M.26:

$$\Delta C_{ACTUAL,t} = \sum_{i=1}^I \sum_{j=1}^J \sum_{k=1}^K \Delta C_{ijk,t} - E_{Non-CO_2,BiomassBurn,t}$$

Where:

$\Delta C_{ACTUAL,t}$	Actual net greenhouse gas removals by sinks; tones CO ₂ -e yr ⁻¹ for year t
i	Stratum i (I = total number of strata)
j	Stratum j (J = total number of strata)
k	Stratum k (K = total number of strata)

Table 11. Values obtained for the project monitoring period.

Strata	Mean above ground carbon stock	Mean below ground carbon stock	Area of stratum	Above ground carbon stock per stratum	Below ground carbon stock per stratum	Total carbon stock (tC)
	tC/ha		ha	tC		
p03-05	44.41	14.21	40.70	1,807.41	578.37	2,385.78
p06-08	67.73	21.67	615.05	41,659.27	13,330.97	54,990.24
p09-10	38.85	12.99	1,435.49	55,770.90	18,652.46	74,423.36
p11-13	24.59	8.99	1,206.99	29,676.87	10,846.70	40,523.57
p14-16	10.13	4.66	440.99	4,465.88	2,054.31	6,520.19
e97-99	103.80	23.27	263.63	27,364.55	6,134.79	33,499.34
e00-02	107.46	23.89	163.29	17,546.98	3,901.72	21,448.70
e03-05	107.08	23.76	359.43	38,486.83	8,539.01	47,025.84
e06-08	117.40	26.46	89.35	10,489.70	2,364.27	12,853.98
e09-10	164.47	32.89	215.39	35,425.04	7,085.01	42,510.05
e11-13	128.64	27.38	691.58	88,962.32	18,935.62	107,897.94
e14-16	113.31	22.66	102.84	11,652.84	2,330.57	13,983.41
Total			5,624.73			560,452
Total carbon stock in tCO₂						2,054,992

The carbon stock accumulated in the project lifetime until 2020 is shown in Table 11, which is 560,452 tC for an area of 5,624.73 ha. The value is then converted into tCO₂ using a default value (44/12) as per IPCC. The project total carbon sequestration is 2,054,992 tCO₂.

However, the long-term average was updated from 3,538,666 tCO₂ (referenced in section A.4.6 of the PDD) to 819,735 tCO₂. This reduction results from i) a change in project boundary, Uchindile area was reduced to about half the initial area, ii) changes in wood densities and changes in the assumed Mean Annual Increment (MAI), which is based on actual inventory data, and c) changes in the plantation management (harvesting and thinning cycles). Six different regimes (3 for Eucalyptus, 3 for Pine) were created based on age cohorts. Harvesting is based on harvesting regimes as determined by GRL forest management system. Moreover, it was assumed that the MAI will be kept in future rotations following a conservative scenario.

With this long-term average update, the project reach the long-term average at this fourth carbon verification, which means that it cannot issue above 819,735 tCO₂ and momentarily this will be the last monitoring that allows the project owner to claim verified carbon units. Nonetheless, it is likely that the long-term average will increase in the upcoming years due to the silvicultural practices and forestry plantation management developed by GRL. It is expected that the planting materials will improve 30% along with the technology employed in the project area.

Finally, the long-term average is used as the maximum volume that the project can issued during its lifetime. To the 819,735 tCO₂ amount, it was subtracted the previously verified emission reduction corresponding to the sum of the last three verification events equal to 228,525 tCO₂ (Table 12), obtaining a final value of 591,210 tCO₂ available to be issued in the present verification event.

Table 12. Previously verified emission reduction.

Change in carbon stock over time	tCO ₂
2002 - 2008 Change in Carbon Stock	139,358
2008 - 2012 Change in Carbon Stock	22,789
2012-2013 Change in Carbon Stock	66,378
	228,525

5.3 Leakage

No leakage was anticipated at the PD stage and was thus not monitored.

5.4 Net GHG Emission Reductions and Removals

Net change in carbon stocks is equal to 591,210 tCO₂ as described in section 5.2.

Non-permanence risk rating (as set in the NPRR) is equal to 10%.

Therefore, buffer credits that need to be deposited in the buffer pool are equal to 59,121 tCO₂

VCU eligible for issuance for the monitoring period is 532,089 tCO₂.

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)	Buffer pool allocation	VCUs eligible for issuance
2013	-	947	-	947	95	853
2014	-	86,455	-	86,455	8,645	77,809
2015	-	86,455	-	86,455	8,645	77,809

2016	-	86,692	-	86,692	8,669	78,023
2017	-	86,455	-	86,455	8,645	77,809
2018	-	86,455	-	86,455	8,645	77,809
2019	-	86,455	-	86,455	8,645	77,809
2020	-	71,296	-	71,296	7,130	64,166
Total	-	591,210	-	591,210	59,121	532,089

APPENDIX 1: FOREST INVENTORY



Figure 14. Inventory field team.

APPENDIX 2: FIRELINES

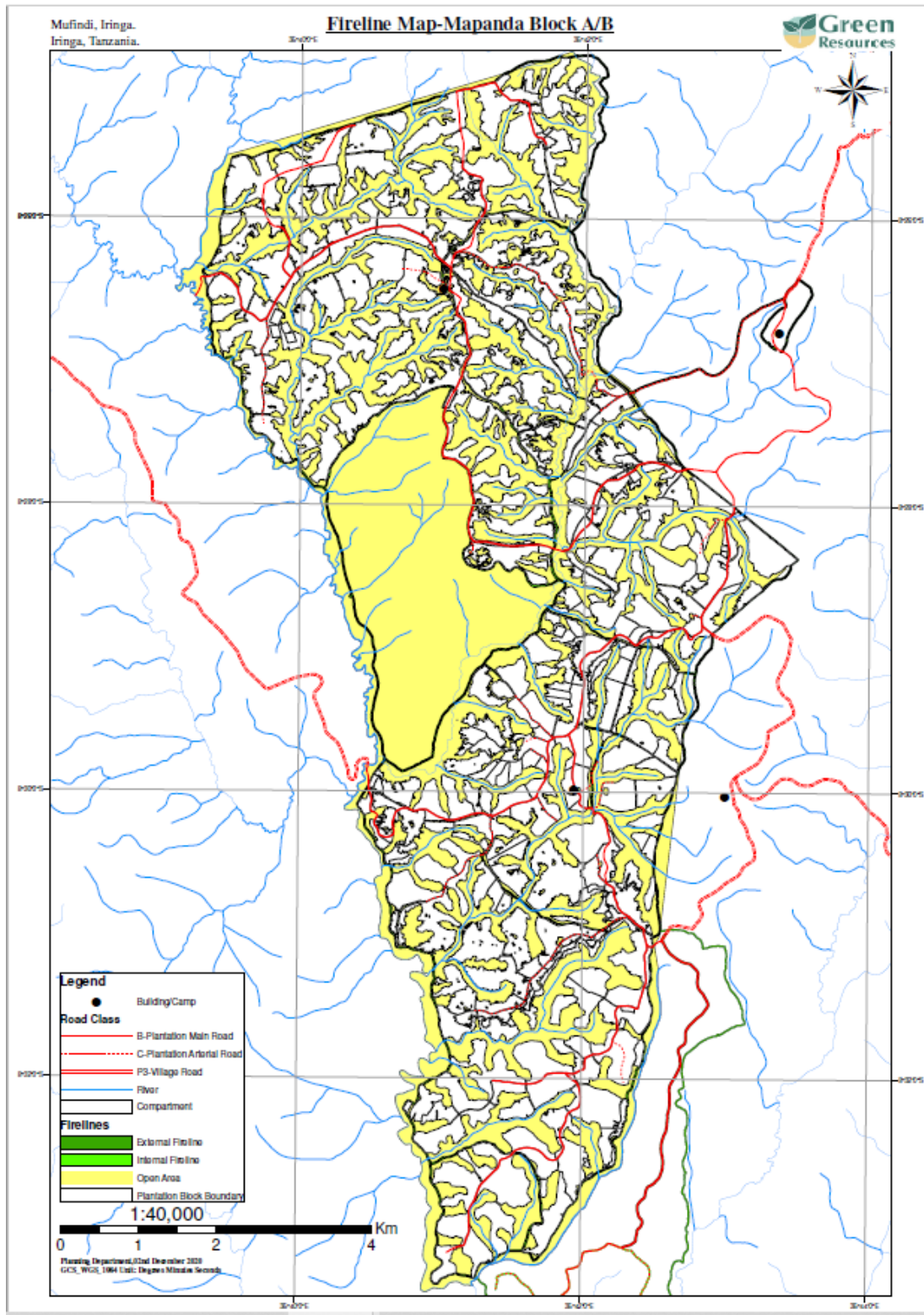


Figure 15. Firelines map for Mapanda.

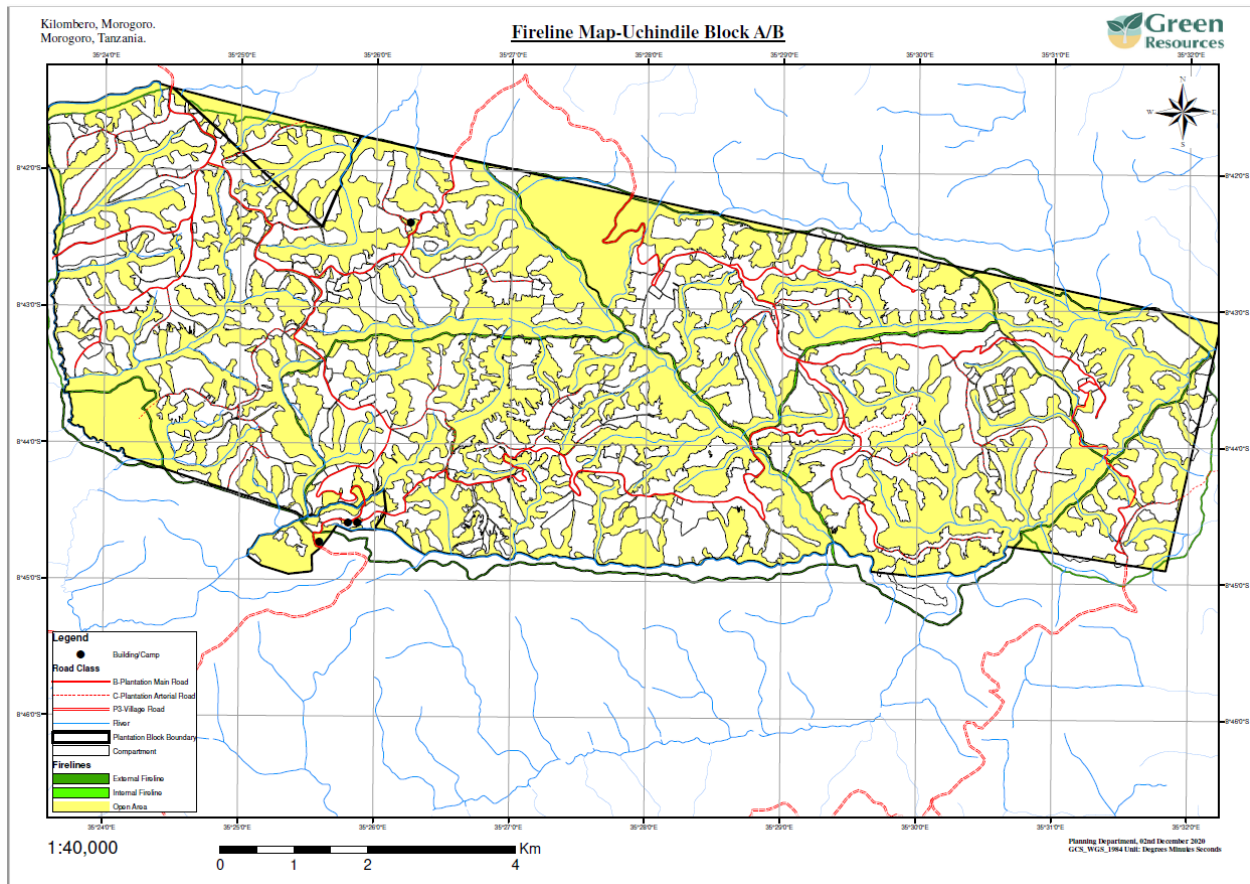


Figure 16. Fireline map for Uchindile.