

Chapter 3

Available Biomass for Power Generation in the Southern Region of Thailand

August 2019

This chapter should be cited as

ERIA (2019), 'Available Biomass for Power Generation in the Southern Region of Thailand, in Han, P., S. Kimura, W. Wongsapai and Y. Achawangku (eds.), *Study on Biomass Supply Chain for Power Generation in Southern Part of Thailand*. ERIA Research Project Report FY2018 no.9, Jakarta: ERIA, pp.30–38.

Chapter 3

Available Biomass for Power Generation in Southern Thailand

This chapter assesses biomass supply from rubberwood in southern Thailand to promote its use in generating power and to ensure that the demand is consistent with the supply.

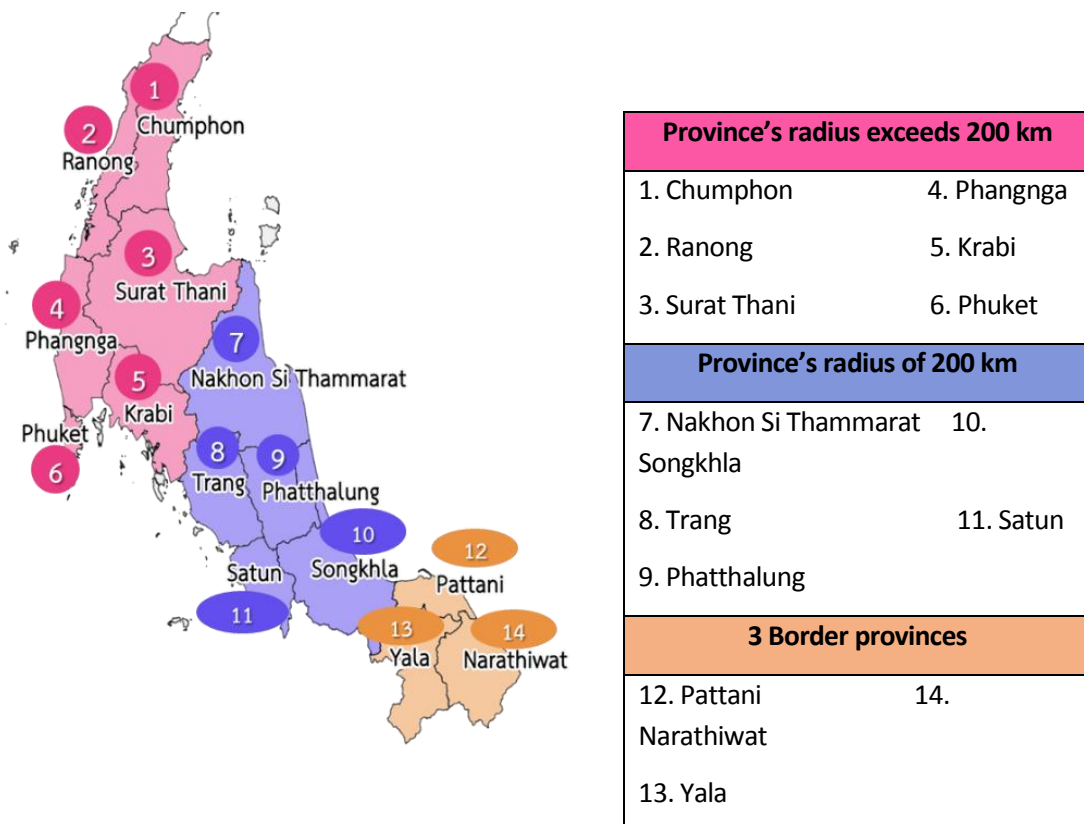
1. Three Border Provinces: At a Glance

To assess biomass supply from rubberwood in southern Thailand, this chapter divides the region into three groups (Figure 3.1):

- (1) Group 1: covering three border provinces – Pattani, Yala, and Narathiwat
- (2) Group 2: covering other provinces within a 200-kilometre (km) radius of three border provinces
- (3) Group 3: covering other provinces of more than 200 km radius of three border provinces.

This chapter focuses mainly on biomass in Group 1 and Group 2.

Figure 3.1: Provinces in Southern Thailand (14 Provinces)

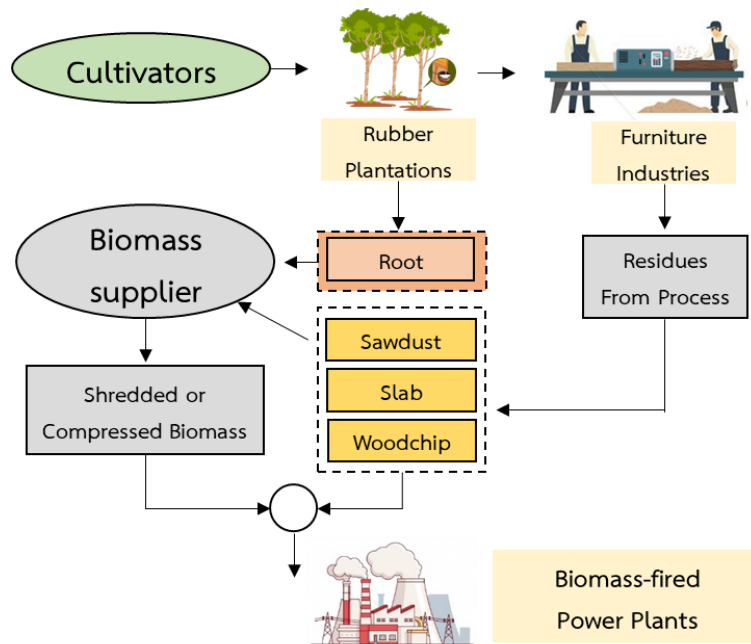


Source: Author's field survey photo, 2019.

2. Rubberwood for Power Generation

Biomass from rubberwood for power generation comes from felling 25–35-year-old rubber trees, which give less latex. The biomass derived from felled rubber trees are stumps, roots, slabs, wood tips, and branches while rubberwood trunks are sent to sawmills, producing sawdust as biomass. Normally, biomass traders collect biomass from felled areas and sawmills to sell to power plants. In brief, the key biomass rubberwood for power generation includes roots, sawdust, slabs, and wood tips (Figures 3.2 and 3.3).

Figure 3.2: Rubberwood for Power Generation



Source: Author's field survey process diagram, 2019.

Figure 3.3: Four Types of Rubberwood for Energy



Roots and Stumps



Slabs



Sawdust



Wood tips

Source: Author's field survey photo, 2019.

3. Assumptions of the Study

- 1) Focuses only on rubberwood in the southern region, including three border provinces.
- 2) Estimates the potential of the plantation data from the Office of Agricultural Economics.
- 3) Considers the current rubberwood consumption in power plants, industry heat generation, and other uses.
- 4) Conducts a field survey to assess the current situation of rubberwood power plants and to recheck data.
- 5) Estimates the 'remaining potential' of biomass from rubberwood for power generation in the areas of three border provinces and other provinces within a 200 km radius of the three border provinces.

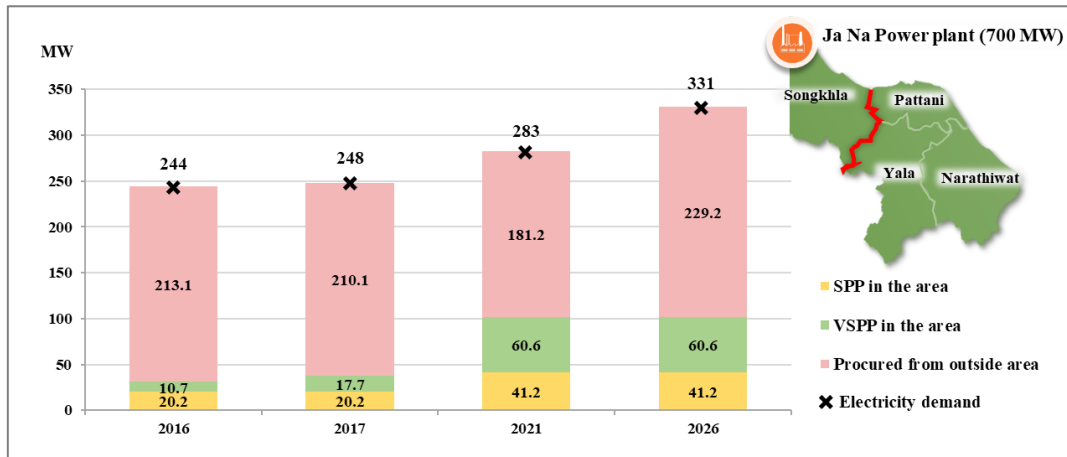
4. Electricity Demand and Supply in the Three Border Provinces

4.1. Electricity demand

Electricity demand in the three border provinces has been increasing. Electricity demand in 2026 is estimated to be 331 MW. The existing capacity of power plants under SPP and VSPP contracts in the three provinces are lower than the current demand (Figure 3.4); therefore, importing electricity from other provinces is needed. The largest power plant closest to the three provinces is Jana Power Plant

in Jana District, Songkhla Province. It has an installed capacity of 700 MW. It is, therefore, very critical for both the government and the private sectors to promote power generation to meet the demand.

Figure 3.4: Electricity Demand in the Three Southern Border Provinces



SPP = small power producer, MW = megawatt, VSPP = very small power producer.

Notes: (1) Demand forecasts are taken from the Load Demand Forecast Committee.

(2) SPP and VSPP information is from the Energy Regulatory Committee Office website.

Source: Department of Alternative Energy Development and Efficiency (DEDE), Ministry of Energy (2018).

4.2. Electricity supply (current status)

All power plants in the three provinces generate 205.1 MW.

EGAT Power plant: 103.3 MW



- Hydro energy: 77.3 MW (Bang Lang Dam, Yala 76 MW/Ban Santi, Yala 1.3 MW)
- Diesel power generation (two plants) Narathiwat: 16 MW
- Diesel power plant (one plant) Pattani: 10 MW



Private power plant: 101.8 MW

- Renewable energy (RE) with government contract: 101.8 MW (Commercial operation date [COD] 40.7 MW/Only power purchase agreement [PPA], [not COD] 61.1 MW)

New project (as planned) in three provinces: 50.05 MW

- Power plant for bidding in the southern region: 4.05 MW (remaining slots)



- Community waste to power: 4 MW
- Pracharath (civil state) power plant project: 42 MW
(Biomass = 12 MW, Biogas = 30 MW)

5. RE power plant in the three border provinces

The status of nine biomass-fired power plants in the three border provinces is as shown in Table 3.1. The COD of three power plants are in 2006, 2013, and 2017 while the scheduled commercial operation date (SCOD) of six power plants are in 2017, 2018, and 2019.

Table 3.1: Nine Operational Biomass Power Plants (COD and SCOD)

Name	Fuel	Installed Capacity (MW)	COD (MW)	Status	COD Year	Type
Narathiwat		13.8	15.3			
Prize of Wood Green Energy Co., Ltd	<i>Biomass</i>	7.5	7.0	COD	2560	FiT
TPCH Power 5 Co., Ltd.	<i>Biomass</i>	6.3	6.3	SCOD	2561	FiT Bidding
Pattani		23.0	25.8			
Pattani Green Co., Ltd	<i>Biomass</i>	23.0	21.0	SCOD	2562	Adder
Yala		65.4	60.7			
Gulf Yala Green Co., Ltd	<i>Biomass</i>	23.0	20.2	COD	2549	N/A
Yala Green Energy Co., Ltd	<i>Biomass</i>	9.9	8.7	COD	2556	FiT
P.C. Be Tong Green Energy Co., Ltd	<i>Biomass</i>	5.2	5.0	SCOD	2560	FiT
Be Tong Green Power Co., Ltd	<i>Biomass</i>	7.5	7.0	SCOD	2561	FiT
TPCH Power 1 Co., Ltd	<i>Biomass</i>	9.9	9.9	SCOD	2561	FiT Bidding
TPCH Power 2 Co., Ltd	<i>Biomass</i>	9.9	9.9	SCOD	2561	FiT Bidding
Total		102.2	101.8			

COD = commercial operation date, FiT = feed-in tariff, SCOD = scheduled commercial operation date.

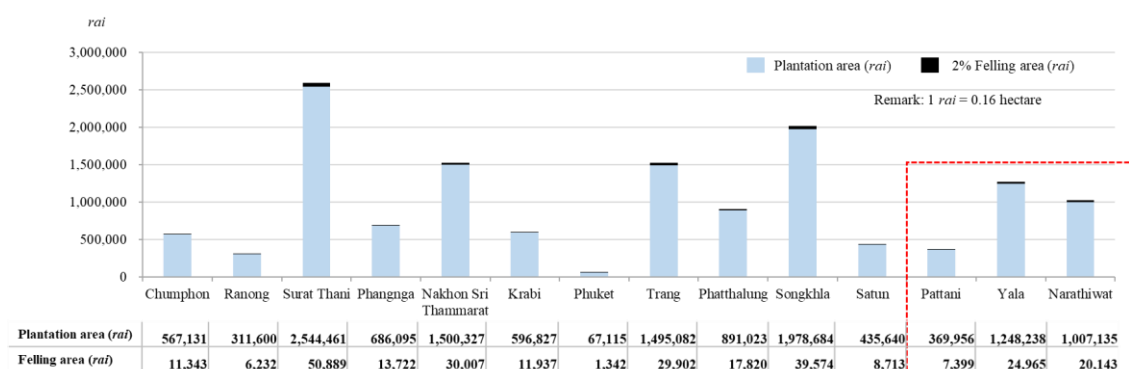
Source: SPP/VSP database, Energy Regulatory Commission (ERC).

6. Rubberwood: From Plantation to Potential (2017)

6.1. Plantation and felling areas of rubber trees in the southern region

In 2017, the plantation area of rubber trees in the three border provinces is more than 2.6 million *rai* (1 *rai* = 0.16 hectare). Assuming that 2% of plantation areas are felling areas, biomass can be produced from 52,000-*rai* felling areas. The felling area in Yala is the largest, about 25,000 *rai*, followed by Narathiwat and Pattani, respectively. For the whole region, the province with the largest plantation of rubberwood, totalling 2.5 million *rai*, is Surat Thani. Figure 3.5 shows the plantation and felling areas of rubberwood by province in southern Thailand. Table 3.2 describes the plantation and felling areas of rubberwood by groups of provinces while Table 3.3 shows the biomass supply from rubberwood by province and by group of provinces.

Figure 3.5: Plantation and Felling Areas of Rubber Trees in Southern Thailand (2017)



Source: Office of Agricultural Economics (OAE), Ministry of Agriculture and Cooperatives (2018).

Table 3.2: Plantation and Felling Areas in Three Groups of Provinces in Southern Thailand

Share Types	Plantation Area (<i>rai</i>)	Felling Area (<i>rai</i>)
Southern Region	13,699,314	273,986
Three provinces + provinces within a radius of 200 km	8,926,085	178,522
Provinces within a radius of 200 km	6,300,756	126,015
Provinces with radius exceeding 200 km	4,773,229	95,465
3 border provinces	2,625,329	52,507

Source: Office of Agricultural Economics (OAE), Ministry of Agriculture and Cooperatives (2018).

Table 3.3: Biomass from Rubber Supply Potential

Province	Biomass Potential of Rubberwood (ton)				
	Root	Sawdust	Slab	Wood Tip	Total
Chumphon	56,713	34,028	136,111	136,111	362,964
Ranong	31,160	18,696	74,784	74,784	199,424
Surat Thani	254,446	152,668	610,671	610,671	1,628,455
Phangnga	68,610	41,166	164,663	164,663	439,101
Krabi	150,033	90,020	360,078	360,078	960,209
Phuket	59,683	35,810	143,238	143,238	381,969
Nakhon Si Thammarat	6,712	4,027	16,108	16,108	42,954
Trang	149,508	89,705	358,820	358,820	956,852
Phatthalung	89,102	53,461	213,846	213,846	570,255
Songkhla	197,868	118,721	474,884	474,884	1,266,358
Satun	43,564	26,138	104,554	104,554	278,810
Pattani	36,996	22,197	88,789	88,789	236,772
Yala	124,824	74,894	299,577	299,577	798,872
Narathiwat	100,714	60,428	241,712	241,712	644,566
Southern region	1,369,931	821,959	3,287,835	3,287,835	8,767,561
Three provinces + provinces within a 200 km radius	892,609	535,565	2,142,260	2,142,260	5,712,694
Provinces within a 200 km radius	630,076	378,045	1,512,181	1,512,181	4,032,484
Provinces with radius exceeding 200 km	477,323	286,394	1,145,575	1,145,575	3,054,867
3 border provinces	262,533	157,520	630,079	630,079	1,680,211

Note: Gained for each rai of felling area is 5 tons of root, 3 tons of sawdust, 12 tons of slab, and 12 tons of wood tips.

Source: Office of Agricultural Economics (OAE), Ministry of Agriculture and Cooperatives (2018).


7. Estimation of 2017 demand of biomass from rubberwood (excluding power plant)

From the data on rubber tree plantation and felling areas in 2017, about 1.68 million tons of biomass from rubberwood are produced annually in the three border provinces. The biomass uses in industries and other uses are about 35,000 tons/year. The remaining amount of biomass for electricity generation is about 1.64 million tons/year. Therefore, the electricity generation using biomass from rubberwood is about 142.4 MW (Table 3.4). The existing capacity of nine operational biomass power plants is about 102.2 MW (COD = 40.4 MW and SCOD = 61.8 MW). Therefore, the


remaining potential of biomass from rubberwood in the three border provinces for electricity generation is about 40.2 MW (Figure 3.6).

The total biomass, including the amount of biomass in other provinces within a 200 km radius is about 4 million tons/year. This can generate about 349.13 MW of electricity. The existing consumption is about 161.51 MW; therefore, 187.62 MW is remaining.

Table 3.4: Estimate of the 2017 Demand of Biomass from Rubberwood (excluding Power Plant)

Summary	Root	Sawdust	Slab	Wood Tip	Total
(1) Total biomass available in three border provinces (ton/yr)	262,533	157,520	630,079	630,079	1,680,211
(2) Total biomass for industry (ton/yr)	-	1,975	-	33,982	35,957
• Used by particle board	Surat Thani and Songkhla				
• Used by industry	-	1,975	-	33,982	35,957
• Other consumption	Other provinces exclude three border provinces				
(3) Available potential (3) = (1) – (2)	262,533	155,545	630,079	596,097	1,644,254  142.4 MW

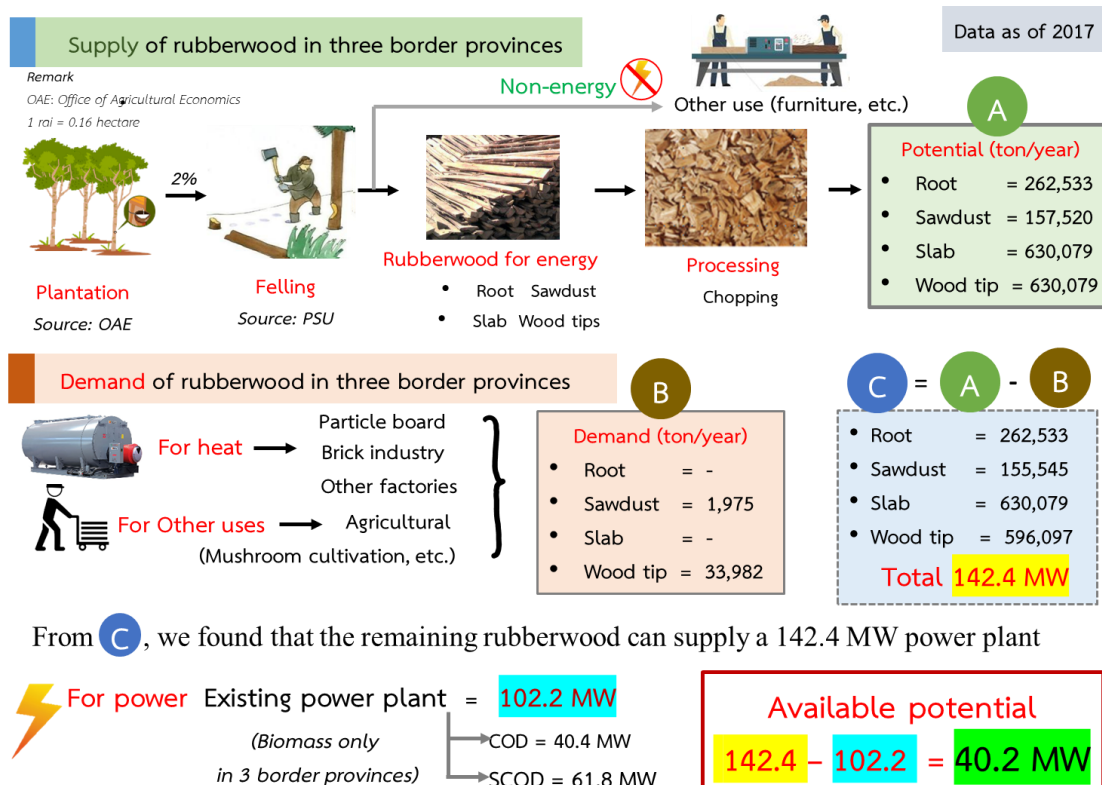
If the areas outside the three border provinces are considered, the biomass potential is more.

Total biomass available in provinces at radius of 200 km (ton/yr)	630,076	378,045	1,512,181	1,512,181	4,032,484  349.13 MW
--	----------------	----------------	------------------	------------------	---

Note: Biomass consumption data in industry is taken from the designated factory database, Department of Alternative Energy Development and Efficiency (DEDE); consumption in others is taken from the DEDE survey project.

Source: DEDE (2018) and author's data field survey, 2019.

Figure 3.6: Supply of Rubberwood in the Three Border Provinces



Source: Author's data, 2019.

8. Challenges in Using Rubberwood for Power Generation

- 1) The remaining potential from rubberwood for new power plants in the three border provinces is only 40.2 MW; more biomass needs to be imported from other provinces.
- 2) Other biomass crops in the three border provinces, i.e. palm and palm residues, are very few.
- 3) The available potential area for producing fast-growing feedstocks is low.
- 4) Increasing rubber trees may result in lower prices for rubberwood products.
- 5) Improving collection efficiency of roots of rubberwood is required.