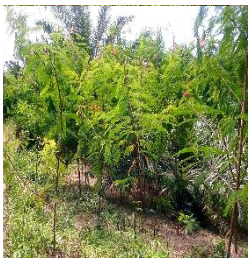
The Feasibility Study Report

Activity 3.4
"To conduct a study on feasibility of investment in commercial manufacturing of wood-based energy including electricity and wood pellet"







ITTO Project PD 737/14 Rev 2 (I)

Developing Supply Capacity of Wood-Based Biomass Energy through Improved Enabling Conditions and Efficient Utilization of Degraded Forest Lands involving Local Communities in North Sumatra Province of Indonesia

Prepared for the project by:
Dr. Dede Hermawan
Dr. Sudarsono Sudomo
Dr. Aswandi Anas

Jakarta, September 2019

ITTO Project PD 737/14 Rev. 2 (I)

”Developing Supply Capacity of Wood-based Biomass Energy through Improved Enabling Conditions and Efficient Utilization of Degraded Forest Lands Involving Local Communities in North Sumatera Province of Indonesia”

Activity 3.4:

To conduct a study on feasibility of investment in commercial manufacturing of wood-based energy including electricity and wood pellet

The Feasibility Study Report

Prepared for the Project by:

Dr. Dede Hermawan

Dr. Sudarsono Sudomo

Dr. Aswandi Anas

Jakarta, September 2019

FOREWORD

Praise be to God Almighty, the Energy Investment Feasibility Analysis Report on the Development of Wood Pellets in North Sumatera has been successfully compiled. This feasibility study aims to (a) assess the potential electricity demand as well as the wood pellet market potential; (b) identify availability of land for the development of energy plantations in North Sumatera; (c) identify potential tree species as raw materials for wood pellets, and (d) assess the technical and economic feasibility of developing a wood pellet industry in North Sumatera.

This study is part of Activity 3.4: To conduct a study on the feasibility of investment in commercial manufacturing of wood-based energy including electricity and wood pellets and it is one of the activity of the ITTO Project PD 737/14 Rev. 2 (I) "Developing Supply Capacity of Wood-based Biomass Energy through Improved Enabling Conditions and Efficient Utilization of Degraded Forest Lands Involving Local Communities in North Sumatera Province of Indonesia".

The study team would like to thank the various parties that helped preparing this feasibility analysis, among others, Simalungun Regency Government, North Padanglawas Regency Government, North Sumatera Province Bappeda, PT North Sumatera Regional PLN (Persero), North Sumatera Energy and Mineral Resources Office, North Sumatera Province Forestry Service, Region II Pematangsiantar FMU, Humbang Hasundutan FMU, Padang Sidempuan FMU, North Sumatera Industry and Trade Office, Aek Nauli Environmental and Forestry Development Research Center, and various other parties.

Bogor, September 2019

The Study Team:
Dr. Dede Hermawan
Dr. Sudarsono Sudomo
Dr. Aswandi Anas

Table of Content

List of Abbreviations and Acronyms

BCR	Benefit Cost Ratio
DAS	River Basin Area or River Catchment Area (Daerah Aliran Sungai)
ESDM	Energy and Mineral Resources
GDP	Gross Domestic Products
GHG	Greenhouse gas
IRR	Internal Rate of Return
KPA	Nature Conservation Area
KPH	Forest Management Unit (Kesatuan Pengelolaan Hutan)
KSA	Nature Reverse Area
MW	MegaWatt
NPV	Net Present Value
PBP	Payback Period
PLN	State Electricity Company (Perusahaan Listrik Negara)
PP	Goverment Regulation (Peraturan Pemerintah)
PT	Corporate Limited (Perusahaan Terbatas)
RGDP	Regional Gross Domestic Products
RTRW	Regional Spatial Plan (Rencana Tata Ruang Wilayah)
SEZ	Special Economic Zone (KEK, Kawasan Ekonomi Khusus)
SOE	State Owned Enterprise
SWP	Watershed Area Management Unit
TOR	Terms of Reference
UU	Act (Undang Undang)

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

Fossil energy sources are declining and non-renewable thus finding alternative energy sources to meet future energy needs is a necessity. One of the new renewable energies is bioenergy from biomass. From a forest area of around 131.5 million hectares, Indonesia has a great opportunity in utilizing biomass energy from forest management.

The purpose of this feasibility study is to (a) assess the potential electricity demand by PT PLN (Persero) in the target area (North Sumatera) as well as the potential for wood pellet markets; (b) identify the availability of land for the development of energy plantations in North Sumatera; (c) identifying potential plant species as raw materials for wood pellets, and (d) assess the technical and economic feasibility of developing the wood pellet industry in North Sumatera.

The assessment of demand for wood pellet products for power plants is done by identifying and calculating the potential electricity needs of PT PLN (Persero), especially for the Northern Sumatera region. The business potential of sustainable wood pellets is known by identifying and mapping the availability of land for the development of energy plantations and the processing industry that will be built based on ecological, economic and socio-cultural aspects. Mapping land availability is used as a basis for formulating recommendations for business models that are developed. Mapping activities are carried out using a Geographic Information System approach, field surveys, and interviews with relevant parties, especially to find out the factual conditions in the field. The information collected is in the form of general conditions, area, location and boundaries, natural resource data (physical and biophysical), human resource conditions (community, government, company), and other related information.

The results of the study indicate that Government policies, specifically ESDM Minister Regulation No. 50/2017, on the Utilization of Renewable Energy Sources for Electricity Supply, and the Minister of Energy and Mineral Resources No.55 / 2019, on the Principal Amount of Costs for the Supply of PT PLN Power Plants, are not in favor of private investors engaged in the EBT sector, where the purchase price of electricity by PLN is still too low, and the scheme of all assets is transferred to PLN after the contract ends. Thus, the construction of PLTBm in North Sumatera is still not profitable.

World demand for wood pellets continues to increase by 13% per year, while production rates are only 11% per year, mainly from European Union countries, followed by Asia & Oceania, and North America. The highest pellet demand rate occurs in Asia & Oceania, which is 40% per year, especially Japan and South Korea.

Until now, the domestic wood pellet market is still not encouraging, this is due to the low selling price, and is not supported by government policies, especially those directly related to energy use.

Based on the distribution of raw materials and the availability of land for industrial development, which is close to the port and road transportation facilities, as well as other infrastructure support, the wood pellet processing plant in North Sumatra could be built in two potential locations, namely in the Sei Mangke Special Economic Zone (KEK) in Simalungun Regency, and Gunung Tua city in North Padanglawas Regency. Sei Mangke SEZ is considered to be very potential because it has several advantages starting with its location in the plantation area far from the settlement, not far from the Port of Kuala Tanjung and including the existence of sources of raw materials namely the area of energy plantations in Simalungun Regency and abundant water sources from the Bah Bolon River.

Some suitable species of energy wood planted in critical and potential areas as raw materials for wood pellets are kaliandra (*Caliandra callothyrsus*), gamal (*Gliricidea sepium*), and lamtoro (*Leucaena leucocephala*). These species were chosen because they have the needed characteristics; can adapt to various soil and climate conditions; grow fast (high increment) and can compete with weeds; fast growing after prunning; and have a high heating value.

Wood raw materials for wood pellet mills in SEI Mangkei SEZ will be supplied from three KPHs, namely KPH Region II Pematang Siantar, covering an area of 34,323.4 ha, and KPH Region III Kisaran, covering 11,955.1 ha and North Labuhanbatu KPH covering 27,631.6 ha . Thus, the potential area suitable for energy crops is 73,910 ha. Whereas in Gunung Tua, it will be supplied from three KPHs, namely Region VI Sipirok KPH covering an area of 45,061.4 ha, KPH Region VII Gunung Tua, covering an area of 137,885 ha, and KPH Region X Padang Sidempuan, covering an area of 12,419.1 ha, bringing the total available land to 195,365 Ha.

With a increment volume of 30 - 54 tons / ha / year, the development of energy forest plantations could produce biomass potential 221,730 - 332,595 tons / year to be supplied to the Sei Mangkei SEZ industry and 586,080 - 879,120 tons / year for the industry in Gunung Tua.

The wood pellet production process includes three main stages namely, drying, grinding, and densification (pelleting). The stage of wood pellet production which has the largest energy consumption is the drying stage. At this stage heat energy is needed for drying raw materials. Based on the available land potential in the two selected locations, a production capacity of 10 tons of pellets per hour can be applied, especially for export-oriented factories, using ring die pelletizers.

The Sei Mangkei factory has an NPV, with a real discount rate of 7.50%, amounting to Rp 81,684 million. The IRR and BCR values are 32.78% and 1.21, respectively. Thus, this project is feasible to run with a 2.9 year payback period. Although not as good as the planned plant in Sei Mangkei, the construction of a pellet plant in Gunung Tua is also financially viable; with a real discount rate of 7.50%, financial indicators are as follows: NPV Rp. 60,863 million, IRR 26.68%, and BCR 1,17%. The payback period is a little longer, which is 3.4 years.