BIOMASS ENERGY

for Climate Change Mitigation & Adaptation in South Pacific

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NABOU BIOMASS POWER PLANT

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2. NABOU BIOMASS POWER PLANT

Project Overview

12 MW

FEA

1. **PROJECT TYPE:** BIOMASS POWER PLANT (Renewable Energy)
2. **LOCATION:** NABOU, WESTERN DIVISION, FIJI
3. **CAPACITY:** 12MW (Covering 40,000 households)
4. **FUEL:** WOOD BIOMASS (Wood Chip)
5. **CONSTRUCTION PERIOD:** 28 Months (200 job creation)
6. **OPERATING PERIOD:** 25 Years (Operator 50 jobs, Forest 100 jobs)
7. **OFFCIAL OPENING:** July 27, 2017

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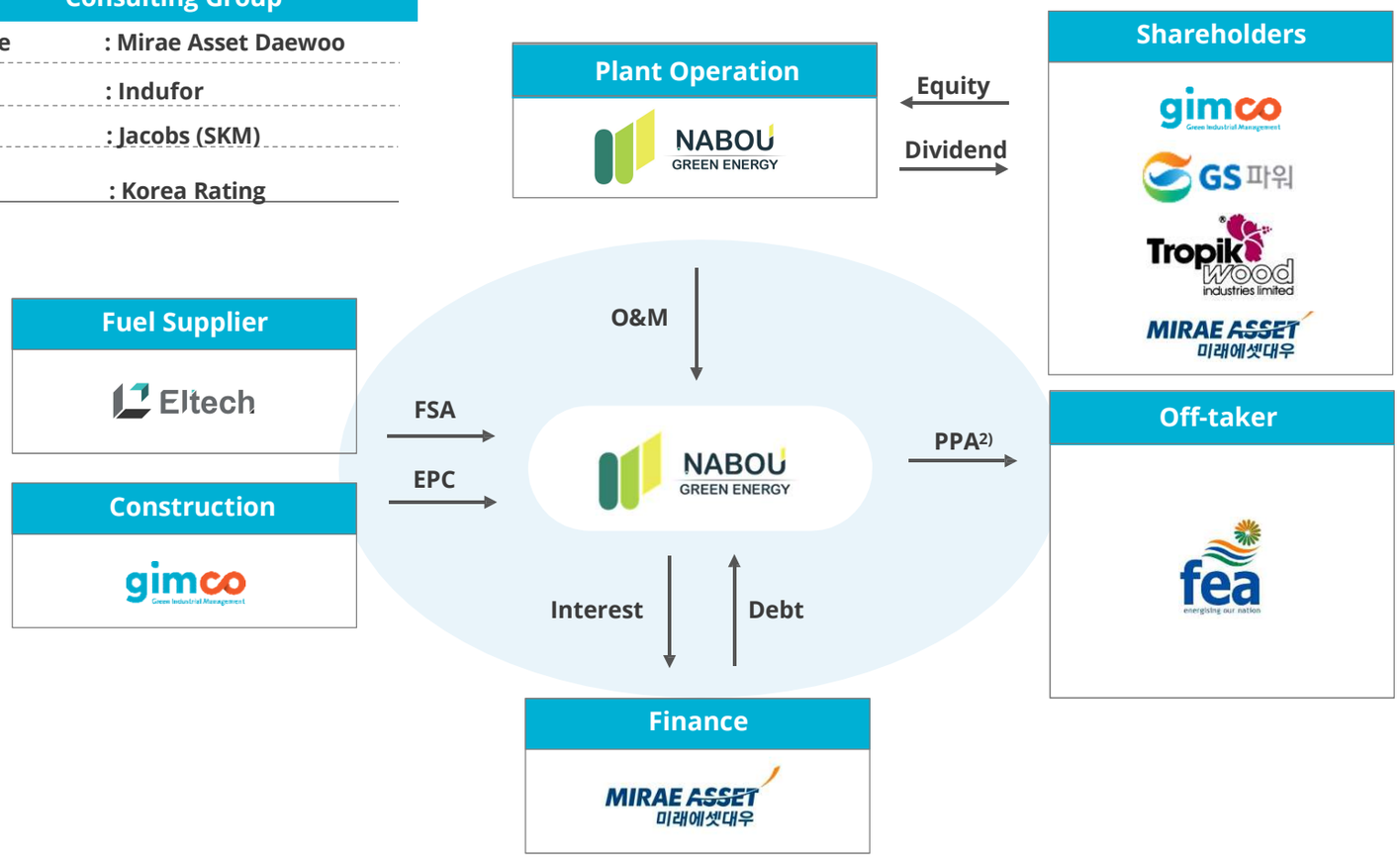
2. Nabou Biomass Power Plant

Project Structure

Consulting Group	
Finance	: Mirae Asset Daewoo
Fuel	: Indufor
Tech	: Jacobs (SKM)
F/S	: Korea Rating



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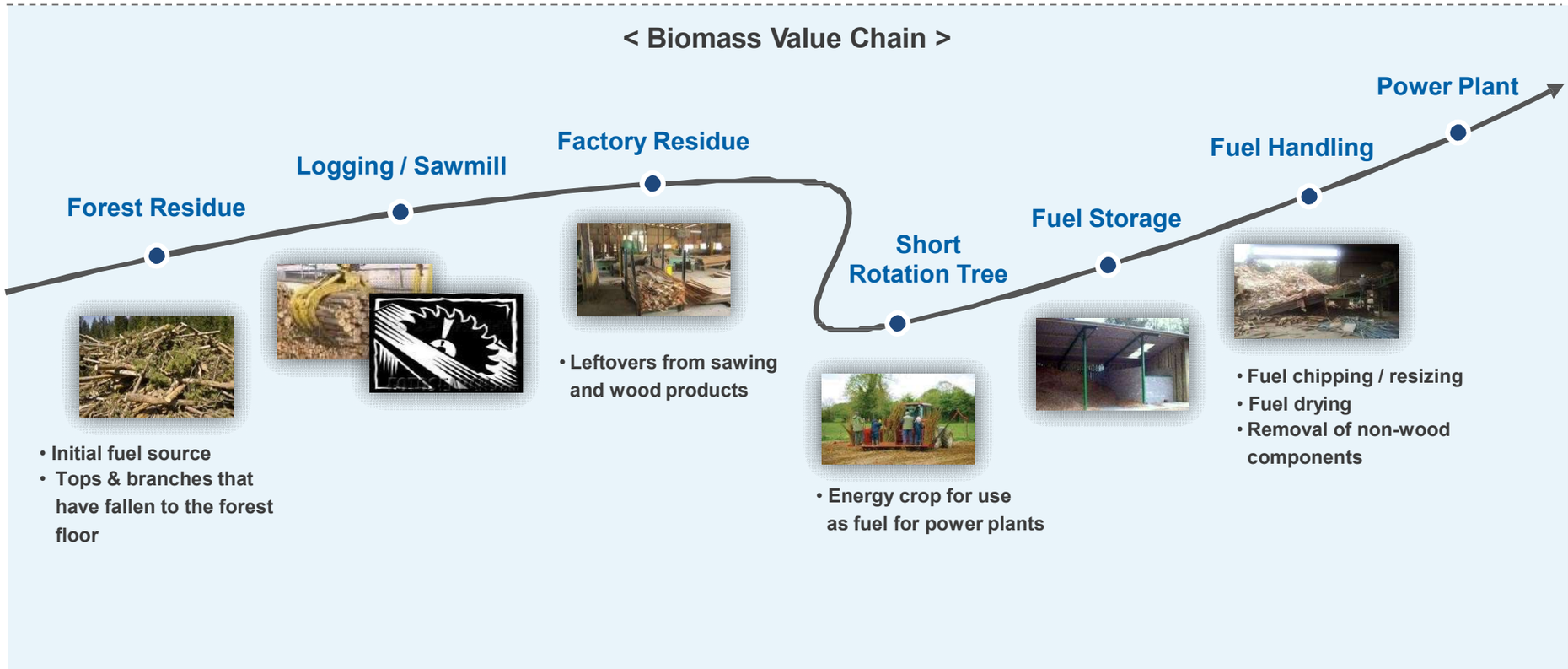
2. NABOU BIOMASS POWER PLANT

Fuel Supply – Biomass Energy

- Stable fuel sourcing strategy and fuel handling “know-how” are the key factors to a successful biomass project.



BIOMASS ENERGY PROGRAMME
IN SOUTH PACIFIC

1. BIOMASS ENERGY PROGRAMME IN SOUTH PACIFIC

Programme Background

- **Energy** is a cornerstone of national advancement.
- **Greening energy system** contributes to directing national development towards a sustainable pathway.
- South Pacific Islands Countries (SPICs) are actively exploring viable alternative energy sources as their energy needs are met predominantly by diesel generation. Given the region's **heavy reliance on imported fossil fuels**, We aims to help the SPICs increase the uptake of renewable energy (RE), and ensure **energy security** across the region.
- Hence, we propose a **"Biomass Energy Programme in the South Pacific"** with Korea Development Bank (KDB) and Green Climate Fund (GCF).

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1. BIOMASS ENERGY PROGRAMME IN SOUTH PACIFIC

Programme Overview

1. **HOST COUNTRIES:** Fiji & Papua New Guinea (PNG)
2. **FOCUS CATEGORIES:** Mitigation (Power Generation) / Adaptation (Plantation)
3. **FINANCING SIZE:** U$ 500 mil (approx., funded by GCF, KDB, Mirae Asset Daewoo)
4. **EXECUTIVE ENTITY:** Korean Consortium SPC
5. **BRIEF SUMMARY:**

   - The proposed programme plans to build and distribute **biomass power plants across SPICs.**
   - Starting with a 12 MW power plant in Fiji Sabeto district.
   - Following the completion of the plant in Sabeto, we intend to leverage the biomass deployment model for **scaling-up and replication** to other parts of targeted area.
   - This RE initiative is to help SPICs make a desirable transition to the **RE-based system**, and further realize their full potential.

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1. BIOMASS ENERGY PROGRAMME IN SOUTH PACIFIC

Programme Components

COMPONENT 1: SIX BIOMASS POWER PLANTS (12MW each)

- 4 Biomass Power Plants in Fiji / 2 Biomass Power Plants in PNG
- Expected total cost for Comp. 1 is around U$ 300 mil, each costs around $U 50 mil

COMPONENT 2: WOOD PELLET PLANT

- Wood Pellet Plant in Fiji for 500,00 ton/yr Production
- Expected total cost for Comp. 2 is around U$ 200 mil

COMPONENT 3: TECHNICAL ASSISTANCE

- Provide to create an enabling environment for a successful delivery of the other two components

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1. BIOMASS ENERGY PROGRAMME IN SOUTH PACIFIC

Sabeto Biomass Power Plant - Overview

12 MW

FEA

1. **PROJECT TYPE:** BIOMASS POWER PLANT (Renewable Energy)
2. **LOCATION:** SABETO, WESTERN DIVISION, FIJI
3. **CAPACITY:** 12MW (Covering 40,000 households)
4. **FUEL:** WOOD BIOMASS (Wood Chip)
5. **CONSTRUCTION PERIOD:** 28 Months (200 job creation)
6. **OPERATING PERIOD:** 25 Years (Operator 50 jobs, Forest 100 jobs)
7. **OFFCIAL OPENING:** Mid 2020 (Expected)

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Sabeto Biomass Power Plant - Location

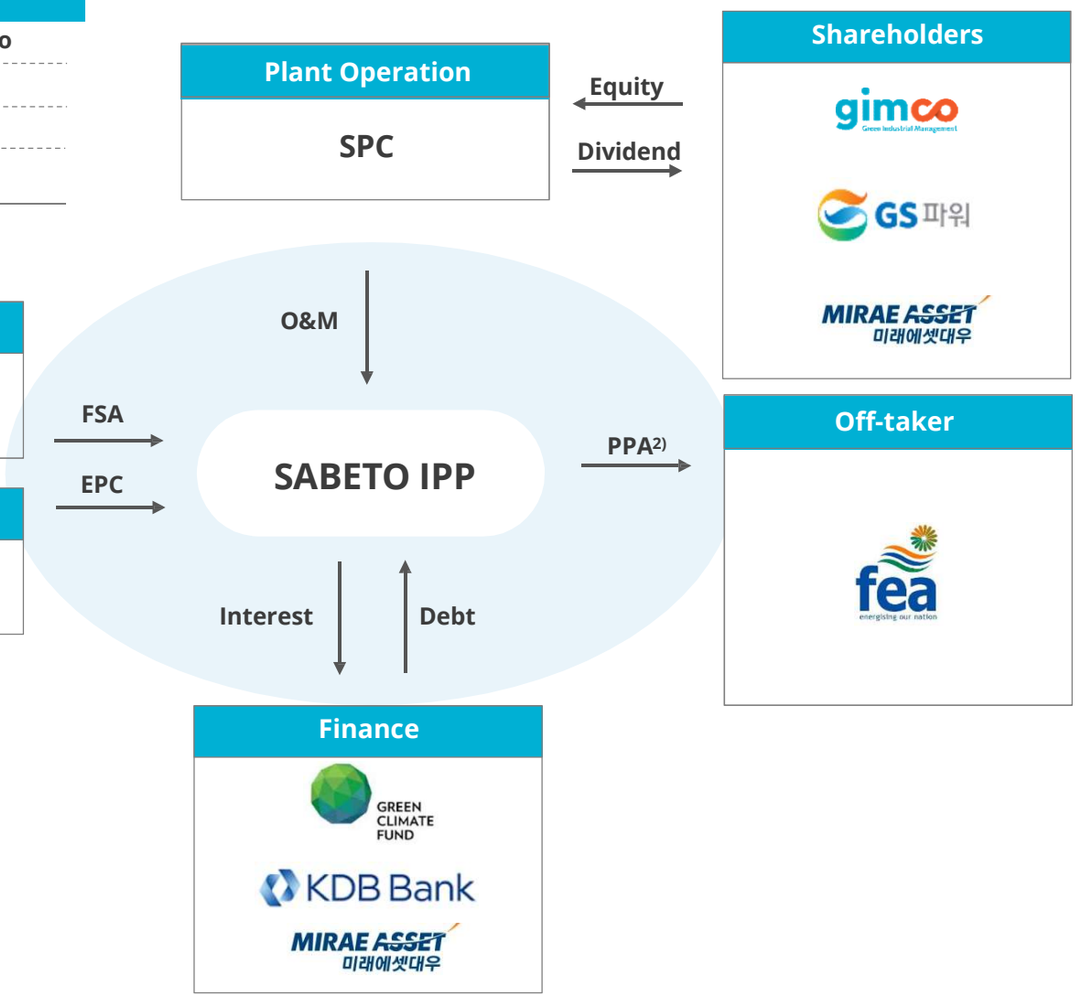
Sabeto Biomass Power Plant

Nabou Biomass Power Plant

1. BIOMASS ENERGY PROGRAMME IN SOUTH PACIFIC

Sabeto Biomass Power Plant – Structure (Tentative)

Consulting Group	
Finance	: Mirae Asset Daewoo
Fuel	: Indufor
Tech	: Jacobs (SKM)
F/S	: Korea Rating



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Biomass Fuel

- Securing biomass fuel source (wood) with sustainability is key to successful programme delivery

Item	Securing Method	Size
Short Rotation Tree (Energy Wood)	Plantation (Rotational)	5,000 ha / 12MW plant
African Tulip (Invasive)	Eradication with MF	10 million ton (est.) in Viti Levu
Wood Residues	Sawmill/Logging	50,000 ton/yr in Western Division

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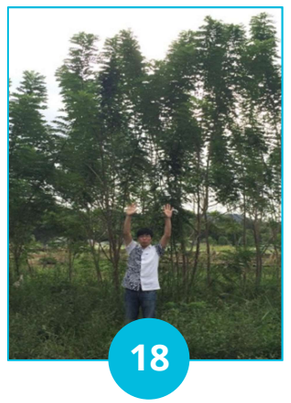
1. BIOMASS ENERGY PROGRAMME IN SOUTH PACIFIC

Biomass Fuel – Short Rotation Tree (Energy Wood)

Species	Securing Method	Size
Short Rotation Tree (Energy Wood)	Plantation (Rotational)	5,000 ha per 12MW plant



- 5,000 ha is already secured and being planted for Nabou power plant.
- Additional 5,000 ha on abandoned farming area will be utilized for Sabeto plant
- Gliricidia Sepium and Acacia Mangium are primary species.

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Biomass Fuel – African Tulip (Invasive)

Species	Securing Method	Size
African Tulip (Invasive)	Eradication with MF	10 million ton (est.) in Viti Levu

- African Tulip is the most invasive species tree in South Pacific
- Utilizing it as biomass fuel can bring the invaded land back to farmers
- After eradication, the land also can be used for energy wood plantation

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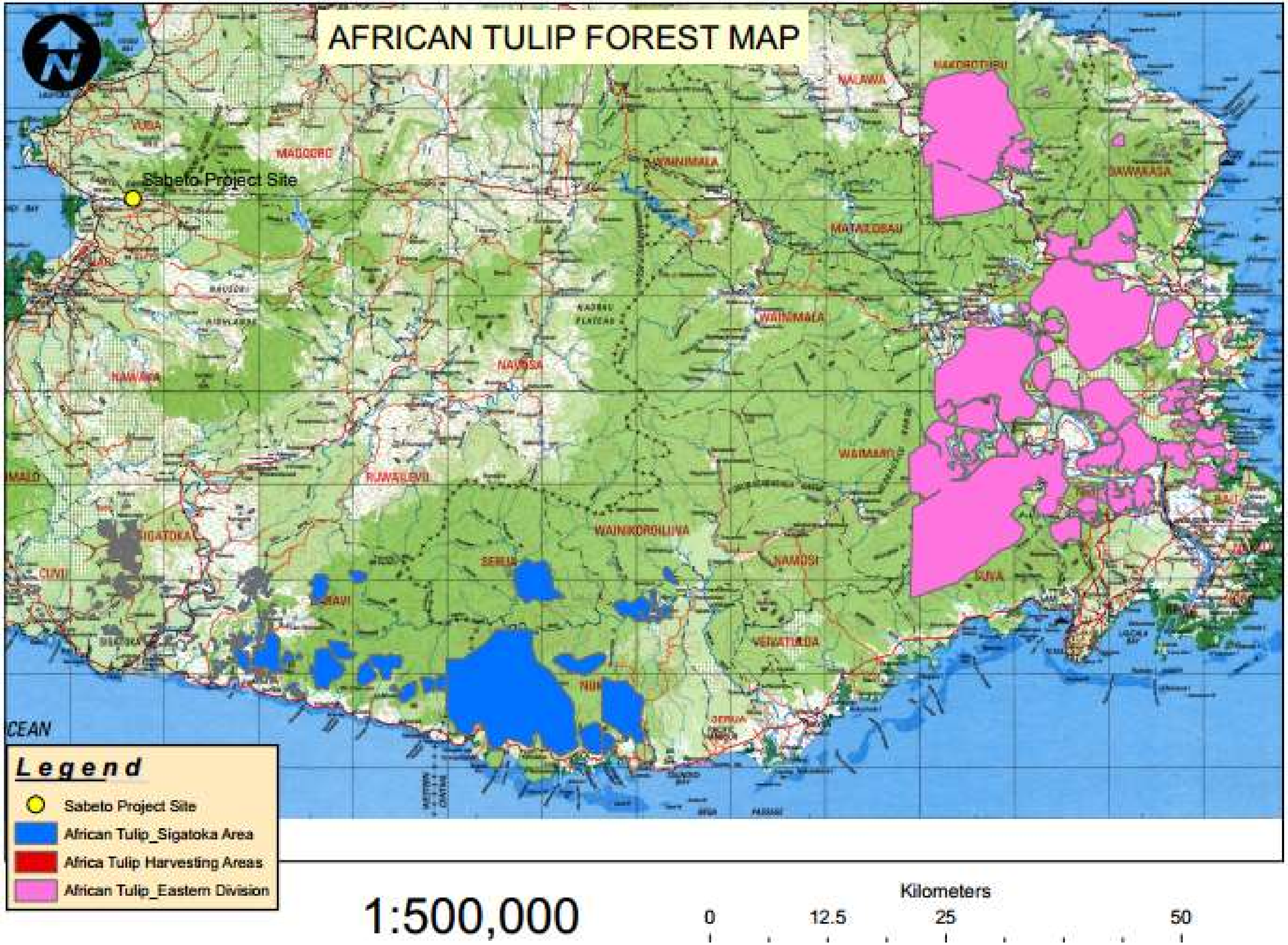

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Biomass Fuel – Wood Residues

Species	Securing Method	Size
Wood Residue	Sawmill / Logging	50,000 ton/yr (est.)

- Sawmill Residue: Sawdust, Shaving, Off-cuts are being dumped or burned
- Harvesting Residue: only 70% of trees (Pine, Mahogany, Raintree) are being taken to sawmill, other branches and small logs are left with accelerated carbon decay

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Biomass Fuel – Wood Residues

Species	Residue Generated (ton/yr)
Natural Forest	25,737
Pine	163,061
Mahogany	15,858
Wood Chips	18,900
Saw Milling	7,240
Wood Veneer Sheets	4,335
Plywood	1,200
Total	**236,331**

* IRENA, Fiji: Renewable Readiness Assessment

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Climate Change - Mitigation

COUNTRY	PROJECT	SIZE	EMISSION REDUCTION
FIJI	NABOU BIOMASS POWER PLANT (2017)	12 MW	37,424 tCO2eq/yr
	SABETO BIOMASS POWER PLANT (2020)	12 MW	37,424 tCO2eq/yr
	3RD BIOMASS POWER PLANT (2022)	12 MW	37,424 tCO2eq/yr
	4th BIOMASS POWER PLANT (2024)	12 MW	37,424 tCO2eq/yr
	5TH BIOMASS POWER PLANT (2026)	12 MW	37,424 tCO2eq/yr
	WOOD PELLET PLANT (2022)	24 MW	74,848 tCO2eq/yr
	SUBTOTAL	**84 MW**	**261,968 tCO2eq/yr**
PNG	1ST BIOMASS POWER PLANT	12 MW	37,424 tCO2eq/yr
	2ND BIOMASS POWER PLANT	12 MW	37,424 tCO2eq/yr
	SUBTOTAL	**24 MW**	**74,848 tCO2eq/yr**
TOTAL		**108 MW**	**336,816 tCO2eq/yr**

* by 2026, most of fossil fuel power generation in Fiji can be replaced with biomass power plants
* Emission Reduction = Baseline Emission – Project Emission

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Climate Change - Adaptation

Category	Impact	Increasing Resilience
Agricultural (Farming)	- Climate Change affecting farming Product (Drier, Cooler, Extreme Events) - Idle farming area is rapidly increasing (income loss, job loss)	- Energy wood plantation on idle farming area for farmers income & job security
Forest Ecosystem (African Tulip)	- Ecosystem Disturbance	- Utilizing as biomass fuel promotes its eradication - Forest ecosystem stabilization - Replantation with Energy wood

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Conclusion

- With Biomass Energy,
  - ✓ SPICs National Renewable Energy Target Implementation
  - ✓ Climate Change Mitigation With Low Emission Development
  - ✓ Increase resilience on climate change with adaptation mechanism
  - ✓ National GDP improvement and other social benefits (Job, Energy Security, Technology)

Indicator	Current	Targets	
	2016	2020	2030
Fiji Electricity Generation with Renewable Energy	Around 50%	81%	99%

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