

Annex 22 – Assessment of GHG Emission Reductions

For Riparian vegetation

Methods: To estimate the annual CO₂ removal from assisted natural regeneration (restoration interventions), the activity area was multiplied by removal factors for riparian forests. The removal factors for each forest type were obtained from the Forest Emission Reference Level (FREL) reports developed under the National REDD+ Project in Fiji. The development of removal factors followed the IPCC recommended approach and methodologies using a combination of field data (e.g., National Forest Inventory, Permanent Sample Plot Inventory), allometric equations for biomass estimation, and conversion factors to arrive at the carbon stock and removal estimates for each forest type. A brief summary of the removal factor methodology is outlined in bullets below.

Natural Forests (Afforestation and Reforestation): For afforestation and reforestation of natural forest species, data on mean annual increment (MAI) provided by Fiji Hardwood Corporation Limited (FHCL) were used. The MAI, reported in volume increments, was converted to carbon increments using a biomass expansion factor (1.1), root-to-shoot ratio (0.37), and carbon fraction (0.47). The calculated mean annual carbon increment for these areas was 2.63 tC ha⁻¹ yr⁻¹ (lower CI [tC ha⁻¹ yr⁻¹]: 1.61 and upper CI [tC ha⁻¹ yr⁻¹]: 3.66). To estimate the total lifetime CO₂ removals, the annual removals were multiplied by 10, 20, 25 and 30 years to account for the number of years the activity is expected to continue to sequester carbon.

With the exception of *Dakua*, which is a native conifer, the proposed species (*Vesi*, *Denu*, *Mavota*, and *Kaudamu*) are all indigenous hardwoods. *Dakua* is a large, long-lived native timber species and is expected to contribute comparably to long-term biomass accumulation in mixed native forest restoration plantings. As there are currently no nationally validated mean annual increment (MAI) or carbon removal factors available for Fiji's native restoration species, the removal factor derived from the FREL represents the best available and nationally approved estimate. Given that the proposed restoration species are predominantly native hardwoods, and that *Dakua* exhibits similar long-term biomass accumulation characteristics despite being a conifer, applying this removal factor provides a reasonable, transparent, and conservative approach for estimating carbon removals until species-specific growth and sequestration data become available.

Fiji FREL removal factors sources (Project Document Folder)

1. Annex 22c_EmissionFactors.docx
2. Annex22c_FRLCalculations.docx

Interventions	Location	Area (ha)	Total annual removals (tCO₂e/year) [area*removal factor]	Total lifetime removals (tCO₂e) [Total annual removal* 10 years]	Total lifetime removals (tCO₂e) [Total annual removal* 20 years]	Total lifetime removals (tCO₂e) [Total annual removal* 25 years]	Total lifetime removals (tCO₂e) [Total annual removal* 30 years]
Riparian vegetation restoration and fencing (500 m buffer) – all areas	Ba	896	8,648	86,483	172,966	216,207	259,448
	Ra	424	4,092	40,925	81,850	102,312	122,775
	Bua	483	4,662	46,620	93,239	116,549	139,859
	Macuata	721	6,959	69,592	139,183	173,979	208,775

Mangrove forests

To estimate the annual CO₂ removal from assisted natural regeneration (restoration interventions), the activity area was multiplied by carbon gains from revegetation or planting by taking into account survival rates from field derived monitoring data and biomass growth rate (4.7 tonnes) and gains from soil carbon accumulation (using IPCC default of 1.62).

IPCC Source: [IPCC Coastal wetlands Supplement 2013, Table 4.12, 4.4 and 4.5](#)

To estimate the total lifetime CO₂ removals, the annual removals were multiplied by 10, 20, 25 and 30 years to account for the number of years the activity is expected to continue to sequester carbon.

Location	Area (ha)	Total Carbon Stocks (tC yr-)	Total Annual removals (tCO₂e yr-)	Total lifetime removals (tCO₂e) [Total annual removal* 10 years]	Total lifetime removals (tCO₂e) [Total annual removal* 20 years]	Total lifetime removals (tCO₂e) [Total annual removal* 25 years]	Total lifetime removals (tCO₂e) [Total annual removal* 30 years]
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Ba	541	2,581	9,465	94,648	189,295	236,619	283,943
Ra	192	983	3,606	36,055	72,111	90,138	108,166
Macuata	102	522	1,915	19,154	38,309	47,886	57,463

The total mitigation benefit of the project over the 10-year implementation period is 393,476 tCO₂e (95% CI: 283,841, 495,281) and total benefit over 30-year project lifespan is 1,180,429 tCO₂e (95% CI: 851,522, 1,485,843). The current estimates reflect a conservation estimate of the true mitigation potential as they account for field derived data on survival rates, and removal factors.

Monitoring, Reporting and Verification (MRV) framework

Mitigation co-benefits will be tracked using a standard MRV framework consisting of baseline assessment, periodic monitoring, and impact assessment. Baseline conditions will be established prior to restoration implementation, including initial vegetation cover, tree density, species composition, biomass/carbon stocks, soil carbon status (where applicable), and hydrological conditions for wetland restoration sites.

During implementation, restoration progress will be monitored through a combination of field measurements and remote sensing approaches. Monitoring will assess changes relative to both the baseline condition (to demonstrate improvement resulting from restoration activities) and an appropriate reference ecosystem (to evaluate progress towards ecological recovery). Reference areas will be selected based on comparable ecological characteristics, including vegetation type, hydrological regime, landscape position, and climate conditions.

Indicators will include vegetation establishment, survival rates, vegetation structure, biomass/carbon accumulation, and ecosystem condition. Satellite imagery and aerial observations will be used to monitor changes in vegetation extent and land-cover conditions, while field surveys will validate remote sensing estimates and assess ecological recovery.

Final measurements will be compared against baseline conditions and reference ecosystem characteristics to evaluate restoration performance, quantify achieved mitigation benefits, and identify any additional management actions required.

Indicators for monitoring

Indicator	Baseline measurement	Reference comparison	Monitoring approach
Restoration area (ha)	Initial degraded area mapped	Extent of comparable intact ecosystem	GIS mapping and satellite imagery
Vegetation cover (%)	Pre-restoration cover	Cover in reference ecosystem	Remote sensing + field plots
Tree/vegetation density (individuals ha ⁻¹)	Initial density	Density of reference vegetation	Permanent sample plots
Species composition	Baseline species inventory	Native species composition/diversity of reference site	Field surveys
Survival rate (%)	NA	Natural regeneration/establishment characteristics	Field monitoring
Above-ground biomass/carbon (tC ha ⁻¹)	Baseline biomass estimate	Biomass stocks in reference ecosystem	Forest inventory measurements
Soil organic carbon (tC ha ⁻¹)	Baseline soil carbon	Soil carbon levels in reference ecosystem (where available)	Soil sampling
Hydrological condition (wetlands)	Baseline inundation/water table	Hydrological characteristics of reference wetland	Field measurements

Land-cover condition	Baseline satellite imagery	Vegetation extent and continuity of reference ecosystem	Remote sensing
Carbon removals (tCO ₂ e)	Baseline carbon estimate	Progress towards reference ecosystem carbon stocks	Carbon accounting