



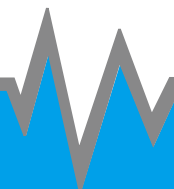
**PT. PLN (Persero)**  
**Unit Induk Pembangunan Pembangkit Sumatera**

## **ANDAL OF DEVELOPMENT PLANT 150 kV TRANSMISSION LINE, PLTP HULULAIS - PEKALONGAN AND RELATED SUBSTATION**



**Location :**  
**Districts of Lebong, Rejang Lebong, Kepahiang**  
**Bengkulu Province**

**2018**



## **FOREWORD**

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## PREFACE

PT PLN (Persero) Induk Pembangunan Pembangkit Sumatra is planning to build electricity infrastructure, in the form of a 150 kV transmission line, PLTP Hululais - Pekalongan along with related substations as its supporting facilities. Then to simplify the mention of the project name, it is the Development Plan of 150 kV Transmission Line, PLTP Hululais - Pekalongan and Related Substation in District of Lebong, Rejang Lebong, and Kepahiang, Bengkulu Province.

**This Environmental Impact Analysis Document (ANDAL)** is one part of the EIA (AMDAL) document, which was prepared to fulfill obligations as stated in Law no.32 of 2009 concerning protection and management of the environment and the regulation of the State Minister of Environment no.5 years 2012, regarding the types of business plans and activities that are required to have an analysis of environmental impacts. Technically, the preparation of this ANDAL document refers to the State Environment Ministerial Regulation no.16 of 2012 concerning Guidelines for Preparation of Environmental Documents.

Our gratitude goes to all those who have assisted in the preparation of this ANDAL Document.

Medan, 25 May 2018



Weddy B. Sudirman  
General Manager

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**CHAPTER I**  
**FOREWORD**

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# CHAPTER I

## FOREWORD

### 1.1 Description of the Business and / or Activities Plan to be Assessed

#### 1.1.1 Status of AMDAL Study

AMDAL study for development plan of 150 KV Transmission Line and related substation by PT PLN (Persero) Unit Induk Pembangunan Pembangkit Sumatera is an environmental feasibility study conducted after the initial survey of the construction of the transmission network (that is: Survey dan Soil Investigation T/L 150 kV PLTP Hululais-Pekalongan), which has produced a transmission route map PLTP Hululais-Pekalongan. The location of this activity is in three regions district namely: districts Lebong, Rejang Lebong and Kepahiang, with lines along  $\pm 46,337$  Km with 131 tower tread point, therefore the assessment process of the EIA study was the authority of the Bengkulu Provincial Government. The EIA process of this activity has been started since an announcement was made in the printout of the Bengkulu People's General Daily published on Thursday, February 1, 2018. he Public Consultation was held twice, on February 5, 2018 located at Aula sub-district Rimbo Pengadang, Lebong and February 6, 2018 located at Aula Pola Pemerintah districts Rejang Lebong for the Regency area Rejang Lebong and Regency Kepahiang.

#### 1.1.2 Conformity of Location of Plan of Activities with RTRW

The location of the planned construction of the 150 kV Transmission Network for the Hululais-Pekalongan PLTP and the Substation connected by PT PLN (Persero) Sumatra Power Plant Development Unit, in principle, it must be in accordance with the regional spatial plan. The planned development activities are in three regencies, namely: Regency Lebong, Rejang Lebong and Kepahiang, Bengkulu Province. To see the location of the planned development activities in accordance / not contrary to the designation in Bengkulu Province,



hence the suitability of the location with the spatial plan refers to the Regional Regulation of Bengkulu Province No.02 of 2012 concerning the Bengkulu Province Spatial Plan for 2012-2032. The suitability of the location of the planned development activities is seen in terms of spatial planning, which includes spatial planning, space utilization and control of spatial utilization. Based on the Bengkulu Province Regional Regulation No.02 of 2012 concerning the Bengkulu Province Province Spatial Plan for 2012-2032, the space rules for the location of the planned development activities are included in the administrative area of Bengkulu Province as follows:

### Spatial Planning

- Based on Article 23 paragraph (1) letter c, in the Bengkulu Province Energy Network System Plan there is a plan to construct a new power plant, including the Hululais Geothermal Power Plant (PLTP);
- Next to Article 24, for the Energy Network System Criteria, namely:
  - 1) Development of energy infrastructure is intended to increase electricity generation capacity by criteria:
    - a. Supporting the availability of electric power supplies for interests in urban, rural and small islands;
    - b. Support the use of high technology that is able to produce energy to reduce dependence on non-renewable energy sources;
    - c. Be in a location safe from natural hazards and safe from other activities.
  - 2) Development of electrical energy network infrastructure is determined by criteria:
    - a. Support the availability of electricity supply for interests in urban, rural, and small islands;
    - b. Crossing residential areas, river areas, seas, forests, agriculture, and transportation routes;
    - c. support the use of high technology that is able to produce energy to reduce dependence on non-renewable energy sources.





Based on the description above, that the location of the planned construction activities of the 150 kV Transmission Network Hululais - Pekalongan PLTP and the Substation Related by PT PLN (Persero) The Sumatra Power Plant Development Unit is in accordance with the direction of the spatial structure plan of the provisions of Regional Regulation No. 02 of 2012 concerning the Bengkulu Province RTRW. In addition, the development plan has received a letter from the Public Works and Spatial Planning Service Number 503 / 13.618 / XI / B.II-DPU-TR / 2017 regarding RTRW Recommendation for the Construction of a 150 kV Transmission Network Hululais PLTP - Pekalongan and Substation.

#### 1. Use of Space

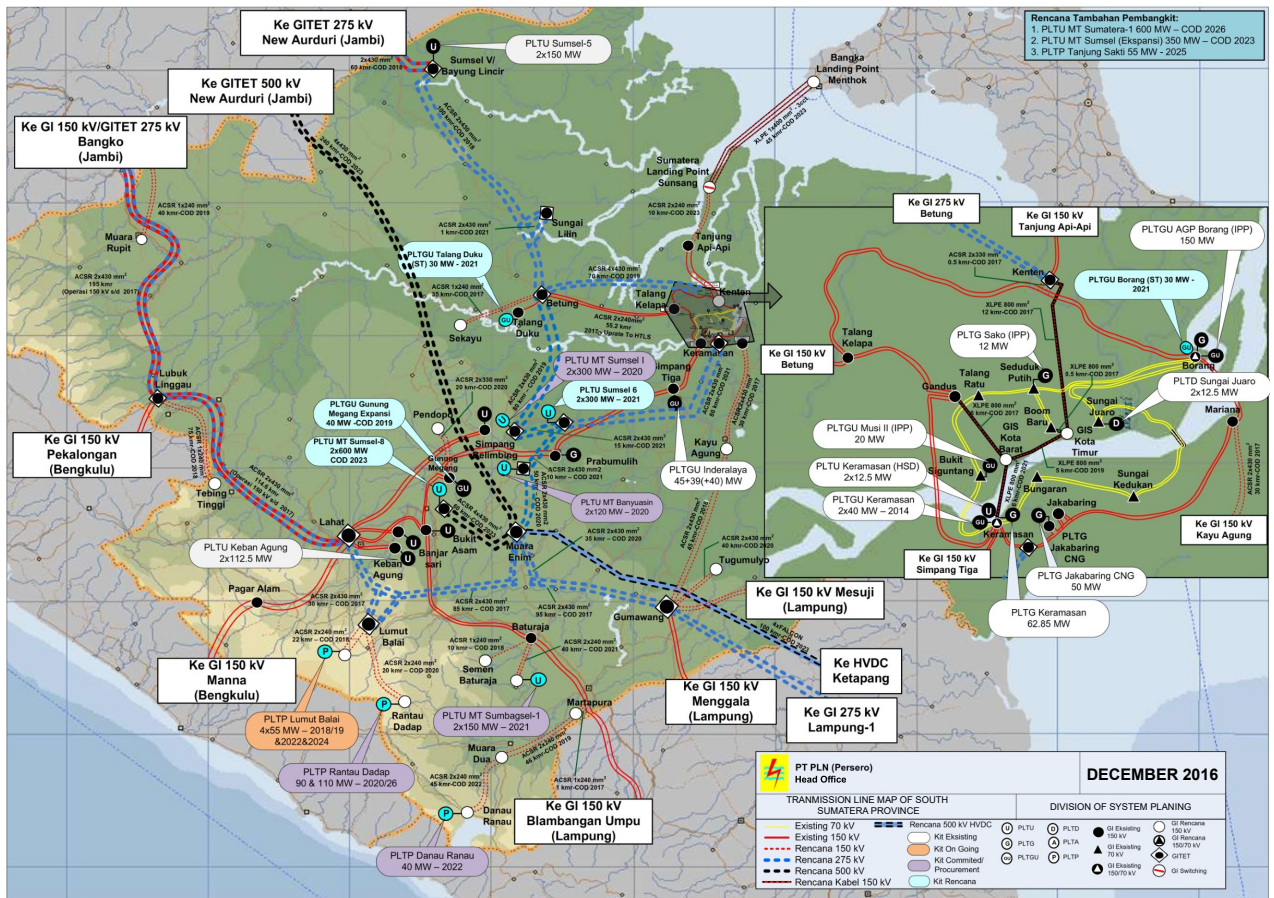
In CHAPTER VIII the Direction for the Use of Provincial Spatial Space Article 55 paragraph (6) is the realization of the development of an energy and mineral resource infrastructure system carried out through :

- a. construction of a new power plant installation;
- b. increasing electricity sourced from alternative energy to meet rural electricity needs, including renewable energy based natural resources such as geothermal energy, solar energy, and wind;
- c. operation of the distribution installation;
- d. development of biodiesel energy for community needs;
- e. development of geothermal energy in the Bengkulu Province.

Based on the description above, the planned construction of the 150 kV Transmission Network of the Hululais - Pekalongan PLTP and the Substation Related to the PT PLN (Persero) Sumatra Power Plant Development Unit, is in accordance with the directions for the existing space in the Bengkulu Province.

#### 1. Control of Spatial Use

In CHAPTER IX Directives for the Use of Space Article 93, there are indications of zoning regulations on the energy infrastructure network system which stipulate that residential buildings are not allowed under SUTT and SUTET, except in the left and right SUTT and SUTET according to statutory regulations. - invite. This needs to be done in order to achieve efforts in realizing an orderly spatial structure and in order to preserve the environment.





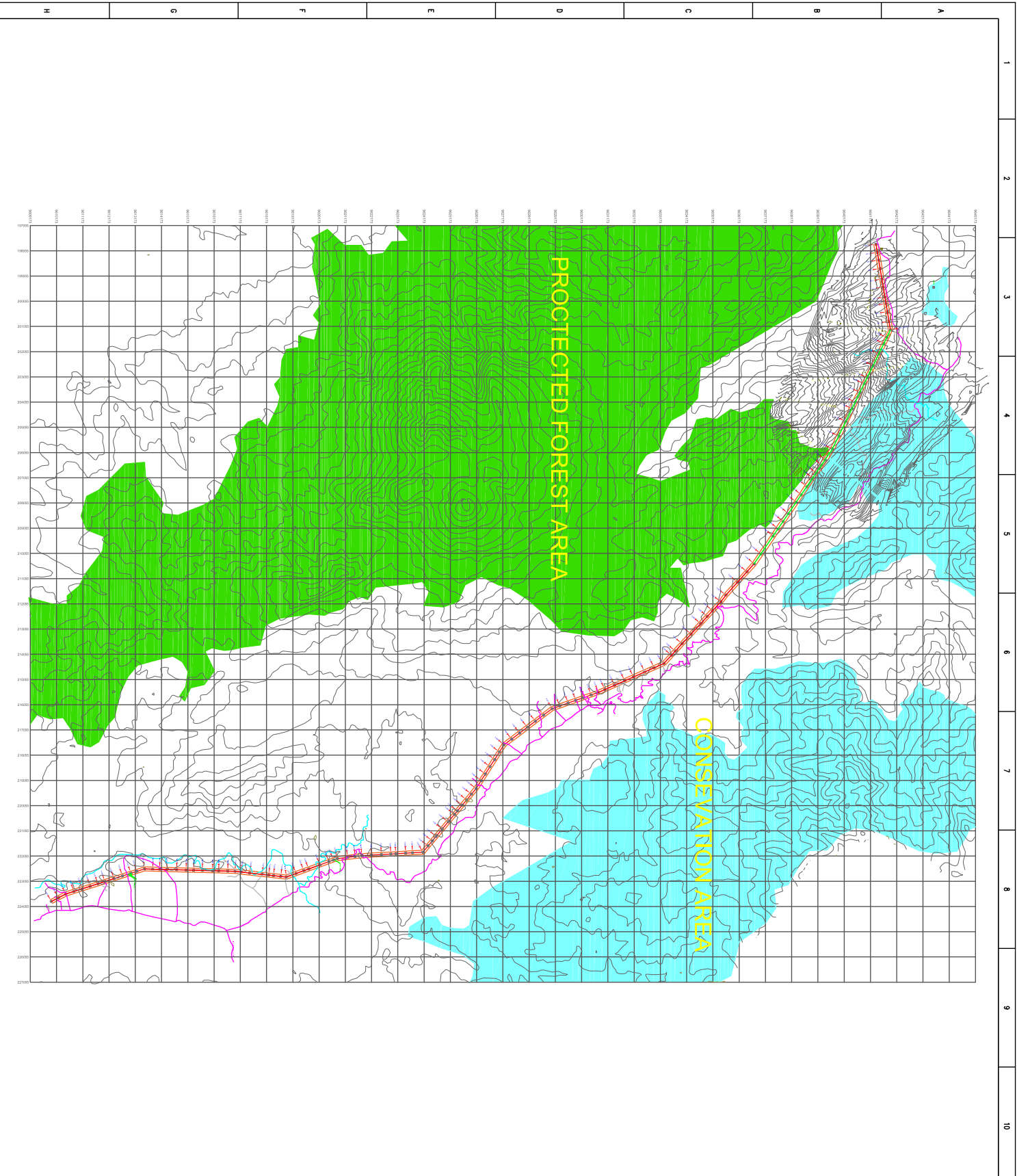
Figures 1.1 : South Sumatra and West Sumatra-Riau Electricity Network

Figure 1.2 :

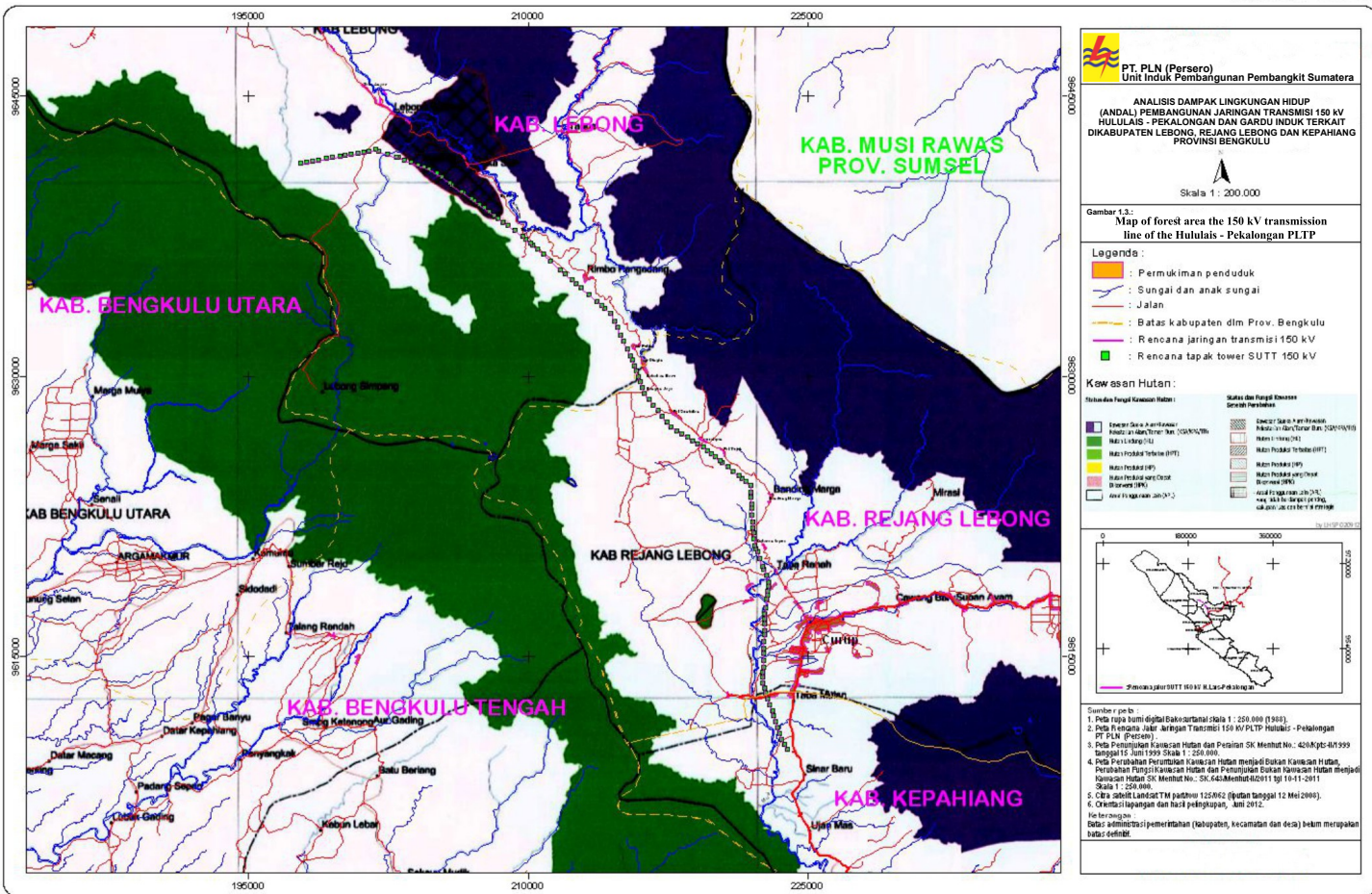
MAP OF THE 150 KV TRANSMISSION NETWORK  
PATH OF THE HULLILAS - PEKALONGAN PLTP

Legend :

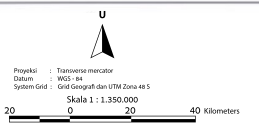
- = Old Tower Path
- = New Tower Path
- = Row
- = Road
-  = Tower Point
- = Protected Forest
- = Conservation Area
-  = Contour Line







**Gambar 1.4.**  
**Map of the Spatial Plan (RTRW) of**  
**Bengkulu Province**



Proyeksi : Transverse mercator  
 Datum : WGS 84  
 System Grid : Grid Geografis dan UTM Zona 48 S  
 Skala 1 : 1.350.000

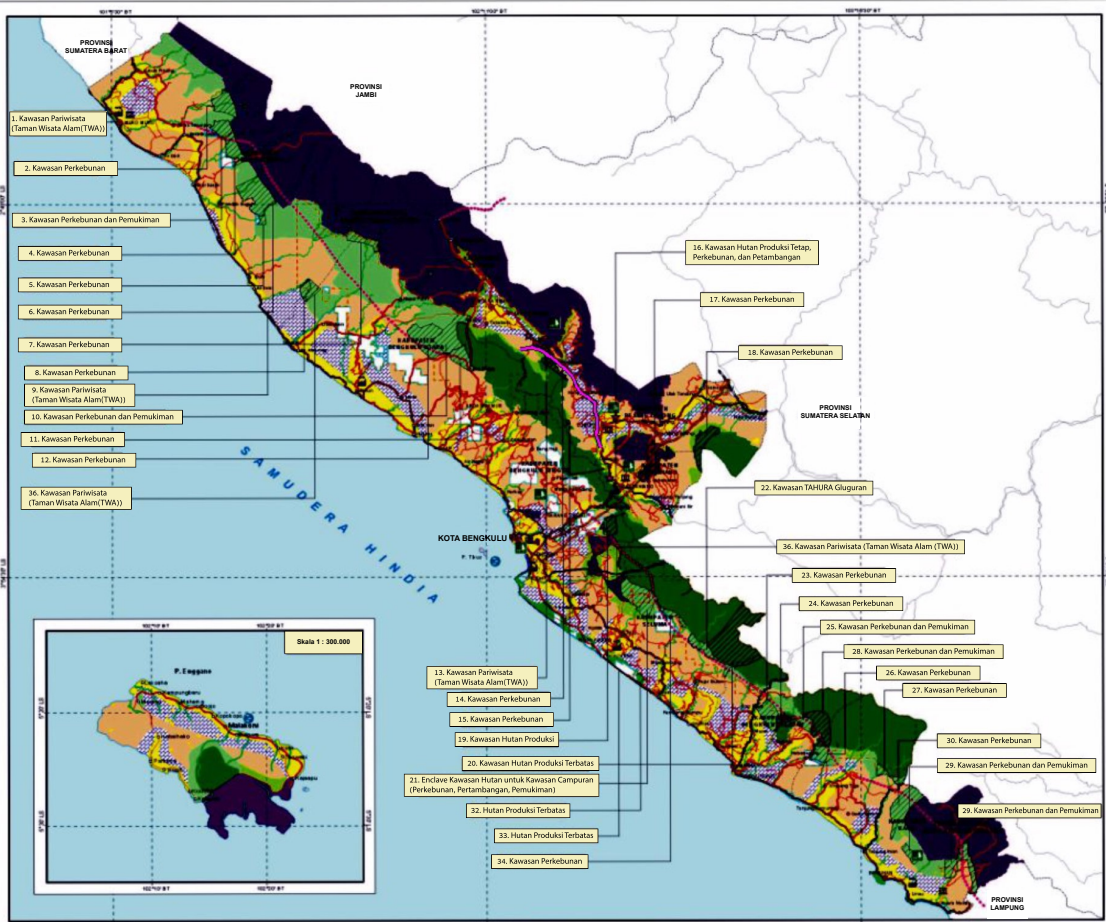
- LEGENDA**
- KOTA**
- Ibu Kota Provinsi
  - Ibu Kota Kabupaten
  - Ibu Kota Kecamatan
  - Kota Lain
- BATAS ADMINISTRASI**
- Batas Provinsi
  - Batas Kabupaten
- PERHUBUNGAN**
- Rel Kereta Api
  - Jalan Bebas Hambatan
  - Jalan Arteri Primer
  - Jalan Kolektor Primer 1 (KP-1)
  - Jalan Kolektor Primer 2 (KP-2)
  - BGR (Bengkulu Outer Ring Road)
  - Sdukan Jalan Nasional Lintas Tengah
  - Jalan Lain
- PERAIRAN**
- Garis Pantai
  - Sungai, Anak sungai
- RENCANA POLA RUANG**
- A. KAWASAN HUTAN LINDUNG**
- Hutan Lindung (RL)
  - Kawasan Perlindungan Setempat (sempadan sungai, sempadan pantai, kawasan lindung lain)
  - Kawasan Suaka Alam, Kawasan Pelestarian Alam (Cagar Alam, Taman Nasional, Hutan Wisata Alam/hutan Wisata, Taman Hutan Rakyat, Taman Bura)
- B. KAWASAN BUDDAYA**
- Hutan Produksi Terbatas (HPT), Hutan Produksi Tetap (HP) dan Hutan Fungsi Khusus (HFH)
  - Hutan Rakyat
  - Pemukiman
  - Pertanian
  - Perkebunan
  - Kawasan Pertambangan
  - Kawasan Tambang SIPP Emas
- LOKASI WISATA**
- Kawasan Wisata Alam
  - Kawasan Wisata Bahari
  - Kawasan Wisata Buatan
  - Kawasan Wisata Budaya
  - Lokasi Industri
- Rencana SUTT 150 kv  
 ■ PLTP Hulubais - Pekalongan



(NB: Skala Sebetulnya adalah Ukuran Asli A1)

**SUMBER PETA:**

1. Peta RTRW TN-AD Skala 1 : 50.000 Tahun 1990
2. Peta RTRW Provinsi Bengkulu Tahun 2002 Skala 1 : 50.000 Belukabangun
3. Peta Lantai Sistem Land Sustainability, RUP/PPH 1988 Skala 1 : 250.000 Belukabangun
4. Data Statistik Lingkungan dan Pembangunan Provinsi Bengkulu (DSTL) Buletin Dinas Pengembangan Perencanaan Bengkulu
5. Peta Kawasan Hutan Provinsi Bengkulu Tahun 1998, Dinas Kehutanan Provinsi Bengkulu
6. Surat Gubernur Bengkulu No. 1/Surat Rencana Kawasan Hutan di Provinsi Bengkulu



**RENCANA TATA RUANG WILAYAH**  
**PROVINSI BENGKULU**



### 1.1.3 Overview of Activity Plans

This 150 kV Transmission Network Development Plan includes two main activities / work components, namely the 150 kV transmission network (SUTT) and substation (GI), with a brief description as follows.

#### 1.1.3.1. 150 kV High Voltage Air Channel (SUTT) Transmission Network

The transmission network consists of pillars or towers in the form of towers / towers of steel and cable lines containing insulators for distribution of electric power. The number of towers to be erected is 131 points. To set up a tower at each predetermined point, land acquisition is needed for the tower site, with the size of the land according to the type of tower used. These towers can be classified into several types of towers, namely types AA, BB, CC, and DD. The land required for tower sites is 15m x 15m for straight type towers (Type A) and 15-20 m x 15-20 m for tower type angles (turns; tension), namely BB type, CC, and DD.

Based on SNI 04.6918.2002, the Minister of Energy and Mineral Resources Regulation No. 18 of 2015 concerning Minimum Free and Distance Spaces for SUTT, SUTET and SUTAS for Electric Power Distribution and Regulation of the Minister of Energy and Mineral Resources No. 27 of 2018, it is determined that a free space along the transmission line with a width of 10 m to the right and 10 m to the left of the vertical axis of the tower is ROW (Right of Way) of the transmission network. For plants, buildings and other objects that are in a free space and have a height up to the vertical minimum limit of a conductor, exemption will be carried out with compensation.

In general, the physical construction of a 150 kV transmission network consists of :

1. The conductive wire (phase wire), made of aluminum coil with a high quality steel core, the cross section diameter of the whole coil is 240 mm with a safety number of 1.3. The number of wires is three for a single circuit, six for a double circuit arranged from top to bottom.
2. Land wire, which functions as lightning and other induction hazards, will then be channeled into the earth layer, installed directly in the uppermost tower body.
3. *Insulator* (isolator), as a separator between kawaenghantar and body tower. The amount / number of insulators has been calculated and guaranteed the danger of induction of wire conductors not to propagate to the body of the tower.



4. Tower / tower, made of high-quality steel frame functions as a hanging wire and ground wire (grounding), has three pairs of arms arranged from top to bottom for phase wire and a pair of upper arms for land wire. Tower steel frames are installed at a distance of between 200 - 400 m, according to ground conditions or land topography. Normal tower height of  $\pm 32$  m, can be raised as needed to +3, +6, +9, +12, +15 even +22 meters.



Table 1.1. Tower Number, Type and Location

No.	Number of tower	Type of Tower	angle °)				Equip-span (m)	Distance of tower (m)	Cummulative distance (m)	Crossing	Land Use	village	Sub district	District	Coordinate of tower (m)		
			d	m	s	L/R									X	Y	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	T.001/TS.01	DRD	+0					308,70	-	0		Kebun terong	Pekalongan	Ujan Mas	Kepahiang	223.855	9.609.973
2	T.002	AA	+0					308,70	307,95	307,95	-	Sawah	Pekalongan	Ujan Mas	Kepahiang	223.710	9.610.244
3	T.003/TS.02	BB	+3	10	55	0	R	308,70	309,45	617,40	-	Sawah	Bumisari	Ujan Mas	Kepahiang	223.562	9.610.520
4	T.004	AA	+3					324,62	331,71	949,11	Jalan	Sawah	Bumisari	Ujan Mas	Kepahiang	223.458	9.610.832
5	T.005	AA	+6					324,62	334,04	1283,15	Sungai	Kebun jagung	Bumisari	Ujan Mas	Kepahiang	223.354	9.611.146
6	T.006	AA	+3					324,62	328,45	1611,60	Alur	Kebun jagung	Bukit Barisan	Merigi	Kepahiang	223.252	9.611.454
7	T.007	AA	+0					324,62	313,65	1925,25	Jalan	Sawah	Bukit Barisan	Merigi	Kepahiang	223.154	9.611.749
8	T.008	AA	+9					324,62	284,99	2210,24	Sungai	Kebun jagung	Bukit Barisan	Merigi	Kepahiang	223.065	9.612.017
9	T.009	AA	+6					324,62	364,68	2574,92	Sungai	Kebun jagung	Lubuk Penyamun	Merigi	Kepahiang	222.951	9.612.360
10	T.010	AA	+6					324,62	343,62	2918,54	Alur	Sawah	Lubuk Penyamun	Merigi	Kepahiang	222.844	9.612.683
11	T.011	AA	+6					324,62	343,96	3262,50	Jalan	Kebun timun	Lubuk Penyamun	Merigi	Kepahiang	222.736	9.613.006
12	T.012	AA	+3					324,62	242,85	3505,35	Sungai	Sawah	Watas Marga	Curup Selatan	Rjg. Lebong	222.661	9.613.234
13	T.013/TS.03	BB	+3	20	0	0	R	324,62	309,47	3814,82	-	Kebun cabe	Lubuk Ubar	Curup Selatan	Rjg. Lebong	222.564	9.613.525
14	T.014	AA	+3					325,20	310,43	4125,25	Jalan	Sawah	Lubuk Ubar	Curup Selatan	Rjg. Lebong	222.573	9.613.836
15	T.015	AA	+0					325,20	262,16	4387,41	-	Sawah	Pungguk Lalang	Curup Selatan	Rjg. Lebong	222.580	9.614.098
16	T.016	AA	+0					325,20	270,68	4658,09	-	Kebun cabe	Pungguk Lalang	Curup Selatan	Rjg. Lebong	222.588	9.614.369
17	T.017	AA	+3					325,20	376,52	5034,61	-	Sawah	Pungguk Lalang	Curup Selatan	Rjg. Lebong	222.598	9.614.747
18	T.018	AA	+3					325,20	359,66	5394,27	-	Sawah	Pungguk Lalang	Curup Selatan	Rjg. Lebong	222.609	9.615.107
19	T.019	AA	+3					325,20	287,08	5681,35	-	Sawah	Dwi Tunggal	Curup	Rjg. Lebong	222.617	9.615.394
20	T.020	AA	+9					325,20	328,96	6010,31	-	Sawah	Dwi Tunggal	Curup	Rjg. Lebong	222.626	9.615.724
21	T.021	AA	+9					325,20	387,16	6397,47	-	Sawah	Talang Benih	Curup	Rjg. Lebong	222.637	9.616.111
22	T.022	AA	+6					325,20	232,46	6629,93	Sungai	Kebun kacang tnh	Talang Benih	Curup	Rjg. Lebong	222.643	9.616.344
23	T.023	AA	+6					325,20	349,14	6979,07	Alur	Kebun/dg. (pisang)	Batupanco	Curup Utara	Rjg. Lebong	222.653	9.616.694
24	T.024/TS.04	BB	+6	4	55	0	R	325,20	275,82	7254,89	-	Kebun/ladang	Batupanco	Curup Utara	Rjg. Lebong	222.661	9.616.970
25	T.025	AA	+9					322,19	234,48	7489,37	Jalan	Kebun kopi	Batupanco	Curup Utara	Rjg. Lebong	222.688	9.617.205
26	T.026	AA	+9					322,19	326,41	7815,78	Sungai	Sawah	Batupanco	Curup Utara	Rjg. Lebong	222.726	9.617.532
27	T.027	AA	+9					322,19	467,78	8283,56	Jalan	Sawah	Lubuk Kembang	Curup Utara	Rjg. Lebong	222.780	9.618.001





No.	Number of tower	Type of Tower		angle *)				Equiv-span (m)	Distance of tower (m)	Cummulative distance (m)	Crossing	Land Use	village	Sub district	District	Coordinate of tower (m)	
				d	m	s	L/R									X	Y
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
28	T.028	BB	+3					322,19	248,51	8532,07	-	Sawah	Lubuk Kembang	Curup Utara	Rjg. Lebong	222.809	9.618.251
29	T.029	BB	+3					322,19	182,83	8714,90	-	Kebun jagung	Suka Datang	Curup Utara	Rjg. Lebong	222.830	9.618.434
30	T.030	BB	+6					322,19	277,37	8992,27	-	Kebun kopi	Pahlawan	Curup Utara	Rjg. Lebong	222.862	9.618.712
31	<b>T.031/TS.05</b>	<b>CC</b>	<b>+3</b>	<b>29</b>	<b>15</b>	<b>0</b>	<b>L</b>	322,19	212,33	9204,60	-	Lks buat batubata	Pahlawan	Curup Utara	Rjg. Lebong	222.887	9.618.925
32	T.032	BB	+3					350,64	399,92	9604,52	Sungai Musi	Kebun kopi	Tabarenah	Curup Utara	Rjg. Lebong	222.746	9.619.298
33	T.033	BB	+3					350,64	314,46	9918,98	Alur	Kebun kopi	Tabarenah	Curup Utara	Rjg. Lebong	222.635	9.619.592
34	T.034	BB	+0					350,64	201,71	10120,69	-	Kebun/ldg. (pisang)	Tabarenah	Curup Utara	Rjg. Lebong	222.564	9.619.780
35	T.035	BB	+3					350,64	450,86	10571,55	Jalan	Belukar (bambu)	Tabarenah	Curup Utara	Rjg. Lebong	222.405	9.620.202
36	T.036	BB	+0					350,64	369,89	10941,44	-	Kebun kopi	Dataran Tapus	Bermani Ulu Raya	Rjg. Lebong	222.275	9.620.547
37	T.037	BB	+12					350,64	181,17	11122,61	-	Belukar	Dataran Tapus	Bermani Ulu Raya	Rjg. Lebong	222.211	9.620.716
38	<b>T.038/TS.06</b>	<b>BB</b>	<b>+12</b>	<b>14</b>	<b>55</b>	<b>0</b>	<b>R</b>	350,64	161,58	11284,19	T/L150 kV	Kebun kopi	Dataran Tapus	Bermani Ulu Raya	Rjg. Lebong	222.154	9.620.867
39	T.39	AA	+3					326,33	390,16	11674,35	Jalan	Kebun kopi	Dataran Tapus	Bermani Ulu Raya	Rjg. Lebong	222.105	9.621.261
40	T.40	BB	+6					326,33	279,66	11954,01	-	Kebun kopi	Dataran Tapus	Bermani Ulu Raya	Rjg. Lebong	222.071	9.621.544
41	<b>T.041/TS.07</b>	<b>BB</b>	<b>+6</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>R</b>	326,33	261,82	12215,83	-	Kebun kopi	Dataran Tapus	Bermani Ulu Raya	Rjg. Lebong	222.038	9.621.808
42	T.042	AA	+9					344,15	352,93	12568,76	Jalan,T/L 30 kV	Kebun kopi	Dataran Tapus	Bermani Ulu Raya	Rjg. Lebong	222.017	9.622.167
43	T.043	AA	+3					344,15	371,07	12939,83	-	Kebun kopi	Dataran Tapus	Bermani Ulu Raya	Rjg. Lebong	221.995	9.622.545
44	T.044	BB	+0					344,15	353,17	13293,00	-	Kebun kopi	Dataran Tapus	Bermani Ulu Raya	Rjg. Lebong	221.974	9.622.905
45	T.045	AA	+3					344,15	186,85	13479,85	-	Kebun kopi	Bandung Marga	Bermani Ulu Raya	Rjg. Lebong	221.963	9.623.095
46	T.046	BB	+9					344,15	371,86	13851,71	-	Kebun kopi	Bandung Marga	Bermani Ulu Raya	Rjg. Lebong	221.942	9.623.474
47	T.047	BB	+6					344,15	255,19	14106,9	-	Kebun kopi	Bandung Marga	Bermani Ulu Raya	Rjg. Lebong	221.926	9.623.734
48	<b>T.048/TS.08</b>	<b>DD</b>	<b>+0</b>	<b>47</b>	<b>55</b>	<b>0</b>	<b>L</b>	344,15	381,40	14488,3	-	Belukar	Bandung Marga	Bermani Ulu Raya	Rjg. Lebong	221.904	9.624.122
49	T.049	BB	+0					312,85	327,53	14815,83	-	Belukar	Bandung Marga	Bermani Ulu Raya	Rjg. Lebong	221.649	9.624.327
50	T.050	BB	+0					312,85	252,51	15068,34	-	Kebun kopi	Bandung Marga	Bermani Ulu Raya	Rjg. Lebong	221.453	9.624.484
51	T.051	AA	+0					312,85	237,28	15305,62	-	Kebun kopi	Bandung Marga	Bermani Ulu Raya	Rjg. Lebong	221.269	9.624.633
52	T.052	AA	+0					312,85	375,17	15680,79	-	Belukar	Pal Seratus	Bermani Ulu Raya	Rjg. Lebong	220.977	9.624.867
53	T.053	AA	+0					312,85	362,39	16043,18	-	Kebun cabe	Pal Seratus	Bermani Ulu Raya	Rjg. Lebong	220.696	9.625.094
54	T.054	BB	+6					312,85	380,57	16423,75	-	Kebun kopi	Pal Seratus	Bermani Ulu Raya	Rjg. Lebong	220.400	9.625.331
55	T.055	BB	+3					312,85	177,51	16601,26	-	Belukar	Pal VII/Tujuh	Bermani Ulu Raya	Rjg. Lebong	220.262	9.625.442
56	T.056	BB	+6					312,85	293,97	16895,23	-	Sawah	Pal VII/Tujuh	Bermani Ulu Raya	Rjg. Lebong	220.033	9.625.626
57	T.057	AA	+3					312,85	270,92	17166,15	-	Kebun/ldg. (pisang)	Pal VII/Tujuh	Bermani Ulu Raya	Rjg. Lebong	219.823	9.625.795



No.	Number of tower	Type of Tower		angle *)				Equiv-span (m)	Distance of tower (m)	Cummulative distance (m)	Crossing	Land Use	village	Sub district	District	Coordinate of tower (m)	
				d	m	s	L/R									X	Y
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
58	T.058	AA	+6					312,85	290,05	17456,20	-	Belukar	Pal VII/Tujuh	Bermani Ulu Raya	Rjg. Lebong	219.598	9.625.977
59	<b>T.059/TS.09</b>	<b>BB</b>	+6	<b>4</b>	<b>51</b>	<b>0</b>	<b>L</b>	312,85	283,80	17740,00	-	Kebun kopi	Pal VIII/Delapan	Bermani Ulu Raya	Rjg. Lebong	219.377	9.626.154
60	T.060	AA	+6					340,00	366,24	18106,24	Alur	Kebun kopi	Pal VIII/Delapan	Bermani Ulu Raya	Rjg. Lebong	219.065	9.626.345
61	T.061	AA	+3					340,00	309,22	18415,46	-	Kebun kopi	Pal VIII/Delapan	Bermani Ulu Raya	Rjg. Lebong	218.801	9.626.507
62	T.062	AA	+3					340,00	340,04	18755,50	-	Kebun kubis	Pal VIII/Delapan	Bermani Ulu Raya	Rjg. Lebong	218.511	9.626.684
63	T.063	AA	+3					340,00	330,39	19085,89	-	Sawah	Pal VIII/Delapan	Bermani Ulu Raya	Rjg. Lebong	218.229	9.626.857
64	T.064	AA	+6					340,00	354,88	19440,77	-	Kebun kopi	Tebat Tenong Luar	Bermani Ulu Raya	Rjg. Lebong	217.927	9.627.042
65	<b>T.065/TS.10</b>	<b>CC</b>	+6	<b>20</b>	<b>6</b>	<b>0</b>	<b>R</b>	340,00	330,24	19771,01	-	Kebun kopi	Tebat Tenong Luar	Bermani Ulu Raya	Rjg. Lebong	217.645	9.627.215
66	T.066	AA	+9					388,43	371,76	20142,77	-	Belukar	Tebat Tenong Luar	Bermani Ulu Raya	Rjg. Lebong	217.416	9.627.508
67	T.067	AA	+3					388,43	387,98	20530,75	-	Belukar	Tebat Tenong Luar	Bermani Ulu Raya	Rjg. Lebong	217.177	9.627.813
68	T.068	AA	+0					388,43	374,93	20905,68	-	Belukar	Tebat Tenong Luar	Bermani Ulu Raya	Rjg. Lebong	216.946	9.628.108
69	T.069	AA	+6					388,43	389,49	21295,17	-	Sawah	Tebat Tenong Luar	Bermani Ulu Raya	Rjg. Lebong	216.706	9.628.414
70	T.070	AA	+3					388,43	393,87	21689,04	-	Kebun/ladang	Air Bening	Bermani Ulu Raya	Rjg. Lebong	216.463	9.628.724
71	<b>T.071/TS.11</b>	<b>BB</b>	+9	<b>16</b>	<b>21</b>	<b>0</b>	<b>R</b>	388,43	409,00	22098,04	-	Kebun kopi	Air Bening	Bermani Ulu Raya	Rjg. Lebong	216.211	9.629.046
72	T.072	AA	+3					314,68	308,59	22406,63	Jalan	Belukar	Bangun Jaya	Bermani Ulu Raya	Rjg. Lebong	216.105	9.629.335
73	T.073	AA	+9					314,68	346,22	22752,85	-	Sawah	Babakan Baru	Bermani Ulu Raya	Rjg. Lebong	215.986	9.629.659
74	T.074	AA	+0					594,73	311,15	23064,00	-	Belukar	Babakan Baru	Bermani Ulu Raya	Rjg. Lebong	215.880	9.629.951
75	T.075	BB	+9					594,73	311,23	23375,23	-	Kebun kopi	Babakan Baru	Bermani Ulu Raya	Rjg. Lebong	215.773	9.630.243
76	T.076	AA	+0					594,73	313,96	23689,19	-	Kebun kopi	Air Dingin	Rimbo Pengadang	Lebong	215.665	9.630.537
77	<b>T.077/TS.12</b>	<b>BB</b>	+3	<b>3</b>	<b>56</b>	<b>0</b>	<b>L</b>	594,73	288,55	23977,74	-	Belukar	Air Dingin	Rimbo Pengadang	Lebong	215.566	9.630.807
78	T.078	AA	+9					406,19	278,87	24256,61	-	Belukar	Air Dingin	Rimbo Pengadang	Lebong	215.451	9.631.057
79	T.079	BB	+9					406,19	409,56	24666,17	-	Belukar	Air Dingin	Rimbo Pengadang	Lebong	215.282	9.631.425
80	T.080	BB	+0					406,19	431,94	25098,11	-	Belukar	Air Dingin	Rimbo Pengadang	Lebong	215.104	9.631.813
81	T.081	AA	+0					406,19	365,55	25463,66	-	Belukar	Air Dingin	Rimbo Pengadang	Lebong	214.953	9.632.142
82	T.082	AA	+3					406,19	469,00	25932,66	-	Belukar	Tik Kuto	Rimbo Pengadang	Lebong	214.759	9.632.563
83	T.083	AA	+3					406,19	397,30	26329,96	-	Belukar	Tik Kuto	Rimbo Pengadang	Lebong	214.595	9.632.919
84	<b>T.084/TS.13</b>	<b>CC</b>	+3	<b>23</b>	<b>57</b>	<b>0</b>	<b>L</b>	406,19	413,27	26743,23	-	Belukar	Tik Kuto	Rimbo Pengadang	Lebong	214.426	9.633.293
85	T.085	AA	+6					457,58	435,58	27178,81	-	Kebun kopi	Tik Kuto	Rimbo Pengadang	Lebong	214.099	9.633.577
86	T.086	BB	+0					457,58	220,36	27399,17	-	Belukar	Tik Kuto	Rimbo Pengadang	Lebong	213.931	9.633.723
87	T.087	AA	+6					457,58	391,29	27790,46	-	Belukar	Rimbo Pengadang	Rimbo Pengadang	Lebong	213.637	9.633.979



No.	Number of tower	Type of Tower	angle *)				Equiv-span (m)	Distance of tower (m)	Cummulative distance (m)	Crossing	Land Use	village	Sub district	District	Coordinate of tower (m)			
			d	m	s	L/R									X	Y		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
88	T.088	AA	+3					457,58	511,11	28301,57	-	Belukar	Rimbo Pengadang	Rimbo Pengadang	Lebong	213.252	9.634.316	
89	T.089	AA	+6					457,58	554,20	28855,77	-	Kebun/ladang	Rimbo Pengadang	Rimbo Pengadang	Lebong	212.835	9.634.680	
90	T.090	AA	+9					457,58	382,83	29238,60	-	Belukar	Rimbo Pengadang	Rimbo Pengadang	Lebong	212.546	9.634.933	
91	T.091	AA	+0					457,58	301,03	29539,63	-	Belukar	Rimbo Pengadang	Rimbo Pengadang	Lebong	212.319	9.635.130	
92	T.092	BB	+9					457,58	475,95	30015,58	-	Kebun kopi	Rimbo Pengadang	Rimbo Pengadang	Lebong	211.961	9.635.444	
93	T.093	BB	+9					457,58	341,21	30356,79	-	Belukar	Rimbo Pengadang	Rimbo Pengadang	Lebong	211.704	9.635.668	
94	T.094	BB	+9					457,58	672,42	31029,21	-	Belukar	Rimbo Pengadang	Rimbo Pengadang	Lebong	211.198	9.636.111	
95	T.095	AA	+3					457,58	547,32	31576,53	-	Belukar	Rimbo Pengadang	Rimbo Pengadang	Lebong	210.786	9.636.471	
96	T.096	BB	+15	7	56	46	L					Kopi	Kopi	Talang Ratu	Rimbo Pengadang	Lebong	210.468	9.636.749
97	T.097	AA	+15									Kopi	Kopi	Talang Ratu	Rimbo Pengadang	Lebong	210.233	9.636.954
98	T.098	AA	+15									Kopi	Kopi	Talang Ratu	Rimbo Pengadang	Lebong	210.115	9.637.058
99	T.099	AA	+12									Kopi	Kopi	Talang Ratu	Rimbo Pengadang	Lebong	209.851	9.637.288
100	<b>T.100/TS.14</b>	<b>AA</b>	<b>+15</b>									Kopi	Kopi	Talang Ratu	Rimbo Pengadang	Lebong	209.668	9.637.448
101	T.101	AA	+12									Kopi	Kopi	Talang Ratu	Rimbo Pengadang	Lebong	209.271	9.637.740
102	T.102	AA	+12									Semak	Semak	Talang Ratu	Rimbo Pengadang	Lebong	208.900	9.638.012
103	T.103	AA	+09									Semak	Semak	Talang Ratu	Rimbo Pengadang	Lebong	208.654	9.638.193
104	T.104	AA	+00									Semak	Semak	Talang Ratu	Rimbo Pengadang	Lebong	208.376	9.638.397
105	T.105	AA	+06									Semak	Semak	Talang Ratu	Rimbo Pengadang	Lebong	208.183	9.638.539
106	T.106	AA	+12									Semak	Semak	Suka sari	Lebong Selatan	Lebong	207.868	9.638.770
107	T.107	AA	+15									Semak	Semak	Suka Sari	Lebong Selatan	Lebong	207.605	9.638.963
108	T.108	AA	+12									Semak	Semak	Suka Sari	Lebong Selatan	Lebong	207.348	9.639.153
109	T.109	AA	+15									Semak	Semak	Suka Sari	Lebong Selatan	Lebong	207.090	9.639.342
110	T.110	BB	+12	8	8	33	L					Ladang	Ladang	Mangkurajo	Lebong Selatan	Lebong	206.940	9.639.452
111	T.111	AA	+12									Jalan, TR 20 kV, Ladang, Semak	Jalan, TR 20 kV, Ladang, Semak	Mangkurajo	Lebong Selatan	Lebong	206.522	9.639.759
112	T.112	AA	+09									Semak	Semak	Mangkurajo	Lebong Selatan	Lebong	206.422	9.639.833
113	T.113	AA	+12									Jalan, TR 20 kV, Ladang, Semak	Jalan, TR 20 kV, Ladang, Semak	Mangkurajo	Lebong Selatan	Lebong	205.895	9.640.220
114	T.114	AA	+15									Semak	Semak	Mangkurajo	Lebong Selatan	Lebong	205.751	9.640.326



No.	Number of tower	Type of Tower		angle *)				Equiv-span (m)	Distance of tower (m)	Cummulative distance (m)	Crossing	Land Use	village	Sub district	District	Coordinate of tower (m)	
				d	m	s	L/R									X	Y
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
115	T.115/TS.15	AA	+12								Semak	Semak	Mangkurajo	Lebong Selatan	Lebong	205.369	9.640.606
116	T.116	AA	+15								Semak	Semak	Mangkurajo	Lebong Selatan	Lebong	205.065	9.640.811
117	T.117/TS.16	AA	+15								Semak	Semak	Mangkurajo	Lebong Selatan	Lebong	204.678	9.641.071
118	T.118	AA	+15								Semak	Semak	Mangkurajo	Lebong Selatan	Lebong	204.379	9.641.177
119	T.119	AA	+06								Semak	Semak	Mangkurajo	Lebong Selatan	Lebong	204.069	9.641.287
120	T.120	AA	+12								Semak	Semak	Mangkurajo	Lebong Selatan	Lebong	203.718	9.641.411
121	T.121	CC	+15	34	20	28	L				Semak	Semak	Mangkurajo	Lebong Selatan	Lebong	203.353	9.641.541
122	T.133	AA	+0					353,48	340,33	43238,86	-	Kebun kopi	Taba Anyar	Lebong Selatan	Lebong	200.855	9.641.884
123	T.134	AA	+0					353,48	390,87	43629,73	Alur	Kebun kopi	Taba Anyar	Lebong Selatan	Lebong	200.469	9.641.821
124	T.135	AA	+3					353,48	327,99	43957,72	-	Kebun kopi	Taba Anyar	Lebong Selatan	Lebong	200.145	9.641.767
125	T.136	AA	+0					353,48	255,14	44212,86	-	Kebun kopi	Taba Anyar	Lebong Selatan	Lebong	199.892	9.641.726
126	T.137	AA	+0					353,48	399,63	44612,49	-	Kebun kopi	Taba Anyar	Lebong Selatan	Lebong	199.497	9.641.661
127	T.138	AA	+0					353,48	322,19	44934,68	-	Kebun kopi	Taba Anyar	Lebong Selatan	Lebong	199.178	9.641.609
128	T.139	AA	+3					353,48	424,66	45359,34	-	Kebun kopi	Taba Anyar	Lebong Selatan	Lebong	198.758	9.641.540
129	T.140	AA	+0					353,48	342,48	45701,82	-	Belukar	Taba Anyar	Lebong Selatan	Lebong	198.420	9.641.485
130	T.141	AA	+0					353,48	303,17	46004,99	-	Belukar	Taba Anyar	Lebong Selatan	Lebong	198.120	9.641.436
131	T.142/TS.18	DRD	+0					353,48	332,62	46337,61	-	Belukar	Taba Anyar	Lebong Selatan	Lebong	197.791	9.641.382
	<b>Total (**)</b>								<b>46337,61</b>								



Table 1.2. Number of Tower Per Villages from the Hululais Transmission Network -  
Pekalongan

No.	Districts	Sub-district	Village		Number of towers		
I	Lebong	1. Lebong Selatan	1	Taba Anyar	10		
			2	Mangkurajo	12		
			3	Sukasari	4		
		2. Rimbo Pengadang	4	Talang Ratau	10		
			5	Rimbo Pengadang	9		
			6	Tik Kuto	5		
			7	Air Dingin(Bioa Sengok)	6		
II	Rejang Lebong	1. Bermani Ulu Raya	8	Babakan Baru	3		
			9	Bangun Jaya	1		
			10	Air Bening	2		
			11	Tebat Tenong Luar	6		
			12	Pal VIII/Delapan	5		
			13	Pal Tujuh	4		
			14	Pal Seratus	3		
			15	Bandung Marga	7		
			16	Dataran Tapus	9		
		2. Curup Utara	17	Tabarenah	4		
			18	Pahlawan	2		
			19	Suka Datang	1		
			20	Lubuk Kembang	2		
			21	Batupanco	4		
		3. Curup	22	Talang Benih	2		
			23	Dwi Tunggal	2		
		4. Curup Selatan	24	Punguk Lalang	4		
			25	Lubuk Ubar	2		
			26	Watas Marga	1		
		III	Kepahiang	1. Merigi	27	Lubuk Penyamun	3
					28	Bukit Barisan	3
2. Ujan Mas	29			Burnisari	3		
	30			Pekalongan	2		
<b>Number of towers</b>					<b>131</b>		

Tabulation of details land use / needs per type of tower in Table 1.3 below.



Table 1.3. Plan for land requirements for tower sites

No.	Type of Tower	Function	Corner	Number of Tower	Landper tower (m x m)	Large of land (m <sup>2</sup> )
1	AA	Suspension	0-5 °C	83	15 x 15	18.675
2	BB	Tension/Secti on	0-10 °C	48	15-20 x 15-20	14.650
3	CC	Tension	10-30 °C	4	20 x 20	1.600
4	DD	Tension	30-60 °C	1	20 x 20	400
5	DRD	Dead-End		2	20 x 20	800
<b>Jumlah</b>				<b>131</b>		<b>36.125</b>

Source: PT PLN (Persero) Sumatra Main Plant Development Unit, with processing.

The weight of the Gantry structure and the support of under crossing equipment are estimated to be 50 tons, the weight of the Gantry (post and bean) structure and support of the equipment at the Switching Station is estimated to be 250 Ton.

The tower that has been built is given security equipment namely:

- Anti Climbing Device
- Plate Danger warning sign to climb high voltage towers

### 1.1.3.2. Substation or Switching Station

The related substation to be built is the Substation located in Taba Anyar, a new substation that requires land acquisition. This substation is located in Taba Anyar Sub-district, Kec. Lebong Selatan Kab. Lebong. For the 150 kV Transmission / SUTT Network with a route of ± 46,337 km, 131 towers pass through 3 Regencies, 8 sub-districts and 30 villages, with land requirements for a tower site of ± 3.6125 hectares (= 36,125 m<sup>2</sup>).

The land area for the substation to be built is one unit of 20,000 m<sup>2</sup>. The GI that will be built is located at Kel. Taba Anyar, Kec. Lebong Selatan located in the Hululais PLTP area, so the land acquisition will be carried out by the PLTP, that is PT Pertamina Geothermal. The main substation is the existing substation (*existing*; GI Pekalongan) namely in Pekalongan Village, Ujan Mas District, Kepahiang Regency. The project site of the new substation location and transmission network is community plantation land.



Substation has uses, among others:

- 1) Transform electric power (from extra high voltage to high voltage, from high voltage to medium voltage, from medium to low voltage)
- 2) Arrangement of load service to other substations through high voltage to the distribution substation after going through a voltage drop process through medium voltage feeders in the substation untuk pengukuran, pengawasan operasi serta pengamanan sistem tenaga listrik
- 3) for telecommunications facilities (Internal) or better known as SCADA (*Supervisory Controlling And Data Acquisition*).

The main components of this type of substation are: Switch Yard (area / location where components of substations are located outside the building) and building / building controls. While based on the Rail System (busbar) used at the 500kV Substation it is planned as a Double Busbar System Substation one and half breaker The figure below shows a different 150kV Single-line Substation diagram with a 500kV Substation.

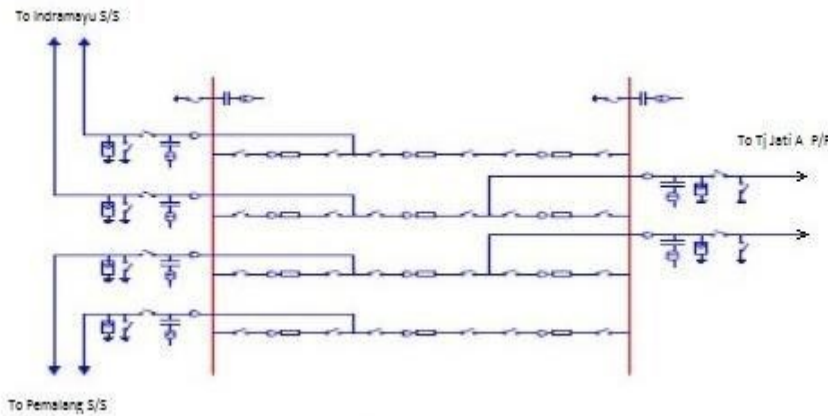
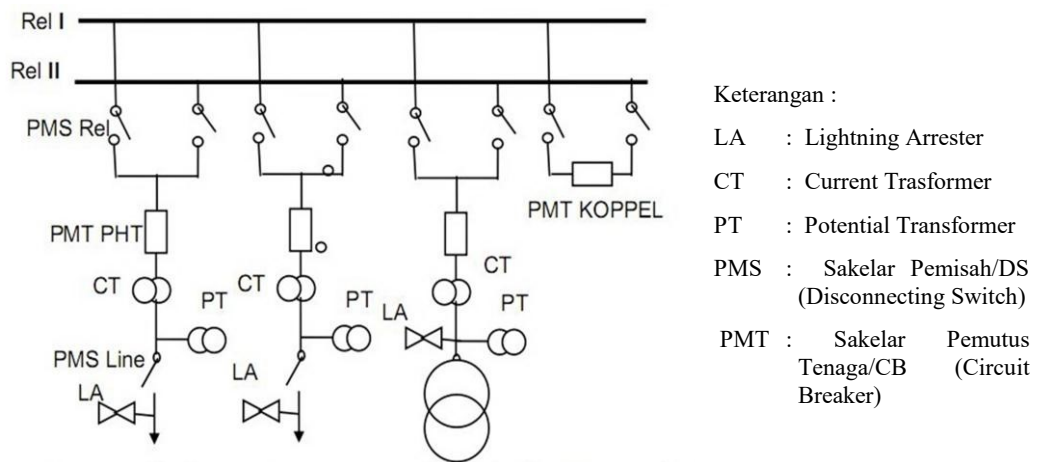


Figure 1.5 Single Line Diagram Gardu Induk 150kV Sistem Double Busbar dan half breaker.

In general the function of Substation is as follows:

1. step up or step down the system voltage magnitude
2. Change the magnitude of the voltage phase angle or power factor
3. Connect or disconnect the power supply
4. Serving electric power loads

Based on its function, substations can be grouped into:

1. GI Step Up : raise the generation voltage to the transmission voltage;
2. GI Transmission: lowers the transmission to sub-transmission voltage;
3. GI Distribution: decreases the sub-transmission voltage to primary distribution voltage.

While based on the construction, substations can be classified into:

1. GI is water insulated (*Air Insulated Substation*)

The GI is air-insulated, the isolation of the voltage equipment, both between phases and phase to ground is atmospheric air (controlled or uncontrolled). GI equipment such as busbars, switchgear and transformers are placed in open spaces. This type of GI requires a relatively large area. The type of GI that will be built in this study is this type of GI.

2. GI gas insulated (*Gas Insulated Substation*)

The GI is gas insulated, the isolation of voltage equipment (except power transformers), both between phases and phase to ground is gas. The gases used are usually electronegative groups (air is not included in this classification). SF<sub>6</sub> is the most commonly used gas type.

3. Underground GI

This type of GI, almost all the main GI equipment, control equipment and measuring instruments are installed on the ground. Sometimes the control room is also on the ground.

4. GI moves

The mobile GI is placed on a special trailer. Usually used in an emergency (emergency) or in the development phase.

Equipment contained in the substation is:

1. Real power (*bus bar*)





Ril power functions as a connecting circuit and GI equipment. The basic form of the GI power circuit relationship is determined by the real power used. There are several types of real systems commonly used, namely superior real systems, double ril, and ril bracelet.

## 2. Connecting equipment

Connecting equipment functions to separate and connect a series of systems. Connecting equipment consists of a power breaker (circuit breaker), separator (disconnecting switch), voltage transformer (potential transformers) and current transformer (current transformer). The power breaker functions to open and close the circuit in a load condition (when there is a disturbance and under normal circumstances) or does not load automatically. Separator functions to separate the circuit in a situation not burdened (for example for maintenance or repair of equipment in a series) and cannot be separated in a situation of burden.

Voltage and current on the voltage side cannot be measured directly, for this purpose a voltage and current transformer is used which functions to change the high voltage and current to low, so that it can be displayed on the measurement instrument. Voltage transformers and current transformers also function as transducer drive power breakers in the event of a disruption in the system circuit.

## 3. Power transformer (*power transformator*)

The power transformer functions to increase or decrease the voltage. There are 2 types of power transformers, namely 1-phase and 3-phase power transformers. The power transformer is likened to a heart in an electric power distribution system, and is the largest asset of a GI. Power transformers vary in size depending on the voltage level and power that can be distributed. In general, the power transformer used is an oil-insulated type (mineral oil). Besides functioning as an insulator, oil also functions as a cooling medium.

## 4. Phase change equipment (*phase shifting devices*)

Phase change equipment serves to regulate the reactive power flow in the system. The phase change equipment consists of reactors and capacitors installed if needed. The reactor functions to absorb reactive power, while the capacity functions to supply reactive power. The size of the phase modifier also varies depending on the voltage and its ability to absorb / supply reactive power.



#### 5. Overvoltage protection system (*surge protection system*)

Overvoltages in the system can be caused by lightning strikes (both direct and indirect) or as a result of the operation of the power breaker. Overvoltage protection systems include ground shielding wire, surge arresters and grounding systems. Shielding wire (overhead ground wire) is mounted on tower tops to protect the GI equipment underneath. Lightning arrester or also called surge arrester serves to cut over voltage and drain the current into the ground through the points of the land system. Surge arresters are usually installed at the ends of the SUTT and before the power transformer.

In addition to protecting operators in maintaining or repairing GI equipment, an earth switch is used. In addition, the earthing switch also serves to channel the remaining current in a newly opened circuit into the ground. This switch is only operated when the circuit is open.

#### 6. GI Building

The GI Building is a place to put control equipment, connecting panels and also functions as an office. Control equipment and connecting panels are the nerve centers of a GI. On the connecting panel (measuring board) the operator can observe the state of the equipment, perform remote equipment operations, as well as measurement of voltage, current, power, and so on every time. Modern GI control systems are equipped with computer systems that control and record data automatically and are known as SCADA systems (*Supervisory Control and Data Acquisition*).

#### 7. Complementary equipment

Which includes GI supplementary equipment is *battery (accu)*, *filler battery (battery charger)*, *backup power source (auxiliary power source)*, *lighting equipment (lightning devices)*, *communication equipment (communication devices)*, *fire extinguishers (fire extinguisher)* and so forth.

#### 1.1.4. Stages of Activity

The stages of the 150 kV Transmission Network and Substation (GI) Construction activities consist of the Pre-Construction, Construction and Operation stages. Each stage is described as follows :



- A. Pre-Construction Phase
  - 1. Management of permits
  - 2. Land survey and lane
  - 3. Disseminate the activity plan
  - 4. Land acquisition and vegetation
- B. Construction Phase
  - 1. Acceptance and mobilization of labor
  - 2. Mobilization and demobilization of equipment and materials
  - 3. Cleaning of the tower site and free space
  - 4. Construction of foundations and towers
  - 5. Withdrawal of conductive wire and ground wire
  - 6. *Commisioning Test*
  - 7. Construction of substations (GI)
- C. Operation Phase
  - 1. Distribution of electricity
  - 2. Maintenance of transmission networks and substations
- D. Post Operation Phase
  - 1. *Upgrading the transmission network; or*
  - 2. Demolition of the transmission network

#### **1.1.4.1. Pre-Construction Phase**

##### **1. Licensing**

Licensing is a fundamental aspect of implementing an activity, including the construction of transmission networks. The construction of the 150 kV transmission plant Hululais - Pekalongan PLTP and the related substation requires permission from both the central government and the regional government as well as from related institutions or ministries. Some of the permits needed for the project activities include: principle permits, location permits, information including or outside the forest area, and others.



### **a. Principle permit**

In a development activity, the permit that is first administered is a principle permit. Principle permit related to electricity and activities with company capital above 200 M centralized online via BKPM Pusat.

### **a. Location permit or location determination**

In any development that requires the use of land / land, the requirements for location permits or location determination are needed. Based on this location permit will be a reference and basis for the process of applying for land rights to the land agency (local National Land Agency), but in accordance with PP No.148 of 2015 that land area <5 Ha does not require a permit to determine the location due to land acquisition turret tower.

### **a. Other permits**

In general, the permits needed in carrying out transmission development activities are as described above. Other permits needed include permits to fell trees, permits to transport goods, and others. Other permits needed will be fulfilled by PT PLN in accordance with the applicable laws and regulations for the legality of the implementation of this SUTT development.

### **b. Land and Path Survey**

The construction of the transmission requires clear path information based on the plan and results of the data collection and field survey. The survey activity of the transmission line includes the activities of topographic and soil mechanics surveys, spatial planning and current land use planning. Topographic survey activities are carried out to determine which SUTT 150 kV path will be traversed by the Hululais-Pekalongan PLTP which is the best path from a technical and economic perspective. Topographic survey activities include field and office activities, namely data processing and depiction of planned transmission lines. Mechanic survey activities are carried out with the aim of knowing soil conditions. The activity was divided into two: activities in the field and activities in the soil mechanics laboratory.

In this research / survey (topography) the activities carried out include :

- Determination of location / network configuration. This activity begins with a topographic survey to determine the location or path to be traversed which is best viewed from a technical and economic perspective.



- Establish the type of pole and conductor
- Draw elongated pieces and tower placement (profile map)

In this work includes field and office activities.

Field work, covering:

- Measurement of longitudinal profiles and lane situations, with several stages, namely: measuring the main polygon, stacking out centerline, and measuring elongated situations and lane situations.
- Tower location and measurement, after the tower location planning work. Measurements in the field using theodolite measuring devices.

Office work, covering:

- data processing and detailed map depiction perencanaan lokasi tower (*tower spotting*)
- depiction of the plan section of the tower location
- making survey reports

Then an investigation / soil mechanics survey was carried out. Done to find out the condition of the soil, with the following objectives:

- Collect data on the condition of the surface of the ground and the inside of the site of the tower site.
- Provide advice on tower construction that is in accordance with soil conditions from the results of soil mechanical surveys.
- Provide technical data in budgeting at the planning stage
- Sondir and boring are carried out to determine the carrying capacity of the soil because some are on land with topography > 25%.
- In locations adjacent to settlements, it is attempted to use a well foundation so that the security of residents' houses is not disturbed due to the project.
- Recording data on land, buildings and plants affected by the lane.

Implementation of tower site land acquisition activities is adjusted to Law No. 2 of 2012 concerning Land Procurement for Public Interest, which begins with an inventory of land covering the land area, land status, land class, land ownership, type of plant affected by the lane. The initial land data needed for the process of land acquisition of tower sites was obtained during this initial survey, before the activities of inventory of land, buildings and



plants which were specifically carried out then a price assessment study was carried out by independent consultants who already had certification recognized as guidelines for stipulation compensation and compensation prices. The inventory was carried out by PT PLN (Persero) together with land owners, local government, and representatives of the district National Defense Agency (BPN), which was then legalized by the village head and the local sub-district head.

## **2. Dissemination of Activity Plan**

The socialization of the 150 kV SUTT construction project Hululais-Pekalongan PLTP and related substations was carried out to provide clear information about the planned implementation of these activities to the community. This socialization is a notification regarding the SUTT 150 kV Construction project of the Hululais-Pekalongan PLTP and related substations by the Proponent and the Study Team aimed at the community directly affected by the implementation of the activity, namely to the community below or around the transmission line. So that later it can be known how much the community's response and expectations towards this project.

Regular consultation / socialization for progress of the AMDAL study conducted in accordance with Minister of Environment Regulation No. LH. 17 of 2012 concerning Guidelines for Community Engagement in the AMDAL Process and Environmental Permits. This public consultation was conducted with a question and answer system involving the initiator, the AMDAL study team, representatives / leaders of the local community and the local village / sub-district apparatus. The right and directed system, time and method of socialization will be very effective for the dissemination of this SUTT development activity.

This socialization aims to find input and response as an ingredient in the scoping process of the significant impact of the planned SUTT 150 kV construction activities of the Hululais-Pekalongan PLTP and related substations in the EIA study process..

## **3. Land Acquisition and Plants**

The legal basis used by PT PLN in conducting land acquisition is Law No. 2 of 2012 concerning Land Procurement for Development in the Public Interest, Presidential Regulation Number 71 of 2012 concerning the Implementation of Land Procurement for Development in the Public Interest. In addition, at the operational level, the ESDM



Ministry specifically regulates the implementation of technical land acquisition and compensation for land, buildings and plants, namely Minister of Energy and Mineral Resources Regulation No. 27 of 2018.

Land under the network is only compensated if there are buildings or trees that need to be cut / cut. For perennials that are more than 4.5 meters high and at a distance of less than 10 meters left and right from the center line, the plants will be released and compensated. Land / land, plants and buildings that are under the SUTT line are not exempted, but for activities below it will be compensated.

Based on the Minister of Energy and Mineral Resources Regulation No. 27 of 2018 the formula for calculating land and building compensation by taking into account the elements of land and building compensation is:

Calculation formula Compensation for land, buildings and plants that are under SUTT or SUTET free space is determined as follows:

**a. The formula for calculating compensation for land:**

$$\text{Compensation} = 15\% \times L_t \times NP$$

Information:

$L_t$  : Area of land under free space

$NP$  : Land Market Value from Appraisal Institutions

**b. Formula for Compensation calculation for buildings:**

$$\text{Compensation} = 15\% \times L_b \times NP_b$$

Information:

$L_b$  : Building area under free space

$NP_b$  : Building Market Value from Appraisal Institutions

**c. Formula for calculating compensation for plants:**

$$\text{Compensation} = NP_t$$

Compensation:

$NP_t$  : Plant Market Value from Appraisal Institutions.

Value of compensation = Optimization of land x function index x status hold x NJOP



## Land Optimization

The choice of pattern of this approach is based on the consideration that the land has social functions without overriding the interests of the individual / the people at large. With this in mind, it means that there is no transfer of land rights and it is hoped that landowners can still work on their land and obtain the expertise. Based on the optimization concept of this land, compensation is calculated at 10%.

Utilization Index of Land and Building Functions The index of utilization of land and building functions is determined by considering the object and designation of land and buildings associated with the optimization of land, the magnitude of which is:

- building	= 1
- land for building	= 1
- yard	= 0,5
- lading / garden	= 0,3
- paddy field	= 0,1

### ▪ Land Status

The compensation for land considers the status of the land in question, with the following assessment:

- land owned (certified)	= 100%
- customary land	= 90%
- land use rights building	= 80%
- land of business use rights	= 80%
- land of use rights	= 70%
- waqf land	= 100%

For building use rights, business use rights, and usufructuary rights, also consider the percentage of the remaining period of utilization of the land in question.





- The Land Price

In order to obtain the legal basis for land and building prices, the price of land and buildings can be based on the Tax Object Selling Value (NJOP) of the current year as determined by the Tax Office.

Also carried out is the release of plants and buildings that enter and have the potential to enter free space with blackheads with applicable laws and regulations; buildings and plants that have been liberated / compensated for must be unloaded and completely cut by the owner. Free space is a space bounded by vertical and horizontal fields around and along the SUTT conductor where there cannot be objects in it for the safety of humans, living things and other objects as well as the safety of SUTT operations. Free space for SUTT 150 kV in accordance with SNI 04.6918.2002 and ESDM Kpem above.

Land, plant and building acquisition and compensation activities will be carried out by the initiator, namely PT PLN (Persero) in accordance with an agreement with residents or landowners. Land acquisition for the construction of 131 150 kV transmission network towers Hululais - Pekalongan PLTP and related substations along  $\pm 46,337$  km with an area of  $\pm 3,6125$  hectares ( $= 36,125$  m<sup>2</sup>); (the area for GIs covering an area of 2.0 ha is in the PLTP area) will be provided by the PLTP management, which will be on land owned by the community. Land and plant / plant acquisition will be carried out by the initiator in accordance with the agreement with the landowners based on consensus agreement.

The land required for tower sites is 15m x 15m for straight type towers (Type A) and 15-20m x 15-20m for tower type angles, namely BB type, CC, and DD (Figure 1.6).

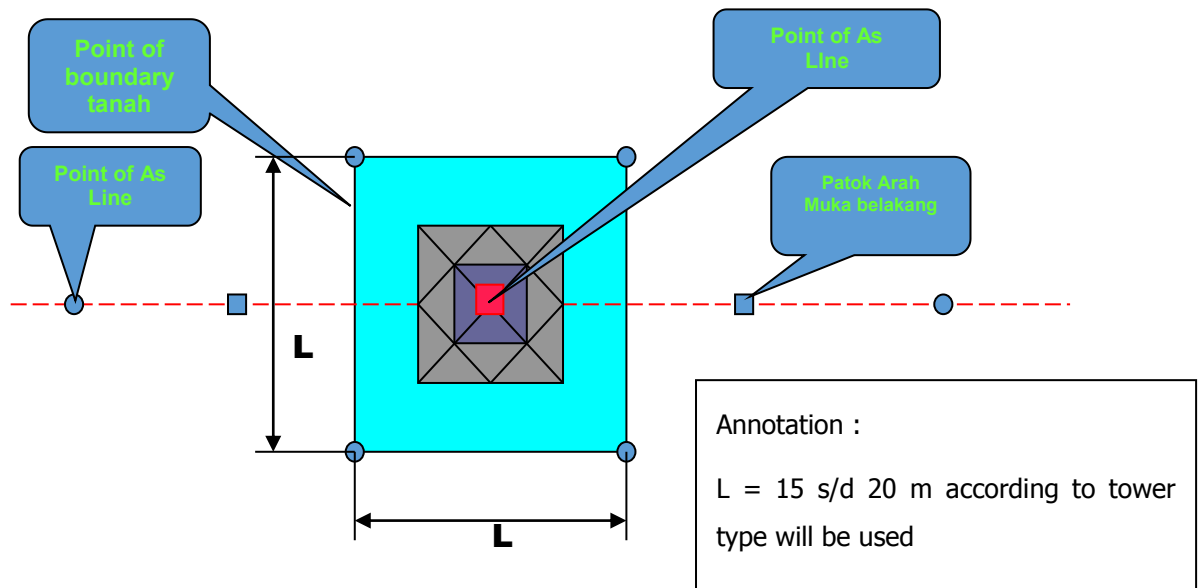


Figure 1.6. of land needed for a 150 kV SUTT tower site

The stages of land acquisition activities must be guided by Law Number 2 Year 2012 and Presidential Regulation Number 71 of 2012, and some accelerated efforts to be immediately carried out by PT PLN include the following:

- a. Hold socialization / counseling to the community whose land is affected by tower sites.
- b. Make a list of results of land inventory that includes land area, land status, class of land and ownership of land and stands / plants and buildings that are above it.
- c. Identify the status of land ownership from the land owner and check the village, sub-district and authorized institutions.
- d. Negotiating land prices. Negotiations are carried out through the following stages: negotiations witnessed by local officials at the village head's office, and then negotiations and approaches are carried out directly with the landowners so that an agreement is reached on the prices of both parties.
- e. The standard used as a benchmark in the land acquisition process is the NJOP and the price of land surrounding it and taking into account land purchase transactions that have occurred in the last two years.
- f. The release of stands and buildings that are located above the ground is carried out based on the regulations of the Governor and the local Regent (if any), on the presence of the Public Works Service for the release of buildings and the Agriculture or Plantation Service of Bengkulu Province and Lebong, Rejang Lebong and Kepahiang.

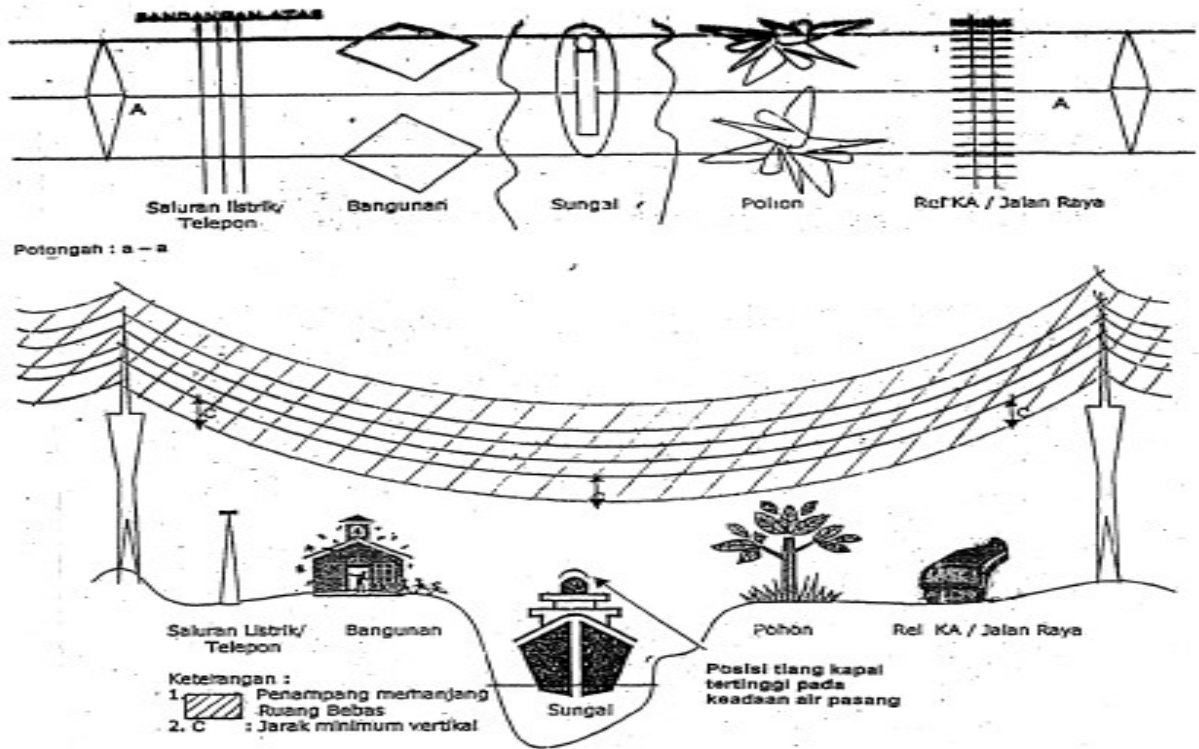


- g. Make payments directly to the land owner if an agreement has been obtained from the community.
- h. Conduct documentation and make minutes of payment that will later be used as evidence of the release of rights from the community, hereinafter can be used as tower sites and or substations.

Before land acquisition, the data obtained from the community was confirmed to the local Regency Land Agency Office to obtain information and clarification of the status of the land. Land acquisition is carried out by taking into account the utilization of the remaining land owned by the community. The remaining land intended is the remaining land left over from the land area for the tower site, so that the remaining land is released and the land can be utilized by the community.

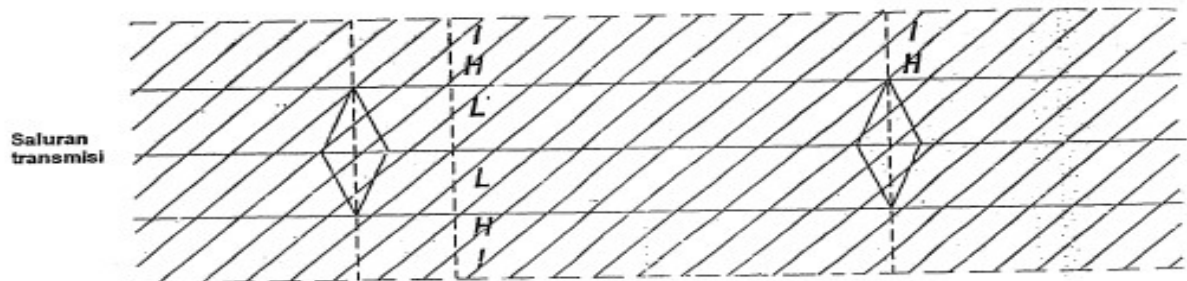
Apart from the land used for tower sites, the stands / plants and buildings that enter the free space are also carried out. Free space is a space that is limited by vertical and horizontal fields around and along the transmission conductor where there must be no objects in it for the safety of humans, living things and other objects as well as the security of transmission operations.

Free space for 150 kV transmission based on SNI 04-6918-2002 as in **Figure 1.7**, **Figure 1.8**, and **Figure 1.9**. In accordance with the applicable provisions in the free space of 150 kV transmission, no stands or anything is permitted, for this reason the stands which are estimated to be in the free space must be released. Free space acquisition activities from stands are called lane liberation activities.



Source: SNI 04-6918-2002

Figure 1.7. The longitudinal section of the SUTT 150 Kv free space

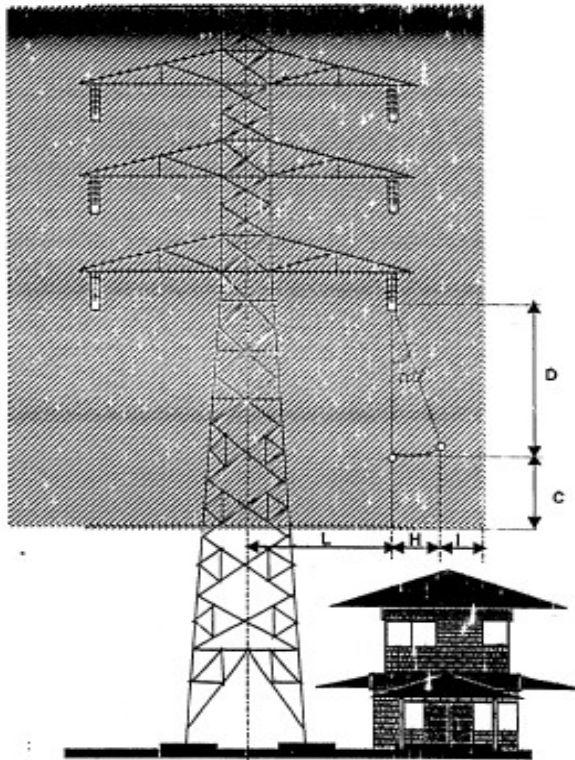



Information:

1. = Cross section free space;
2. L = Lighting impulse free distance (for SUTT) or switching impulse free distance (for ...)

Source: SNI 04-6918-2002

Figure 1.8. Top view of free space

**Keterangan :**

-  : Penampang melintang ruang bebas pada tengah gawang
- L : Jarak dari sumbu vertikal tiang ke konduktor
- H : Jarak horizontal akibat ayunan konduktor
- I : Jarak bebas impuls petir
- C : Jarak bebas minimum vertikal
- D : Jarak andongan terendah ditengah gawang (antara dua menara)

Source: SNI 04-6918-2002

Figure 1.9. Cross section of free space in the center of the goal

Stages of lane liberation activities include:

- a. Identify stands and ownership that are expected to enter into free space.
- b. Make a list of types and numbers of stands that are expected to enter into free space.
- c. Disseminating free space to stand owners, this socialization was carried out in stages starting from the district, sub-district to village.
- d. Approach and negotiate directly with the owner of the stand until a price agreement is obtained.
- e. Make payments directly to the land owner if an agreement has been obtained from the community.
- f. Conduct documentation and make minutes of payment that will later be used as evidence of the release of rights from the community.

The area under the lane for transmission of 150 kV horizontal minimum clearances from the vertical axis of the tower / tower / pole for a 150 kV transmission network is 5-10 meters to the left and right of the transmission point's midpoint with details according to the 1.4.

Table 1.4. The minimum horizontal free distance from the vertical axis of the tower at SUTT 150 kV

No.	Transmission line SUTT 150 kV	Distance from the vertical axis of the tower to the conductor (L); (m)	Jarak horizontal akibat ayunan konduktor (H);(m)	Lightning impulse clearance (I); (m)	Total L+H+I (m)	Total in intregation (m)
1.	Tiang baja	2,25	2,05	1,5	5,80	6,00
2.	Tiang beton	2,25	0,86	1,5	4,61	5,00
3.	Menara	4,20	3,76	1,5	9,46	10,00

Source : SNI 04-6918-2002 and Regulation of Energy and Mineral Resource Ministry No. 27/2018.

The mechanism for giving compensation is as follows:

1. Make a land and building inventory list that is entered into the free space of transmission area of 10 m left and right from the midpoint which includes land area, land status, land class and landowner.
2. Identifying the status of land ownership from the land owner and checking the village, sub-district and authorized institutions.
3. Make payments directly to land and building owners.
4. Document and make payment minutes.

The minimum clearance of a vertical field from a conductor is the limit at which buildings or stands that are allowed may not exceed the minimum limits specified in WHO and SNI standards. The minimum vertical clearance for transmission between conductors and other objects below can be seen in the following table.



Table 1.5. The minimum vertical clearance between the delivery of 150 kV SUTT with the ground and other objects

No.	Location	T/L 150 kV
1.	Open field or open area	7,5 m
2.	Regions with certain circumstances	
2.1.	Building Not Fireproof	13,5 m
2.2.	Fire Resistant Building	4,5 m
2.3.	Road / highway traffic	9 m
2.4.	Trees in general, forests, plantations	4,5 m
2.5.	Sports field	13,5 m
2.6.	Other SUTTs, low voltage air conductors, telecommunications networks, radio antennas, television antennas and cable cars	4 m
2.7.	Regular railroad tracks	9 m
2.8.	Iron bridge, anchor iron frame, nearest electric train, etc.	4 m
2.9.	The highest point of the mast on the tide / highest position in water traffic	4 m

Source: SNI 04-6918-2002 and Regulation of the Minister of Energy and Mineral Resources No. 27/2018.

#### 1.1.4.2. Construction Phase

##### 1. Labor Procurement

The workforce needed for the construction of the transmission network includes experts from various disciplines, supervisors and implementing staff, whose numbers are in accordance with their needs. Most of the workers are rough workers who are taken from the population around the location of the activity, in addition to making it easy to also avoid other social problems that will arise, and this has become PT PLN's commitment in carrying out each of its work.

Whereas for workers who need special expertise not obtained from the area around the location of the activity will be taken from outside the region. The number of workforce plans needed in the construction of the 150 kV SUTT Hululais-Pekalongan PLTP and the main substation in the construction phase amounts to  $\pm 207$  people including:

- Coarse / implementing personnel = 108 people
- Middle power = 48 people
- Experts = 46 people
- Elements of the leadership = 5 people



Tabulate the amount of labor requirements planned for carrying out this activity in **Table 1.6** .

Table 1.6. The composition of the workforce plan needed

No.	Description	Total (person)	Education	% Origin *)	
				Local	Non local
1	Site Manager/Team Leader	5	S1 Teknik	1	4
2	Expert / Trained staff	36	STM s/d S1 Teknik	10	26
3	Surveyor	16	STM s/d D3 Teknik	5	11
4	Overseer / Supervisor	7	STM/ sederajat	4	3
5	Operator / Driver	25	STM/ sederajat	20	5
6	Carpenter, iron, stone	28	--	22	6
7	Daily labor	90	--	70	20
	<b>Total</b>	<b>207</b>		<b>132</b>	<b>75</b>
	<b>Persentase</b>			<b>63,77</b>	<b>36,23</b>

Note: \*) = Local is labor originating from the Bengkulu Province

Source: PT PLN (Persero) Sumatra Power Plant Development Unit.

The receipt and reduction of labor is carried out in stages in accordance with the volume and type of work. In this construction phase, it will have an effect on changes in the livelihoods of residents around the location of the activity, namely being temporary / incidental daily / implementing personnel. Obligations related to the use of labor will be obeyed / obeyed according to the applicable laws and regulations.

## 2. Mobilization and Demobilization of Equipment and Materials

The mobilization of equipment and materials referred to here is to bring equipment and materials to the project location. The material needed for the project is tower material and material for the foundation (building material).

The tower used is a type of Lattice Tower, the type of construction that is most widely used in the PLN network, because it is easily assembled, especially for installation in mountainous areas and far from the highway. The material for the tower is in the form of pieces that are strung together at the site of the tower site. Material transportation is used by trucks with a capacity of 5 6 tons or with a smaller weight by adjusting road class conditions. The vehicle used must be in good condition and meet the applicable requirements.





Material to be used is transported to the location and placed around the location of the tower to be built. The laying of material in this location uses land owned by the community with the permission of the owner with the rental system. Materials used for tower foundation construction activities include sand, river stone, gravel and cement. The material is sought to be obtained from around the location of the activity. The amount of material depends on the type of tower to be built.

The foundation made of iron frame with concrete cast with the composition of cast concrete consists of: sand, coral, and cement and water as a mixer. The material used for the tower is galvanized steel. This tower material consists of separate pieces of iron which will be arranged step by step per height. The weight of the material for the tower differs depending on the type and type of tower. In Table 1.7. present plans for the amount of building materials and steel for the tower, which will be transported / mobilized to the location of this project.

Table 1.7. Plans for material requirements for foundations and towers

No.	Tower type	Building material (m <sup>3</sup> ; tons)					Steel tower (tons)	Total (tons)
		Sand	Gravel	Cement	total			
					m <sup>3</sup>	Ton		
1	AA	8-16	15-33	23-49	46-98	123-263	25-35	148-298
2	BB	11-25	21-50	31-76	63-151	169-405	38-53	207-458
3	CC	14-27	27-55	41-82	82-164	220-440	48-56	268-496
4	DD	20-43	39-87	60-132	119-262	318-703	61-71	379-774

Source: PT PLN (Persero) Sumatra Power Plant Development Unit with processing, 2017.

Activities for mobilizing and demobilizing equipment and materials, especially during loading and unloading, to comply with the procedures for transporting goods in accordance with Article 7 and 8 of the Minister of Transportation Regulation No. 69 of 1993, namely:

1. Conducted in places that do not disturb security, smoothness and order traffic.
2. General goods that protrude beyond the back of a car must not exceed 2000 mm.
3. A prominent part of more than 1000 mm must be given a sign that can reflect light.
4. For the Heaviest Axis (MST) heavy equipment transportation whose size exceeds the stipulated provisions so that or it is mandatory for approval requests to the Transportation Agency and the Public Works Agency of the Highways of Bengkulu



Province, related to: Types of heavy equipment being transported; Loading place, trajectory that is passed, place of dismissal and demolition; Transportation time and schedule; The number and type of vehicles transporting heavy equipment.

The mobilization of equipment and materials will have an impact on road damage, traffic disruption, increased noise, community unrest due to the traffic activities of project vehicles around the location of the activity.

The equipment used in this construction phase includes: molen concrete, generator sets, compacting machines, stringing equipment, and intermediate pulling devices. Equipment such as dump trucks, trucks and pick ups will be used in accordance with the conditions of the class of road being passed and the material to be used can also be transported by human power if indeed the road being passed cannot be traversed by transporters or if the tower location is far from the road. Simple tools used include: hoes, shakes, crowbars, and shovels. The list of light equipment, heavy equipment, vehicles and machinery that will be used in carrying out this activity is presented in **Table 1.8**.

The equipment and materials are generally relatively small in size so that the transport to each tower location can be carried out using a truck to the closest possible position and then carried by human power to the location of the tower. The larger ones are coils of conductor wire (conductor drums) and conveying wire pulling machines that must be transported by trailer to the final storage area of the equipment.

The route for transportation of materials, work tools and materials in the construction of SUTT uses national routes (Bengkulu-Curup line), provincial roads (Curup-Tes line), district roads, sub-district roads and village roads. Material and equipment transportation routes in **Figure 1.10**.

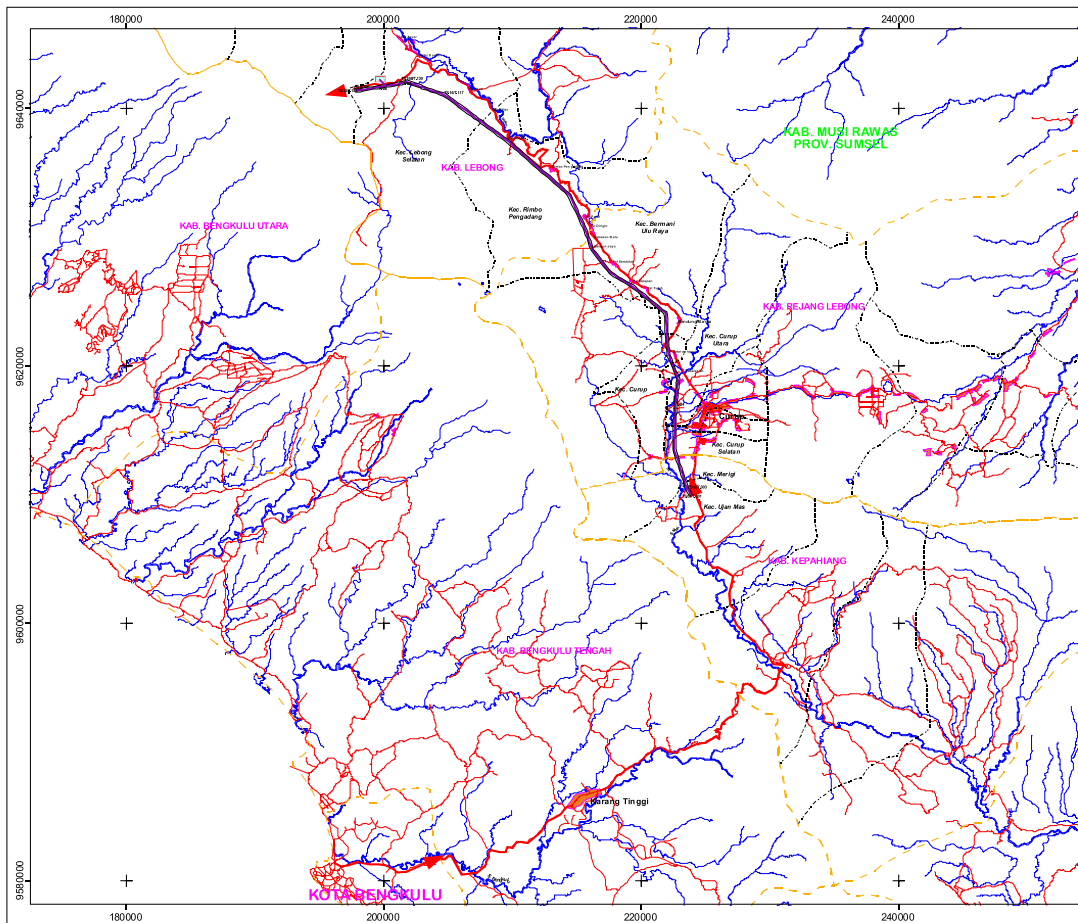
The schedule for equipment and material mobilization will be adjusted to the traffic conditions around the project so that it does not interfere with the smooth flow of existing traffic, especially during rush hour. The next process for wire installation is fully implemented using human power.



Table 1.8. List of planned equipment, vehicles and engines to be used

No	Activity step	Equipment, vehicles and work machines				
		No	Name	Capacity	Total	Unit
A.	Making tower foundations	1	Truck	4,5 ton	2	Unit
		2	Pickup	2 ton	2	Unit
		3	Mixer beton	125 liter/proses	6	Unit
		4	Vibrator	8-10 PK	3	Unit
		5	Pompa lumpur	7,5-10 PK	1	Unit
		6	Stamper	7-10 PK	1	Unit
		7	Rig/Hammer	400-600 kg	1	Unit
		8	Mixer	50-75 liter/proses	1	Unit
		9	Genset	350 kVA	1	Unit
		10	Work safety equipment	--	48	Set
		11	Work tools (hoes, crowbars, shovels, etc.)	--	10	Set
B.	Establishment of a tower	1	Truck	6-8 ton	2	Unit
		2	Pickup	2 ton	2	Unit
		3	Handwin/Pally	1-1,25 ton	7	Unit
		4	Rolling	--	14	Unit
		5	Rope	250 m/unit	7	Unit
		6	Working tools	--	7	Set
		7	Safety belt dan helm kerja	--	48	Set
C.	Withdrawal wire ( <i>Stringing</i> )	1	Truck	6-8 tons	2	Unit
		2	Pickup	2 tons	1	Unit
		3	Pulling Winch Machine	7 tons	1	unit
		4	Cunductor Tension	--	1	unit
		5	Tension Winch Machine	Nycable joint	2	unit
		6	Pilot wire	--	5	Set
		7	Safety belt dan helm kerja	--	50	Set

Source: PT PLN (Persero) Sumatra Power Plant Development Unit, with processing, 2018.



**PT. PLN (Persero)**  
**Unit Induk Pembangunan Pembangkit Sumatera**

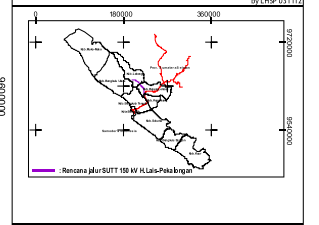
ANALISIS DAMPAK LINGKUNGAN HIDUP  
 (ANDAL) PEMBANGUNAN JARINGAN TRANSMISI 150 kV  
 HULULAIS - PEKALONGAN DAN GARDU INDUK TERKAIT  
 DI KABUPATEN LEBONG, REJANG LEBONG DAN KEPAHIANG  
 PROVINSI BENGKULU

Skala 1 : 300,000

Gambar 1.10:  
**Maps of Plans for Transporting Materials and Equipment**

**Legenda :**

- : Permukiman penduduk
- : Sungai dan anak sungai
- : Jalan
- : Batas kabupaten dim Prov. Bengkulu
- : Batas kecamatan
- : Rencana jaringan transmisi 150 kV
- : Rencana rute transportasi alat & material
- : Rencana lokasi Gardu Induk (GI)



**Sumber peta :**

1. Peta topografi digital Bakosurtanal skala 1 : 250.000 (1998).
2. Peta Rencana Jalur Jaringan Transmisi 150 kV PLTP Hululais - Pekalongan Skala 1 : 300.000 PT PLN (Persero).
3. Peta Persebaran Kawasan Hutan dan Persebaran SK Menhut No. 420/Kpts-4/1999 tanggal 05 Juni 1999 Skala 1 : 250.000.
4. Peta Perubahan Persebaran Kawasan Hutan menjadi Bukan Kawasan Hutan, Perubahan Fungsi Kawasan Hutan dan Persebaran Bukan Kawasan Hutan menjadi Kawasan Hutan SK Menhut No. SK.643/Menhut/2011 tgl 10-11-2011 Skala 1 : 250.000.
5. Citra satelit Landsat TM pathrow 125/042 (bulan tanggal 12 Mei 2008).
6. Orientasi Bagan dan hea Bakosurtanal, Juni 2012.

**Keterangan:**  
 Batas administratif pemerintahan (kabupaten, kecamatan dan desa) belum merupakan batas definitif.



### **3. Cleaning of Tower Tread and Free Space**

The intended cleaning of the tower / tower site and free space is to clean the location of the tower site from plants and other disturbances before the foundation building work begins. These activities include land clearing, land leveling and soil compaction for the preparation of tower foundation construction. In this activity, trees / trees were cut down on the tower site and stands that entered the ROW (right of way) along the SUTT 150 kV construction line of the Hululais-Pekalongan PLTP. It also includes making temporary / emergency roads for the purpose of smooth transportation of materials and equipment to the work location. The procedure for supplying materials will be carried out in accordance with the applicable provisions.

### **4. Construction of foundations and towers**

Construction of foundations and towers is carried out after the tower site is cleared (land clearing has been carried out), according to the type, size and type of tower to be erected. The types and sizes of tower foundations are designed and built based on the results of soil investigations and the magnitude of the calculation of tower loads. The type of foundation used in this project is drill foundation, block foundation, and well foundation.

For tower sites, a solid foundation is needed to be able to carry tower loads and equipment, including moments arising from pulling on transmission wire. Foundation construction activities include: making / extracting foundation holes, assembling iron reinforcement, and casting. Cast concrete material such as coral and sand needed is taken from the seller of the location closest to the track or tower being built.

Based on local conditions and the results of the sondir survey and boring that has been done on land and track survey activities, the appropriate type of foundation will be chosen. The tower foundation that bears the tensile load (tower angle; tension) is designed to be stronger / bigger than the straight tower (suspension type).

Some types of SUTT / SUTET tower foundations that can be selected are: (1) Normal, selected for areas that are considered to be sufficiently hard; (2) Specials, fabrications and castings are selected for soft / non-hard areas so that they must be attempted to reach deeper hard soil; (3) Raft, selected for marshy / watery areas; (4) Auger, chosen because it is easy to process by drilling and filling it with cement, and (5) Rock, drilled selected for rocky areas.



A description of the characteristics of the tower to be built on the SUTT 150 kV construction plan of the Hululais-Pekalongan PLTP and tower type configuration is presented in Table 1.9 and Table 1.10, while the technical details of the tower.

Table 1.9. Description of tower plan and 150 kV transmission network

No	Description	Value
1	Tower height	± 32,5 – 44,5 m (jenis tower & lokasi)
2	Extensive tower suspension footprint	± 15 X 15 m
3	Tension tower tread area	± 20 x 20 m
4	Distance range	± 350 m
5	SUTT total length	46,33761 km
6	Number of towers	131 buah
7	Vertical free space	4-13,5 m (dari permukaan tanah)
8	Horizontal free space	10 m (kiri dan kanan dr sumbu vertikal tower)
9	Tower type	<i>Ripe Lattice (Tower)</i>
10	Conduit wire type	<i>ACSR (Aluminium Conductor Steel Reinforced)</i>
11	The distance between lightning wire and phase S	+ 2,8 m
12	The distance between phase S and phase R	± 4,5 m
13	Distance between phase R and phase T	± 4,5 m
14	Sagging distance	2,15 m
15	Distance of tower mast (lower arm cross)	21 m

Source: PT PLN (Persero) Sumatra Network Development Main Unit, Palembang.

Table 1.10. Tower type configuration

No.	Tower Type	Function	Angle (degree)	Jumlah Tower
1	AA	Suspension	0-5	83
2	BB	Tension/Section	0-10	48
3	CC	Tension	10-30	4
4	DD	Tension	30-60	1
5	EE	Tension	60-80	0
6	FF/DRD	Dead-End	-	2
<b>Total</b>				<b>131</b>



The establishment of the tower is done by connecting the parts or pieces and the iron frame of the tower. The shape of the tower is the construction of iron towers or commonly called lattice steel towers. Tower construction is an iron frame arranged in such a way as to be able to withstand wind loads, moments and styles up the lift. The method of installation is carried out every piece by piece starting from the bottom and the upper joints are successively strung together with the bolt system and bolt binding is carried out. These towers will be used as a place to attach the transmission conductor.

The network secured from lightning strikes uses a safety system consisting of conductors mounted at the very top of the tower to other towers and in the grounding in each tower.

The type of foundation and tower that will be used is a tower that is selected from various kinds of alternative tower options and meets the Indonesian National Standard (SNI) in the electronics field. The construction of new tower foundations and foundations has been carried out as many as 131 towers in stages for <2 years, this activity will have an impact on reducing air quality in the form of noise, potential workplace accidents, and indirect impacts on public unrest.

#### **a. Withdrawal of Conductor Wire (Conductor)**

A conductor is a medium for flowing electric current from a power plant to a substation (GI) or from another GI to the GI, which is stretched through the tower to the tower. The conductor on the tower tension is held by a clamp tension, while the tower suspension is held by a suspension clamp. Behind the clamp, a ring of insulator is installed which is connected to the tower.

Copper type conductor (BC = copper copper) is a good conductor because it has high conductivity and good mechanical strength, but because of its high price, copper type conductors are prone to theft. Aluminum is lower and lighter, but its conductivity and mechanical strength are lower than copper.

In general, SUTT uses ACSR (Aluminum Conductorn Steel Reinforced). The inside of the wire is steel which has a high mechanical strength, while the outside has a high conductivity. Because the nature of electrons prefers the outer part of the wire to the inside of the wire, ACSR is suitable for use in SUTT / SUTET.

For areas where the air contains high sulfur content, ACSR / US is used, which is steel wire coated with aluminum.



In transmission lines that need to be increased in channeling capacity, in SUTT / SUTET in areas prone to landslides, a type of TACSR (Thermal Aluminum Conductor Steel Reinforced) conductor is installed which has a large capacity but the weight of the wire does not undergo much change. Conductors on SUTT / SUTET are stranded or twisted fibers, so that they have a greater capacity than solid wire.

Table 1.11. Technical specifications of the type of ACSR type wire

No	Nama kode	Cross-sectional area Total (mm <sup>2</sup> )	Wire weight (kg/km)	Current rating	
				Factory	SPLN
				(Ampere)	
1.	ACSR	327,94	1.137	495	580

Source: PLN, 2017

The work on the wire drawing is carried out after the tower is completed. The implementation of ground wire and conductor installation is carried out from one section to the next section in sequence with the design of tower tension to other tower tension.

The location of the tension tower is open and quite wide, because the tension of the tower is the place of conductor drums, tension meters and other equipment. The location of this tension is at each angle, and if the distance between each corner is too long, then every 10 towers is made tower tension. After the location of the drum of the conductor is properly arranged, the tip of the conductor is connected to York, which is then connected to the wire. The activity of pulling wire can be done using a machine or manually or using human power. Intermediate withdrawal activities include work:

### **1. Installation of insulators (separator between delivery wire and tower body) and equipment**

Installation of insulators is done when all towers have been established. If all insulators have been installed, pulling the wire can be done. The conductive wire coils are placed in one of the most accessible locations which are then connected to the fishing line horizontally from one tower to another, if it is sufficient, the fishing wire will be removed and the conductive wire will be pulled according to a certain size according to the specified requirements. In this conductor withdrawal activity if there is damage to both the plant and the house of the resident it will be compensated by PT PLN (Persero).





## **1. Withdrawal of conductor and ground wire, carried out through the following stages:**

### **Prepare the tools and materials needed**

- Coordinate with local authorities regarding the schedule to be carried out
- Prepare the work team involved
- Installing a stager at the location of a crossing, strategic areas
- Prepare location security
- Installing tower fittings (insulators)
- Installing hoists as a place for passing wire conductors
- Install fishing lines on one of the conductor wires
- Insert fishing wire into the hoist
- Connecting the fishing line to the tower, then onwards
- Binding the fishing wire on the pulling machine
- Coordinating the team involved
- Connecting fishing lines from one side that will be installed
- Turn on the pulling machine
- Make a withdrawal until all conductor wires are attached
- Doing activities during the day
- Connect or tie a conductor wire with a clamp on an insulator installed in the tower
- Remove the hoists from each tower
- Tidy up the tools used
- Dismantling the attached enclosure
- Give compensation to the community, if there is damage due to the activity of pulling conductor wire
- Checking in each tower on the holder of conductors, insulators and other transmission equipment.

### **3. Barrier adjustment and tensile stress**

Connection / installation between insulator sets and fittings using a ball and socket system. The connection setting of the insulator set is grounded then each new set is raised and mounted on the tower arm. Conduit wire and ground wire used from stranded wire types.



The withdrawal / installation of conductor and ground wire is carried out in the section between two towers (tension towers) and are done one by one. To protect buildings, public facilities that are below the damage that may be caused due to the conduct of pulling and ground wire activities, a stager is installed in buildings and public facilities, such as: (1) Highway crossings, (2) Telephone wire crossings or electric wires, (3) building buildings and others deemed necessary. Withdrawal of conductive wire and ground wire along with the arrangement of its support using equipment such as: *Pulling Winch Machine, Conductor Tension, and Tension Winch Machine.*

a. Wire Conduit Equipment

Carrying wire fittings or fittings are: spacers, vibration dampers. For repair purposes, a sleeve repair and armor rod are installed. A wire connection is called a mid span joint. Repair sleeve is an aluminum sleeve which is split into two parts and can be attached to the conductive wire, serves to improve the conductivity of the wire that is in contact with it, the way the installation is pressed with high pressure hydraulic.

b. Safety Ball

It is a warning sign against air traffic signals, serves to signal aircraft pilots that there is a transmission wire. Safety balls are installed on ground wire at a distance of 50-75 meters around the field / airport.

c. Aviation Lights

It is a warning sign in the form of an air traffic light, which functions to signal aircraft pilots that there is a transmission wire. The types of aviation lights are as follows: (1) Aviation lights installed on the tower with supply from low voltage networks, and (2) Aviation lights installed on conductive wires with induction systems from conductive wires.

a. *Arching Horn*

Is equipment that is installed on the side of the cold (tower) of the insulator rencengan, which functions: (1) As a fire release medium of overvoltage between the Cold and Hot sides (delivery wire), (2) At the desired distance it is useful to cut over voltage if it occurs: lightning strikes, switching, interference, so that it can secure more expensive equipment in the substation (transformer). Media such as arcing horn installed on the hot side (delivery wire).



b. *Guarding Ring*

Oval-shaped, has a dual role, namely as arcing horn and voltage distribution on some hot-side insulators. Generally installed in each tower tension and suspension along the transmission.

c. *Arcing Ring*

Circular which has a dual role, namely as arcing horn and voltage distribution on some hot side insulators. The unit is only installed in tower dead end and GI gantry.

**b. Ground Wire Installation**

Ground wire serves as a grounding for each tower. The use of a grounding system is not always with ground wire but other grounding systems can also be used by utilizing the tower legs as grounding. Ground wire or grounding is based on lightning strike data in the area where the tower is located. The type of grounding or ground wire can differ from region to region.

Ground wire or earth wire is a medium for protecting phase wires from lightning strikes. This wire is installed on the wire of the phase with the smallest possible protection angle, because it is thought that lightning strikes from the top of the wire. However, if lightning strikes from the side, it can cause the wire to be struck and can cause interference.

The wire in the tower tension is held by the clamp tension, while the tower suspension is held by the suspension clamp. In tension clamp, a jumper wire is installed which connects it to the tower so that lightning currents can be discharged to the ground through the tower. For the purpose of improving ground quality, a wire is added to the jumper wire to the ground which is then connected to the land wire.

a. Ground wire material

Ground wire material is made of steel which has been galvanized, or has been coated with aluminum. In SUTET, which was built in the 1990s, optical fiber functioned for ground wire for telemetry, teleprotection and telecommunications, known as OPGW (Optic Ground Wire), so that it has several functions. Given the OPGW has Fiber Optics, the withdrawal and installation must meet the required technical rules.



b. Number and position of ground wire;

There are at least one piece of ground wire above the phase wire, but generally two towers are installed in each tower. Installing only one piece for two transmitters will make the protection angle large so that the phase wire is easily struck by lightning. The distance between the ground wire and the phase wire in the tower is equal to the distance between the phase wires, but in the middle area the post can reach 120% of that distance.

## 5. Construction of substations (GIs) in this case the Switching Station

A related substation is planned to be built on one area of  $\pm 20,000$  m<sup>2</sup> in Taba Anyar Village, South Lebong District, Lebong Regency, Bengkulu Province. Land for GI will be provided at the location of the Hululais PLTP. The substation that will be built is a conventional substation or an outdoor relay station. This substation is a distribution substation and load arrangement, planned to consist of 1 line bay and 1 transformer bay 150/20 kV 30 MVA.

Substation is an inseparable part of the electric power distribution transmission line. Where a power system is centered on a place containing transmission and distribution channels, connecting equipment for transformers, and safety equipment and control equipment.

The main function of the substation:

- a. To regulate the flow of electric power from the transmission line to other transmission lines which are then distributed to consumers Sebagai tempat control
- b. As a safety system operation
- c. As a place to reduce the transmission voltage to a distribution voltage.

Therefore, when viewed in terms of the benefits and usability of the substation itself, the equipment and components of the substation must have high reliability and high quality.

A substation as a node of an electric power system is an electrical installation that has parts and control buildings, occupies a certain location, functions to receive and distribute electricity, increase and decrease the voltage according to the level of work voltage, do switching work circuit electric power system and support the reliability of the associated power system.



### **a. Main equipment at substation**

The substation consists of two main parts, namely: (1) Switch (switchyard) and (2) control building.

- **Switchyard**, is a plot of land which is part of a substation where main substations are installed, consisting of support structures, power rails, power breakers, switches, ground switches, current transformers, voltage transformers, power transformers, antidotes solar, line traps, equipment foundations and supporting structural structures and land networks.
- Control building is a place to place and install control equipment, protection equipment, auxiliary equipment (LVAC and DC auxiliary supply), fault recording, 20 kV cobbled switchgear, battery set, battery charger, communication equipment / SCADA, where the substation operator is located do work control and monitoring of substation operations.

The substation building as a multi-functional building is also equipped with other necessary facilities such as offices, warehouses, electricity facilities for lighting and power, clean water, air conditioning equipment (AC), exhaust fans, fire engines, CCTV systems etc.

The main equipment in the substation is:

1. Busbar or Rail, is a meeting point / relationship between power transformers, TT Air Channels, TT Cable Channels and other electrical equipment to receive and distribute electricity / electric power.
2. **Lightning Arrester**, as the safety of the installation (electrical equipment at the substation installation) from overvoltage disturbances due to lightning strikes (lightning surge) or by switching switches Surge Surge).
3. **Instrument transformer or measuring transformer:**
  - **Voltage transformer**, is a single phase transformer which lowers high voltage to low voltage which can be measured by a voltmeter which is useful for indicators, relays and synchronization devices.
  - **Current transformers**, used for measuring currents that are hundreds of amperes more flowing in high voltage networks. If the current flowing at a low voltage and the magnitude is below 5 amperes, the measurement can be done directly while for large flowing currents, it must be measured indirectly by using a current



transformer (designation for large current measurement transformers). Besides that the current transformer also functions for measuring power and energy, remote measurement and protection relay.

4. **Transformator Bantu (Auxilliary Transformator),**

Transformer used to assist in the overall operation of the substation. And is the main supply for assistive devices such as the 3 phase electric motor motor that is used in the transformer oil circulation pump motor along with the motor motor cooling fan. The most important thing is as a supplier of 'main backup power sources such as DC sources, where this DC source is the main source if there is interference and as a power supply for protection so that the protection still works even though there is no AC current supply. Auxiliary transformers are often referred to as self-use transformers because in addition to the main functions above, they are also used for lighting, sources for circulation systems in the battery room, sources of driving air conditioners because some of the electronic / digital protection requires a room temperature of between 20 - 28° C.

5. **Separator Switch (PMS) or Disconnecting Switch (DS),** to isolate electrical equipment from other equipment or other voltage installations.

6. **Switch Breaker (PMT) or Circuit Breaker (CB),** to connect and disconnect the circuit at the time of load (under normal load conditions or in the event of a fault current).

7. **Ground Switch,** to connect a conductor wire with earth 1 earth that serves to eliminate / ground induced voltage on the conductor when it will be carried out maintenance or isolation of a system.

8. **Compensator,** It is also called a phase change device used to regulate the voltage drop in a transmission line or transformer, by regulating reactive power or can also be used to reduce power losses by improving the power factor.

9. **SCADA and Telecommunication Equipment,** data received by SCADA (Supervisory Control And Data Acquisition) interface from various inputs (sensors, measuring instruments, relays, etc.) in the form of digital data and analog data and converted in the form of high frequency data (50 kHz to 500 kHz) then transmitted along with high voltage electricity.

10. **Protection Relay and Alarm Board (Annunciator).** Protection relay is a device that works automatically to secure an electrical device when a fault occurs, avoid or reduce



the occurrence of equipment damage due to interference and limit the disturbed area as small as possible. All of these benefits will provide electric power distribution services with high quality and reliability. While the alarm board or annunciator is a series of names of types of interference that are equipped with lights and sound sirens in the event of interference, making it easier for officers to know the relay protection that works and the type of interference that occurs.

**a. Construction of Substation or Switching Station**

The construction of the substation in question is the construction of a control building and 150/20 kV substation equipment with 30 MVA transformer capacity on a land area of  $\pm 2$  Ha. The impact predicted by the construction of substations is damage to public roads, decreasing water quality, air quality and increasing noise and the emergence of public perceptions. The main activities in the construction of substations include the following activities: civil and mechanical preparation, implementation.

**1. Administrative preparation:**

- a. Preparing permission for permission related to work at the location of the activity,
- b. Prepare work schedule,
- c. Study the instructions for carrying out the work correctly and carefully, according to what was determined in the work plan and terms of conditions (RKS)
- d. Prepare forms for daily report forms, weekly reports, etc.
- e. Make kit directors.

**2. Technical Preparation:**

- a. Make warehouses at work locations, for storage of equipment and materials.
- b. Make working drawings (implementation drawings)
- c. Prepare work plans according to the type of work, personnel plans that are involved, etc..
- d. Mobilization of work equipment needed and materials to be installed.
- e. Prepare installation manuals and other information relating to the implementation of the work.



### 3. Implementation of Civil Works

Civil works on the GIs serve as support / support for electricity work. All main electrical equipment that is on the yard switch, rests (mounted) on the foundation (civil works). Components of other electrical components that are supported/supported by civilian components, are control panels and control relays, cubicles and the like, power cables, and control cables, etc. Construction of substations, preceded by the implementation of civil works, electrical works are carried out after civil works are completed. Sub-activities of civil works include:

- a. Civil works infrastructure & facilities (public):
- b. Civil work switch yard
- c. Mechanical work
- d. Control building civil works (control building)
- e. e. Installation of power transformers, neutral current transformers (NCT) & neutral grounding resistance (NGR)
- f. Installation of transformer equipment
- g. Carry out transformer oil filtering:
- h. Internal and external wiring
- i. Connecting (connecting) transformers to other equipment
- j. Other jobs such as installing an earthing installation and painting the scuffed transformer body (parts).

### 4. Mechanical Work Implementation

The various mechanical and electrical instruments that will be installed at the substation are:

- a. Installation of Disconnecting Switch (DS) Circuit Breaker (CB), Rail (BusBay)
- b. Installation of Lightning Arrester (LA), Current Transformer (CT), Capacitor Voltage Transformer (CVT)
- c. Installation of Control Panels and Relay Panels (placed inside the substation control building)
- d. Installation of 20 kV Cubicle Cells (placed inside the substation control building)
- e. Grounding and ground wire





- f. Installation of AC / DC panel and battery
- g. Wiring (wiring) control and wiring (wiring)
- h. Finishing work, finishing work is done after all work is done, so that it can be known if there are shortcomings or errors.

### **1.1.4.3. Operational Phase**

#### **1) Electricity Distribution**

After the construction phase is complete, the 150 kV transmission system from the Hululais-Pekalongan PLTP and substation is ready to be powered by electricity. During the operation phase, the transmission will cause an electric field and magnetic field at a certain radius of the conductive wire. The field strength can be weakened as the distance or the presence of obstructions become more distant. With the fulfillment of the required technical requirements, the field strength under the transmission network is below the safe limit value determined by WHO. After being feasible to operate, the 150 kV Transmission and Substation Network is submitted to PLN.

#### **2) Maintenance of Transmission Networks and Substations**

Maintenance of this transmission is closely related to the continuity of electricity distribution. This activity is carried out regularly, including tower maintenance, transmission cables (including equipment) and ROW. Maintenance activities along the SUTT line are also in the form of logging of stands / trees that will enter the ROW, cleaning around the tower site and repairs due to technical and non-technical disturbances. With the large number of paddy fields or dry land entering free space, other efforts are needed in accordance with the applicable laws and regulations in terms of maintenance, considering that the rice fields are the source of livelihood for the surrounding community. Periodic maintenance is also carried out on a regular basis, which includes: (1) technical equipment, such as power transformers, breakers (PMT, PMS), monitoring performance and influences on the surrounding environment, etc .; (2) non-technical equipment, such as: control buildings, environmental roads, waterways, etc. GI maintenance is intended to maintain and control the operation of GIs without obstacles / obstacles and GIs can function optimally continuously.



### 1.1.5. Schedule of activities

Table 1.12. Activity Implementation Schedules

No.	Activities	Year of Implementation															
		Year 1				Year 2				Year 3				Year...			
		I	II	III	IV	I	II	III	IV	I	II	III	IV	I	...		
<b>A. Pre-Construction Phase</b>																	
1.	Permit Management	■	■	■	■												
2.	Land and Path Survey	■	■														
3.	Dissemination of Activity Plans	■	■	■													
4.	Land Acquisition and Plant Growth	■	■														
<b>B. Construction Phase</b>																	
1.	Procurement of Construction Workers	■															
2.	Mobilization of Heavy Equipment and Construction Materials		■	■													
3.	Cleaning of Tower Tread and Free Space			■	■												
4.	Construction of foundations and towers				■	■	■	■									
5.	Withdrawal of Conduit Wire and Ground Wire								■	■	■						
6.	Construction of substations including infrastructure & civil works								■	■	■						
7.	Commissioning Test												■				
<b>C. Operational Phase</b>																	
1.	Electricity Distribution													■	■	■	
2.	Maintenance of Trnasmisi Network and Substation													■	■	■	

### 1.1.6. Alternatives to be Assessed in EIA

The planned construction of a 150 kV transmission network that will be carried out by PLN has gone through the stages of feasibility studies both technically and economically. Based on this description, location and technology have no other alternatives to be reviewed in the EIA.



## **1.2. Summary of Important Impacts Assessed / Reviewed**

Important impacts that will be reviewed and reviewed in this document are important hypothetical impacts that have been identified and evaluated according to the scoping process and the impact of planned activities on the environmental components contained in the agreed EIA Reference Framework (RK). In accordance with the scoping process that has been carried out, the method of determining hypothetical important impacts (HII) is carried out using the Identification Matrix Method and Flow Chart as presented in Table 1.13 and Figure 1.11.



Table 1.13. Summary of Important Hypothetic Impacts to be Assessed/Reviewed

No.	Components of activities that have the potential to cause impacts	Planned Environmental Management	Affected Environmental Components	Scoping			Region Studies	Study deadline
				Potential Impact	Impact evaluation Potential	Important Hypothetic Impacts (DPH)		
<b>I. Pre-construction Phase</b>								
1.	Permit management	-	Socio-economic culture	Attitudes and negative perceptions of society	Permit management activities at the village / kelurahan, sub-district and regency level will indirectly provide information to the community about the project plan so that opinions from some communities appear that support and some do not support due to information that the project has not clearly received. But over time and the intensive coordination carried out with various stakeholders in the framework of the licensing process, the information about the projects received by the community is increasingly clear. Based on the results of the public consultations, it was seen that the people present had clearly understood the project plan	It was concluded to be DTPH because based on the results of the public consultation it was apparent that the people present had clearly known the project plan	-	-
2.	Land survey and lane	-	Socio-economic culture	Attitudes and negative perceptions of society	The activities of managing land and track surveys will indirectly provide information to the community about the project plan so that opinions from some communities appear that support and some do not support due to information that the project is not clearly accepted by the community. Information about the planned construction of a transmission network when a site survey or environmental survey activity can cause	It was concluded to be DTPH because based on the results of the public consultation it was apparent that the people present had clearly known	-	-



No.	Components of activities that have the potential to cause impacts	Planned Environmental Management	Affected Environmental Components	Scoping			Region Studies	Study deadline
				Potential Impact	Impact evaluation Potential	Important Hypothetic Impacts (DPH)		
					restlessness to the people whose land or land will be affected by land acquisition. However, over time and the intensity of the survey which was always preceded by coordination with various stakeholders in the context of the survey, the information about the projects received by the community became increasingly clear. Based on the results of the public consultations, it was seen that the people present had clearly understood the project plan	the project plan		
3.	Dissemination of activity plans	Continuous socialization with the community	Socio-economic culture	Attitudes and negative perceptions of society	The socialization activities of the activity plan will indirectly provide information to the community about the project plan so that there is an opinion that some communities support and some do not support due to information that the project has not clearly received. Based on the results of public consultations, it can be seen that with socialization carried out continuously before the activities of the community, the community understood and gave rise to positive attitudes and perceptions of the project.	It was concluded to be DTPH because based on the results of public consultations, it was seen that with the ongoing socialization prior to the activities of the community, the community understood and gave rise to positive attitudes and perceptions of the project.	-	-
4.	Land acquisition	-	Socio-economic	Disruption of	Land needs to build 131 towers spread	It was		The study



No.	Components of activities that have the potential to cause impacts	Planned Environmental Management	Affected Environmental Components	Scoping			Region Studies	Study deadline
				Potential Impact	Impact evaluation Potential	Important Hypothetic Impacts (DPH)		
	and vegetation		culture	people's livelihoods	across 8 sub-districts and 30 villages / kelurahan, while for GI buildings it takes around 20 hectares of land. Generally the land use is rice fields and coffee plantations, as well as a small portion of settlements. The Land Procurement Plan will have an impact on livelihoods because some of the paddy fields and coffee plantations used by farmers and cultivators will change to tower sites and GI buildings. At the time of the public consultation there was no input from the public regarding concerns about losing the source of livelihood because the tower location was spread in 3 districts, 8 sub-districts, but based on the consideration that the land needs for GIs were quite large (20 Ha)	concluded to be DPH		deadline is 36 months, with consideration that the release activities will continue until the construction phase for 36 months
		Continuous socialization with the community	Socio-economic culture	Attitudes and negative perceptions of society	There are fears of non-conformity in compensation or compensation for land acquisition, as well as inaccuracies in boundary measurement, which can lead to public unrest. Anxiety in the community can be triggered if previously there is hope that the community is not well accommodated. Consultation with landowners and representatives of local governments prior to the implementation of land acquisition and land acquisition without coercion and the preparation and implementation of Land Procurement	It was concluded to be DPH		The study deadline is 36 months, with consideration that the release activities will continue until the construction phase for 36 months



No.	Components of activities that have the potential to cause impacts	Planned Environmental Management	Affected Environmental Components	Scoping			Region Studies	Study deadline
				Potential Impact	Impact evaluation Potential	Important Hypothetic Impacts (DPH)		
					Plans in accordance with Indonesian regulations, is considered to reduce the likelihood of such impacts, but during public consultations there is still some people's concern about the non-transparent compensation that will cause disputes that can disturb the community			
		Deliberations agree to determine the appropriate price so that it does not harm both parties	Socio-economic culture	The Potential for Conflict	Concerns about the incompatibility of compensation or compensation for land acquisition, as well as differences in the determination of land use boundary measurements can lead to public unrest. Unrest in the community can be triggered if previously there is hope that the community is not well-accommodated such as land prices and planting compensation to grow. Public unrest in the form of complaints to the project if left unchecked is feared to cause social conflict in the form of demonstrations against the project. Consultation with landowners and representatives of local governments prior to the implementation of land acquisition and land acquisition without coercion and the preparation and implementation of Land Procurement Plans in accordance with the regulations in Indonesia, are considered to reduce the possibility of these impacts. However, at the time of the public consultation there were still concerns from some people about the non-transparent compensation process which would cause public unrest,	It was concluded to be DPH		The study deadline is 36 months, with consideration that the release activities will continue until the construction phase for 36 months



No.	Components of activities that have the potential to cause impacts	Planned Environmental Management	Affected Environmental Components	Scoping			Region Studies	Study deadline
				Potential Impact	Impact evaluation Potential	Important Hypothetic Impacts (DPH)		
					which was feared to cause potential social conflict.			
<b>II. Construction Phase</b>								
1.	Procurement of labor	Priority of local workforce	Socio-economic culture	Timbulnya peluang kerja dan berusaha	Absorption of labor at the peak of the transmission network construction activities can reach 207 people. Of these, some of them can be filled by the community around the tower location. The high construction activities and involvement of the community as project workers will lead to other business opportunities that can be utilized by the community to provide for the daily needs of workers. In addition, the needs of goods / materials such as sand, split stone, cement, etc., can be supplied by local companies. Based on these considerations, and enter during the public consultation, namely the community expects the workforce to be prioritized from the local	It was concluded to be DPH		The deadline for study is for 3 years, taking into account the construction activities carried out for 3 years until the workforce is released
		Priority of local workforce	Socio-economic culture	Attitudes and negative perceptions of society	The involvement of local (local) workers who work on projects that are not optimal, ie less than outside workers can cause community unrest, so that attitudes and perceptions of the community become negative. Such conditions are based on the results of public consultations, namely the expectations of the community so much for the project that they can work, while the transmission line that must be built	It was concluded to be DPH		The deadline for study is for 3 years, taking into account the construction activities carried out for 3 years until the workforce is released





No.	Components of activities that have the potential to cause impacts	Planned Environmental Management	Affected Environmental Components	Scoping			Region Studies	Study deadline
				Potential Impact	Impact evaluation Potential	Important Hypothetic Impacts (DPH)		
					stretches and passes through 30 villages / kelurahan, making it difficult to receive workers			
		Priority of local workforce	Socio-economic culture	The Potential for Social Conflict	The negative attitudes and perceptions of the community towards the project due to dissatisfaction with the involvement of the local community working on the project will have a further impact on social conflicts in the form of demonstrations or demonstrations. Based on these considerations and the results of public consultations that the public is concerned about pollution that occurs during project activities and expects to be able to work on the project	It was concluded to be DPH		The deadline for study is for 3 years, taking into account the construction activities carried out for 3 years until the workforce is released
2.	Mobilization and demobilization of heavy equipment and construction materials	Set the time, frequency of the vehicle	Physical Chemistry	Decreasing Air Quality	The transportation of tools and construction materials for the construction of transmission networks will cause an increase in dust and vehicle exhaust gas (CO, NO <sub>2</sub> , SO <sub>2</sub> , Pb) on roads that are passed by heavy and material transport vehicles, especially in settlements, access to the location of activities. Transport vehicles are required to have passed the emission test so that vehicle exhaust emissions can be suppressed. The distribution of local dust is predicted to contribute to the addition of pollutants in the air, which is relatively low, because the road being passed is a national road and a village or sub-district road in the form of asphalt pavement. The transportation of tools and materials will	It was concluded to be DPH		The study deadline is 3 years, with consideration that construction activities are carried out for 3 years and will stop after construction activities



No.	Components of activities that have the potential to cause impacts	Planned Environmental Management	Affected Environmental Components	Scoping			Region Studies	Study deadline
				Potential Impact	Impact evaluation Potential	Important Hypothetic Impacts (DPH)		
					pass through areas of population activities such as school stalls and settlements so that the spread of dust will be directly felt by the community. Based on consideration of the results of public consultations that the community is concerned about the increase in local dust during construction activities			
		Set the time, frequency of the vehicle	Physical chemistry	Noise Increase	The transportation of tools and construction materials for the construction of transmission networks will cause an increase in noise from the activities of vehicles passing on roads that are traversed by heavy and material transport vehicles, especially near settlements, access to the location of activities. The road being traversed is a National road and the village / sub-district road is in the form of asphalt pavement. The transportation of tools and materials will pass through residential areas, but the construction of 131 towers spread across 30 villages / kelurahan, and the construction of GIs is only in one location, and these activities are carried out only during the day, so as not to disturb the residents	It was concluded to be DTPH because the mobilization and demobilization of heavy equipment and construction materials was carried out during the day, so as not to disturb population breaks	-	-
		Set the time, frequency of the vehicle	Transportation	Disruption of land traffic	The mobilization and demobilization of tools and construction materials will have an impact on traffic in the form of generation and traffic. The transportation of tools and materials includes a	It was concluded to be DTPH because the construction of 131 towers	-	-



No.	Components of activities that have the potential to cause impacts	Planned Environmental Management	Affected Environmental Components	Scoping			Region Studies	Study deadline
				Potential Impact	Impact evaluation Potential	Important Hypothetic Impacts (DPH)		
					considerable amount of material so that it can cause disruption of smooth traffic. The number of heavy equipment to be transported is not too large, besides the road conditions to the location of the activity are relatively busy Regency roads but relatively narrow to be passed by equipment and material transport vehicles, so that traffic jams occur, other tools and material mobilization are predicted. not significant to traffic generation because the construction of 131 towers spread over 30 villages / kelurahan so that it does not accumulate in one particular road segment, and the work for each tower is quite short	was spread over 30 villages / kelurahan so that it did not accumulate in one particular road segment, and the work for each tower was quite short		
		-	Road damage	Road Damage Occurred	The mobilization and demobilization of equipment and construction materials will have an impact on road damage. The transportation of tools and materials includes a considerable amount of material so that it can cause damage to the road being passed. The road to the tower location is a relatively crowded and paved Regency road, so that the impact is not significant on road damage because the construction of 131 towers is spread over 30 villages so that it does not accumulate in one particular road segment, and the work for each tower is quite short	It was concluded to be DTPH because the construction of 131 towers was spread over 30 villages / kelurahan so that it did not accumulate in one particular road segment, and the work for each tower was quite short	-	-
		Continuous socialization	Socio-economic culture	Attitudes and negative	The emergence of attitudes and perceptions of the community becomes	It was concluded to be		The study deadline is 3



No.	Components of activities that have the potential to cause impacts	Planned Environmental Management	Affected Environmental Components	Scoping			Region Studies	Study deadline
				Potential Impact	Impact evaluation Potential	Important Hypothetic Impacts (DPH)		
		with the community		perceptions of society	negative in the mobilization of heavy equipment and materials is a derivative impact of a decrease in air quality due to the spread of local dust. The impact of heavy equipment and material mobilization activities is categorized as a hypothetical important impact on the reduction of air quality based on the consideration of the results of public consultations that the public is concerned about the increase in local dust during construction activities.	DPH		years, with consideration that construction activities are carried out for 3 years and will stop after construction activities
3.	Cleaning of tower site and free space	-	Physical chemistry	Penurunan Kualitas Udara	The activity of land clearing and free space will cause an increase in dust in the location of activities, especially in the settlement location of the activity. Local dust distribution is predicted to contribute to the increase of pollutants in the air, which is relatively low, because maturation of land for towers is only limited to tower masts and 131 towers are spread over 30 villages and most of the towers are in paddy fields and coffee gardens settlement	It was concluded to be DTPH because the maturation of land for the tower was only limited to its tower posts and 131 of these towers were spread over 30 villages / kelurahan, and most of the towers were in paddy fields and coffee gardens and a small portion in settlements	-	-



No.	Components of activities that have the potential to cause impacts	Planned Environmental Management	Affected Environmental Components	Scoping			Region Studies	Study deadline
				Potential Impact	Impact evaluation Potential	Important Hypothetic Impacts (DPH)		
		-	Physical chemistry	Noise Increase	The activity of cleaning the tower site and free space will increase the noise of various equipment used especially engine equipment that are fueled by oil such as chainsaws. Most of the land used by the project is rice fields and coffee plantations, as well as a small portion of residential areas. Although there are towers and free space in the settlements, 131 towers are scattered in 30 villages / kelurahan, and these activities are carried out only during the day	It was concluded to be DTPH because tower site cleaning and free space activities were only carried out during the day, so as not to disturb residents' breaks	-	-
		-	Physical chemistry	Decreasing Water Quality	The activity of cleaning the tower site and free space for the construction of transmission networks in the form of cleaning plants and maturing land for tower sites is predicted to have an impact on reducing the quality of surface water due to increased TSS in receiving water bodies. TSS increase occurs due to spillage of material when ripening erodes and is washed away to the receiving water body during rain. In addition to TSS, lubricant oil and fuel are used for heavy equipment, if runoff water is carried out, it will reduce river water quality, which has a derivative impact on disruption of aquatic biota. The transmission line passes through most of the fields, coffee plantations and a small part of the settlements, so that residents are concerned that pollution will occur	It was concluded to be DPH		The study deadline is 1 year, taking into account 1 year of tower site cleaning and free space cleaning activities



No.	Components of activities that have the potential to cause impacts	Planned Environmental Management	Affected Environmental Components	Scoping			Region Studies	Study deadline
				Potential Impact	Impact evaluation Potential	Important Hypothetic Impacts (DPH)		
					according to the results of public consultations			
			Land use	Changes in land use	The source of the impact of changes in land use is the cleaning of tower sites and free space, construction of tower foundations and substations. As a result of the transmission network, the land below will not be planted with crops because there are special restrictions in accordance with Minister of Energy and Mineral Resources Regulation 27/2018, namely a free space along the transmission line with a width of 17 m to the right and 17 m to the left of the axis vertical tower which is the ROW (Right of Way) of the transmission network, as well as the height of the building and plants from the maximum land surface of 9 m. Based on these regulations, there will be changes in land use that must adjust to these provisions, especially annual crops of the community must be annual crops so that land can still be utilized	It was concluded to be DPH		The study deadline is 3 years, with consideration that construction activities are carried out for 3 years and will stop after construction activities
		-	Land flora	Reduced vegetation cover	Tower site cleaning and free space activities will open land cover and cut plants for tower foundations and a maximum free space of 9 m from the ground for plants along the transmission network. Vegetation along the transmission line is built because the land use is in the form of rice fields, coffee	It was concluded to be DTPH because most of the terrestrial flora is built plants or agricultural crops, which	-	-



No.	Components of activities that have the potential to cause impacts	Planned Environmental Management	Affected Environmental Components	Scoping			Region Studies	Study deadline
				Potential Impact	Impact evaluation Potential	Important Hypothetic Impacts (DPH)		
					plantations and a small portion of settlements planted with timber, other planted banana plants. Most of the terrestrial flora, are built plants or agricultural crops, which need to be compensated for planting plantations on land and community land	need to be compensated for planting plantations and community land.		
		-	Land Fauna	Disruption of terrestrial fauna	The activity of clearing land and free space will open land cover and cut down plants for transmission networks that are located on plantations and communities planted with timber, other planted banana plants and some of the land owned by Perhutani. Most of the terrestrial flora, are built plants or agricultural crops, which need to be compensated for planting plantations and community lands, as habitat for fauna, especially birds and mammals, garden lands are relatively common habitat for fauan	It was concluded to be DTPH because most of the terrestrial flora is built plants or agricultural crops, which need to be compensated for planting plantations and community land.	-	-
		-	Water biota	Disruption of aquatic biota	Site clearance and free space will ripen land for transmission lines, predicted to have an impact on reducing the quality of surface water due to increased TSS in receiving water bodies. TSS increase occurs due to spillage of material during ripening, especially when extracting and storing land which is possible to be carried away by rainwater and into sea waters around the transmission location. In addition to TSS, lubricant oil and fuel used by heavy equipment are scattered, if	It was concluded to be DPH		The study deadline is 1 year, taking into account 1 year of tower site cleaning and free space cleaning activities



No.	Components of activities that have the potential to cause impacts	Planned Environmental Management	Affected Environmental Components	Scoping			Region Studies	Study deadline
				Potential Impact	Impact evaluation Potential	Important Hypothetic Impacts (DPH)		
					runaway water is carried out it will reduce river water quality. Based on this			
		-	Socio-economic culture	Attitudes and negative perceptions of society	The activity of maturing / preparing land and free space has the potential to create community attitudes and perceptions which are derivative impacts of decreasing air quality, increasing noise, decreasing quantity of water, decreasing water quality and disrupting water biota.	It was concluded to be DPH		The study deadline is 3 years, with consideration that construction activities are carried out for 3 years and will stop after construction activities
		-	Socio-economic culture	The potential for conflict arises	The negative attitudes and perceptions of the community towards the project caused by the impact on decreasing water quality due to increased TSS content in surface water bodies, changes in land use that used to be agricultural land and gardens and disruption to aquatic biota will have a further impact on social conflict in the form of demonstrations taste or demo. Based on these considerations and the results of public consultations that the public was concerned about pollution that occurred during project activities	It was concluded to be DPH		The study deadline is 3 years, with consideration that construction activities are carried out for 3 years and will stop after construction activities
4.	Construction of foundations and towers	-	Air quality	Decreasing air quality	Foundation and tower construction activities will cause increased dust at the location of the activity, especially in the settlement location. Local dust distribution is predicted to contribute to	It was concluded to be DTPH because the construction of foundations	-	-





No.	Components of activities that have the potential to cause impacts	Planned Environmental Management	Affected Environmental Components	Scoping			Region Studies	Study deadline
				Potential Impact	Impact evaluation Potential	Important Hypothetic Impacts (DPH)		
					increasing pollutants in the air, which is relatively low, because the construction of foundations and towers is limited to tower sites and tower posts, and 131 towers are scattered in 30 villages and most towers are in paddy fields and coffee gardens and a small portion in settlements	and towers was only limited to tower sites and tower poles, and 131 towers were scattered in 30 villages / kelurahan, and most of the towers were in paddy fields and coffee gardens and a small portion in settlements		
		-	Noise	Increased noise	Foundation and tower construction activities will increase noise in the environment due to the use of various equipment used in particular oil-fueled machine tools such as generators and electric welding equipment. Most of the land used by the project is rice fields and coffee plantations, as well as a small portion of residential areas. Even though there are tower locations in settlements, 131 towers are scattered in 30 villages / kelurahan, so that the work in each location is quite short, and the activities are carried out only during the day, so as not to disturb the residents of the population	It was concluded to be DTPH because the construction of foundations and towers was only carried out during the day, so as not to disturb residents' breaks	-	-
		-	Water quality	Decreasing water quality	The activity of making site footings for the construction of transmission networks	It was concluded to be		The study deadline is 1



No.	Components of activities that have the potential to cause impacts	Planned Environmental Management	Affected Environmental Components	Scoping			Region Studies	Study deadline
				Potential Impact	Impact evaluation Potential	Important Hypothetic Impacts (DPH)		
					will ripen the land for tower sites predicted to have an impact on reducing the quality of surface water due to increased TSS in receiving water bodies. TSS increase occurs due to spillage of material during ripening, especially during excavation and landfilling which is possible to be carried away by rainwater and into river waters around the location of the transmission tower. In addition to TSS, lubricant oil and fuel used by heavy equipment are scattered, if runaway water is carried out it will reduce river water quality which has a derivative impact on disruption of aquatic biota.	DPH		year, with consideration of tower foundation construction activities carried out for 1 year
		-	Water biota	Disruption of aquatic biota	The activity of making site footings for the construction of transmission networks will ripen the land for tower sites predicted to have an impact on reducing the quality of surface water due to increased TSS in receiving water bodies. TSS increase occurs due to spillage of material during ripening, especially during excavation and landfilling which is possible to be carried away by rainwater and into river waters around the location of the transmission tower. In addition to TSS, lubricant oil and fuel used by heavy equipment are scattered, if runaway water is carried out it will reduce river water quality which has a	It was concluded to be DPH		The study deadline is 1 year, with consideration of tower foundation construction activities carried out for 1 year



No.	Components of activities that have the potential to cause impacts	Planned Environmental Management	Affected Environmental Components	Scoping			Region Studies	Study deadline
				Potential Impact	Impact evaluation Potential	Important Hypothetic Impacts (DPH)		
					derivative impact on disruption of aquatic biota.			
		-	Socio-economic culture	Attitudes and negative perceptions of society	The activity of building tower footings and the establishment of towers has the potential to cause community unrest which is a derivative impact of decreasing air quality, increasing noise, decreasing quantity of water, decreasing water quality and disrupting water biota.	It was concluded to be DPH		The study deadline is 3 years, with consideration that construction activities are carried out for 3 years and will stop after construction activities
5.	Construction of substations	-	Air quality	Decreasing Air Quality	The construction of substations in a land area of 20 hectares will cause local dust due to earthwork in the form of excavation and stockpiling, land maturation and land management activities especially during hot or dry weather. The spread of local dust when it comes to settlements will have an impact on environmental health due to dust sticking to the surface of plants and buildings.	It was concluded to be DPH	Project site location and surroundings	The study deadline is for 9 months, taking into account 9 months of substation construction activities
		-	Noise	Noise Increase	The potential construction of substations by using heavy equipment will cause an increase in noise at the location of activities, especially in the settlement location of the activity. The increase in noise from heavy equipment is predicted to contribute to the addition of noise, which is quite low because the location of activities is on coffee plantation land. The	It was concluded to be DTPH because the location of the activity was in mixed gardens	-	-



No.	Components of activities that have the potential to cause impacts	Planned Environmental Management	Affected Environmental Components	Scoping			Region Studies	Study deadline
				Potential Impact	Impact evaluation Potential	Important Hypothetic Impacts (DPH)		
					construction of substations is far from the settlement so that the noise distribution will not be immediately felt by the community			
		-	Water quality	Decreasing water quality	The construction of substations will ripen the land for substations predicted to have an impact on reducing the quality of surface water due to increased TSS in receiving water bodies. TSS increase occurs due to spillage of material during ripening, especially during excavation and landfilling which is possible to be carried away by rainwater and into river waters around the location of the substation. In addition to TSS, the spread of lubricating oil and fuel used by heavy equipment, if runny water is carried out will reduce the quality of river water which has a derivative impact on the disruption of water biota	It was concluded to be DPH	Drains or irrigation channels that are directly adjacent to the project site	The study deadline is for 9 months, taking into account 9 months of substation construction activities
		-	Water biota	Disruption of aquatic biota	The construction of substations will ripen the land for substations predicted to have an impact on reducing the quality of surface water due to increased TSS in receiving water bodies. TSS increase occurs due to spillage of material during ripening, especially during excavation and landfilling which is possible to be carried away by rainwater and into river waters around the location of the substation. In addition to TSS, lubricant oil and fuel used by heavy equipment are	It was concluded to be DPH	Drains or irrigation channels that are directly adjacent to the project site	The study deadline is for 9 months, taking into account 9 months of substation construction activities



No.	Components of activities that have the potential to cause impacts	Planned Environmental Management	Affected Environmental Components	Scoping			Region Studies	Study deadline
				Potential Impact	Impact evaluation Potential	Important Hypothetic Impacts (DPH)		
					scattered, if runaway water is carried out it will reduce river water quality which has a derivative impact on disruption of aquatic biota.			
		-	Socio-economic culture	Attitudes and negative perceptions of society	The construction of the substation has the potential to cause public unrest which is a derivative impact of a decrease in air quality, increased noise, a decrease in the quantity of water, a decrease in water quality and the disruption of water biota.	It was concluded to be DPH		The study deadline is 3 years, with consideration that construction activities are carried out for 3 years and will stop after construction activities
<b>III. Operation Phase</b>								
1	Electricity distribution and operation of substations	-	Noise	Increased noise	Electricity distribution in the GI transmission and operation network will cause noise levels to increase in the environment. Based on experience and several events that when high humidity occurs, a buzzing sound occurs along the transmission line and around. The affected settlements are quite a lot, namely residents around the SUTT line. Based on these considerations, as well as the results of public consultations that the public was worried about the impact of the electric field radiation that sounded buzzing (noise) too the impact felt by the community is not only from the aspect of unrest, but the aspects of comfort and worry when a	It was concluded to be DPH	-	3 years; Operational activities will carry out routine environmental monitoring, ie monthly, quarterly, semester and yearly in accordance with the monitored environmental components, so that the series data can be used to evaluate the



No.	Components of activities that have the potential to cause impacts	Planned Environmental Management	Affected Environmental Components	Scoping			Region Studies	Study deadline
				Potential Impact	Impact evaluation Potential	Important Hypothetic Impacts (DPH)		
					tower collapses, cable breaks, interference with electronic equipment and others including health aspects			study deadline specifically in determining the environmental tone (basic data)
		-	Land use	Changes in land use	The source of the impact of land use change is the distribution of electricity along the transmission network. As a result of the transmission network, the land below will not be planted with plants because there are special restrictions according to ESDM Minister Regulation No. 27/2018, namely a free space along the transmission line with a width of 17 m to the right and 17 m to the left of the vertical axis of the tower ROW (Right of Way) from the transmission network, as well as the height of buildings and plants from a maximum land surface of 9 m. Based on these regulations, there will be changes in land use that must adjust to these provisions, especially annual crops of the community must be annual crops so that the land can still be utilized, and there should be no buildings with a height of more than 9 m	It was concluded to be DPH	-	3 years; Operational activities will carry out routine environmental monitoring, ie monthly, quarterly, semester and yearly in accordance with the monitored environmental components, so that the series data can be used to evaluate the study deadline specifically in determining the environmental tone (basic data)
		-	Electric field and magnetic field	The existence of electric fields and magnetic fields	Electricity distribution in the GI transmission and operation network will cause the electric and magnetic fields around the transmission and GI networks to increase. Electric fields and magnetic	It was concluded to be DPH	-	3 years; Operational activities will carry out routine environmental



No.	Components of activities that have the potential to cause impacts	Planned Environmental Management	Affected Environmental Components	Scoping			Region Studies	Study deadline
				Potential Impact	Impact evaluation Potential	Important Hypothetic Impacts (DPH)		
					fields will be safe for human life if they are fulfilled the provisions of minimum clearances and free space in accordance with SNI 04-6918-2002; SNI 04-6950-2003; IRPA, 1990, ESDM Minister Regulation No. 18/2015 and ESDM Minister Regulation No. 27/2018. The affected settlements are quite a lot, namely residents around the SUTT line			monitoring, ie monthly, quarterly, semester and yearly in accordance with the monitored environmental components, so that the series data can be used to evaluate the study deadline specifically in determining the environmental tone (basic data)
		-	Land assets	Decreasing land assets	The source of the impact on the decline in land assets is the distribution of electricity along the transmission network. As a result of the transmission network, the land below will not be planted with plants because there are special restrictions according to ESDM Minister Regulation No. 27/2018, namely a free space along the transmission line with a width of 17 m to the right and 17 m to the left of the vertical axis of the tower ROW (Right of Way) from the transmission network, as well as the height of buildings and plants from a maximum land surface of 9 m. Based on these regulations, there will be changes in	It was concluded to be DPH	-	3 years; Operational activities will carry out routine environmental monitoring, ie monthly, quarterly, semester and yearly in accordance with the monitored environmental components, so that the series data can be used



No.	Components of activities that have the potential to cause impacts	Planned Environmental Management	Affected Environmental Components	Scoping			Region Studies	Study deadline
				Potential Impact	Impact evaluation Potential	Important Hypothetic Impacts (DPH)		
					land use that have to adjust to these provisions, which causes limited use of land under the electricity network, so the sale value of the land will be much cheaper than before the transmission network. Based on these considerations and the results of public consultations stating that land under the transmission network is cheaper			to evaluate the study deadline specifically in determining the environmental tone (basic data)
		-	Socio-economic culture	Attitudes and negative perceptions of society	Electricity distribution in the GI transmission and operation network will cause the electric and magnetic fields around the transmission and GI networks to increase. Electric fields and magnetic fields will be safe for human life if they are fulfilled the provisions of minimum clearances and free space in accordance with SNI 04-6918-2002; SNI 04-6950-2003; IRPA, 1990, ESDM Minister Regulation No. 18/2015 and ESDM Minister Regulation No. 27/2018. There are quite a number of affected settlements, namely residents around the SUTET route. Based on these considerations, as well as the results of public consultations that the public is concerned about the effects of electric field radiation	It was concluded to be DPH	-	3 years; Operational activities will carry out routine environmental monitoring, ie monthly, quarterly, semester and yearly in accordance with the monitored environmental components, so that the series data can be used to evaluate the study deadline specifically in determining the environmental tone (basic data)
		-	Potential for	The Potential	Electricity distribution in the GI	It was	-	3 years;





No.	Components of activities that have the potential to cause impacts	Planned Environmental Management	Affected Environmental Components	Scoping			Region Studies	Study deadline
				Potential Impact	Impact evaluation Potential	Important Hypothetic Impacts (DPH)		
			Conflict	for Conflict	transmission and operation network will have an impact on potential conflicts in the form of demonstrations or demonstrations due to disruption of the electric and magnetic fields to the health of the community around the transmission network and increased GI. Electric fields and magnetic fields will be safe for human life if they are fulfilled the provisions of minimum clearances and free space in accordance with SNI 04-6918-2002; SNI 04-6950-2003; IRPA, 1990, ESDM Minister Regulation No. 18/2015 and ESDM Minister Regulation No. 27/2018. There are quite a number of affected settlements, namely residents around the SUTET route. Based on these considerations, as well as the results of public consultations that the public is concerned about the effects of electric field radiation	concluded to be DPH		Operational activities will carry out routine environmental monitoring, ie monthly, quarterly, semester and yearly in accordance with the monitored environmental components, so that the series data can be used to evaluate the study deadline specifically in determining the environmental tone (basic data)
		-	Public health	Environmental health disorders	Distribution of electricity in the transmission network that has been built will cause environmental health problems due to increased electric fields and magnetic fields around the transmission network. Electric fields and magnetic fields will be safe for human life if they are fulfilled the provisions of minimum load and free space in accordance with SNI 04-6918-2002; SNI 04-6950-2003; IRPA, 1990, ESDM Minister Regulation No. 18/2015 and ESDM Minister	It was concluded to be DPH	-	3 years; Operational activities will carry out routine environmental monitoring, ie monthly, quarterly, semester and yearly in accordance with the monitored



No.	Components of activities that have the potential to cause impacts	Planned Environmental Management	Affected Environmental Components	Scoping			Region Studies	Study deadline
				Potential Impact	Impact evaluation Potential	Important Hypothetic Impacts (DPH)		
					Regulation No. 27/2018. The affected settlements were affected quite a lot, namely residents around the SUTET line. The operation of the transmission network will last long as long as the PLTP activities operate and it is feared that it will have an impact on environmental health, as well as the results of public consultations that the public is worried about the impact of electric field radiation			environmental components, so that the series data can be used to evaluate the study deadline specifically in determining the environmental tone (basic data)
		-	Public health	Increased numbers in pain	Distribution of electricity in the transmission network that has been built will cause an increase in morbidity (morbidity) due to the electric field and magnetic field around the transmission network increases. Electric fields and magnetic fields will be safe for human life if they are fulfilled the provisions of minimum load and free space in accordance with SNI 04-6918-2002; SNI 04-6950-2003; IRPA, 1990, ESDM Minister Regulation No. 18/2015 and ESDM Minister Regulation No. 27/2018. The affected settlements were affected quite a lot, namely residents around the SUTET line. The operation of the transmission network will last long as long as the PLTP activities operate and it is feared that it will have an impact on environmental health which has a derivative impact on increased morbidity,	It was concluded to be DPH	Panganan District,	3 years; Operational activities will carry out routine environmental monitoring, ie monthly, quarterly, semester and yearly in accordance with the monitored environmental components, so that the series data can be used to evaluate the study deadline specifically in determining the environmental



No.	Components of activities that have the potential to cause impacts	Planned Environmental Management	Affected Environmental Components	Scoping			Region Studies	Study deadline
				Potential Impact	Impact evaluation Potential	Important Hypothetic Impacts (DPH)		
					as well as the results of public consultations that the public is worried about the impact of electric field radiation			tone (basic data)
2.	Maintenance of transmission lines and substations	-	Water quality	Decreasing water quality	The maintenance of the transmission and GI lines is predicted to have an impact on reducing the quality of surface water due to increased TSS, oil and fat in the receiving water body. Increased TSS, oil and fat occur due to scattered maintenance products carried by rainwater and into river waters around the location of the substations, resulting in a derivative impact on disruption of aquatic biota. Based on this, as well as consideration of the results of public consultations that the public is concerned about pollution from project activities	It was concluded to be DPH	Drains or irrigation channels that are directly adjacent to the project site	3 years; Operational activities will carry out routine environmental monitoring, ie monthly, quarterly, semester and yearly in accordance with the monitored environmental components, so that the series data can be used to evaluate the study deadline specifically in determining the environmental tone (basic data)
		-	Water biota	Disruption of aquatic biota	The maintenance activities of the transmission and GI lines are predicted to have an impact on disturbances in aquatic biota due to a decrease in the quality of surface water caused by increased TSS, oil and fat in the receiving water bodies. Increased TSS, oil and grease occur due to scattered maintenance products carried	It was concluded to be DPH	Drains or irrigation channels that are directly adjacent to the project site	3 years; Operational activities will carry out routine environmental monitoring, ie monthly, quarterly,



No.	Components of activities that have the potential to cause impacts	Planned Environmental Management	Affected Environmental Components	Scoping			Region Studies	Study deadline
				Potential Impact	Impact evaluation Potential	Important Hypothetic Impacts (DPH)		
					by rainwater and into river waters around the location of substations, resulting in a derivative impact on disruption of aquatic biota			semester and yearly in accordance with the monitored environmental components, so that the series data can be used to evaluate the study deadline specifically in determining the environmental tone (basic data)
		-	Socio-economic culture	Attitudes and negative perceptions of society	The maintenance activities of the transmission and GI lines are predicted to have an impact on people's attitudes and perceptions due to the reduction in the quality of surface water due to increased TSS, oil and fat in the receiving water bodies. Increased TSS, oil and fat occur due to scattered maintenance products carried by rainwater and into river waters around the location of substations, resulting in a derivative impact on disruption of aquatic biota and attitudes and perceptions of the community. Based on this, as well as consideration of the results of public consultations that the public is concerned about pollution from project activities	It was concluded to be DPH		3 years; Operational activities will carry out routine environmental monitoring, ie monthly, quarterly, semester and yearly in accordance with the monitored environmental components, so that the series data can be used to evaluate the study deadline



No.	Components of activities that have the potential to cause impacts	Planned Environmental Management	Affected Environmental Components	Scoping			Region Studies	Study deadline
				Potential Impact	Impact evaluation Potential	Important Hypothetic Impacts (DPH)		
								specifically in determining the environmental tone (basic data)
		-	Public health	Environmental health disorders	The activity of maintaining transmission and GI lines is predicted to have an impact on environmental health reduction due to a decrease in the quality of surface water caused by increased TSS, oil and fat in receiving water bodies. Increased TSS, oil and fat occur due to scattered maintenance products carried by rainwater and into river waters around the location of substations, resulting in derivative impacts on disruption of environmental health. Based on this, as well as consideration of the results of public consultations that the public is concerned about pollution from project activities	It was concluded to be DPH		3 years; Operational activities will carry out routine environmental monitoring, ie monthly, quarterly, semester and yearly in accordance with the monitored environmental components, so that the series data can be used to evaluate the study deadline specifically in determining the environmental tone (basic data)
		-	Public health	Increased numbers in pain	The maintenance activities of the transmission and GI lines are predicted to have an impact on the increase in morbidity (morbidity rate) due to a decrease in the quality of surface water caused by increased TSS, oil and fat in the receiving water body. Increased TSS,	It was concluded to be DPH		3 years; Operational activities will carry out routine environmental monitoring, ie monthly,



No.	Components of activities that have the potential to cause impacts	Planned Environmental Management	Affected Environmental Components	Scoping			Region Studies	Study deadline
				Potential Impact	Impact evaluation Potential	Important Hypothetic Impacts (DPH)		
					oil and fat occur due to scattered maintenance products carried by rainwater and into river waters around the location of substations, resulting in derivative impacts on disruption of environmental health. Based on this, as well as consideration of the results of public consultations that the public is concerned about pollution from project activities			quarterly, semester and yearly in accordance with the monitored environmental components, so that the series data can be used to evaluate the study deadline specifically in determining the environmental tone (basic data)



Table 1.14. Matrix for Evaluating Potential Impacts of Activity Plans on Environmental Components

TYPE OF ACTIVITY  COMPONENT ENVIRONMENT	PRA CONSTRUCTION				CONSTRUCTION					OPERATION	
	Permit Management	Land and Path Survey	Sosialisai Rencana Kegiatan	Land Acquisition and Plants	Labor Procurement	Mobilization and Demobilization Heavy Equipment and Construction Materials	Cleaning of Tread Tower and Free Space	Foundation and Construction Tower	Construction of substations	Electricity Distribution and Operation of the Substation	Trasmisi Line Maintenance and Substation
	1	2	3	4	5	6	7	8	9	10	11
<b>A. PHYSICAL-CHEMISTRY</b>											
1. Air quality						DPH	DTPH	DTPH	DPH		
2. Noise						DTPH	DTPH	DTPH	DTPH	DPH	
3. Water quality							DPH	DPH	DPH		
4. Tata Guna Lahan							DPH			DPH	
5. Magnetic Field and Electric Field										DPH	
6. Traffic											
a. Smooth Traffic						DTPH					
b. Road Damage						DTPH					
<b>B. BIOLOGY</b>											
7. Flora (Vegetation)							DTPH				
8. Fauna							DTPH				
9. Water Biota							DPH	DPH	DPH		
<b>C. SOCIAL ECONOMIC CULTURE</b>											
10. Livelihood				DPH	DPH						DPH
11. Decreasing Land Assets										DPH	
12. Attitudes and Perceptions Society	DTPH	DTPH	DTPH	DPH	DPH	DPH	DPH	DPH	DPH	DPH	DPH
13. Social conflict				DPH	DPH		DPH			DPH	
<b>D. PUBLIC HEALTH</b>											
14. Environmental Health										DPH	
15. Morbidity Figures										DPH	

Description: DPH: Important Hypothetic Impact, DTPH: Hypothetic Not Important Impact

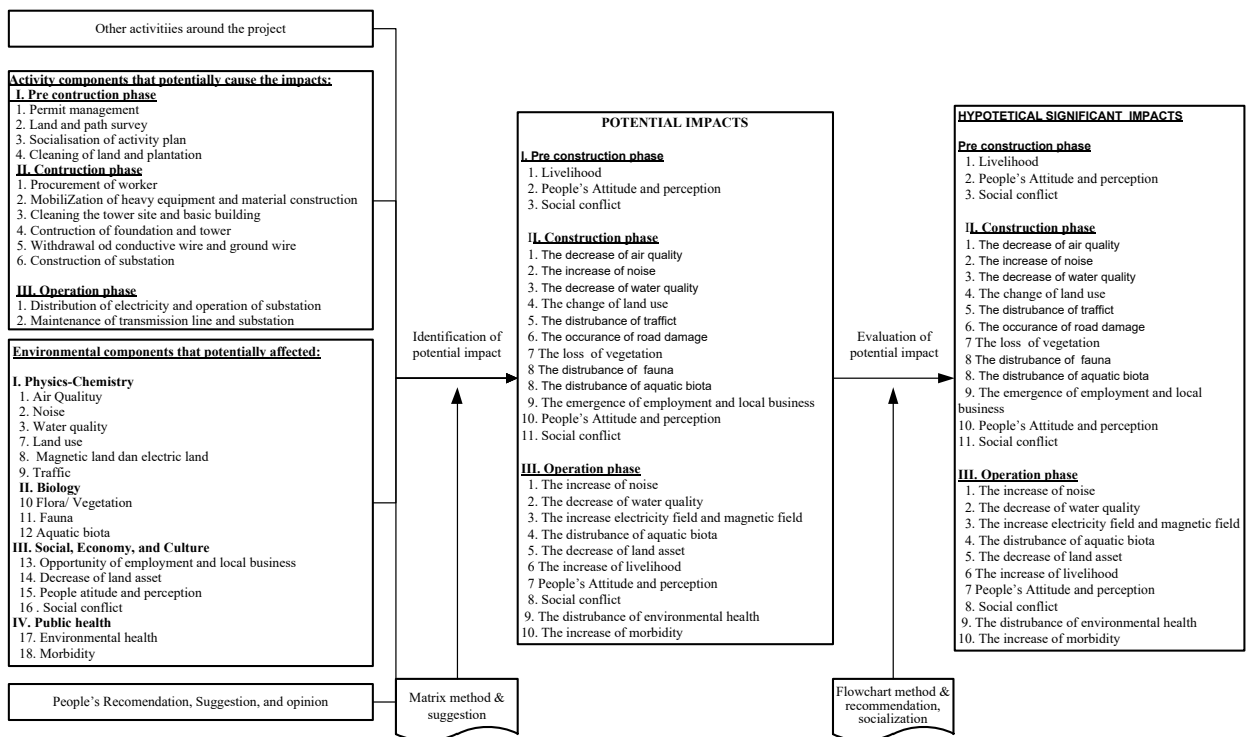


Figure 1.11. Scoping Flow Chart





### **1.3. Study Area Boundaries and Study Deadlines**

#### **1.3.1. Study Area Limits**

The boundaries of the study area are determined based on the resultant of the project boundaries, ecological boundaries, social boundaries, and administrative boundaries with due regard to technical constraints.

##### **1.3.1.1. Project Limits**

The project boundary is the entire project area of the Network Development Plan where the Administration of the 150 kV Transmission Network is planned to be administratively located in Bengkulu Province which covers three regencies, 8 sub-districts and 30 villages with 46,337.61 meters and 131 towers and The GI is 20,000 square meters located in Taba Anyar Village. The location of the activity is agricultural land, mixed gardens and rice fields and coffee gardens.

##### **1.3.1.2. Ecological Limits**

The ecological limit is the distribution space of the impact of the 150 kV Transmission Network Development Plan according to air and air pollution media. The natural process that takes place in the space is predicted to undergo fundamental changes. Included in this space is the space around the planned activities which ecologically impacts the activity.

1. The distribution of pollutants through the medium of water in the receiving water body is 500 m downstream from the location of the activity.

The ecological limit of impact distribution is based on the discharge of the receiving water body (ditch / irrigation channel), which is 1.5-2 liters / second, so that the maximum distance of impact distribution through water reaches a distance of around 500 m.

2. The ecological limit of the impact distribution through air media is based on consideration of wind direction and speed.

##### **1.3.1.3. Social Boundaries**

Social boundaries are determined based on the possibility of the social community being affected by the planned activities and areas where social, economic and cultural benefits and interests change. This social boundary encompasses settlements that are in the area of impact that is expected to be affected by activities, both directly and indirectly, which



includes the community in Taba Anyar Village, Mangkoharjo Village, Sukasari Village, Talang Ratau Rimbo Pengadang Exit, Tik Kuto Village , Air Dingin Village (Biao Sengok), Babakan Baru Village, Bangun Jaya Village, Air Bening Village, Tebat Tenong Luar Village, Pal VIII / Delapan Village, Pal Tujuh Village, Pal Seratus Village, Bandung Marga Village, Dataran Tapus Village, Tabarenah Village , Heroes' Village, Suka Datang Village, Lubuk Kembang Village, Batupanco Village, Talang Benih Village, Dwi Tunggal Exit, Punguk Lalang Village, Lubuk Ubar Village, Watas Marga Village, Lubuk Penyamun Village, Bukit Barisan Village, Burnisari Village and Pekalongan Village.

#### 1.3.1.4. Administrative Limits

Administrative boundaries are determined on the basis of government administrative boundaries that are directly influenced by the planned activities, which include Lebong Regency, Rejang Lebong and Kepahiang.

#### 1.3.2. Study deadline

The deadline for the EIA review of the 150 kV Transmission Network Development Plan is determined based on the type of activity during pre-construction, construction and operation. Determination of the deadline for review based on consideration:

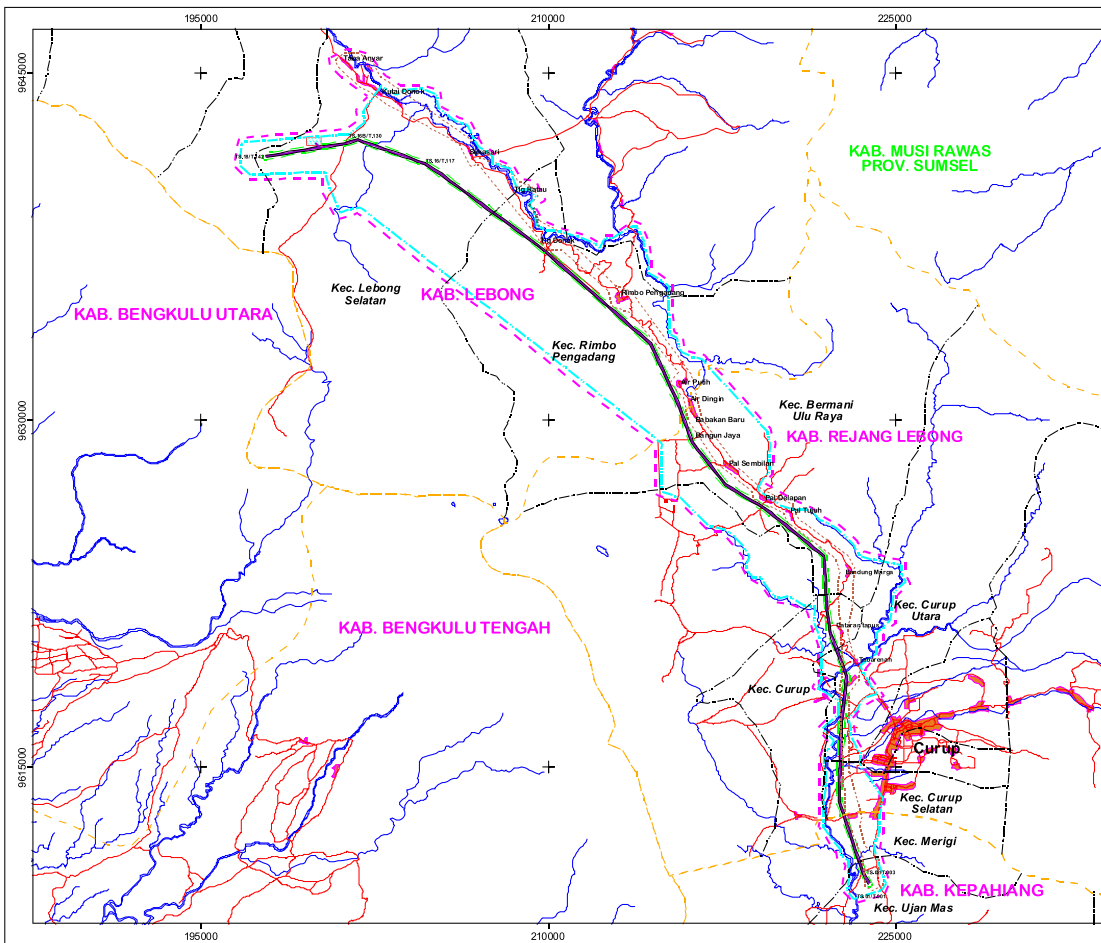
1. The hue condition of the environment does not change significantly in a short time, that is, if the development of the region and activities are the same as it is today.
2. Government policies do not change in environmental aspects.
3. Activities carried out by the 150 kV Transmission Network Development Plan have not undergone many fundamental changes.

Table 1.15. Study deadlines for each of the important hypothetical impacts

No.	Important Hypothetic Impacts	Study deadline	Reason
<b>I</b>	<b>Pre-Construction Phase</b>		Surveys and permits and land acquisition will last for 36 months, until construction activities are carried out and surveys and permits are predicted to be completed.
1	Permit Management	36 months	
2	Land and Path Survey	36 months	
3	Dissemination of Activity Plans	36 months	
4	Land and Plant Liberation	36 months	
<b>II.</b>	<b>Construction Phase:</b>		
1.	Decreasing air quality	12 Months	Construction activities of the transmission network and substations will be carried out for up to 36 months



No.	Important Hypothetic Impacts	Study deadline	Reason
2.	Increased noise	12 Months	Construction activities of the transmission network and substations will be carried out for up to 36 months
3.	Decreasing river water quality	12 Months	Construction activities of the transmission network and substations will be carried out for up to 36 months
4.	Change in Land Use	12 Months	Construction activities of the transmission network and substations will be carried out for up to 36 months
5.	Disruption of smooth traffic	12 Months	Construction activities of the transmission network and substations will be carried out for up to 36 months
6.	Road Damage Occurred	12 Months	Construction activities of the transmission network and substations will be carried out for up to 36 months
7.	Loss of Vegetation (Flora)	12 Months	Construction activities of the transmission network and substations will be carried out for up to 36 months
8.	Disruption of Land Fauna	12 Months	Construction activities of the transmission network and substations will be carried out for up to 36 months
9.	Disruption of Freshwater Biota Habitat	12 Months	Construction activities of the transmission network and substations will be carried out for up to 36 months
10.	Open employment and business opportunities	12 Months	Construction activities of the transmission network and substations will be carried out for up to 36 months
11.	Community attitudes and perceptions	36 Months	Construction activities of the transmission network and substations will be carried out for up to 36 months
12.	The Potential for Social Conflict	36 Months	Construction activities of the transmission network and substations will be carried out for up to 36 months
<b>III.</b>	<b>Operation Phase:</b>		
1.	Peningkatan kebisingan	24 Months	<ul style="list-style-type: none"> <li>- Activities around the project location are difficult to predict changes.</li> <li>- As long as the management plan is carried out in accordance with the directions given, the impact of activities on social, economic and cultural components can be completed within 36 months</li> </ul>
2.	Decreasing water quality	24 Months	
3.	Electric field and magnetic field	24 Months	
4.	Disruption of Water Biota	24 Months	
5.	Decrease in land assets	36 Months	
6.	Livelihood improvements	36 Months	
7.	Community attitudes and perceptions	36 Months	
8.	Timbulnya Potensi Konflik Sosial	36 Months	
9.	Gangguan Kesehatan masyarakat	36 Months	
10.	Increased Morbidity	36 Months	



**PT. PLN (Persero)**  
**Unit Induk Pembangunan Pembangkit Sumatera**

**ANALISIS DAMPAK LINGKUNGAN HIDUP (ANDAL) PEMBANGUNAN JARINGAN TRANSMISI 150 KV HULULAIS - PEKALONGAN DAN GARDU INDUK TERKAIT DI KABUPATEN LEBONG, REJANG LEBONG DAN KEPAHIANG PROVINSI BENGKULU**

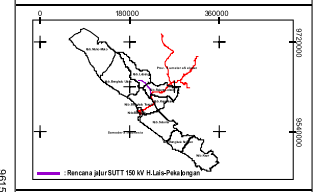


Skala 1 : 170.000

Gambar 1.12 :  
**Maps of Study Area Boundaries**

- Legenda :**
- : Permukiman penduduk
  - : Sungai dan anak sungai
  - : Jalan
  - - - : Batas kabupaten dlm Prov. Bengkulu
  - - - : Batas kecamatan
  - : Rencana jaringan transmisi 150 kV
  - : Rencana lokasi Gardu Induk (GI)

- Batas wilayah studi :**
- : Batas kegiatan/proyek
  - : Batas sosial
  - : Batas ekologi
  - : Batas administrasi
  - : Batas wilayah studi



- Sumber peta :**
1. Peta rupa bumi digital Bakosurtanal skala 1 : 250.000 (1988).
  2. Peta Rencana Jalur Jaringan Transmisi 150 KV PLTP Hulubis - Pakabangan Skala 1 : 30.000 PT PLN (Persero).
  3. Peta Penunjukan Kawasan Hutan dan Perairan SK Menhut No. 420/Kpts/1999 tanggal 15 Juni 1999 Skala 1 : 250.000.
  4. Peta Perubahan Peruntukan Kawasan Hutan menjadi Bukan Kawasan Hutan, Perubahan Fungsi Kawasan Hutan dan Penunjukan Bukan Kawasan Hutan menjadi Kawasan Hutan SK Menhut No. SK.243/Menhut/2011 tanggal 15 Mei 2011 Skala 1 : 250.000.
  5. Citra satelit andal TM paninow 1250622 bulan tanggal 12 Mei 2008).
  6. Orientasi lapangan dan hasil pengukuran, Juni 2012.
- Keterangan :**  
 Batas administrasi pemerintahan (kabupaten, kecamatan dan desa) belum merupakan batas definitif.

**CHAPTER II**  
**DETAILED DESCRIPTION**  
**ENVIRONMENTAL BASELINE DATA**

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## CHAPTER II

### DETAILED DESCRIPTION OF THE ENVIRONMENTAL BASELINE DATA

The general description of the condition of the environmental setting in the study area is based on primary data and secondary data. Primary data collection is done by survey methods, such as conducting observations, field measurements, sampling for analytical materials in the laboratory and structured interviews, while secondary data is collected through literature studies from various research reports relevant to ANDAL (Environmental Impact Analysis Report) study of the activity plan and information from relevant agencies. The following is an overview of the condition of the environmental conditions at the location of the project site and

#### 2.1. Chemical Physical Components

##### 2.1.1 Climatology

###### 1. Climate

Descriptions of climate in the study area are stated, among others, by parameters of average monthly air temperature, relative humidity, rainfall and monthly rainy days, dominant wind direction, dominant wind speed and class or climate type. Monthly rainfall in Bengkulu Province is attained from climate data in 2016. Rainfall data in the study area are presented in Table 2.1.

Table 2.1. Rainfall of the Study Area in 2016

<i>Month</i>	<i>Rainfalls (mm)</i>
January	321
February	224
March	638
April	132
May	281
June	117
July	105
August	433
September	353
October	316
November	555
December	286

Source : Class II Climatology Station, Baai Island, Bengkulu, 2017



Table 2.2. Climate parameter summary in the study area year 2016

No	Month	Average Temperature (°C)	Relative Humidity (%)	Wind direction		Wind velocity	
				Term	Value (degree)	(km/hr)	(Knots)
1.	January	27,70	84	W	270	4,10	13,00
2.	February	27,50	82	W	270	4,00	12,00
3.	March	27,73	85	W	270	4,03	10,00
4.	April	27,65	85	W	270	3,90	10,00
5.	May	27,78	85	W	270	3,58	8,00
6.	June	27,33	81	W	270	4,02	12,00
7.	July	26,99	83	SE	135	4,16	30,00
8.	August	26,54	84	SE	135	3,96	12,00
9.	September	26,93	83	SE	135	4,69	18,00
10.	October	26,46	85	S	180	4,31	11,00
11.	November	27,76	86	W	270	4,39	13,00
12.	December	26,32	85	W	270	5,00	13,00

Source: Class II Climatology Station in Baai Island, Bengkulu (2017); 1 km / h = 0.5399568 knots

Climate in the study area falls in type "A" climate category according to the Schmidt and Ferguson climate classification, where the average dry month is 1,000 months while the average wet month is 10,300 months. The quotient for both produce numbers  $Q = 0.097$ . Thus, the activity area falls under the climate type "A" (Q value between  $<0.143$ ). In Koppen climate classification it is categorized as climate type Af (tropical rainforest climate), which is characterized by an average monthly temperature of more than 18 oC, an annual temperature of 20 oC - 25 oC with monthly rainfall of more than 60 mm. While according to Oldeman climate classification is classified as climate type B1 (having 7-9 times wet months in a row; where wet months are the months with monthly rainfall > 200 mm, humid months are the months with 100-200 mm monthly rainfall, and dry months are the months with <100 mm rainfall). In Figure 2.11 a wind rose is shown and it is visible that the dominant wind blows from the West and Southeast. Resultan wind direction is between the west and south (southwest) lines. Average wind velocity based on data for the last 10 years from Class II Climatology Station in Baai Island, Bengkulu, is 13.96 km / h or 7.55 knots.

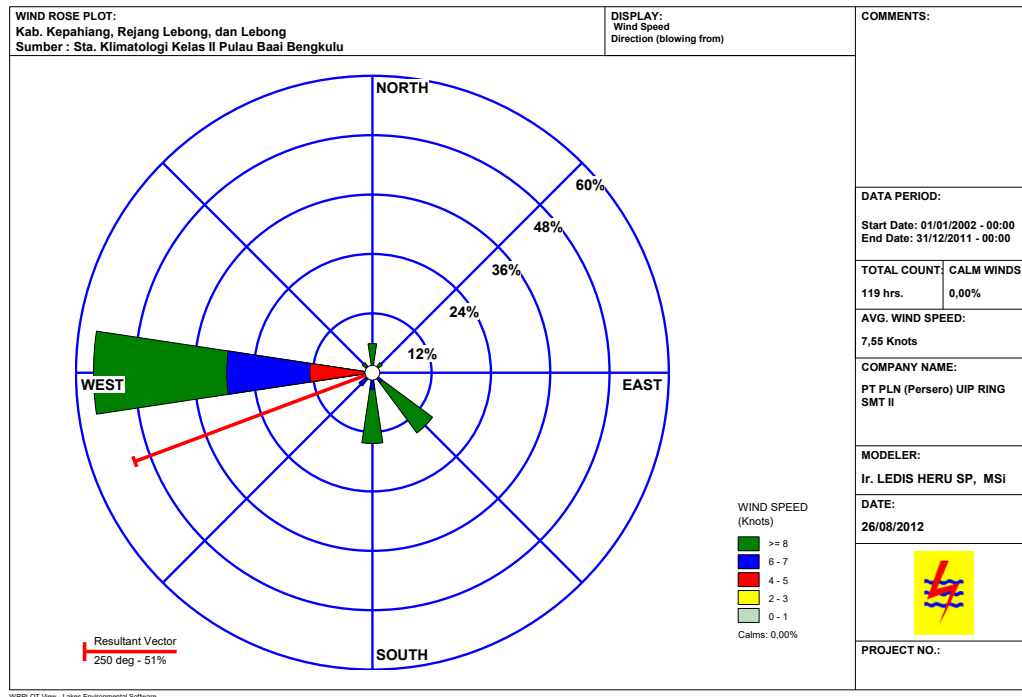


Figure 2.1. Windrose of wind direction and wind velocity in the study area

### 2.1.2. Air Quality

The SUTT 150 kV (High Voltage Air Channel) will pass through the area consists partly of local plantations, rice fields, shrubs, and around the forest area. For residential areas the air quality is generally influenced by domestic activities both household activities and passing through motorized vehicles, even though it still looks relatively low. Whereas for areas with lower population density (plantation/agricultural areas), generally affected by topography, climatology and meteorology in the area. In general, air quality in an area is influenced by: geographical conditions, topography, climatology, meteorology, pollutant sources in the area and surrounding areas.

The condition of environmental setting for ambient air quality parameters is carried out by taking samples and measuring air quality at several sampling locations as presented in Table. Sampling is done during the day.





Table 2.3. Ambient Air Quality Test Result (First Measurement)

No.	Parameter	Unit	Test Result	Quality Standard	Method
1	Sulfur Dioxide (SO <sub>2</sub> )	µg/Nm <sup>3</sup>	<7,83	900 <sup>1)</sup>	SNI 19-7119.7-2005
2	Carbon Monoxide (CO)*	µg/Nm <sup>3</sup>	<22,76	30.000 <sup>1)</sup>	IK-S.UA5 (CO Meter)
3	Nitrogen Dioxide (NO <sub>2</sub> )	µg/Nm <sup>3</sup>	5,43	400 <sup>1)</sup>	SNI 19-7119.2-2005
4	Oxidane (O <sub>3</sub> )	µg/Nm <sup>3</sup>	27,58	235 <sup>1)</sup>	SNI 19-7119.8-2005
5	T S P*	µg/Nm <sup>3</sup>	35,66	-	Gravimetric
6	Noise	dBA	47,31	70 <sup>2)</sup>	IK- S.UA2 (Sound Level Meter)

Annotation:

Location of PLTP Ulu Lais (03°14'26.8 "LS; 102°16'44.3 BT)

1) Quality Standards for Ambient Air Quality Based on Government Regulation No. 41 of 1999

2) Noise Level Standards Based on Minister of Environment Decree No. Kep. 48 / MENLH / II / 1996.

The sign (<) shows below the detection limit.

Signs (\*) indicate that they have not been accredited by KAN.

Details on Test Sampling :

Bright Air Condition (weather), Air Temperature 30.0oC, Humidity 51.4%, Wind is coming from 60 ° - 100 °, Wind Velocity 0.2 - 2.5 m / sec.

Table 2.4. Ambient Air Quality Test Result (second measurement)

No.	Parameter	Unit	Test Result	Quality Standards	Method
1	Sulfur Dioxide (SO <sub>2</sub> )	µg/Nm <sup>3</sup>	11,24	900 <sup>1)</sup>	SNI 19-7119.7-2005
2	Carbon Monoxide (CO)*	µg/Nm <sup>3</sup>	<22,76	30.000 <sup>1)</sup>	IK-S.UA5 (CO Meter)
3	Nitrogen Dioxide (NO <sub>2</sub> )	µg/Nm <sup>3</sup>	14,90	400 <sup>1)</sup>	SNI 19-7119.2-2005
4	Oxidane (O <sub>3</sub> )	µg/Nm <sup>3</sup>	17,39	235 <sup>1)</sup>	SNI 19-7119.8-2005
5	T S P*	µg/Nm <sup>3</sup>	<5,40	-	Gravimetric
6	Noise	dBA	45,80	55 <sup>2)</sup>	IK- S.UA2 (Sound Level Meter)

Annotation:

Location of Rejang Lebong District settlement (03°20'25,7 "LS; 102°26'39,3" BT)

1) Quality Standards for Ambient Air Quality Based on Government Regulation No. 41 of 1999

2) Noise Level Standards Based on Minister of Environment Decree No. Kep. 48 / MENLH / II / 1996.

The sign (<) shows below the detection limit.



Signs (\*) indicate that they have not been accredited by KAN.

Details on Test Sampling :

Bright Air Condition (weather), Air Temperature 27.3oC, Humidity 66.0%, Wind is coming from 20 ° - 60 °, Wind Velocity 0.6 - 4.7 m / sec.

Table 2.5. Ambient Air Quality Test Results (third measurement)

No.	Parameter	Unit	Test Result	Quality Standards	Method
1	Sulfur Dioxide (SO <sub>2</sub> )	µg/Nm <sup>3</sup>	<7,83	900 <sup>1)</sup>	SNI 19-7119.7-2005
2	Carbon Monoxide (CO)*	µg/Nm <sup>3</sup>	229,04	30.000 <sup>1)</sup>	IK-S.UA5 (CO Meter)
3	Nitrogen Dioxide (NO <sub>2</sub> )	µg/Nm <sup>3</sup>	8,35	400 <sup>1)</sup>	SNI 19-7119.2-2005
4	Oxidane (O <sub>3</sub> )	µg/Nm <sup>3</sup>	64,13	235 <sup>1)</sup>	SNI 19-7119.8-2005
5	T S P*	µg/Nm <sup>3</sup>	90,94	-	Gravimetric
6	Noise	dBA	51,06	70 <sup>2)</sup>	IK- S.UA2 (Sound Level Meter)

Annotation:

Location Around the Substation (03°31'30,3 "LS; 102°31'04,5" BT)

1) Quality Standards for Ambient Air Quality Based on Government Regulation No. 41 of 1999

2) Noise Level Standards Based on Minister of Environment Decree No. Kep. 48 / MENLH / II / 1996.

The sign (<) shows below the detection limit.

Signs (\*) indicate that they have not been accredited by KAN.

Details on Test Sampling:

Bright Air Condition (weather), Air Temperature 30.9oC, Humidity 57.5%, Wind from Direction 160 ° - 200 °, Wind Speed 0.1 - 2.6 m / sec

The laboratory analysis results of air quality samples (Table 2.4) indicate that all air quality parameters are below their respective quality standards in accordance with Government Regulation of the Republic of Indonesia Number 41 year 1999 concerning Air Pollution Control, except TSP parameters at U-2 locations. Thus the test results and conditions of air quality at the location of the activity plan are still very good and meet the applicable regulations. The TSP parameters at the location of Babakan Baru settlement that exceed BML, are caused by the condition of the location of the settlements. It is an open land located by the roadside of the district road, and the village road is unpaved which increases flying dust (TSP).



### 2.1.3. Noise

The condition of the environmental setting for noise parameters is done by sampling and measuring noise at several sampling locations as presented in the table. Sampling is done during the day.

Noise is an unwanted sound, and its nature is relatively dependent on the perception of the individual who hears it. This noise can arise from natural activities / processes such as wind and other things, it can also arise due to human activities such as the sound of motorized vehicles, settlements, and others.

To determine the condition of air quality at the location of the activity, measurements and sampling of air quality were carried out at three locations that represent the location of prospective plantation and settlements. Sampling location map for ambient air quality and noise as well as water / biota, soil, flora / fauna and socioeconomic and culture are presented in the Image of Air Quality and Noise Measurement / Analysis Results presented in Table 2.3; Table 2.4 and Table 2.5.

The noise parameter level shows that the average noise level at the activity location is 45.80 - 51.06 dBA, the quality standard for this parameter is 55 dBA (resident settlement). Thus, the current noise level still meets the quality standards in accordance with the Decree of the State Minister of Environment Number: KEP-48 / MENLH / 1996 concerning Noise Level Standards. Most of these parameters are even far below the quality standards such as CO, SO<sub>2</sub>, and NO<sub>2</sub>.

From the detected air quality parameters it can be seen that the CO concentration is very low, which is around 229.04 µg / Nm<sup>3</sup>, compared to the quality standard of 30,000 µg / Nm<sup>3</sup>. CO parameters are generally a by-product of incomplete combustion of oil or gas fuel. Around this area there are no industries, small community industries such as the manufacture and combustion of brick, rice mills, etc., thus, CO emissions from industry to ambient air have not yet occurred, CO levels are originated from motorized vehicles that are passing, both land and water/river transportation that already exist along the highway of the location of the activity. Natural factors such as wind also influence the low concentration of CO around this location. Blowing winds make the CO dispersion in the air stronger, which can reduce CO concentration in the air.



#### 2.1.4. Hydrology

The hydrological study plays an important role in determining the characteristics of water resources. The water resources mentioned are quantity and quality that can meet all water demand for both domestic, agricultural and industrial use. Around the study area there are two large major rivers, the Musi River and the Ketahun River. In general the catchment area or watershed (DAS) around SUTT Hululais-Pekalongan PT. PLN (Persero) Sumatera Power Plant Development Main Unit can be called the Musi watershed and Ketahun Sub-watershed.

The rivers around the study area are generally used for transportation of people and goods. Also used by residents for wild fisheries activities, power plants, both rivers, Musi River and Ketahun River and its tributaries (S. Padi, S. Selatjaran, Sungai Buntu etc.).

Musi River, located in Tabarenah Village, Curup Utara Sub-District (Rejang Lebong Regency), and Ketahun River, located in Talang Ratau Village, Rimbo Pengadang Sub-District (Lebong Regency), have depth ranging in order from 10 1,24,5 to 24 m to 15 m and 0.7 to 3.7 m, and both has the equal instantaneous flow rates of 137,760.4 m / sec, so that it has an instantaneous discharge value of 137.7688,9253.13m<sup>3</sup> / second.

#### 2.1.5. Water quality

To provide an overview of the current condition of water quality at the study area, river water quality was observed. River water is taken upstream of the rivers adjacent to the activity plan of the SUTT network of PT PLN (Persero) Development Main Unit, which are Musi River and Ketahun River. The quality of well water is not sampled because this activity has no impact on the quality of well water (it is not a Significant Hypothetic Impact). The laboratory analysis results of river water quality are shown in Tables 2.6 and 2.7. The certificate for the water quality test result (SHU) attached to the appendix of the analyzed parameters were in accordance with Indonesian Government Regulation No. 82 of 2001 concerning Management of Water Quality and Water Pollution Control, the analysis results of this river water will be compared to quality standards for river water according to PP (government regulations) 82/2001 . Photographs of field conditions and sampling processes of environmental components are presented in the Appendix.

Based on the results of surveys and interviews, the Musi River and the Ketahun River were used by residents for recreation and freshwater fish farming. Therefore the results of the sample analysis were compared, based on their allotment, to class II river water quality



standards in Government Regulation No. 82 of 2001, where it is utilized for water recreation facilities / infrastructure, freshwater fish farming, farming, irrigation water.

The results of the water sample analysis showed that most of the levels of river water quality parameters met the class II river water quality standards except for the parameters PO<sub>4</sub>, H<sub>2</sub>S and Cd (for Ketahun River). Allegedly due to the natural conditions of the two rivers which are located in the upstream and affected by natural conditions (soil and rocks in the upstream catchment area), and allegedly due to multiplend land clearings for cultivation using TOT (no tillage) in the upstream part of this river.

Table 2.6. Sampling Data of River Water Quality (surface water)

No.	Parameter	Unit	Test Result	Quality Standard	Method
<b>Physical</b>					
1	Temperature	°C	26,0	Deviasi 3	SNI 06-6989.23-2005
2	TSS	mg/L	1,20	50	SNI 06-6989.3-2004
3	TDS	mg/L	<8,21	1000	IK-S3 TDS Meter
<b>Chemical</b>					
1	pH	mg/L	7,0	6 – 9	SNI 06-6989.11-2004
2	BOD	mg/L	3,65	3	APHA 5210 B 2012
3	COD	mg/L	15,14	25	SNI 6989.2-2009
4	DO	mg/L	4,56	>4	IK-S2 (DO meter)
5	Nitrate (NO <sub>3</sub> -N)	mg/L	<0,07	10	SNI 6989.79:2011
6	Ammonia (NH <sub>3</sub> -N)*	mg/L	0,73	-	MP-K-A45-Amonia Skalar
7	Arsenic (As)*	mg/L	0,006	1	IK-L 42-MP-AES
8	Cobalt (Co)	mg/L	<0,02	0,2	IK-L 42-MP-AES
9	Barium (Ba)	mg/L	0,01	-	IK-L 42-MP-AES
10	Boron (B)	mg/L	0,16	1	APHA 4500-B – B 2012
11	Selenium (Se)*	mg/L	0,007	0,05	IK-L 42-MP-AES
12	Cadmium (Cd)	mg/L	<0,0007	0,01	IK-L 42-MP-AES
13	Chromium VI (Cr <sup>6+</sup> )	mg/L	0,03	0,05	APHA 3500-Cr-B-2012
14	Copper (Cu)	mg/L	<0,009	0,02	IK-L 42-MP-AES
15	Iron (Fe)	mg/L	0,33	-	IK-L 42-MP-AES
16	Lead (Pb)	mg/L	<0,004	0,03	IK-L 42-MP-AES
17	Manganese (Mn)	mg/L	0,02	-	IK-L 42-MP-AES
18	Mercury (Hg)*	mg/L	<0,0007	0,002	IK-L 42-MP-AES
19	Zinc (Zn)	mg/L	0,58	0,05	IK-L 42-MP-AES
20	Chloride (Cl)	mg/L	0,80	-	SNI 6989.19-2009
21	Cyanide (CN)*	mg/L	<0,003	0,02	APHA 4500 CN F 2012



No.	Parameter	Unit	Test Result	Quality Standard	Method
22	Fluoride (F)	mg/L	0,29	1,5	SNI 06-6989.29-2005
23	Nitrite (NO <sub>2</sub> -N)	mg/L	<0,003	0,06	SNI 06-6989.9-2004
24	Sulfate (SO <sub>4</sub> )	mg/L	2,75	-	SNI 6989.20:2009
25	Chlorine (Cl <sub>2</sub> )	mg/L	0,02	0,03	IK-S4 ( Cl <sub>2</sub> meter)
26	Sulfide (H <sub>2</sub> S)*	mg/L	0,03	0,002	APHA 4500-S <sup>2</sup> D 2012
27	Oil and Fat	mg/L	2,11	1	SNI 6989.10-2011
28	MBAS	mg/L	0,13	0,2	SNI 06-6989.51-2005
29	Phenol*	mg/L	<0,001	0,001	MP-K-A44-Phenol Skalar
30	Total Phosphate as P	mg/L	<0,10	0,2	APHA 4500-P 2012
31	Salinity	‰	0,10	-	IK – S1 (Salt meter)
32	Discharge*	m <sup>3</sup> /s	6,36	-	SNI 6989.80-2011
<b>MICROBIOLOGY</b>					
1	Total Coliform	CFU/100 mL	3.700	5.000	APHA 9222 B 2012
2	Fecal Coliform	CFU/100 mL	120	1.000	APHA 9222 D 2012

Annotation:

- Standard quality of Government Regulation No. 82 of 2001 Class II.
- The <sign shows results below the detection limit
- The \* sign is not in the scope of KAN
- Deviation of temperature from its natural state

Details on Test Sampling:

Bright Air Condition (Bright Weather), Air Temperature 28.8oC, Humidity 73.4%

Table 2.7. Sampling Data of River Water Quality (surface water)

No.	Parameter	Unit	Test Result	Quality Standard	Method
<b>Physical</b>					
1	Temperature	°C	27,0	Deviasi 3	SNI 06-6989.23-2005
2	TSS	mg/L	4,99	50	SNI 06-6989.3-2004
3	TDS	mg/L	<8,21	1000	IK-S3 TDS Meter
<b>Chemical</b>					
1	pH	mg/L	8,0	6 – 9	SNI 06-6989.11-2004
2	BOD	mg/L	3,66	3	APHA 5210 B 2012
3	COD	mg/L	9,08	25	SNI 6989.2-2009
4	DO	mg/L	3,40	>4	IK-S2 (DO meter)
5	Nitrate (NO <sub>3</sub> -N)	mg/L	0,07	10	SNI 6989.79:2011
6	Ammonia (NH <sub>3</sub> -N)*	mg/L	0,74	-	MP-K-A45-Amonia Skalar
7	Arsenic (As)*	mg/L	0,006	1	IK-L 42-MP-AES
8	Cobalt (Co)	mg/L	<0,02	0,2	IK-L 42-MP-AES
9	Barium (Ba)	mg/L	0,02	-	IK-L 42-MP-AES



No.	Parameter	Unit	Test Result	Quality Standard	Method
10	Boron (B)	mg/L	0,06	1	APHA 4500-B – B 2012
11	Selenium (Se)*	mg/L	0,006	0,05	IK-L 42-MP-AES
12	Cadmium (Cd)	mg/L	<0,0007	0,01	IK-L 42-MP-AES
13	Chromium VI (Cr <sup>6+</sup> )	mg/L	<0,02	0,05	APHA 3500-Cr-B-2012
14	Copper (Cu)	mg/L	<0,009	0,02	IK-L 42-MP-AES
15	Iron (Fe)	mg/L	0,52	-	IK-L 42-MP-AES
16	Lead (Pb)	mg/L	<0,004	0,03	IK-L 42-MP-AES
17	Manganese (Mn)	mg/L	0,05	-	IK-L 42-MP-AES
18	Mercury (Hg)*	mg/L	<0,0007	0,002	IK-L 42-MP-AES
19	Zinc (Zn)	mg/L	0,52	0,05	IK-L 42-MP-AES
20	Chloride (Cl)	mg/L	<0,43	-	SNI 6989.19-2009
21	Cyanide (CN)*	mg/L	<0,003	0,02	APHA 4500 CN F 2012
22	Fluoride (F)	mg/L	0,16	1,5	SNI 06-6989.29-2005
23	Nitrite (NO <sub>2</sub> -N)	mg/L	0,01	0,06	SNI 06-6989.9-2004
24	Sulfate (SO <sub>4</sub> )	mg/L	8,12	-	SNI 6989.20:2009
25	Chlorine (Cl <sub>2</sub> )	mg/L	0,02	0,03	IK-S4 ( Cl <sub>2</sub> meter)
26	Sulfide (H <sub>2</sub> S)*	mg/L	0,04	0,002	APHA 4500-S <sup>2</sup> D 2012
27	Oil and Fat	mg/L	2,07	1	SNI 6989.10-2011
28	MBAS	mg/L	0,08	0,2	SNI 06-6989.51-2005
29	Phenol*	mg/L	<0,001	0,001	MP-K-A44-Phenol Skalar
30	Total Phosphate as P	mg/L	0,35	0,2	APHA 4500-P 2012
31	Salinity	‰	<0,01	-	IK – S1 (Salt meter)
32	Discharge*	m <sup>3</sup> /s	5,76	-	SNI 6989.80-2011
<b>MICROBIOLOGY</b>					
1	Total Coliform	CFU/100 mL	3.900	5.000	APHA 9222 B 2012
2	Fecal Coliform	CFU/100 mL	230	1.000	APHA 9222 D 2012

Annotation:

- Standard quality of Government Regulation No. 82 of 2001 Class II.
- The <sign shows results below the detection limit
- The \* sign is not in the scope of KAN
- Deviation of temperature from its natural state

Details on Sampling Test:

Bright Air Condition (Bright Weather), Air Temperature 29.9oC, Humidity 65.8%

### A. Total Suspended Solids (TSS)

The suspended solids (TSS) attained from water samples ranged from 1.2-4.99 mg / liter. The quality of this TSS is relatively low and meet all the quality standard (class II river water quality standard 50 mg / liter). Suspended solids have an impact on increasing sedimentation in the body of water, so the body of water will become shallow and water is



cloudy. Other than that, solids in water will inhibit the infiltration of sunlight into water body, thus disrupting photosynthesis and disrupting the life of aquatic biota.

### **B. Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD)**

BOD<sub>5</sub> levels (through the incubation process at 200 C for 5 days) and COD in water show the size of the content of organic matter that can be described biochemically and chemically. This high BOD and COD value will cause a decrease in the oxygen content dissolved in the water body.

The value of COD and BOD at the study area still meet the quality standard, this shows that although the location contains a lot of organic material resulted from human life activities both by agriculture / plantation activities, domestic and industrial, but in general the existing natural processes are still able to stabilize it.

The value of Biochemical Oxygen Demand (BOD) shows the amount of dissolved oxygen needed by living organisms to break down or oxidize waste materials in the water. So the BOD value does not show the actual amount of organic matter but only measures the relative amount of oxygen needed to oxidize the waste material.

Based on the results of the laboratory analysis, the value of Biochemical Oxygen Demand (BOD) for the river water in the study area ranged from 3.65 to 3.66 mg / liter. The value of this BOD level exceeds the permissible environmental quality standard of 3 mg / l in accordance with PP 82/2001 for class II water quality. The BOD value indicates that in the water has relatively low organic matter and based on class II determination, it has not exceeded the quality standard.

Chemical Oxygen Demand (COD) describes the amount of oxygen needed to oxidize or reduce organic compounds to be anorganic. The COD value will increase in proportion to the increase in organic matter content in the water.

Based on the results of laboratory analysis, the value of Chemical Oxygen Demand (COD) for the river water in the study area ranged from 9.04 to 15.14 mg / l which meets the class II river water quality standard (25 mg / l) according to PP 82 of 2001.

### **C. Degree of Acidity (pH)**

The degree of acidity in the analyzed water sample when compared to the pH standard (6-9), the water conditions that are too acidic or alkaline can interfere with aquatic biota and are corrosive to metals. The dominant source of acidity comes from organic acids.





Acidity value (pH) provides an illustration of acid alkaline balance in water, since this is very closely related to its function as a solvent in chemical reactions. The pH value is influenced by several factors including photosynthesis, biology and various types of cations and anions that are contained in the water.

The results of measurements on the parameters of the acidity of the water (pH) of river waters at the study areas showed that it ranges from 7 to 8, this met the river water quality standards. To serve as drinking water materials the pH level must meet the Water Quality Standard requirements, according to PP 82/2001 class II quality which is a pH ranges from 6 to 9. The pH level of this river water is very good because it is located relatively in the upstream, so there are no puddles or swamps around the river which is generally the cause of low pH (acid), other than that it is also because there is no influence of sea tides.

#### **D. Ammoniac (NH<sub>3</sub>), Nitrite (NO<sub>2</sub> – N) and Nitrate (NO<sub>3</sub> – N)**

Ammonia is a process of reducing nitrate (denitrification) or a by-product of industrial processes. Ammonia is an additional nitrogen source that is important for the growth of algae, and other water weeds that can arise quickly in natural waters and can cause contamination (eutrophication).

Ammonia is rapidly oxidized in the natural system by groups of bacteria that produce nitrites and nitrates. This event requires oxygen dissolved in water. In the dissociated form, ammonia is relatively more toxic to fish than in its basic form (NH<sub>4</sub>OH) which is closely related to the water pH level. Ammonia toxicity increases in proportion to the increase of pH and free CO<sub>2</sub> content. Ammoniac content based on the analysis results is ranged from 0.73 to 0.74 mg / l.

Nitrite (NO<sub>2</sub>-N) together with nitrate (NO<sub>3</sub>-N) is a nitrogen compound which is usually found in small amounts in the waters. Nitrite (NO<sub>2</sub>-N) is a less stable compound that is in the form of a nitrogen compound which is made from organic matter containing protein. This compound if in large quantities will be toxic to the organisms in the waters. Nitrate (NO<sub>3</sub>-N) is a nitrogen compound which is the result of organic matter reformation by microorganisms. Nitrate compounds are indicators to see the fertility of a waters, because their presence in a waters is highly expected. Thus the more nitrate content in the waters, the productivity of these waters will increase. Based on the results of laboratory analysis, the Nitrate (NO<sub>3</sub>-N) content of the rivers included in the study area is 0.07 mg / l, this



nitrate content still meets the BML (below the environmental quality standard of 10 mg / l).

### 2.1.6. Land Use

Based on the interpretation of the Land Unit Map and Land 1: 250,000 Bengkulu Sheet (0912), published by the Cooperation of Bakosurtanal and Bogor Center for Soil and Agro-Climatic Research (1990), the SUTT pathway passing through four types of land unit classifications, namely: Hab. 1.2.2 , Mab.2.1.2, Mab.2.2.2, and Vab.1.4.2 which are hill groups (H), mountains (M), and Volkan (V), description of each unit of land is in Table 2.8.

Table 2.8. Land units and geographic conditions around the SUTT Pathways

No.	Land unit	Physiography	Main Components	Land/Area Form; Slope	Altitude (m)	Scratch Level	Soil Type ( <i>great group; USDA</i> )
1	Hab.1.2.2 (Perbukitan)	Small hills	Rough acidic sedimentary rocks	Small hills dan hills with random pattern, quite steepy steep slope; 16-25%	100-800	A bit scratchy	Dystropepts, Humitropepts, Eutropepts
2	Mab.2.1.2 (Pegunungan)	Mountains	Intermediary Tuf and intermediary up to basis lava	Quite steepy slope up to steep; < 25 %	400-1500	Scratchy enough	Dystropepts, Hapludults, Haplohumults, Humitropepts.
3	Mab.2.2.2 (Pegunungan)	Mountains	Intermediary Tuf and intermediary up to basis lava	Quite steepy slope up to steep; 25-75 %	200-1350	Scratchy enough	Hapludults, Haplohumults Humitropepts
4	Vab.1.4.2 (Volkan)	Stratovolcano	Intermediary tuf nad lava, down slope and foot slope.	Flat up to sloping; < 16 %	500-1200	Scratchy enough	Dystrandepsts, Humitropepts, Tropaquepts, Dystropepts.

Source: Information book on the land and land unit map of Bengkulu (0912) Sumatra, Center for Soil Research and Agroclimate, Bogor, 1990.

Classification of dominant soil types based on land taxonomy systems according to the USDA (1987) in land units Hab.1.2.2, Mab.2.1.2, Mab.2.2.2, and Vab.1.4.2 in the activity plan location of 150 Kv transmission development network PLTP Hululais - Pekalongan



and Substation related to PT PLN (Persero) Sumatra Network Development Main Unit are: Red Yellow Podsollic (Ultisol), Latosol and Inseptisol. The study location has a slope or topography between <16% to 75%.

In the study area around the SUTT development plan have dominant land cover or use in the form of mixed plantation, primary forests, fields, rice fields, and settlements.

### 2.1.7. Electric Field and Magnetic Field

The environmental setting hue conditions for the electric and magnetic field parameters are known by measuring the electric and magnetic fields around the residential settlements and existing lines of the SUTT (High Voltage Air Channel). The results of the measurement of the electric field and magnetic field

Natural electric fields; The electric field and the earth's magnetic field are more dominant in the form of static components and smaller components that change with time at frequencies (50-60) Hz. The results of the measurement of natural electric fields at frequencies (50-60) Hz are 10 V / m, while the natural electric field near the surface of the earth is a static electric field of about 130 V / m (Polk, 1974; Dolezalek, 1979 in WHO, 1984)

The static electric field strength is an electric field caused by the separation of the electrical charge between the atmosphere and the ground, so that the earth resembles a ball capacitor with its upper atmosphere. The natural electric field which is electric in the atmosphere, sometimes in the form of lightning accompanied by flashes of light with the strength of the electric field around 3 kV / m to 20 kV / m (WHO, 1984)

Natural magnetic field; The natural magnetic field consists of internal and external magnetic fields, the internal field of the earth can produce electricity in the upper layer of the center of the earth. The magnitude of the megnet induction at the Earth's pole reaches 67 uT and in the equator the size is around 33 uT, this magnetic field varies with changes of 0.03 uT (WHO, 1987).

The external magnetic field consists of many components with different spectrums and characteristics. The variation of the magnetic field is related to the activity of sunlight (solar), lightning flow, atmospheric changes and air ionization. Natural magnetic fields at frequencies (50-60) Hz approximately 10 mT (Polk, 1974 in WHO, 1984)



## B. Artificial Source

Humans are more exposed to electric and magnetic fields from the use of man-made electric power for example in the form of high-voltage cables to industrial household appliances and offices. This condition still needs to be carried out in the assessment considering that the exposure of the electric field and artificial magnetic fields is increasing.

### B.1. Electromagnetic fields (magnets) Extremely Low Frequency (ELF) from equipment

Measuring the strength of the electric field carried out at a distance of 30 cm from some household appliances, It resulted in variety between 2-5 V / m. While the measurement of electric field strength carried out in American households ranges from 1 V / m to 10 V / m (WHO, 1984).

Roland, J. et al. (1992), reported that from the measurements of electromagnetic fields in homes of 207 houses, it was found that 50% of the magnetic induction values were below 1.82 mG (= 0.182 uT) and that 50% were below 0, 47 mG (= 0.047 uT). WHO (1987). The results of the magnetic field measurements of household appliances are presented in Table 2.9 (WHO, 1987).

Table 2.9. Results of ELF magnetic field measurements around household appliances

No.	Appliances	Magnetic Field ( $\mu$ T) with a distance of		
		(3 cm)	(30 cm)	(100 cm)
1.	Hair dryers	6-2000	<0,01-7	0,01-0,03
2.	Television	2,5-130	0,04-2	<0,01-0,15
3.	Vacuum cleaners	200-800	2-20	0,13-2
4.	Mixers	60-700	0,6-10	0,02-0,025
5.	Microwave ovens	75-200	4-8	0,25-0,6
6.	Blenders	25-130	0,6-2	0,03-0,12
7.	Electric ovens	2,5-50	0,15-0,5	0,01-0,04
8.	Flourescent lamps	40-400	0,5-2	0,01-3



## **B.2. Electric and magnetic fields (ELF electromagnetic waves) caused by SUTT (High Voltage Air Chanel)**

One source of artificial electric and magnetic fields that needs to be considered with regard to exposure in the environment is high voltage transmission lines.

Electric field; The electric field strength above the ground is very much determined by the height of the conductor, the lateral distance and the transmission voltage. Against a barrier such as houses, the electric field decreases approximately 10-100 times smaller, it is determined by the structure and the materials that built the building.

Magnetic field; Unlike the electric field, the magnetic field is able to penetrate obstructive objects such as the walls of buildings, trees and the human body, while magnetic induction will decrease linearly with respect to the distance from the transmission conductor (WHO, 1984)

WHO reports the results of magnetic field measurements at a distance of 60 meters lateral to the extra high voltage airway cable 765 kV is less than 2 uT. Magnetic flux at the surface of the ground under extra high voltage airways is determined by the height of the conductor and the amount of voltage transmitted (WHO, 1984).

### **2.1.7.1. Limits and Effects of Exposure to Electric Fields and Magnetic Fields Towards Community Health**

According to INIRC (International Non Ionizing Radiation Committee) from the IRPA (International Radiation Protection Association), the value of electric and magnetic fields that are characteristic of a not disturbed exposure conditions is the field that exists when all objects are removed.

An uninterrupted electric field with a field strength of 10 kV / m will induce a meeting of effective currents averaging less than 4 milliliters / meter in all areas of the head and trunk of the human body. Magnetic induction of 0.5 mT at 50/60 Hz will induce an effective current density of about 1 milliamperere / meter on the circumference of a loop of body tissue with a radius of 10 cm.

UNEP (United Nations Environmental Program), WHO (World Health Organization) and IRPA (International Radiation Protection Association) in 1990 issued a statement about the

value of induction current density with its biological effects caused by 50/60 Hz field-field exposure at whole body as follow :

1. Between 1 and 10 millimeters / meter, it does not cause significant biological effects;
2. Between 10 and 100 milliliters / meter, it is proven to cause biological effects, including effects on the visual and nervous system;
3. Between 100 and 1000 milligrams / meter, it causes stimulation in tissues that can be stimulated and there are possible dangers to health;
4. Above 100 milliliters / meter, can cause extrasistole and ventricular and cardiac fibrillation (acute danger from health).

According to IRPA 1990, SNI 04 6918-2002, and SNI 04 6950 2003 the threshold exposure limits of 50/60 Hz electric fields and magnetic fields are presented in Table 2.10. The value of the electric field and magnetic field from the results of monitoring by PT PLN UPT Bengkulu in the Bengkulu Province and its surrounding areas from the existing SUTT in 2011, are all below the prescribed threshold, it is fully presented in the following table.

Table 2.10. The threshold for Electric Field and Magnetic Field Exposures

Exposures Characteristics	Electric Field Strength kV/m (efective)	Magnetic Field strength (magnetic flux density) mT (efective)
Related to work :		
- Allday working day	10	0,5
- Short term	30 <sup>a)</sup>	5 <sup>b)</sup>
- Only at arms	-	25
Related to public :		
- Up to 24 hours/day <sup>c)</sup>	5	0,1
- Few hours/day <sup>d)</sup>	10	1

Source: SNI 04 6918-2002, SNI 04 6950-2003, and IRPA, 1990.

Annotation :

- a) = The duration of field exposure between 10 and 30 kV / m can be calculated from the formula  $t \leq 80 / E$ , with t = time (hours / working days), E = electric field strength (kV / m).
- b) = The maximum duration of exposure is 2 hours / working day.
- c) = This restriction applies to open spaces where members of the general public can reasonably be expected to spend part of a day, such as recreation areas, fields to meet and such.
- d) = The value of the electric field strength and the strength of the magnetic field can be exceeded for a duration of several minutes / day provided that preventive action is taken to prevent the effects of indirect coupling.



Table 2.11. Results of monitoring of electric and magnetic fields by PT PLN UPT  
(Transmission Service Unit) Bengkulu in 2011

No	Segment	Voltage (kV)	No. Tower	Village	E mak (kV/m)	B mak ( $\mu$ T)
1	PLTA Tes-Pekalongan	70	116 dan 117	Perbo	0,410	0,002
			141 dan 142	Pulo Geto	2,540	0,005
2	Pekalongan-Sukamerindu	70	184 dan 185	Kelobak	2,660	0,004
3	Lb.Linggau-Pekalongan	150	167 dan 168	Kota Pagu	0,770	0,004
			211 dan 212	Bumi Sari	0,570	0,004
4	Pekalongan-PLTA Musi	150	20 dan 21	Kepahiyang	4,780	0,297

Source: PT PLN (Persero) Development Unit III;

E mak = maximum electric field, and

B mak = maximum magnetic field.

Likewise, the results of the measurement of the electric and magnetic fields around the location of the existing transmission network around the SUTT activity plan to be built, the electric and magnetic field values still meet the safe threshold, according to: SNI 04 6918-2002, SNI 04 6950-2003 , and IRPA, 1990 (i.e. E mak <5 kV / m and B mak <0.1 mT (milli Tesla).

#### **A. The Mechanism of Interaction of the Electric Field and the Magnetic Field with Biological Material**

The organs and tissues of the body are made of structural material consisting of polar molecules, biological fluids containing electrolyte ions and soluble macromolecules. The force generated by the electric field can cause free electric charges (electrolyte ions) to move. If our body is directly related to the ground, the movement of the charge (ions) in the body will produce an electric current. If our body is isolated from the soil, the potential will increase and the amount depends on the capacity to the soil.

Considering that the electric field radiation and the magnetic field of ELF electromagnetic waves are very low, the energy they carry is small so that the depth of penetration of the field lines into the body is very shallow. But the current flow produced by ELF electric fields in the human body can be measured indirectly (WHO, 1984).

Biological interactions between electric fields and magnetic fields by ELF electromagnetic wave radiation can also cause heat. The electric force that flips quickly on a motionless structural molecule can cause its atoms to vibrate or spin, which in turn can cause heat. The



amount of heat generated by the ELF electromagnetic field radiation is small when compared to natural heat from the body's cells.

In principle, an electric field of sufficient magnitude can have a direct effect on biological tissues in the form of free ion movements in extracellular environments or through the interaction of electric moments from molecular structures.

### **B. Biological effects by exposure to electric fields and magnetic fields (ELF electromagnetic waves)**

Since humans cannot be used for research that potentially has adverse effects, laboratory studies often use various species of experimental/laboratory animals.

The 60 Hz electromagnetic field has an effect on decreasing the level of concentration of melatonin in the blood which encourages an increase in the release of estrogen from the reproduction organs and as a result it will stimulate an increase in the development of the breast arrangement. Furthermore it was found that when the magnetic field interacts with the cell, it will change the conductivity of the cell membrane so that it will affect the balance of Na, K and sensitive ions which are Ca ions. Though Ca ions function as regulatory signals for various levels of biological symptoms and play an important role in delivering nerve stimulation, influencing the system and regulating the effect of cell poisons.

Furthermore Murthy et al. (1995), from his research report that the exposure of ELF 60 Hz electromagnetic waves at 6 kV / m electric field intensity and 50  $\mu$ T magnetic field on Papis cynocephalus with the frequency of exposure 12 hours per day for 6 weeks was significantly able to reduce CD3, CD4 and IL receptors -2.

Current induction in the body caused by ELF electromagnetic fields around us are very weak, and currents also arise in other organ cells, but the energy they contain is too weak to break chemical bonds in cells.

### **C. Effect of ELF Electromagnetic Fields on Public Health**

The effect of electric field radiation and the magnetic field of ELF electromagnetic waves on human health is basically related to changes in cell structure and function. If there is a change in the function and structure of the cell, it is likely to cause changes in the tissue, and then can interfere with the function of the organ and possibly can lead to health problems after a certain period of time.





Some cells and tissues that are sensitive to radiation include white blood cells, basal cells (sex cells, cells in the embryo, red bone marrow cells, digestive cells and alveola cells). The results of research conducted on animals that are exposed to the electric and magnetic fields reported can affect:

Cell growth, reproductive function, pre and post natal development, biolistic activity of isolated nerve cells, behavior, cardiovascular function (acute exposure), system of formation of blood cells, immune function, regulation of physiology and circadian rhythm (Cember, 1969).

Sazanova et al. (1967), conducted research on residents around the transmission line 400 kV - 500 kV, found that those exposed to higher electric fields will experience lower blood pressure, higher neuromuscular activity, increased time to respond and higher mean errors. in the trial response to the stimulation given, but in the study it still cannot be ascertained whether the strength or duration of exposure is the most important.

Data from neuro physiological tests in vivo and in vitro show that the electric field can affect tissue, especially in the components of the nervous system. But the significance of humans exposed to the electric field or magnetic field from the environment cannot be determined (WHO, 1984).

Haryanto (1995-1996), reported the results of research on residents living under T / L 150 kV and 500 kV SUTET, concluding that there were no significant differences in the pattern of disease of residents residing at a distance of 150 meters outside transmission and SUTET.

Based on existing literature, magnetic fields and natural electric fields have existed since the earth and nature were created. Magnetic fields and electric fields are formed because of activities that produce magnetic fields and electric fields.

Based on the results of field measurements that have been carried out on Java Island by PT PLN (Persero) in 1992 for 500 kV SUTET of 0.8 kV / m for the electric field and 59 mG (0.0059 mT) for the magnetic field, so that the field strength electricity and magnetic field strength are still below the WHO recommendation standard which is electric field strength <10 kV / m and magnetic field strength <50,000 m Gauss.

The electric field and magnetic field around humans cannot be felt by the human senses unless the intensity is large enough. The electric field and magnetic field are non ionizing



radiation groups. Electric fields and magnetic fields existed since this nature was created. The atmosphere surrounding the earth has an ionospheric layer, where between the ionosphere and the surface of the earth there is an electric field of 100-500 V / m. Likewise cloudy clouds that contain lightning potential can generate an electric field of 300-30,000 V / m. The earth is a giant magnet that has magnetic poles that are close to the earth's poles. The magnetic field envelops the earth with a power of 40-70 microtesla. The electric field inside a house, office or factory building mainly comes from installations in buildings and equipment used. The electric field of an installation outside the building will generally be absorbed by building parts by 90 percent.

The electric field (Electric) arises when there is an electric potential difference, in the case of T / L the electric potential difference occurs due to an electric voltage in the conductor to the earth, while the magnetic field arises due to flowing electric current in the T / L conductor. The magnetic field and the electric field generated by the Power Line (SUTR, SUTM, T / L, SUTET) depend on the strength of the flowing current to it. Under T / L the magnetic field strength varies between 0.5-8 microtesla (The Regulatory Assistance Team of the Minister of Mining and Energy, 1992), while the measurement results of PT PLN (Persero) show the magnitude of the magnetic field and electric field for High Voltage Air Channels (SUTT ) with measurements at an altitude of 1.5-3 meters above ground level in open space of 0.0059 microtesla and 0.8 kV / m respectively. The measurement results are far below SNI (Indonesian National Standard) and WHO standards, which is equal to 5 kV for electric field strength and 0.1 mT for magnetic field strength.

The electric and magnetic fields will decrease rapidly if the measurement / observation position is further away from the transmission line. The greatest electric field intensity occurs at the midpoint of the channel, which is 1.26 kV / m in the case of double channels and 2.56 kV / m in the case of horizontal single channels, while the magnetic field induction is 2 micro Tesla in the case of double channels and 6 , 3 micro Tesla on a single horizontal channel; these values are for the height of 1 m above ground level. The electric and magnetic field values are still below the WHO threshold, which are 5 kV / m (= 5000 V / m) for the electric field, and the magnetic field threshold is 100 micro Tesla at a current of 1000 Ampere



This theoretical calculation is accurate enough to describe the state of electric and magnetic fields around T / L, especially for magnetic field estimation because magnetic induction is not disturbed by the presence of any objects around it.

The intensity of the electric field is strongly influenced by the presence of objects around T / L, such as for example: trees, roofs, etc. But the effect is actually beneficial, because these objects act as screens that have the effect of reducing the intensity of the electric field. Therefore, the intensity of the electric field in the house due to T / L becomes lower, it can even be lower than the intensity of the electric field due to household electrical appliances, such as televisions, refrigerators, computers, etc.

**Electric field;** If one particle or an object is electrically charged, in the surrounding area of the particle or object will occur electric field. Likewise if the conductor possesses voltage then around the conductor will be generated electric field. Electric field strength depends on the amount of voltage working on the conductor and depends on the distance from the source. The electric field strength is getting weaker if the source distance is farther away. Electric field strength has units of volts per meter (V / m or kV / m).

**Magnetic field;** The magnetic field is generated by iron or steel that is magnetic, as well as one conductor which is electrified will generate a magnetic field around it. The strength of the magnetic field depends on the magnetism of the iron. The magnetic field strength generated by an electric current depends on the amount of electric current. The strength of the magnetic field weakens if the distance from the source farther away. The strength of the magnetic field has units of tesla (T) or militesla (mT), often used gauss or milligauss (mGauss); (1 T = 1000 mT; 1 G = 100 mG and 1 T = 10,000 G).

The Electric and Magnetic Fields at Home and Workplace; The magnetic field and the electric field in the house are the sum of fields generated by installations and electrical equipment existed inside and outside the home, including:

1. Low Voltage Air Channels (SUTR)
2. Medium Voltage Air Channels (SUTM)
3. Installation system in the house
4. Refrigerator
5. Air conditioner (AC)



6. Copier
7. Welding machine
8. Television
9. Computers and others

**Neon lights in an electric field;** If the fluorescent lamp or test pen of one pin is held and the other end is worn by zinc under the electric field, the fluorescent light will light up but not as bright as when it is installed on a 220 volt network. The same symptom will also occur on a fluorescent lamp or test pen held near the "coil" on a car engine, or near a radio communication antenna (CB, ORARI) or a private radio transmitter antenna or RRI (the state radio network) that is working.

#### **2.1.7.2. Research on Electric Fields and Magnetic Fields**

The activity of distributing electricity will cause magnetic field and electric field that can cause health problems. The results of field measurements carried out by PT PLN (Persero) are still far below the WHO recommendation standard, namely the electric field strength  $<5 \text{ kV / m}$  and magnetic field strength  $<0.1 \text{ mT}$ , so that it can be analogous to the magnetic field and electric field produced by SUTT and SUTET are the same which is still below the standards permitted by WHO.

Electricity distribution activities can also cause public unrest which has an impact on health problems due to the induction of electric fields and magnetic fields in the environment around the 150 kV transmission line.

Recently there are developing discourse and opinions about the magnetic field and electric field which resulted in two conclusions / opposite conditions, those are: (1) which does not have an impact and (2) which causes human health effects / disturbances. These things are reinforced by various results of existing research or experiments.

Theoretically the electric and magnetic fields will decrease dramatically if there are obstacles ("the theory of faraday cage") thus the 150 kV T / L transmission line that has been operating in the PT PLN (Persero) environment, the lowest result is  $0.1 \text{ kV / m}$  for electric fields with a current of 398 A with a distance of 13 meters and the highest is  $3.2 \text{ kV / m}$  for electric fields with a current of 398 A with a distance of 13 meters. The lowest magnetic field measurement obtained was  $0.003 \text{ mT}$  with a current of 100 A and a distance of 13 meters and the highest was  $0.019 \text{ mT}$  with a current of 398 A for a 13 meters



distance where the results were below the SNI standard or WHO which is 5 kV / m for electric fields and 0.1 mT for magnetic fields. Electricity distribution activities at the operating stage will increase the reliability of the electrical system, but this activity will also cause magnetic fields and electric fields to arise. The occurrence of magnetic field and electric field is caused by electric charge is given to conductive wire. The magnetic field and electric field are still being debated, especially scientifically.

The understanding about magnetic field and electric field will be very difficult to be relayed to the community, especially with the condition of our society which is diverse in levels of education. A lot of information about magnetic fields and electric fields can lead to negative perceptions, especially the influence on life and human health.

Research conducted on the world level as well as on the national level, have until now, not been answered with certainty about the influence of magnetic field and electric field on health. If we trace the results of researches conducted by experts, the results of research conducted by experts there are two conflicting groups.

#### **A. Research that gives positive results regarding magnetic fields and electric fields**

**1. Steven, R.G. (1994);** with the study title Residing near Swedish high-voltage power lines with child subjects aged <16 years living under 200-400 Kv with Swedish methodology 1960-1985 case control (142: 558) that there was no association between the occurrence of cancer with exposure caused by high voltage air channel;

**2. Fairbain, D.N. and O'neil, K.L. (1994);** Bulgaria with the study title The electromagnetic effect field exposure on the formation of DNA single strand breaks in human cells. With the subject of human DNA, the methodology used by epidemiology from the results of the study stated that there is no direct influence on the exposure of electromagnetic fields to DNA;

#### **B. Research that gives negative results (affecting health) regarding magnetic fields and electric fields**

**1. Warindi (1994);** in Indonesia with the title: SUTET (Extra High Voltage Air Channel) environmental impact, the subject of the SUTET experiment obtained 4 main types of environmental impacts from SUTET, which are: interference with radio & television waves, noise, strong electric and magnetic fields;

**2. Christine, G .; Feychting, M .; Ahlbom, A (1992);** Sweden, with the title Danger over head the subjects are people/residents with a methodology of 300 m distance from T / L / SUTET 1960-1985 in Sweden applied to 500 people, it is found in the results that cancers in adults did not increase while the risk of childhood leukemia increased;

**3. Pearson, S.L. et al. (1993);** with the title Gene-specific modulation of RNA shynytetys and degradation by extremely low frequency electromagnetic fields, with human DNA subjects, stated that ELF radiation affects the formation and degradation of transcription of RNA ribosomes. Other evidence shows that the influence of ELF is quite selective, by controlling one of the transcription speeds and / or the RNA transcription process and vice versa.

The existence of two opinions that run in parallel and continue to the present causes doubts that require policies by the authorized agency to overcome these problems.

WHO, after conducting various types of research and considering various aspects has issued provisions regarding permissible threshold values, especially those relating to the magnetic field and electric field produced by the operation of Transmission / SUTET.

This WHO standard is used by many countries as the standard applied in the country, the standard is as follows 5 kV for electric field strength and 0.1 mT for magnetic field strength, in Indonesia by adopting WHO regulations and taking into account research which has been carried out by the Department of Energy and Mineral Resources, the Directorate General of Electricity and Energy Utilization issues regulations relating to the magnetic field and electric field which are poured in SNI and the Regulation of the Minister of Energy and Mineral Resources, those are: SNI 04 6918-2002, SNI SNI 04 - 6950-2003, IRPA, 1990, Permen ESDM No. 18/2015 and Permen ESDM No. 27/2018.

Magnetic fields and electric fields are knowledge that is difficult to be explained to common people or to be understood by them, especially to general public with different levels of education background with their personal understandings and interests, relaying an understanding on magnetic field and electric field to the community needs to be done by applying language that is rather simple and easy to undertand. Submitting incorrect information about the magnetic field and electric field will cause negative perceptions, this negative perception if not immediately overcome by providing an understandable / accepted explanation, it will cause anxiety especially anxiety about the danger due to



magnetic fields and electricfield, especially the feeling of fear due to the presence of magnetic fields and electric fields around their homes.

Based on the results of the measurement of the electric and magnetic fields, it is known that the magnitude of the magnetic field impact is  $<0.1$  mT and the electric field  $<5V / m$  which is the level of exposure of the magnetic and electric fields at the location around the existing electricity grid lines and residential settlements which is still below the treshold.

## 2.2. Biology Components

The existing land use composition at the site of the tower site, 131 pieces, dominated by 33.33% of coffee plantations or 40 tower sites, then shrubs (31.16% or 42 towers) and the lowest at the location of brick workshop and the location of Imperata (0.27% or 1 tower location respectively), while the rice field location is 15.22% (21 towers). An overview of the situation of land use and pal BM (tower point center) is presented in Figure 2.2.

Percentage of land use distribution at the site of the tower site plan in Table 2.12.





<b>A. Location T.048, land use of shrubs</b>	<b>B. Location T.013, land use of chilli field</b>	<b>C. Location T.008, land use of cornfield</b>	<b>Location T.062, land use of cabbage field</b>
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<b>E. Location T.100, land use of rubber tree plantation</b>	<b>F. Location T.038, land use of coffe plantation</b>	<b>G. Location T.023, land use of field</b>	<b>Location T.015, land use of rice field</b>
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Figure 2.2. Land use around the tower site plan and pal / monument Bench Mark (BM); (at the midpoint of the tower tread).

Table 2.12. Percentage of land use distribution in the tower site plan

No.	Land Use	Number of Towers	Percentage
1.	Cogongrass	1	0,72
2.	Shrubs	43	31,16
3.	Shrubsr/Secondary forest	2	1,45
4.	Horticulture fields	12	8,70
5.	Rubber tree plantation	6	4,35
6.	Coffee Plantation	46	33,33
7.	Non-horticulture fields	6	4,35
8.	Bricks workshop	1	0,72
9.	Rice field	21	15,22
	<b>Total</b>	<b>131</b>	<b>100,00</b>





### 2.2.1. Vegetation

The collected vegetation data is in the form of primary data derived from observations in the field. Observation of vegetation and wildlife was carried out at several locations representing the overall condition of the project site for the planned construction of a 150 kV high voltage air channel network (SUTT) for the Hululais-Pekalongan PLTP and related substations. The vegetation data components taken are plant species at the observation location.

#### 2.2.1.1. Vegetation of Secondary Forests and Shrubs

Plant ecosystem types found around / along the location of the 150 kV transmission network plan (SUTT) The Hululais-Pekalongan PLTP are secondary forest and mixed plantation owned by residents and / or cultivated by residents. Mixed field vegetation that is dominated by coffee, cinnamon, cocoa, rubber tree plantations and there are also rice fields. Field observations show that canopy cover is quite tight, so that at the bottom or floor of the forest tends to be moist and many types of ferns and lianas are found. Whereas in shrubs or mixed fields, there are still many types of trees found at the level of trees, shrubs and herbs. Herbaceous plants (understorey) found are many types of ferns. In vegetation types or mixed fields ecosystems, there are many palm trees, durian, cinnamon, and mango trees. In general, the composition of plant species that comprise secondary forest ecosystems around the site has a high diversity of plant species, especially tree species. This is because this secondary forest is a conservation forest area, although the forest is also inseparable from the pressure of timber exploitation and land opening to be used as plantation by the community.

For tree-level plants (i.e. plants with a stem diameter at chest height (DBH)  $\geq$  10 cm), dadap trees (*Erythrina variegata*) and rubber (*Hevea brasiliensis*) have the highest Important Value Index (INP) compared to other species. The high important index values of the two types, and also followed by types of Cassia (juwar), Durio (durian), Hibiscus tiliaceus (waru), Aleuritas moluccana (pecan), and Cinnamomum burmanni (cinnamon), are due to many of these plant species are planted as shade plants, protectors or intercropping in coffee plantation belonging to the community. These types are usually planted when new fields/plantation are opened and subsequently will be used as a source of firewood, fruits or bark that can be of economic value, especially when waiting for the time to pick coffee fruits that are ripe and ready to be harvested.



The high value index of *Macaranga sp* (mahang) is because it is a pioneer type, a type that is tolerant to sunlight, indicating that the fields observed are mixed secondary vegetation types. The types of vegetation that make up the community types of secondary forest plants and shrubs can be seen in Table 2.13 and Figure 2.3.

Table 2.13. Types of vegetation composing secondary forest community type and shrubs in the study area

No	Local Name	Binomial Name	INP (%)		
			Tree	Stake	Seedling
1	2	3	4	5	6
1	Dadap	<i>Erythrina variegata</i>	37,42	9,24	
2	Karet	<i>Hevea brasiliensis</i>	33,11		11,65
3	Mahang	<i>Macaranga sp</i>	29,04	28,81	5,97
4	Juwar	<i>Cassia sp</i>	26,35	11,36	11,85
5	Durian	<i>Durio zibethinus</i>	24,41		
6	Waru	<i>Hibiscus tiliaceus</i>	22,26	9,19	
7	Kemiri	<i>Aleuritis moluccana</i>	21,13	3,17	
8	Kayu Manis	<i>Cinnamomum burmanni</i>	16,42		
9	Angsana	<i>Pterocarpus indicus</i>	14,91		
10	Awar-awar	<i>Ficus septica</i>	14,32	9,46	
11	Kepayang	<i>Pangium edule</i>	13,24	10,26	
12	--	<i>Ficus sinuata</i>	12,38		
13	Pokat	<i>Persea americana</i>	9,42		
14	--	<i>Ficus fulva</i>	9,42	11,98	
15	--	<i>Draxylum indicum</i>	7,24		
16	Nangka	<i>Arthocarpus heterophyllus</i>	6,51		
17	Jambu biji	<i>Psidium guajava</i>	2,42		
18	Kopi	<i>Coffea arabica</i>		47,61	43,39
19	Kerinyu	<i>Eupatorium odoratum</i>		23,01	
20	Bambu kuning	<i>Bambusa vulgaris</i>		19,10	
21	Bambu biasa	<i>Bambusa sp</i>		17,18	
22	Rotan duduk	<i>Calamus sp</i>		17,22	
23	Harendong bulu	<i>Clidemia hirta</i>		16,10	15,64
24	Pakis sp1	<i>Lygodium circinnatum</i>		14,32	27,38
25	Mikania	<i>Mikania cordata</i>			10,11
26	--	<i>Tinospora glabra</i>		10,02	
27	Pecut kuda	<i>Stachytarpetta urticaefolia</i>		9,61	4,21
28	Sirih-sirihan	<i>Piper aduncum</i>		8,30	
29	Tuba	<i>Cf. Derris</i>		5,44	9,02
30	--	<i>Octomeles sumatranus</i>		5,24	8,42
31	--	<i>Taxotropis spinosus</i>		4,34	



No	Local Name	Binomial Name	INP (%)		
			Tree	Stake	Seedling
1	2	3	4	5	6
32	Katu	<i>Sauropus androgynus</i>		4,34	
33	Jenis beringin	<i>Ficus hirta</i>		4,70	
34	Paku rane	<i>Selaginella biformis</i>			<b>43,11</b>
35	Pakis sp2	<i>Neprolepis exaltata</i>			<b>39,03</b>
36	--	<i>Eleutherantera ruderalis</i>			20,08
37	--	<i>Peperomia pellucida</i>			17,31
38	--	<i>Christella dentata</i>			10,86
39	Pakis sayur	<i>Pleocnemia irregularis</i>			8,96
40	--	<i>Urena lobata</i>			7,1
41	--	<i>Micromelum pubescens</i>			5,91
<b>Jumlah</b>			<b>300,00</b>	<b>300,00</b>	<b>300,00</b>

Source: Primary data on field data and interviews, with processing, 2012



Figure 2.3. Types of rubber plantation vegetation (a), coffee plantation vegetation type with shade plants Cassia (b), coffee tillers intercrop between fruit trees (c), secondary forest vegetation type and shrubs (d).

For the stake / shrubs level (ie plants with a chest height diameter of <10 cm and less than 5 m in height), the highest index of importance is owned by coffee plants (*Coffea arabica*), mahang (*Macaranga sp*) and kerinyu (*Eupathorium odoratum*). While for seedling/understorey levels, it is also dominated by coffee tillers and types of ferns.

### 2.2.1.2. Vegetation of the Cultivation

The types of cultivated plants that are widely planted by the community look diverse but the abundance of individuals of each type is low. In general, the types of plants planted are fruit trees and vegetables that are used for family consumption purposes. In addition it is also often found decorative plants and protective plants that are planted in the front yard of the house.

The high diversity of cultivated plants is due to the fact that most villagers are farmers who like to grow crops. The condition of fertile soil and land strongly supports plant growth so that various types of plants can grow well. The types of plants that are widely planted as cultivated plants (plantations) and also as garden plants include coffee, cocoa, bananas, coconut and rambutan, and durian. The types of cultivation or yard vegetation in the study area are presented in Tables 2.14 and Figure 2.4.

Table 2.14. Types of cultivation or yard vegetation in the study area

No.	Local Name	Binomial Name	No.	Local Name	Binomial Namen
1	Akalipa	<i>Acalipha sp</i>	20	Kopi	<i>Coffea arabica</i>
2	Akasia	<i>Acacia sp.</i>	21	Kembang Sepatu	<i>Hibiscus rossinensis</i>
3	Padi	<i>Oryza sativa</i>	22	Kemiri	<i>Aleuritas moluccana.</i>
4	Angsana	<i>Pterocarpus indica</i>	23	Mangga	<i>Mangifera indica</i>
5	Antanan	<i>Lantana camara</i>	24	Mengkudu	<i>Morinda citrifolia</i>
6	Bakung	<i>Crinum asiaticum</i>	25	Nangka	<i>Artocarpus integra</i>
7	Bougenvil	<i>Bougenville sp.</i>	26	Palem hias	<i>Palmae spp.</i>
8	Bungur	<i>Lagerstromia speciosa</i>	27	Pandan besar	<i>Pandanus sp.</i>
9	Cemara pinus	<i>Pinus sp.</i>	28	Pinang	<i>Areca catechu</i>
10	Coklat	<i>Theobroma cacao</i>	29	Pisang	<i>Musa sp.</i>
11	Durian	<i>Durio zibethinus</i>	30	Pokat	<i>Persea americana</i>
12	Embacang	<i>Mangifera sp</i>	31	Puring	<i>Codiaeum variegatum</i>
13	Flamboyan	<i>Delonix regia</i>	32	Rengas	<i>Gluta renghas</i>
14	Jagung	<i>Zea mays</i>	33	Sirsak	<i>Annona muricata</i>
15	Jarak	<i>Riccinus communis</i>	34	Sukun	<i>Arthocarpus sp.</i>
16	Kayu Manis	<i>Cinnamomum burmannii</i>	35	Soka	<i>Ixora sp.</i>
17	Keladi	<i>Colocasia esculenta</i>	36	Waru	<i>Hibiscus similis</i>
18	Jabon	<i>Anthocephalus cadamba</i>			
19	Kelapa	<i>Cocos nucifera</i>			



Figure 2.4. Types of rice ecosystems (a), several types of yard crops (b)

### 2.2.2. Fauna (Wildlife)

The types of wildlife that are often found around the location of planned activities are classified as diverse, especially the types of Reptiles, Aves and Mammals. The high diversity of wildlife in this location is due to the fact that not far from this location is Danau Tes Nature Park (TWA) area which is an old secondary forest, some of which are still dominated by tree species that have relatively dense canopy cover. Despite this, the area has also undergone many changes, which have become coffee plantations and mixed fields/plantation by local residents. This secondary forest is a habitat for wildlife for same species interaction and population. In addition, the local people do not perform hunting (exploitation) of wild animals found in the protected forest which is also one of the factors that there are still many types of wildlife in the study area.

Some types of wildlife in the primary forest including species that belongs in endangered species category and protected by the Law of the Republic of Indonesia, among others: deer (*Tragulus javanicus*), Deer (*Cervus* sp), Sumatran Tiger (*Panthera tigris sumatrensis*), bear honey (*Helarctos malayanus*) and so on. The existence of various types of wildlife at the study site indicates that the area is still able to support various types of animals. However, it should be noted that there is a possibility that various types of animals still need space and habitat that supports their roaming range. The types of wildlife in the study location, whether recorded through interviews or based on information from local residents, are presented in Table 2.15.





Table 2.15. Types of wildlife at the study site

No	Class	Local Name	Binomial Name	Estimation of the population	Source	Conservation Status
1	2	3	4	5	6	7
1	Amphibia	Kodok	<i>Leptophryne borbonica</i>	+	Observation	TDL
2	Aves	Ayam Hutan	<i>Gallus gallus</i>	+	Interview	TDL
3	Aves	Beo/Ketiong	<i>Gracula religiosa</i>	+	Interview	TDL
4	Aves	Bubut Alang-Alang	<i>Centropus bengalensis</i>	+++	Observation	TDL
5	Aves	Burung Madu	<i>Anthreptes cf. simplex</i>	++	Observation	DL
6	Aves	Cekakak	<i>Halcyon sp</i>	++	Observation	DL
7	Aves	Cucak Kuning	<i>Pycnonotus melanicterus</i>	+	Observation	TDL
8	Aves	Cucak Kutilang	<i>Pycnonotus aurigaster</i>	++	Observation	TDL
9	Aves	Delimukan Zamrud	<i>Chalcophaps indica</i>	+	Observation	TDL
10	Aves	Elang	<i>Haliastur sp</i>	+	Interview	DL
11	Aves	Julang Emas/Rangkong	<i>Aceros undulatus</i>	+	Observation	DL
12	Aves	Kacer	<i>Copsychus sp</i>	++	Observation	TDL
13	Aves	Kepodang	<i>Oriolus sp</i>	+	Interview	TDL
14	Aves	Kipasan	<i>Rhipidura sp</i>	+	Observation	DL
15	Aves	Merbah	<i>Pycnonotus sp</i>	+++	Observation	TDL
16	Aves	Pipit	<i>Lonchura malacca</i>	++	Observation	TDL
17	Aves	Tekukur Biasa	<i>Streptopelia chinensis</i>	++	Observation	TDL
18	Aves	Walet	<i>Collocalia sp</i>	+++	Observation	TDL
19	Mammalia	Babi Hutan	<i>Sus sp</i>	+++	Interview	TDL
20	Mammalia	Bajing	<i>Callosciurus sp</i>	+++	Observation	TDL
21	Mammalia	Berang-Berang	<i>Lutra sp</i>	+	Interview	DL
22	Mammalia	Beruang Madu	<i>Helarctos malayanus</i>	+	Claw Mark	DL
23	Mammalia	Beruk	<i>Macaca nemestrina</i>	++	Observation	TDL
24	Mammalia	Cinguk	<i>Presbytis sp</i>	++	Observation	TDL
25	Mammalia	Codot	<i>Rousettus sp</i>	++	Capturing	TDL
26	Mammalia	Harimau sumatra	<i>Panthera tigris sumatrensis</i>	+	Observation	DL
27	Mammalia	Kancil	<i>Tragulus sp</i>	+	Interview	DL
28	Mammalia	Kelelawar	<i>Rhinolophus sp</i>	+++	Capturing	TDL
29	Mammalia	Kera Ekor Panjang	<i>Macaca fascicularis</i>	++	Interview	TDL
30	Mammalia	Kukang	<i>Nycticebus coucang</i>	+	Interview	DL
31	Mammalia	Musang	<i>Paradoxurus sp</i>	++	Interview	TDL
32	Mammalia	Rusa	<i>Cervus sp</i>	+	Interview	DL



No	Class	Local Name	Binomial Name	Estimation of the population	Source	Conservation Status
1	2	3	4	5	6	7
33	Mammalia	Siamang	<i>Hylobates syndactylus</i>	+	Interview	DL
34	Mammalia	Simpai	<i>Presbytis sp</i>	+++	Interview	TDL
35	Mammalia	Tikus	<i>Rattus sp</i>	+++	Interview	TDL
36	Mammalia	Tikus Hutan	<i>Maxomys surifer</i>	++	Observation	TDL
37	Mammalia	Trenggiling	<i>Manis javanica</i>	+	Interview	DL
38	Reptil	Biawak	<i>Varanus salvator</i>	++	Interview	TDL
39	Reptil	Kadal	<i>Mabouya sp</i>	++	Observation	TDL
40	Reptil	Ular welang	Cf. <i>Natrix</i>	+	Observation	TDL
41	Reptil	Ular Sawo	<i>Phyton sp</i>	+	Interview	TDL
42	Reptil	Ular Sendok	<i>Naja sp</i>	++	Interview	TDL

Description: + = Little; ++ = Medium; +++ = Many; TDL = Not protected by Republic of Indonesia Law; DL = Protected

Source: Results of direct observation and based on population information, 2012.

### 2.2.3. Biology Components

#### 2.2.3.1. Water Biota

##### 1) Plankton

##### a) Phytoplankton

Phytoplankton are tiny plant-based organisms that live floating in aquatic ecosystems. This organism is a biological component that is vulnerable because it is sensitive to environmental changes. The composition of phytoplankton in aquatic ecosystems can show the level of stability of the ecosystem. If it is associated with the phenomenon of pollution, the consequences of input from various chemicals or changes in the environment not only affect lethally in an instant but also affect the high-level organisms through the food web. Therefore, the abundance and diversity of phytoplankton can describe the condition of an ecosystem.

Based on the results of identification of the type and abundance of phytoplankton obtained from two rivers, which are the upstream of Musi river (at coordinates 03 ° 26'18.8 "LS; 102 ° 30'41.8" BT) and the upstream Ketahun river (at coordinates 03 ° 15'34.5 "LS; 102 °



22'56.9" BT), it is found at least 30 species of phytoplankton in the waters of the two rivers (26 species in the Musi River and 17 species on the Ketahun River).

Table 2.16. Types and Abundance of Phytoplankton

No.	Organism	Location	
		Musi Upstream	Ketahun Upstream
1	<i>Fragilaria</i> sp.	16.250	5.250
2	<i>Nitzschia Vermicularis</i>		200
3	<i>Nitzschia</i> sp.	2.500	375
4	<i>Amphora</i> sp.	6.250	100
5	<i>Synedra</i> sp.	10.000	625
6	<i>Cymbella</i> sp.	2.000	125
7	<i>Phormidium</i> sp.	75	
8	<i>Closterium</i> sp.	375	75
9	Diatom	25	
10	<i>Scenedesmus</i> sp.	75	
11	<i>Scenedesmus Armatus</i>	25	
12	<i>Scenedesmus Obliquus</i>	25	
13	<i>Pediastrum Duplex</i>	25	
14	<i>Navicula</i> sp.	25	100
15	<i>Phacus</i> sp.	150	25
16	<i>Pinnularia</i> sp.	375	125
17	<i>Achnanthes</i> sp.	150	25
18	<i>Frustulia</i> sp.	25	
19	<i>Surirella</i> sp.	150	200
20	<i>Chaetophora</i> sp.	25	
21	<i>Pandorina</i> sp.	25	
22	<i>Diatoma</i> sp.	25	
23	<i>Stanieria</i> sp.	25	
24	<i>Spirogyra</i> sp.	25	75
25	<i>Chlamydomonas</i> sp.	25	
26	<i>Selenastrum</i> sp.	25	
27	<i>Euglena</i> sp.	25	50
28	<i>Diatomella</i> sp.		25
29	<i>Pleurothaenium</i> sp.		25
30	<i>Cosmarium</i> sp.		25
<b>Total Abundance (sel/L)</b>		<b>38.700</b>	<b>7.425</b>
<b>Shannon - Wiener (H') Diversity Index</b>		<b>1.583</b>	<b>1.274</b>
<b>Simpson (D) Dominance Index</b>		<b>0.277</b>	<b>0.513</b>

Source: Results of Analysis of LPKL-BINALAB, 2018





The results of the Shannon-Wiener ( $H'$ ) Diversity Index calculation on the types of phytoplankton observed in the two rivers have a diversity index value of 1.583 (Musi River) with an abundance of 38700 cells / liter and 1.274 (Ketahun River) with an abundance of 7425 / liter.

Based on the Shannon-Wiener Diversity Criteria, the stability of the phytoplankton community in the Musi River tends to be moderate. The phytoplankton community in the Ketahun River tends to be unstable. The stability condition of phytoplankton in both rivers is in such condition possibly because it is influenced by the conditions of the surrounding environment.

The relationship between the phytoplankton diversity index size and environmental quality according to Carter and Hill (1979) is as follows:

$<1$  = the quality of the environment is very bad

1.1 - 1.5 = poor environmental quality

$> 1.5 - 2.0$  = moderate environmental quality - good

$> 2.0 - 3.0$  = environmental quality is good - very good

Similarly, based on the Simpson Dominance Index criteria, it shows that the stability of the phytoplankton community in the waters of Musi River tends to be moderate, whereas in the Ketahun River it tends to be unstable with each of the Dominance Index values of 0.277 (Musi River) and 0.513 (Ketahun River).

The Simpson Dominance Index Criteria are as follows:

D close to 0 : there are no kinds of phytoplankton which dominate other kinds of phytoplankton. In other words, the structure of phytoplankton community is in stable condition.

D close to 1 : there are kinds of phytoplankton which dominate other kinds of phytoplankton. In other words, the structure of phytoplankton community is unstable because there is an ecological pressure.



## b) Zooplankton

Zooplankton is a microorganism that is typically animal. Zooplankton lives dependently on phytoplankton. Zooplankton moves actively in order to look for foods and stay alive. Functional ability of zooplankton is very dependent on both quality and quantity of phytoplankton because phytoplankton is the main source of its nutrition. The quality water also affects on the functional ability of zooplankton.

As the result of identification of zooplankton species, there are found at least 13 species of zooplankton in the upstream water of Musi River (in coordinate point of 03°26'18.8" South Latitude; 102°30'41.8" East Longitude) and in the upstream water of Ketahun River (in coordinate point of 03°15'34.5" South Latitude; 102°22'56.9" East Longitude). There are ten species of zooplankton in Musi River, and there are seven species of zooplankton in Ketahun River.

Table 2.17. Species and Abundance of Zooplankton

No.	Organism	Location	
		Upstream Water of Musi River	Upstream Water of Ketahun River
1	<i>Arcella</i> sp.	5000	150
2	<i>Amoeba</i> sp.	125	
3	<i>Euglypha</i> sp.	75	
4	Ciliata	25	
5	<i>Panagrolaimus</i> sp.	75	
6	<i>Notholca</i> sp.	25	100
7	<i>Cephalodella</i> sp.	75	25
8	<i>Paramaecium</i> sp.	25	
9	<i>Lepadella</i> sp.	25	50
10	<i>Monostyla</i> sp.	25	
11	Nauplii		25
12	<i>Trinema</i> sp.		25
13	<i>Diffugia</i> sp.		25
<b>Total Abundance (individual/L)</b>		<b>5.475</b>	<b>400</b>
<b>Diversity Index of Shannon - Wiener (H')</b>		<b>0.468</b>	<b>1.667</b>
<b>Dominance Index of Simpson (D)</b>		<b>0.836</b>	<b>0.235</b>

Source: Analysis Result of LPKL-BINALAB, 2018



The value of calculation from Diversity Index of Shannon - Wiener ( $H'$ ) towards zooplankton species in Musi River is 0,468, with the abundance of 5.475 individual/liter. Meanwhile the value of calculation in Ketahun River is 1,667, with the abundance of 400 individual/liter. The value of Dominance Index of Simpson towards zooplankton in Musi River is 0,836. Meanwhile, the value of Dominance Index in Ketahun River is 0,235.

Based on the Diversity Index of Shannon - Wiener ( $H'$ ) and Dominance Index of Simpson, the condition of structure community of zooplankton in Musi River is very bad. Meanwhile, the condition of structure community of zooplankton in Ketahun River is moderate.

Based on *Carter and Hill (1979)*, the relation between the diversity index of zooplankton and the environment quality stated as follows:

- < 1 = very bad environment quality
- 1 - 1,4 = bad environment quality
- > 1,4 - 1,75 = moderate environment quality
- > 1,75 - 2,2 = moderate – good environment quality
- > 2,2 - 3,0 = good – excellent environment quality

### c) Saprobic Index

Saprobic index is one of the river monitoring or other water bodies to determine the level of contamination. Plankton saprobic index in the upstream of Musi River is +0,652. Meanwhile, the saprobic index in Ketahun River is +1,235. The value of saprobic index in Musi River shows that the contamination level is quite low. It means that the organic and anorganic compounds as contamination load is in the  $\beta$ -Mesosaprobic phase. It also happens in Ketahun River that the saprobic index shows the low contamination level with the phase of  $\beta$ -Meso/oligo saprobic. This phase also has the low contamination level.



Table 2.18. Saprobic Index with Biological Interpretation of Water Quality

Contamination Load	Contamination Degree	Saprobic Phase	Saprobic Index
High Level of Organic Compounds	Very High	Polisaprobic	-3 s/d -2
		Poli/ $\alpha$ –Mesosaprobic	-2 s/d -1,5
Organic and Anorganic Compounds	Quite High	$\alpha$ –Meso/Polisaprobic	-1,5 s/d -1
		$\alpha$ –Mesosaprobic	-1 s/d -0,5
Low Level of Organic and Anorganic Compounds	Moderate	$\alpha$ / $\beta$ –Mesosaprobic	-0,5 s/d 0
	Low	$\beta$ / $\alpha$ –Mesosaprobic	0 s/d +0,5
		$\beta$ –Mesosaprobic	+0,5 s/d +1
Very Low	Very Low	$\beta$ –Meso/oligosaprobic	+1 s/d +1,5
		Oligo/ $\beta$ –Mesosaprobic	+1,5 s/d +2
		Oligosaprobic	+2 s/d +3

Source: Dresscher & Mark (1974)

## 2) Benthos

Benthos is an organism that inhabits in the bottom of the water. Benthos generally is a kind of both plant and animal. However, benthos is more well-known belongs to animal group. Benthos lives from the organic materials in the bottom of the water. Benthos filters the organic materials or as known as filter feeder. This animal settles in the bottom of the water (sessile), so that the composition of benthos in one location is often related to the environment condition where it lives. Hence, benthos is an indicator organism which is used as a criteria to determine whether the water quality is good or not.

As a result of identification, there are found three species of benthos taken from the upstream water of Musi River (in coordinate point of 03°26'18.8" South Latitude; 102°30'41.8" East Longitude) and in the upstream water of Ketahun River (in coordinate point of 03°15'34.5" South Latitude; 102°22'56.9" East Longitude). Two species of benthos are found in Musi River, and others are found in Ketahun River.



Table 2.19. Species and Abundance of Benthos

No.	Organism	Location	
		Upstream Water of Musi River	Upstream Water of Ketahun River
1	<i>Gomphus</i> sp.	15	
2	<i>Filopaludina</i> sp.		30
3	Oligochaeta	6	39
<b>Total Abundance (individual /m<sup>2</sup>)</b>		<b>21</b>	<b>69</b>
<b>Diversity Index of Shannon - Wiener (H')</b>		<b>0.598</b>	<b>0.684</b>
<b>Dominance Index of Simpson (D)</b>		<b>0.592</b>	<b>0.509</b>

Source: Analysis Result of LPKL-BINALAB, 2018

The value of calculation from Diversity Index of Shannon - Wiener (H') towards benthos species in Musi River is 0,598, with the abundance of 21 individual/m<sup>2</sup>. Meanwhile the value of calculation in Ketahun River is 0,684, with the abundance of 69 individual/m<sup>2</sup>. The value of Dominance Index of Simpson towards benthos in Musi River is 0,598. Meanwhile, the value of Dominance Index in Ketahun River is 0,509.

Based on the Diversity Index of Shannon - Wiener (H') and Dominance Index of Simpson, the community of benthos both in Musi River and Ketahun River is tend to be unstable with the bad environment quality.

Based on *Carter and Hill* (1979), the relation between the diversity index of benthos and the environment quality stated as follows:

- < 1 = bad environment quality
- 1,0 - 2,0 = moderate environment quality
- 2,0 - 3,0 = good environment quality
- > 3,0 = excellent environment quality

### 2.3. Transportation

Study of the traffic flow aspect around the project site of transmission network construction of 150 kV Hululais-Pekalongan Geothermal Power Plant is generally conducted by collecting and calculating data in the field. First, the collection and calculation data initially started from Curup-Tes highway road in Dataran Tapus Village

(Bermani Ulu Raya Subdistrict in Rejang Lebong District) and then continue to Tes-Taba Anyar highway road in Tes Village (South Lebong Subdistrict in Lebong District). Those two highway roads are predicted to be affected by the planning of transmission network construction of 150 kV Hululais-Pekalongan Geothermal Power Plant.

Curup-Tes highway road is a province road which connects to the capital city of South Lebong Subdistrict. Meanwhile, Tes-Taba Anyar highway road connects the capital city of South Lebong Subdistrict to the villages in this subdistrict. According to the Indonesian Highway Capacity Manual (*MKJI*, 1997), this highway road has the characteristics as follows:

Table 2.20. Characteristics and Capacity of Highway Roads

Curup-Tes Highway	Tes-Taba Anyar Highway
- Lane Type : 2/2 UD (Two undivided lanes)	- Lane Type : 2/2 UD (Two undivided lanes)
- Width : 6 meters	- Width : 6 meters
- Direction Split : 50-50	- Direction Split : 50-50
- Side barriers = 0,95	- Side barriers = 0,93
- Roadside width : $\geq 2$ m	- Roadside width : $\geq 2$ m

Source : Based on data collection in Dataran Tapus and Tes Village, 25-09-2012; and data processing according to *MKJI* (1997).

### 2.3.1. Basic and Actual Capacity of Highway

Basic capacity of Curup-Tes highway with the lane type of 2/2 UD is 3.000 PCU/hour. Meanwhile, the basic capacity of Tes-Taba Anyar highway is 2.900 PCU/hour. The inventory data of those highway roads are shown in the table below.

Table 2.21. Highway Capacity around Project Site

No.	Highway	$C_o$	$F_{CW}$	$F_{CSP}$	$F_{CSF}$	Highway Capacity (PCU/hour)
1	Curup-Tes	3000	0,91	1	0,95	2593,5
2	Tes-Taba Anyar	2900	0,91	1	0,93	2454,3

Source : data processing according to *MKJI* (2011).

Based on the characteristic on Curup-Tes and Tes-Taba Anyar highway, it can be calculated that the highway capacity are 2593,5 PCU/hour and 2454,3 PCU/hour. The unit of PCU/hour is calculated by the regulation of *MKJI*, 2011.



### 2.3.2. Traffic Flow Volume

The condition of traffic flow in main and dominant highway which will be affected by the transmission network construction of 150 kV Hululais-Pekalongan Geothermal Power Plant are in Curup-Tes highway and Tes-Taba Anyar highway. The condition in those highway roads has been observed and calculated directly in rush hour in every morning, noon, and afternoon. The observation, the calculation of traffic flow volume, and the highway capacity are shown in the table below.

Table 2.22. Density of Vehicle and Traffic Flow Volume in Two Highway Roads around Project Site

No.	Vehicle Type	PCE )	Vehicle/hour					Traffic flow volume (PCU/hour) **)			
			Moning	Noon	Afternoon	Average	Percentage	Morning	Noon	Afternoon	Average
A.	Curup-Tes Highway										
1	Public Transportation	1,0	8	5	8	7	2,6	8	5	8	7
2	Private Vehicle	1,0	19	13	20	17	6,6	19	13	20	17
3	Motorcycle	0,5	229	155	240	208	79,9	115	78	120	104
4	Trucks	1,3	19	13	20	17	6,6	25	17	26	22
5	Light truck/Pickup	1,0	13	8	12	11	4,2	13	8	12	11
	Amount A		287	193	300	260	100,0	179	119	186	161
B.	Tes-Taba Anyar Highway										
1	Public Transportation	1,0	17	6	8	10	4,2	17	6	8	10
2	Private Vehicle	1,0	17	13	20	17	6,8	17	13	20	17
3	Motorcycle	0,5	220	143	216	193	79,1	110	72	108	97
4	Trucks	1,3	18	7	12	12	5,0	23	9	15	16
5	Light truck/Pickup	1,0	12	12	11	12	4,8	12	12	11	12
	Amount B		285	181	267	244	100,0	180	112	162	151

Source : Field observation 2012, with data processing according to *MKJI* (1997).

Remarks :

\*) = PCE : Passenger Car Equivalent : a constant to equalize the overall use level of the vehicle type.

\*\*\*) = PCU/hour : Passenger Car Unit : a unit from equalizing the level of use.

Based on the table, it can be concluded that the highest average percentage of vehicle is motorcycle. The percentage for Curup-Tes highway is 79,9%, and for Tes-Taba Anyar highway is 79,1%. The amount vehicle per hour in Curup-Tes highway is 260 and in Tes-Taba Anyar highway is 244. The traffic flow volume in Curup-Tes highway is 161 PCU/hour and in Tes-Taba Anyar highway is 151 PCU/hour.



### 2.3.3. Traffic Degree of Saturation

In order to getting know the function or usage of the highway compared to its current capacity in Curup-Tes and Tes-Taba Anyar highway, then it is needed to calculate the Degree of Saturation (DS). It is also well-known as V/C Ratio (Ratio between the traffic flow volume vs highway capacity). Based on the data, the result of Degree of Saturation (DS) in rush hour in morning, noon, and afternoon shows the low highway volume compared to the highway capacity. The average result both in Curup-Tes and Tes-Taba Anyar highway is 0,062 or 6,2%.

Table 2.23. Degree of Saturation (DS) in Two Highway Roads arond Project Site

No	Highway Road	Traffic volume (PCU/hour)				Highway capacity (PCU/hour)	Degree of Saturation (DS) or V/C Ratio			
		Morning	Noon	Afternoon	Average		Morning	Noon	Afternoon	Average
1	Curup-Tes Highway	179	119	186	161	2593,5	0,069	0,046	0,072	0,062
2	Tes-Taba Anyar Highway	180	112	162	151	2454,3	0,073	0,046	0,066	0,062

### 2.3.4. Traffic Velocity

Another result of survey in the highway roads besides traffic Degree of Saturation or V/C Ratio is spot speed. This survey is conducted in Curup-Tes and Tes-Taba Anyar highway roads around the transmission network construction of 150 kV Hululais-Pekalongan Geothermal Power Plant. The length of observation field is 50 meters. From the analysis of the average travel time of a vehicle, the data of existing velocity as the result of field observation are shown in the **Table 2.22**.

It can be inferred from the table below that the lowest velocity of vehicle in Curup-Tes highway in the morning from Curup to Tes is 32,9 km/hour. Meanwhile, the highest velocity from Tes to Curup in the morning is 41,6%. The average velocity of vehicle in Curup-Tes highway is 36,7 km/hour and in Tes-Taba Anyar highway is 39,4%.





Table 2.24 Velocity of Existing Vehicle around Project Site

No.	Direction	Velocity (km/hour)		
		Morning	Noon	Afternoon
A.	Curup-Tes highway			
1	To Tes	32,9	34,0	35,2
2	To Curup	41,6	39,7	36,5
	Average			<b>36,7</b>
B.	Tes-Taba Anyar highway			
1	To Tes	42,5	40,1	43,7
2	To Taba Anyar	36,6	35,7	37,5
	Average			<b>39,4</b>

Source : Field data with processing, 2012.

## 2.4. Social, Economy, and Culture

### 2.4.1 Population

#### 1. Population Amount and Density

The high-voltage wires activity plans to be constructed in three regions of district. They are Kepahiang, Rejang Lebong, and Lebong District. In 2016, there are 133.703 inhabitants live in Kepahiang District with the area of 665,0 km<sup>2</sup>. Then it can be calculated that the population density is 187,8 inhabitant/km<sup>2</sup>. The area of Rejang Lebong District is 1.638,98 km<sup>2</sup>. With the population amount of 257.498 inhabitants, it can be calculated that the population density in Rejang Lebong District is 162,8 inhabitant/km<sup>2</sup>. The population amount in Lebong District is 111.063 inhabitants. They settle in the area of 1.921,82 km<sup>2</sup> so that the population density is 36,3 inhabitants/km<sup>2</sup>.

One of the objectives of the construction is to improve the equity of population distribution. By improving the equity of population distribution generally can help improving the population welfare. Hence, in order to achieve the ideal equity of population, the composition of population amount has to be balanced with the area of the region.



**Table 2.25. Population Profile of Each Village in Affected Area of High-Voltage Wires Construction Site**

District	Subdistrict	Num	Village	Amt. of household	Population amount			Area of Village (Ha)	Population Density (inhabitant / km <sup>2</sup> )	Ave. of Population Amt. (inhabitant/householder)	
					Male	Female	Total				
1	2	3	4	5	6	7	8	9	10	11	
Kepahiang (4 villages)	Ujan Mas	1	Pekalongan	400	723	695	1418	-	-	3,5	
		2	Bumisari	490	827	809	1636	-	-	3,3	
	Merigi	3	Bukit Barisan	229	395	348	743	-	-	3,2	
		4	Lubuk Penyamun	223	453	431	884	-	-	4,0	
Rejang Lebong (19 villages)	South Curup	5	Watas Marga		243	238	481	308	156,2	-	
		6	Lubuk Ubar	-	439	401	840	338	248,5	-	
		7	Pungguk Lalang	-	844	818	1662	410	405,4	-	
	Curup	8	Dwi Tunggal	-	1409	1495	2904	1713	169,5	-	
		9	Talang Benih	-	3279	3240	6519	9781	66,6	-	
	North Curup	10	Batu Panco	236	508	492	1000	248	403,2	4,2	
		11	Lubuk Kembang	271	567	568	1135	1128	100,6	4,2	
		12	Suka Datang	164	361	366	727	338	215,1	4,4	
		13	Pahlawan	176	381	345	726	253	287,0	4,1	
		14	Taba Renah	280	488	479	967	122	792,6	3,5	
		Bermani Ulu Raya	15	Dataran Tapus	-	202	178	380	779	48,8	-
			16	Bandung Marga	-	499	444	943	1309	72,0	-
			17	Pal Seratus	-	228	208	436	649	67,2	-
			18	Pal VII/Tujuh	-	408	372	780	695	112,2	-
			19	Pal VIII/Delapan	-	792	734	1526	329	463,8	-
			20	Tebat Tenong Luar	-	331	326	657	260	252,7	-
			21	Air Bening	-	907	814	1721	7174	24,0	-
			22	Bangun Jaya	-	424	410	834	1948	42,8	-
			23	Babakan Baru	-	792	809	1601	779	205,5	-
Lebong (7 villages)	Rimbo Pengadang	24	Air Dingin *)	-	575	621	1196	-	-	-	
		25	Tik Kuto	-	397	287	684	-	-	-	
		26	Rimbo Pengadang	-	649	609	1258	-	-	-	
		27	Talang Ratau	-	405	400	805	-	-	-	
	South Lebong	28	Kutai Donok	284	491	509	1000	-	-	3,5	
		29	Sukasari	221	409	414	823	-	-	3,7	
		30	Taba Anyar	628	1241	1274	2515	-	-	4,0	

Source : Ujan Mas District In Number (2017); Merigi District In Number (2017); South Curup District In Number (2017); Curup District In Number (2017); North Curup District In Number (2017); Bermani Ulu Raya District In Number (2017); Rimbo Pengadang District In Number (2017); South Lebong District In Number (2017).

Notes : \*) = Name of Air Dingin Villages = Bioa Sengok Villages (it has same meaning in Rejang language);  
 - Several data is empty because there is no source.

## 2. Population Growth Rate

Bengkulu Province has a quite big amount of human resource. As seen from the amount of population, there is always an increasing rate of population growth each year. From 2013



to 2016, the increasing rate of population growth is relatively stabil. However, in 2013 there is an increasing rate (obtained from population census which is a factual data).

In 2013, the amount of population in Bengkulu Province is 1.814.357 inhabitants. Meanwhile, there is an increasing rate in 2014 so that the amount of population reaches 1.844.788 inhabitants. The population growth rate also increases in 2015 with the amount of population is 1.874.944 inhabitants. In 2016, the amount of population increases until 1.904.793 inhabitants. This huge amount of population indicates that there is also a huge potency of human resource.

The population growth amount is a number which shows the level of increasing population in a certain periode. It is stated from the basic amount of population. From 2013 to 2014, Bengkulu Province has a stabil population growth rate of 1,56-1,52%. Meanwhile in 2016, the population growth rate increases to 2.92% compared to the previous years.

## 2.4.2. Social Economy

### 1. Livelihood

There are various business fields of the population in Bengkulu Province. However, in the study area, most of them are dominated by food and secondary farmers. In the last three years, the highest average of livelihood are food and secondary crops of 30,17%, then followed by farm of 14,51%, and the last are electricity and drinking water of 0,11%. The detail of business field percentage is as shown in the table below.

Table 2.26. Percentage of Business Field in Bengkulu Province in 2014-2016

No.	Business field	2014	2015	2016	Average
1	Food and Secondary Crop	30,30	30,29	29,93	30,17
2	Farm	16,18	14,60	12,76	14,51
3	Husbandry	5,42	5,87	5,28	5,53
4	Forest	2,74	2,72	2,20	2,55
5	Fishery	10,62	9,79	7,88	9,43
6	Mine	0,91	1,24	1,08	1,08
7	Industry	2,66	3,46	2,52	2,88
8	Electricity and drinking water	0,09	0,1	0,15	0,11
9	Construction	4,48	3,75	4,34	4,19
10	Trade	12,52	12,6	15,45	13,52
11	Transportation and Communication	3,62	3,9	3,01	3,51
12	Bank and Finance	0,31	0,77	0,86	0,65
13	Services/Others	10,16	10,91	14,53	11,87
	<b>Amount (%)</b>	<b>100,00</b>	<b>100,00</b>	<b>100,00</b>	<b>100,00</b>

Source : Bengkulu Province In Number Year 2017

## 2. Income Level of Respondents' Family

Table 2.27. Respondents' Income Level

No	District	Subdistrict	Village	Average income per month							Amount of Respondent	
				No Income	< 1.000.000	1.000.000 - 2.000.000	2.001.000 - 3.000.000	4.001.000 - 5.000.000	> 5.000.000	No Answer		
1	Kepahiang	Ujan Mas	Bumisari	0	0	5	0	0	0	0	5	
2		Merigi	Lubuk Penyamun	0	0	0	0	0	0	0	0	
3	Rejang Lebong	South Curup	Pungguk Lalang	0	0	0	0	0	0	0	0	
4		Curup	Dwi Tunggal	0	0	0	0	0	0	0	0	
5		North Curup	Batupanco	0	0	1	0	0	0	0	1	
6		Bermani Ulu Raya	Dataran Tapus		0	0	0	0	0	2	1	3
7			Tebat Tenong Luar		0	2	3	0	0	1	0	6
8	Lebong	Rimbo Pengadang	Rimbo Pengadang	0	0	1	1	2	0	0	4	
9		South Lebong	Kutai Donok	0	0	0	0	0	0	0	0	
10			Sukasari		1	0	4	1	0	0	6	
<b>Total Amount of Respondent</b>				<b>1</b>	<b>2</b>	<b>14</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>25</b>	
<b>%</b>				<b>4,0%</b>	<b>8,0%</b>	<b>56,0%</b>	<b>8,0%</b>	<b>8,0%</b>	<b>12,0%</b>	<b>4,0%</b>	<b>100%</b>	

Source : Survey, 2018

Income level of community is one of many important aspects in economy aspects. Based on the survey, there are 56,0% of respondents have total income of Rp1.000.000,00-Rp2.000.000,00 per capita. The rest of 48,0% respondents have the income under of the minimum wage of Bengkulu Province. The minimum wage of Bengkulu Province is Rp1.730.000,00. This occurs because most of the community in the study area work in agricultural sector which makes the income is fluctuative and cannot be determined by the province minimum wage.

### 2.4.3. Social Culture

#### 1. Education and Religion

One effective effort to improve the education condition in one region is related to the construction of education infrastructure and facility. In addition, by increasing the amount of school and teacher directly opens the wider opportunity for the community to obtain the education easily.



Data obtained from Central Bureau of Statistic in Bengkulu Province in 2016, Bengkulu Province has 2.340 public and private schools. They are divided into: 481 Kindergartens, 1.310 Elementary Schools, 368 Junior High Schools, and 181 Senior and Vocational Schools.

During the school year of 2015/2016 in Bengkulu Province, there are 18.613 students of Kindergarten, 222.998 students of Elementary School, 83.763 students of Junior High School, and 42.773 students of Senior and Vocational Schools.

The amount of teacher who teaches in each school during the school year of 2015/2016 are 31.453 Elementary School teachers, 3.750 Junior High School teachers, and 5.316 Senior and Vocational School teachers. Meanwhile, the comparison of total amount of teacher to total amount of student is shown in the ratio of teacher and student. The ratio of teacher and student during the school year of 2015/2016 in Bengkulu Province are 7 for Elementary School, 22 for Junior High School, and 8 for Senior High School.

There are some education infrastructures which are affected due to the high-voltage wires activity plans. Most of the students have been accommodated in some Elementary Schools, Junior High Schools, and Senior High Schools in the location site or in the capital city of the affected districts. Only a few of them who continue to the Senior High School to the capital city of the affected district.

In 2017, there are 94,77% of population in Bengkulu Province are Moslems, 3,06% of population are Christians, 0,83% of populations are Catholics, 0,8% of population embrace Hindu, and the last 0,54% of embrace Budha. (Central Bureau of Statistic in Bengkulu Province, 2017)

Table 2.28. Education Infrastructure, Amount of Student and Teacher in Kepahiang, Rejang Lebong, and Lebong Districts Bengkulu Province in 2016

No.	Status Per District	Elementary School/Ibtidaiyah			Junior High School/Tsanawiyah			Senior/Vocational High School/Aliyah		
		Unit	Amt. of Teacher	Amt. of Student	Unit	Amt. of Teacher	Amt. of Student	Unit	Amt. of Teacher	Amt. of Student
<b>A.</b>	<b>Kepahiang</b>									
1.	Public	97	1169	15648	33	765	5957	13	553	1447
2.	Private/MI,MTS,MA	8	108	1159	6	166	1259	3	100	971
	<b>Amount A</b>	105	1.277	16.807	39	931	7.216	16	653	2.418



No.	Status Per District	Elementary School/Ibtidaiyah			Junior High School/Tsanawiyah			Senior/Vocational High School/Aliyah		
		Unit	Amt. of Teacher	Amt. of Student	Unit	Amt. of Teacher	Amt. of Student	Unit	Amt. of Teacher	Amt. of Student
<b>B.</b>	<b>Rejang Lebong</b>									
1.	Public	170	2046	31548	41	622	11493	17	654	7417
2.	Private	12	175	1767	8	84	552	10	184	1382
	<b>Amount B</b>	182	2.221	33.315	49	706	12.045	27	838	8.799
<b>C.</b>	<b>Lebong</b>									
1.	Public	93	774	1255	23	332	1271	6	151	1859
2.	Private	1	9	11	1	5	72	1	4	80
	<b>Amount C</b>	<b>94</b>	<b>783</b>	<b>1.266</b>	<b>24</b>	<b>337</b>	<b>1.343</b>	<b>7</b>	<b>155</b>	<b>1.939</b>

Source : Bengkulu Province In Number; Kepahiang, Rejang Lebong, and Lebong District In Number, Tahun 2017.

## 2. General Characteristic of Community around the Project Site

Study of social, economy, and cultural components in a location site activity is always based on the secondary and primary data as its supportive data. The activity plan covers 3 districts, 8 subdistricts, and 28 villages. However, there are only several villages taken as study area to represent each subdistrict. Those regions are:

Table 2.29. Amount of Respondent in Each Region

No.	District	Subdistrict	Village	Amount of Respondent
1	Kepahiang	Ujan Mas	Bumisari	6
2		Merigi	Lubuk Penyamun	1
3	Rejang Lebong	South Curup	Pungguk Lalang	1
4		Curup	Dwi Tunggal	1
5		North Curup	Batupanco	2
6		Bermani Ulu Raya	Dataran Tapus	4
7			Tebat Tenong Luar	6
8	Lebong	Rimbo Pengadang	Rimbo Pengadang	5
9		South Lebong	Sukasari	7
10				
<b>Total Amount of Respondent</b>				<b>33</b>

Source : Survey, 2018



Consequently, the study of social, economy, and cultural components is conducted only in those regions above. The study involves area observation and interview to the respondents which is conducted in April 2018. There are total 33 of respondents with the detail of 8 respondents from the representative of village government, and other 25 respondents are the affected population. The effects of the study are land acquisition and the settlements that are located in the transmission project.

### 3. Groups of Age and Education

According to the data, most respondents are the affected inhabitants who are in the productive age (25 to 64 years old). The rest of 16% of total respondents are more than 64 years old.

Table 2.30. Community Identity Based on Ages

No	District	Subdistrict	Village	Groups of Age					Amount of Respondent
				25-34 yo	35-44 yo	45-54 yo	55-64 yo	> 64 yo	
1	Kepahiang	Ujan Mas	Bumisari	1	0	0	3	1	5
2		Merigi	Lubuk Penyamun	0	0	0	0	0	0
3	Rejang Lebong	South Curup	Pungguk Lalang	0	0	0	0	0	0
4		Curup	Dwi Tunggal	0	0	0	0	0	0
5		North Curup	Batupanco	0	0	1	0	0	1
6		Bermani Ulu Raya	Dataran Tapus	1	0	1	0	1	3
7			Tebat Tenong Luar	0	3	2	0	1	6
8		Lebong	Rimbo Pengadang	Rimbo Pengadang	1	0	3	0	0
9	South Lebong		Sukasari	4	0	1	0	1	6
10									
<b>Total Amount of Respondent</b>				<b>7</b>	<b>3</b>	<b>8</b>	<b>3</b>	<b>4</b>	<b>25</b>
<b>%</b>				<b>28,0%</b>	<b>12,0%</b>	<b>32,0%</b>	<b>12,0%</b>	<b>16,0%</b>	<b>100%</b>

Source : Survey, 2018

Education is one of many important factors that influences human resource development index in one region. Based on the following table, there are 44,0% of the householders graduated from elementary school. Referring to the program of 9 years study compulsory, there are 52,0% of respondents who belong to the government program. Then it can be concluded that the last level of education from the householders in the location site is quite good.

Table 2.31. Community Identity Based on Last Level of Education

No	District	Subdistrict	Village	Last Level of Education				Amount of Respondent
				ES/MI	JHS/MTs	SHS/MA	None	
1	Kepahiang	Ujan Mas	Bumisari	3	1	0	1	5
2		Merigi	Lubuk Penyamun	0	0	0	0	0
3	Rejang Lebong	South Curup	Pungguk Lalang	0	0	0	0	0
4		Curup	Dwi Tunggal	0	0	0	0	0
5		North Curup	Batupanco	0	1	0	0	1
6		Bermani Ulu Raya	Dataran Tapus	3	0	0	0	3
7			Tebat Tenong Luar	3	1	2	0	6
8		Lebong	Rimbo Pengadang	Rimbo Pengadang	1	2	1	0
9	South Lebong		Sukasari	1	1	4	0	6
10								
<b>Total Amount of Respondent</b>				<b>11</b>	<b>6</b>	<b>7</b>	<b>1</b>	<b>25</b>
<b>%</b>				<b>44,0%</b>	<b>24,0%</b>	<b>28,0%</b>	<b>4,0%</b>	<b>100%</b>

Source : Survey, 2018

#### 4. Job Kinds

One important information in social aspect study of Environmental Impact Analysis is the aspect of population livelihood or job kinds which is predicted to be affected by the activity plan. Based on the result of questionnaire, most respondents (92,0%) are farmers, 4% respondents are sellers, and the last 4% respondents are housewives. This result is affected by the condition of the location site. The location site is surrounded by ricefields and coffee farms that the community utilizes as their source of living. The detail information is shown in the following table.

Table 2.32 Job Kinds of Respondent

No	District	Subdistrict	Village	Main Job			Amount of Respondent
				Seller	Farmer	Housewife	
1	Kepahiang	Ujan Mas	Bumisari	0	5	0	5
2		Merigi	Lubuk Penyamun	0	0	0	0
3	Rejang Lebong	South Curup	Pungguk Lalang	0	0	0	0
4		Curup	Dwi Tunggal	0	0	0	0
5		North Curup	Batupanco	0	1	0	1
6		Bermani	Dataran Tapus	1	2	0	3





No	District	Subdistrict	Village	Main Job			Amount of Respondent
				Seller	Farmer	Housewife	
7		Ulu Raya	Tebat Tenong Luar	0	6	0	6
8	Lebong	Rimbo Pengadang	Rimbo Pengadang	0	4	0	4
9		South Lebong	Sukasari	0	5	1	6
10							
<b>Total Amount of Respondent</b>				<b>1</b>	<b>23</b>	<b>1</b>	<b>25</b>
<b>%</b>				<b>4,0%</b>	<b>92,0%</b>	<b>4,0%</b>	<b>100%</b>

Source : Survey, 2018

The following table is shown the general condition related of main livelihood in each study area.

Table 2.33 General Condition of Community Livelihood in the Study Area

No	District	Subdistrict	Village	Main Livelihood
1	Kepahiang	Ujan Mas	Bumisari	Rice and Vegetable Farmers
2		Merigi	Lubuk Penyamun	Rice Farmers
3	Rejang Lebong	South Curup	Pungguk Lalang	Rice and Coffee Farmers
4		Curup	Dwi Tunggal	Civil Servants (75%) and Rice Farmers
5		North Curup	Batupanco	Rice Farmers
6		Bermani Ulu Raya	Dataran Tapus	Coffee Farmers
7			Tebat Tenong Luar	Rice and Coffee Farmers
8	Lebong	Rimbo Pengadang	Rimbo Pengadang	Rice and Coffee Farmers
9		South Lebong	Sukasari	Coffee Farmers

Source : In-depth interview with the representatives of government in study area, 2018

The crop of ricefields is usually used by the community in the study area for private consumption. Meanwhile, the crop of farms such as vegetables, fruits, and coffee are usually sold to the collector or to village-owned business entity.



## 5. Income Level of Household

Table 2.34. Income Level of Respondents

N u m	District	Subdistrict	Village	Average Income Per Month							Amount of Respon dent
				No Income	< 1.000.000	1.000.000 - 2.000.000	2.001.000 - 3.000.000	4.001.000 - 5.000.000	> 5.000.000	No Answer	
1	Kepahiang	Ujan Mas	Bumisari	0	0	5	0	0	0	0	5
2		Merigi	Lubuk Penyamun	0	0	0	0	0	0	0	0
3	Rejang Lebong	South Curup	Pungguk Lalang	0	0	0	0	0	0	0	0
4		Curup	Dwi Tunggal	0	0	0	0	0	0	0	0
5		North Curup	Batupanco	0	0	1	0	0	0	0	1
6		Bermani Ulu Raya	Dataran Tapus	0	0	0	0	0	2	1	3
7			Tebat Tenong Luar	0	2	3	0	0	1	0	6
8	Lebong	Rimbo Pengadang	Rimbo Pengadang	0	0	1	1	2	0	0	4
9		South Lebong	Sukasari	1	0	4	1	0	0	0	6
10	<b>Total Amount of Respondent</b>			<b>1</b>	<b>2</b>	<b>14</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>25</b>
				<b>4,0%</b>	<b>8,0%</b>	<b>56,0%</b>	<b>8,0%</b>	<b>8,0%</b>	<b>12,0%</b>	<b>4,0%</b>	<b>100%</b>

Source : Survey, 2018



Income level of community is one of many important aspects in economy aspects. Based on the survey, there are 56,0% of respondents have total income of Rp1.000.000,00-Rp2.000.000,00 per capita. The rest of 48,0% respondents have the income under of the minimum wage of Bengkulu Province. The minimum wage of Bengkulu Province is Rp1.730.000,00. This occurs because most of the community in the study area work in agricultural sector which makes the income is fluctuative and cannot be determined by the province minimum wage.

## 6. Status and Condition of Houses

There are 92,0% of respondents who live in their own houses. The rest of 2,0% respondents rent the houses. The respondents who generally live in the study location are the native inhabitants of each village. Only a few of them are migrants who originally from the same district of city. However, most natives and migrants have been living for more than 20 years in the village. This creates the deep sense of belonging towards the environment of the inhabitants. Consequently, a good socialization and communication to the community and government are needed regarding to the project site.

Table 2.35. House Ownership Status

Num	District	Subdistrict	Village	House Ownership Status		Amount of Respondent
				Owned	Rented	
1	Kepahiang	Ujan Mas	Bumisari	5	0	5
2		Merigi	Lubuk Penyamun	0	0	0
3	Rejang Lebong	South Curup	Pungguk Lalang	0	0	0
4		Curup	Dwi Tunggal	0	0	0
5		North Curup	Batupanco	1	0	1
6		Bermani Ulu Raya	Dataran Tapus	2	1	3
7			Tebat Tenong Luar	6	0	6
8	Lebong	Rimbo Pengadang	Rimbo Pengadang	3	1	4
9		South Lebong	Sukasari	6	0	6
10						
<b>Total Amount of Respondent</b>				<b>23</b>	<b>2</b>	<b>25</b>
<b>%</b>				<b>92,0%</b>	<b>8,0%</b>	<b>100%</b>

Source : Survey, 2018

The building houses of the respondents have many various area. There are 48,0% of respondents whose area of houses are 29 m<sup>2</sup> to 70 m<sup>2</sup>. The house area of 14 m<sup>2</sup> to 28 m<sup>2</sup> are settled by 12,0% respondents. Then the last 40,0% respondents live in the houses with the area of more than 70 m<sup>2</sup>.

The typology of respondent houses is also various. There are 20,0% of respondents live in permanent houses. A permanent type of house refers to the house that is built of brick or wall. Then, the highest percentage of respondents, 60,0%, live in semi permanent houses. The last 20,0% respondents live in houses built of wood and cement floor. The detail information of typology of respondents houses can be seen in the following table.

Table 2.36. Typology of Houses

No	District	Subdistrict	Village	Typology of Houses			Amount of Respondent	
				Permanent (brick/wall house)	Semi Permanent (mixed of brick and wood)	Wooden house with cement floor		
1	Kepahiang	Ujan Mas	Bumisari	1	3	1	5	
2		Merigi	Lubuk Penyamun	0	0	0	0	
3	Rejang Lebong	South Curup	Pungguk Lalang	0	0	0	0	
4		Curup	Dwi Tunggal	0	0	0	0	
5		North Curup	Batupanco	0	0	1	1	
6		Bermani Ulu Raya	Dataran Tapus		1	1	1	3
7			Tebat Tenong Luar		2	3	1	6
8		Lebong	Rimbo Pengadang	Rimbo Pengadang	1	2	1	4
9	South Lebong		Sukasari	0	6	0	6	
10	<b>Total Amount of Respondent</b>			<b>5</b>	<b>15</b>	<b>5</b>	<b>25</b>	
				<b>20,0%</b>	<b>60,0%</b>	<b>20,0%</b>	<b>100%</b>	

Source : Survey, 2018

In this study site, not all respondents have their own bathroom in their houses. 80,0% respondents use their own bathrooms inside their houses, and the rest 20,0% of respondents live in the houses which do not provide bathrooms, which means that the bathroom is separated from the main building of house. This condition forces them to use the separate bathrooms outside their houses.



Meanwhile, for the need of drinking or cooking water, there are 52,0% of respondents utilize the water from water supply company. Then the rest of the respondents utilize the water from the well. All respondents admit that the water quality is clean and tasteless.

Regarding to the waste management, the respondents react variously. There are 44,0% of community throw the garbage away in the empty land around the settlement, 4,0% of the community throw the garbage away in the gutter near houses, 44,0% community burn the garbage, 4,0% of the community buried it, and the last 4,0% respondents said that the garbage is taken by the garbage officer. Meanwhile, the responds regarding feces waste management split the respondents into 2 groups; 92,0% of respondents use septic tank, and the last 8,0% use gutter/river.

## 6 Condition of the Environment around Community Settlement

Based on the survey to 25 respondents, the inhabitants are generally affected by the pollution. The pollution itself appears in a form of noise and dust. However, this kind of pollution seldom occurs and does not disrupt the activity of the community. Basically the condition of respondents' houses is a settlement near the palm and rubber tree so that the environment is still cool and fresh. The detail information can be seen in the following table.

Table 2.37 Kinds of Pollution around Project Site

No	District	Subdistrict	Village	Kinds of Pollution					Amount of Respondent
				Noise	Odor	Dust	Noise & Dust	No Pollution	
1	Kepahiang	Ujan Mas	Bumisari	0	0	2	2	1	5
2		Merigi	Lubuk Penyamun	0	0	0	0	0	0
3	Rejang Lebong	South Curup	Pungguk Lalang	0	0	0	0	0	0
4		Curup	Dwi Tunggal	0	0	0	0	0	0
5		North Curup	Batupanco	0	0	0	1	0	1
6		Bermani Ulu Raya	Dataran Tapus	0	0	2	0	1	3
7			Tebat Tenong Luar	1	0	0	1	4	6
8	Lebong	Rimbo Pengadang	Rimbo Pengadang	0	1	0	0	3	4
9		South Lebong	Sukasari	0	0	0	0	6	6
10									



<b>Total Amount of Respondent</b>	<b>1</b>	<b>1</b>	<b>4</b>	<b>4</b>	<b>15</b>	<b>25</b>
<b>%</b>	<b>4,0%</b>	<b>4,0%</b>	<b>16,0%</b>	<b>16,0%</b>	<b>60%</b>	<b>100%</b>

Source : Survey, 2018

The kinds of pollution which often disrupt the inhabitants are noise, dust, and a few of odor. 28% of respondents said that the source of noise comes from the activity of vehicle, and the rest of them said that there is no noise disruption. Meanwhile, most respondents (12%) said that the activity of vehicle produces most dust. There are 4,0% respondents claimed that dust disruption comes from the public road. The other 4,0% respondents answered that the dust disruption is produced due to the logging. Then the last respondents said that there is no dust disruption.

Table 2.38 Flood Intensity around Project Site

N u m	District	Subdistrict	Village	Flood Intensity			Amount of Respondent
				Often	Seldom	Never	
1	Kepahiang	- Ujan Mas	- Bumisari	0	1	4	5
2		- Merigi	- Lubuk Penyamun	0	0	0	0
3	Rejang Lebong	- South Curup	- Pungguk Lalang	0	0	0	0
4		- Curup	- Dwi Tunggal	0	0	0	0
5		- North Curup	- Batupanco	0	0	1	1
6		- Bermani	- Dataran Tapus	0	0	3	3
7		- Ulu Raya	- Tebat Tenong Luar	2	0	4	6
8	Lebong	- Rimbo Pengadang	- Rimbo Pengadang	0	0	4	4
9		- South Lebong	- Sukasari	0	0	6	6
10							
Total Amount of Respondent				2	1	22	25
%				8,0%	4,0%	88,0%	100%

Source : Survey, 2018

According to the result of 4,0% respondents, the flood seldom happens in their settlement. On the other hand, there are 8,0% of respondents said that the flood often happens in their settlement. Then the last 88,0% claimed that the flood never happens in their settlement. Meanwhile, according to 8,0% respondents, the flood occurs due to the dysfunction of drainage channel. There are 4,0% respondents said that the flood occurs due to the absence of drainage channel, and the last 88,0% respondents claimed that the flood never occurs in their settlement.



The data of the survey also explains the height of the flood which is various. 12,0% respondents said that the height of the flood starts from less than 0,5 meters. If the flood occurs, the water generally will recede in a various times. 8,0% respondents claimed that the flood will be recede in less than one day.

### Pattern of Team Work in the Community

Every community has certain way of team work or collaboration to achieve the goal together or to cope the problems together. One form of team work which is very typical in Indonesia is a mutual cooperation or collaboration.

The social interaction of inhabitants intertwined closely because the inhabitants know each other. However, the inhabitants also need institution as a place to share problems and information. There are various institutions in the location site. The inhabitants can join any kind of activity together such as religious recitation in the mosque, family welfare development, and others.

Table 2.39 Activities that are Often Carried Out Together around Project Site

No	District	Subdistrict	Village	Togetherness Activities							Amount of Respondent	
				Religious Recitation	Social Gathering	Community Service	Cleanliness	All	Religious Recitation and Community Service	Religious Recitation and Hunting		
1	Kepahiang	Ujan Mas	Bumisari	3	1	0	0	0	2	0	6	
2		Merigi	Lubuk Penyamun	0	0	0	0	0	1	0	1	
3	Rejang Lebong	South Curup	Pungguk Lalang	0	0	0	0	0	0	1	1	
4		Curup	Dwi Tunggal	0	0	0	0	1	0	0	1	
5		North Curup	Batupanco	0	0	1	0	0	1	0	2	
6		Bermani Ulu Raya	Dataran Tapus		3	1	0	0	0	0	0	4
7			Tebat Tenong Luar		1	1	0	1	3	0	0	6
8	Lebong	Rimbo Pengadang	Rimbo Pengadang	0	0	0	0	0	5	0	5	
9		South Lebong	Kutai Donok		0	0	0	0	1	0	1	
10			Sukasari		0	0	1	0	0	6	0	7
Total Amount of Respondent				7	3	2	1	4	16	1	34	
%				20,6%	8,8%	5,9%	2,9%	11,8%	47,1%	2,9%	100%	

Source : Survey, 2018



Table 2.40 Institution Types which Accommodate the Community

No	District	Subdistrict	Village	Institution Types						Amount of Respondent
				Religious Groups	Youth Organization	Family Welfare Development	All	None	Religious Groups and Family Welfare Development	
1	Kepahiang	Ujan Mas	Bumisari	1	1	0	4	0	0	6
2		Merigi	Lubuk Penyamun	0	1	0	0	0	0	1
3	Rejang Lebong	South Curup	Pungguk Lalang	0	1	0	0	0	0	1
4		Curup	Dwi Tunggal	1	0	0	0	0	0	1
5		North Curup	Batupanco	0	0	2	0	0	0	2
6		Bermani Ulu Raya	Dataran Tapus	0	0	0	0	2	2	4
7			Tebat Tenong Luar	2	0	1	2	1	0	6
8	Lebong	Rimbo Pengadang	Rimbo Pengadang	0	0	1	0	0	4	5
9		South Lebong	Kutai Donok	1	0	0	0	0	0	1
10		Sukasari	2	0	4	0	1	0	7	
<b>Total Amount of Respondent</b>				<b>7</b>	<b>3</b>	<b>8</b>	<b>6</b>	<b>4</b>	<b>6</b>	<b>34</b>
<b>%</b>				<b>20,6%</b>	<b>8,8%</b>	<b>23,5%</b>	<b>17,6%</b>	<b>11,8%</b>	<b>17,6%</b>	<b>100%</b>

Source : Survey, 2018

## 7 Conflict Potential in Community

The conflict in community which is seldom happens depicts that the community can get along very well. There are 76.5% of respondents answered that the conflict never occurs in the community. However 8,8% respondents said that sometimes the conflict between the community happens in the study site. The last 14,7% respondents claimed that the conflict often happens in the study site. The conflict which occurs in the community is due to the land grabbing. In addition, conflict also appears regarding the job involving the natives and the migrants.

Table 2.41 Intensity of Conflict

No.	District	Subdistrict	Village	Intensity of Conflict			Amount of Respondent
				Often	Seldom	Never	
1	Kepahiang	Ujan Mas	Bumisari	0	0	6	6
2		Merigi	Lubuk Penyamun	0	0	1	1
3	Rejang Lebong	South Curup	Pungguk Lalang	0	0	1	1
4		Curup	Dwi Tunggal	0	0	1	1
5		North Curup	Batupanco	1	1	0	2





No.	District	Subdistrict	Village	Intensity of Conflict			Amount of Respondent
				Often	Seldom	Never	
6		Bermani Ulu Raya	Dataran Tapus	0	0	4	4
7			Tebat Tenong Luar	2	1	3	6
8	Lebong	Rimbo Pengadang	Rimbo Pengadang	1	1	3	5
9		South Lebong	Kutai Donok	1	0	0	1
10			Sukasari	0	0	7	7
<b>Total Amount of Respondent</b>				<b>5</b>	<b>3</b>	<b>26</b>	<b>34</b>
<b>%</b>				<b>14,7%</b>	<b>8,8%</b>	<b>76,5%</b>	<b>100%</b>

Source : Survey, 2018

Table 2.42 Perpetrators of Community Conflict

No	District	Subdistrict	Village	Perpetrators of Community Conflict				Amount of Respondent
				Between natives and migrants	Between natives	Between migrants	Never	
1	Kepahiang	Ujan Mas	Bumisari	0	0	0	6	6
2		Merigi	Lubuk Penyamun	0	0	0	1	1
3	Rejang Lebong	South Curup	Pungguk Lalang	0	0	0	1	1
4		Curup	Dwi Tunggal	0	0	0	1	1
5		North Curup	Batupanco	0	2	0	0	2
6		Bermani Ulu Raya	Dataran Tapus		0	0	0	4
7	Tebat Tenong Luar			3	0	0	3	6
8	Lebong	Rimbo Pengadang	Rimbo Pengadang	1	0	1	3	5
9		South Lebong	Kutai Donok	1	0	0	0	1
10			Sukasari		0	0	0	7
<b>Total Amount of Respondent</b>				<b>5</b>	<b>2</b>	<b>1</b>	<b>26</b>	<b>34</b>
<b>%</b>				<b>14,7%</b>	<b>5,9%</b>	<b>2,9%</b>	<b>76,5%</b>	<b>100%</b>

Source : Survey,2018

## 2.4.4 Community Perception and Attitude Regarding the Project Site

### 1. Information about the Project Plan

Many inhabitants do not know about the planning of the project construction. However, several inhabitants are already involved in the land survey conducted by the previous initiator. The following table shows the stages of project activities that have been conducting in study area until the survey of environmental impact analysis conducted.

Table 2.43 Stages of Project Activities that have been conducting in Study Area

No.	District	Subdistrict	Village	Stages of Project
1	Kepahiang	Ujan Mas	Bumisari	Data collection of land and house due to the project
2		Merigi	Lubuk Penyamun	No activity and further information from the initiator
3	Rejang Lebong	South Curup	Pungguk Lalang	No activity and further information from the initiator
4		Curup	Dwi Tunggal	Land survey permit from the initiator just entered the village
5		North Curup	Batupanco	Data collection of land and house due to the project
6		Bermani Ulu Raya	Dataran Tapus	Data collection of land and house due to the project
7			Tebat Tenong Luar	Data collection of land and house due to the project
8	Lebong	Rimbo Pengadang	Rimbo Pengadang	Data collection of land and house due to the project
9		South Lebong	Kutai Donok	No activity and further information from the initiator
10			Sukasari	Data collection of land and house due to the project

Source : In-depth interview with the representatives of government in study area, 2018

\*respondents consist of the affected inhabitants (25 people) and representatives of government in study area (9 people).

## 2. Attitude of Community Regarding the Project Plan

100% respondents who consist of affected inhabitants and the representative of government generally agree with the project plan. However, there is a landlord in Batupanco Village who disagrees with the project plan. The landlord also refuses to be surveyed. The following table shows the reasons from the respondents towards the project plan.



Table 2.44 Reasons to Agree with the Project Plan

No	District	Subdistrict	Village	Reasons to Agree with the Project Plan						Amount of Respondent	
				More positive impacts on the community	Government programs that must be supported	Need better electricity	Related to public interest	Open employment opportunities for local residents	Appropriate compensation		
1	Kepahiang	Ujan Mas	Bumisari	0	5	0	0	1	0	6	
2		Merigi	Lubuk Penyamun	0	0	0	0	1	0	1	
3	Rejang Lebong	South Curup	Pungguk Lalang	0	0	0	0	1	0	1	
4		Curup	Dwi Tunggal	0	1	0	0	0	0	1	
5		North Curup	Batupanco	0	0	0	1	0	1	2	
6		Bermani Ulu Raya	Dataran Tapus		0	0	0	0	0	4	4
7			Tebat Tenong Luar		0	2	0	0	0	4	6
8	Lebong	Rimbo Pengadang	Rimbo Pengadang	0	0	0	1	4	0	5	
9		South Lebong	Kutai Donok	1	0	0	0	0	0	1	
10			Sukasari		1	0	6	0	0	0	7
<b>Total Amount of Respondent</b>				<b>2</b>	<b>8</b>	<b>6</b>	<b>2</b>	<b>7</b>	<b>9</b>	<b>34</b>	
<b>%</b>				<b>5,9%</b>	<b>23,5%</b>	<b>17,6%</b>	<b>5,9%</b>	<b>20,6%</b>	<b>26,5%</b>	<b>100%</b>	

Source : Survey, 2018

### 3. Community Expectation towards the Project Plan

Community who lives around the affected area expects that the construction of 150 kV high-voltage wires Hululais-Pekalongan Geothermal Power Plant will bring many positive effects for them. Their expectations are various. Most inhabitants expect that the project construction can absorb and optimize the natives' potency in working in the construction site or when the 150 kV high-voltage wires Hululais-Pekalongan Geothermal Power Plant starts the operational activity. The detail information is shown in the following table.

Table 2.45 Expectations from the Project Plan

No	District	Subdistrict	Village	Expectations from the Project Plan								Amount
				A	B	C	D	E	F	G	H	
1	Kepahiang	Ujan Mas	Bumisari	2	0	0	5	0	1	0	0	8
2		Merigi	Lubuk Penyamun	1	0	0	1	0	0	0	0	2
3	Rejang Lebong	South Curup	Pungguk Lalang	1	0	0	0	0	0	0	0	1
4		Curup	Dwi Tunggal	0	0	0	0	1	0	1	0	2
5		North Curup	Batupanco	1	0	0	1	1	0	0	0	3



No	District	Subdistrict	Village	Expectations from the Project Plan								Amount
				A	B	C	D	E	F	G	H	
6	Bermani Ulu Raya		Dataran Tapus	4	0	1	0	0	3	0	0	8
7			Tebat Tenong Luar	2	1	2	0	2	1	0	0	8
8	Lebong	Rimbo Pengadang	Rimbo Pengadang	5	0	0	1	1	1	0	0	8
9		South Lebong	Kutai Donok	0	0	0	1	0	0	0	0	1
10		South Lebong	Sukasari	1	0	0	6	0	0	0	7	14
<b>Total Pendapat Terkait Harapan and Manfaat Proyek</b>				<b>17</b>	<b>1</b>	<b>3</b>	<b>15</b>	<b>5</b>	<b>6</b>	<b>1</b>	<b>7</b>	<b>55</b>
<b>%</b>				<b>30,9 %</b>	<b>1,8 %</b>	<b>5,5 %</b>	<b>27,3 %</b>	<b>9,1 %</b>	<b>10,9 %</b>	<b>1,8 %</b>	<b>12,7 %</b>	<b>100%</b>

Source : Survey, 2018

Remarks :

A : The initiators prioritize the community to work

B : The community do not loss

C : There is a compensation for the community if their business is disrupted

D : The initiators have a good communication with the government and community

E : The project construction can be held safe and smooth

F : There is an appropriate compensation for the affected community

G : The project can fulfill the power supply needed by the community

H : The initiators contribute in the community's activity

#### 4. Community Concern Due to Project Plan

The community in the location site concerns on the risks and losses due to the project plan. The biggest concern of the community are the disruption of business field and limited supply of water. The detail information of community concerns is displayed on the following table.

Table 2.46 Risks / Losses Due to Project Plan

No	District	Subdistrict	Village	Concerns				Amount of Respondent
				Disruption of the place of business	None	Decreasing agricultural land	People from outside the villages who take advantage of the opportunity	
1	Kepahiang	Ujan Mas	Bumisari	0	6	0	0	6
2		Merigi	Lubuk Penyamun	0	1	0	0	1
3	Rejang Lebong	South Curup	Pungguk Lalang	0	1	0	0	1
4		Curup	Dwi Tunggal	0	1	0	0	1
5		North Curup	Batupanco	1	0	1	0	2
6		Bermani Ulu	Dataran Tapus	4	0	0	0	4



No	District	Subdistrict	Village	Concerns				Amount of Respondent
				Disruption of the place of business	None	Decreasing agricultural land	People from outside the villages who take advantage of the opportunity	
7		Raya	Tebat Tenong Luar	1	5	0	0	6
8	Lebong	Rimbo Pengadang	Rimbo Pengadang	0	5	0	0	5
9		South Lebong	Kutai Donok	0	0	0	1	1
10			Sukasari	0	7	0	0	7
<b>Total Amount of Respondent</b>				<b>6</b>	<b>26</b>	<b>1</b>	<b>1</b>	<b>34</b>
<b>%</b>				<b>17,6%</b>	<b>76,5%</b>	<b>2,9%</b>	<b>2,9%</b>	<b>100%</b>

Source : Survey, 2018

Table 2.47 Other Complaints regarding Project Plans

Num	District	Subdistrict	Village	Other Complaints Regarding Project Plans							Amount of Respondent
				A	B	C	D	E	F	G	
1	Kepahiang	Ujan Mas	Bumisari	6	0	0	0	0	0	0	6
2		Merigi	Lubuk Penyamun	1	0	0	0	0	0	0	1
3	Rejang Lebong	South Curup	Pungguk Lalang	1	0	0	0	0	0	0	1
4		Curup	Dwi Tunggal	1	0	0	0	0	0	0	1
5		North Curup	Batupanco	0	0	1	1	0	0	0	2
6		Bermani Ulu Raya	Dataran Tapus	0	0	0	0	4	0	0	4
7			Tebat Tenong Luar	4	0	0	1	0	1	0	6
8	Lebong	Rimbo Pengadang	Rimbo Pengadang	2	1	0	0	0	2	0	5
9		South Lebong	Kutai Donok	1	0	0	0	0	0	0	1
10			Sukasari	1	0	0	0	0	0	6	7
<b>Total Amount of Respondent</b>				<b>17</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>4</b>	<b>3</b>	<b>6</b>	<b>34</b>
<b>%</b>				<b>50,0%</b>	<b>2,9%</b>	<b>2,9%</b>	<b>5,9%</b>	<b>11,8%</b>	<b>8,8%</b>	<b>17,6%</b>	<b>100%</b>

Source : Survey, 2018

Remarks :

A : No complaint

B : Broken roads due to the project

C : Uncompensated land of the community will be broken due to the mobilization of construction material

D : Disruption due to the mobilization of construction material

E : Contribution from the State Electricity Company to the affected villages in a form of public facility construction, etc.

F : Compensation to the affected regions which passed by the electric cables

G : Project plan does not work



## 5. Suggestion

The affected community suggests various things to anticipate the risks regarding the construction site of 150 kV high-voltage wires Hululais-Pekalongan Geothermal Power Plant. However, most important suggestions from the community are the absorption of local labours, appropriate compensation, and good communication between the initiators of the project, government, and the community. Other suggestions are explained in the table below.

Table 2.48 Community Suggestions regarding Project Plans

No	District	Subdistrict	Village	Community Suggestions Regarding Project Plans						Amount of Respondent
				A	B	C	D	E	F	
1	Kepahiang	Ujan Mas	Bumisari	0	3	4	1	0	0	8
2		Merigi	Lubuk Penyamun	0	1	1	0	0	0	2
3	Rejang Lebong	South Curup	Pungguk Lalang	0	1	0	0	0	0	1
4		Curup	Dwi Tunggal	0	0	1	0	0	0	1
5		North Curup	Batupanco	0	1	1	0	1	0	3
6		Bermani Ulu Raya	Dataran Tapus	3	1	0	4	0	0	8
7			Tebat Tenong Luar	0	2	2	4	0	0	8
8		Lebong	Rimbo Pengadang	Rimbo Pengadang	1	2	0	3	0	0
9	South Lebong		Kutai Donok	0	1	1	0	0	1	3
10	Sukasari		0	7	0	0	0	0	7	
Total Pendapat Responden Terkait Saran Terhadap Proyek				4	19	10	12	1	1	47
%				8,5%	40,4%	21,3%	25,5%	2,1%	2,1%	100%

Source : Survey, 2018

Remarks :

A : Indisruption of the farmers' activity

B : Hiring the local labours

C : Good communication between the initiators, government, and community

D : Appropriate compensation for the affected community

E : Build the retaining wall around the transmission site

F : Environmental Community Service Responsibility

### 2.5. Community Health Component

Several medical experts theoretically found the influence factors of a community health degree. Those factors are the initial condition, medical facility, behavior, and environmental condition. The environmental condition itself consists of chemical, physical, biological, social, and cultural environment.



### 2.5.1. Infrastructure of Community Health Service

Health is expensive, because being healthy is the main requirement for everyone in order to do the daily activity. The adequate health infrastructure and service will support the community welfare, especially in medical field.

In 2017, government provides Integrated Health Service Post and Auxiliary Health Center in the study location. Although in limited amount, doctors, midwives, and nurses are available in project location. In order to improve the lack of medical infrastructure and facility, the company should help in fulfilling the community needs towards medical service.

#### 1) Medical Infrastructure and Facility

The table below shows the detail information of medical facilities in the affected districts in 2017.

Table 2.49 Amount of Medical Facilities in Lebong, Rejang Lebong, and Kepahiang District in 2017

Nu m.	Medical Facility	Lebong District	Rejang Lebong District	Kepahiang District
1	General Hospital	1	-	-
2	Community Health Center	13	-	14
3	Integrated Health Service Post	115	-	118
4	Village Maternity Center	-	-	117
5	Auxiliary Health Center	-	51	-
6	Village Health Post	-	40	-
7	Hospital	-	2	-
8	Medical Center	-	18	-
9	Joint doctor practice	-	5	-
10	Individual Doctor Practice	-	46	-
11	Drugstore	4	25	-

Source : Public Health Office of Lebong, Rejang Lebong, and Kepahiang District, 2017

## 2) Medical Worker

The following table shows the amount of medical worker in districts around study area in 2017.

Table 2.50. Amount of Medical Worker in Lebong, Rejang Lebong, and Kepahiang District in 2017

<b>Nu m.</b>	<b>Medical Worker</b>	<b>Lebong District</b>	<b>Rejang Lebong District</b>	<b>Kepahiang District</b>
1.	Medical Worker	-	-	51
2.	Medical Specialist	-	-	5
3.	General Practitioner	9	20	25
4.	Dentist		7	2
5.	Nurse	105	177	233
6.	Dental Nurse		5	
7.	Midwife	52	263	110
8.	Pharmacist	6	10	18
9	Others	11	5	98
10	Public Health	34	52	-
11	Environmental Health	5	22	-
12	Nutritionist	3	21	-

Source : Public Health Office of Lebong, Rejang Lebong, and Kepahiang District, 2017

### 2.5.2. Morbidity/Pattern of Disease

Based on the obtained data from several sources in 2017, it is known that there are 10 most diseases suffered by the community as stated in the following table:

Table 2.51. Biggest 10 Cases in Curup Community Health Center Rejang Lebong District in 2017

<b>No.</b>	<b>Type of Disease</b>	<b>Amount of Case</b>
1.	Acute Respiratory Infections	1.317
2.	Gastritis	312
3.	Rheumatism	255
4.	Hypertension	239
5.	Allergy	251
6.	Febris	126
7.	Diarrhea	162
8.	Cephalgia	78
9.	Diabetes	72
10.	Dental Caries	79

Source : Curup Community Health Center Rejang Lebong District, 2017





Based on the above table, it can be seen that the highest 3 diseases are Acute Respiratory Infections, gastritis, and rheumatism.

The following table shows the biggest 10 cases in Kepahiang District.

Table 2.52. Biggest 10 Cases in Kepahiang District in 2017

No.	Type of Disease	Amount of Case
1.	Acute Respiratory Infections	7.096
2.	Gastritis	3.099
3.	Febris	2.939
4.	Hypertension	2.563
5.	Rheumatism	2.159
6.	Skin Allergy	1.802
7.	Diarrhea	1.485
8.	Other diseases of the upper respiratory tract	1.244
9.	Tonsillitis	1.016
10.	Typhoid	869

Source : Public Health Office of Kepahiang District, 2017

Meanwhile, the highest case happens in Lebong District are hypertension, diabetes mellitus and dyspepsia, then followed by other diseases. The details of cases can be seen in the following table.

Table 2.53. Biggest 10 Cases in Lebong District in 2017

No.	Type of Disease	Amount of Case
1.	Hypertension	332
2.	Diabetes Mellitus	246
3.	Dyspepsia	232
4.	Pulmonary Tuberculosis	186
5.	Gastroesophageal Reflux Disease	74
6.	Chronic Obstructive Pulmonary Disease	71
7.	Urinary Tract Infection	67
8.	Non Hemorrhagic Stroke	56
9.	Congestive Heart Failure	36
10.	Myalgia	10

Source : Public Health Office of Lebong District, 2017



### 2.5.3. Environment Sanitation

Environment sanitation is the depiction of health condition. It is important both in the project site and around the project site. Environment sanitation can be in a form of providing sanitation infrastructure and facility such as clean water supply, good management of waste, bathroom supply, settlement construction, etc. Good environment sanitation will affect the community risk of health problem due to the activity plan. In the end, good environment sanitation will support community health in location site.

#### House & Settlement

According to the Regulation of the Minister of Health Number 829 Year 1999, healthy house is a physical, chemical, and biological condition in the house and settlement, thus the inhabitant will get the optimal health degree. The requirements of healthy house are; clean water supply, good waste management, good air circulation, good lighting, and dry and clean rooms.

Based on the result of the survey, there are 60% respondents live in a semipermanent house. The house building indicates that the condition of the building and the inhabitants health are not adequate to fulfill the requirements as healthy house.

As reported by 58.3% respondents, the distance of the community settlement to the project location is >500m. The distance influences the pollutant level of exposure from the project location to the surrounding community. The nearer the community settlement to the project location, the higher the risk of health problems suffered by the community. One of the health problems that usually appears is the respiratory infection due to the mobilization of project materials.

The result of the survey also shows the types of pollution that the community has to deal with in the project location. Dust is the major pollution for the respondents. The project site influences the level of environment contamination that the community has experienced previously. The detail information is shown in the following table.

Table 2.54 Types of Pollution Experienced around the Study Area

Types	Amount	Percentage (%)
Noise	1	2,94
Odor	1	2,94
Dust	7	20,59
Noise and dust	4	11,76



Types	Amount	Percentage (%)
None/Others	21	61,76
<b>Total</b>	<b>34</b>	<b>100.0</b>

Source: Primary Data Processing, 2018

### Waste Management System

The waste management system done by the community will affect the environment health regarding the potency of health problem from the waste. The solid waste in the settlement has to be managed well in order to keep the environment clean. A good waste management will also prevent the odors and other contaminations to the water and soil.

According to the result of the survey, 44.1% of respondents burn the waste. There are 38.2% of respondents throw the waste away in the empty land around the settlement. This result proves that the waste management system of the community is risky to community health. This is because the waste management system can contaminate the water and the soil in the settlement. The detail information can be seen in the table below.

Table 2.55 Waste Management System

Management System	Amount	Percentage (%)
Gutter near the house	1	2.9
Empty land around the settlement	13	38.2
Taken by the garbage officer	3	8.8
Buried	1	2.9
Burnt	15	44.1
Gutter near the house and burnt	1	2.9
<b>Total</b>	<b>34</b>	<b>100.0</b>

Source: Primary Data Processing, 2018

### Clean Water Supply

The clean water supply also affects the environment health. The water supply which is clean both in quality and quantity will affect to the development and distribution of disease in the community.

The result of the survey shows that the most community in the project location really depends on the Water Supply Company (55.9% respondents). The community uses the source of the water to drink, cook, and take a bath. This indicates that the clean water

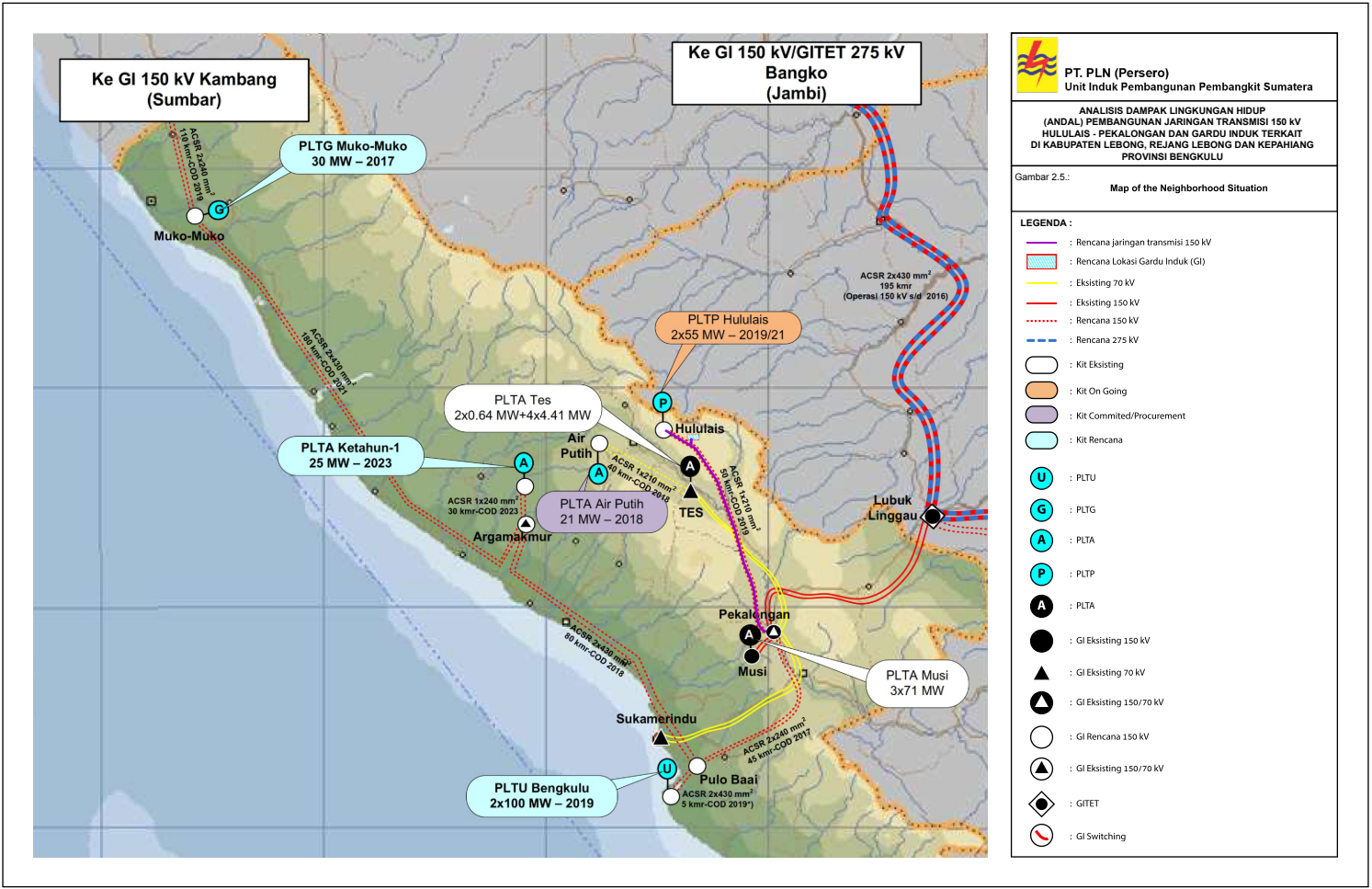


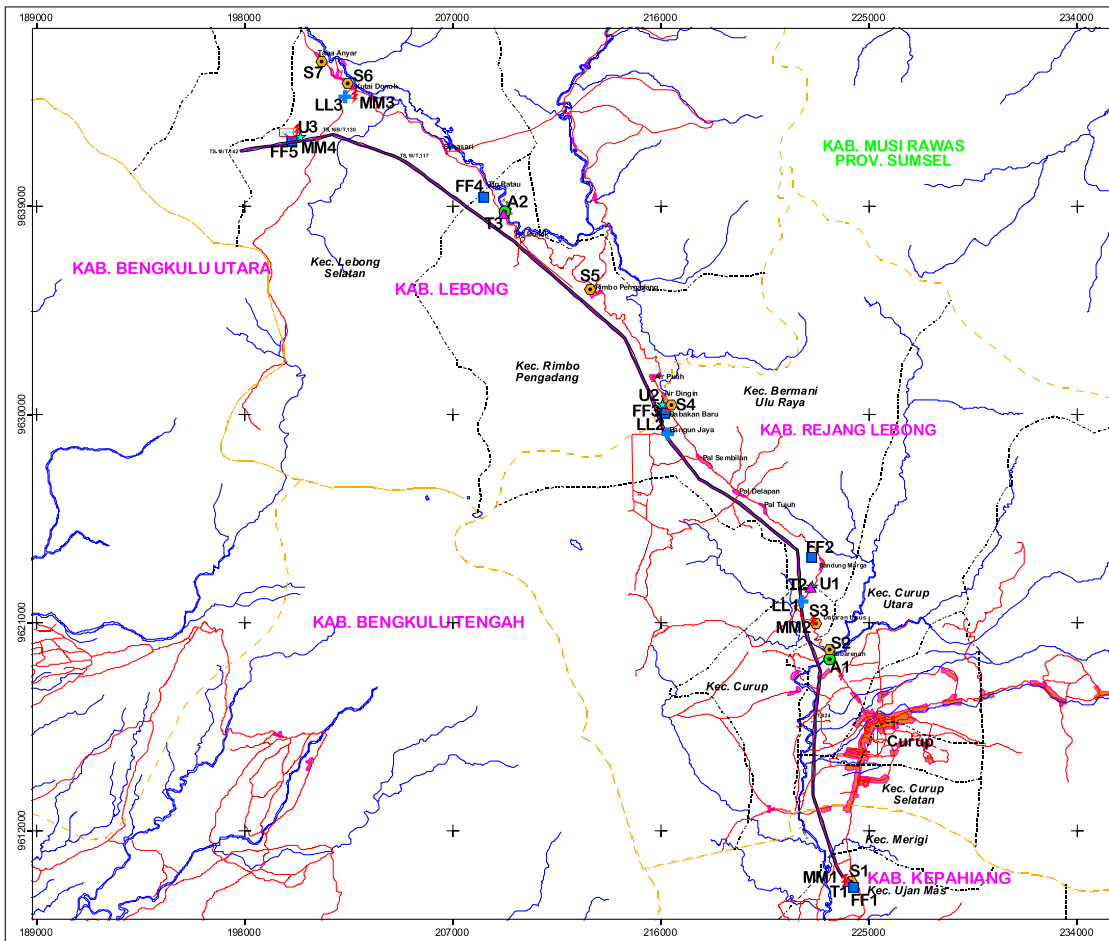
supply of the community depends on the Water Supply Company, so that the community around the project site can be in a risk of health problem when there is a trouble in Water Supply Company. The detail data is shown in the table below.

Table 2.56 Source of Drinking Water

Source	Amount	Percentage (%)
Water Supply Company	19	55.9
Well	15	44.1
<b>Total</b>	<b>34</b>	<b>100.0</b>

*Source: Primary Data Processing, 2018*





PT. PLN (Persero)  
Unit Induk Pembangunan Pembangkit Sumatera

ANALISIS DAMPAK LINGKUNGAN HIDUP  
(ANDAL) PEMBANGUNAN JARINGAN TRANSMISI 150 KV  
HULU ULU AIS - PEKALONGAN DAN GARDU INDUK TERKAIT  
DI KABUPATEN LEBONG, REJANG LEBONG DAN KEPAHIANG  
PROVINSI BENGKULU

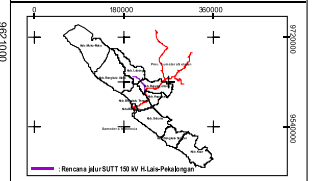


Skala 1 : 170.000

Gambar 2.6:  
Sampling Location Map

- Legenda :**
- Permukiman penduduk
  - Sungai dan anak sungai
  - Jalan
  - Batas kabupaten dlm Prov. Bengkulu
  - Batas kecamatan
  - Rencana jaringan transmisi 150 kV
  - Rencana lokasi Gardu Induk (GI)

- Lokasi Sampling :**
- ★ : Udara ambien (3 titik; U)
  - ★ : Medan Listrik & Medan Magnet (4 titik; MM)
  - : Flora/Fauna (5 Lokasi; FF)
  - : Sosek/bud di desa contoh (7 lokasi; S)
  - + : Lalu-lintas (3 lokasi; LL)
  - ▲ : Tanah (3 titik; T)
  - : Air sungai (2 titik; A)



**Sumber peta :**

1. Peta topografi digital Bakostranada skala 1 : 250.000 (1988)
2. Peta Rencana Jalur Jaringan Transmisi 150 KV PLTP Hula-Bula - Pekalongan skala 1 : 30.000 PT. PLN (Persero)
3. Peta Persebaran Kawasan Hutan dan Persebaran SK Menurut No. 420/Kpts-B/1999 tanggal 15 Juni 1999 Skala 1 : 250.000
4. Peta Perubahan Persebaran Kawasan Hutan menjadi Bukan Kawasan Hutan, Perubahan Fungsi Kawasan Hutan dan Petunjuk Bukan Kawasan Hutan menjadi Kawasan Hutan SK Menurut No. SK.643/Minhut/2011 tanggal 10-12-2011 Skala 1 : 250.000
5. Citra satelit Landsat TM periode 125/043 Bantul tanggal 12 Mei 2008 Skala 1 : 250.000
6. Orientasi lapangan dan hasil pengumpulan, Juni 2012.

**Keterangan :**  
Batas administrasi pemerintahan (kabupaten, kecamatan dan desa) belum merupakan batas definitif.

**CHAPTER III**  
**ESTIMATION OF IMPORTANT IMPACT**

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## CHAPTER III

### ESTIMATION OF IMPORTANT IMPACT

In the surrounding area the project plan is rice fields and coffee plantations that can be used by the community as their main source of livelihood. Based on the results of questionnaires related to the largest respondents (92.0%) having a livelihood as farmers, both rice farmers, coffee farmers, and vegetable farmers. Especially for agricultural products commonly used by people in the study area for personal consumption, while for plantation products such as vegetables, oranges or ordinary coffee are sold to collectors or through village-owned enterprises.

The method of determining the important nature of impact refers to the criteria for important impacts based on Government Regulation Number 27 of 2012 concerning Environmental Permits (Explanation of article 3 Paragraph 1), namely:

- 1) The amount of the population who will be affected by the business plan and / or activity;
- 2) Area of spread of impact;
- 3) The intensity and duration of the impact;
- 4) The number of other environmental components that will be affected;
- 5) Cumulative nature of impact;
- 6) Reversibility or irreversibility of the impact; and / or
- 7) Other criteria in accordance with the development of science and technology.

Estimates of important impacts are carried out on environmental components that will be affected by activities in the construction and operation stages.

The magnitude of the impact is determined based on changes in each of the impacts of each activity on each component of the environment. Whereas to determine the importance of the impact as a basis for environmental management and monitoring is associated with Government Regulation No. 27 of 2012 an explanation of article 3 Paragraph 1 concerning the criteria for important impacts as described above.





### 3.1. Pre-Construction Phase

#### 3.1.1. Disruption of Population Livelihoods

##### A) Land Acquisition and Plants

##### 1) Estimated Impact Magnitude

In the surrounding area the project plan is rice fields and coffee plantations that can be used by the community as their main source of livelihood. Based on the results of questionnaires it is known that the largest percentage of respondents (92.0%) have a livelihood as farmers, both rice farmers, coffee farmers, and vegetable farmers. Especially for paddy agricultural products commonly used by people in the study area for personal consumption, while for plantation products such as vegetables, oranges or regular coffee are sold to collectors or through village-owned enterprises.

The following are common community livelihoods carried out by residents around the project site.

Table 3. 1 Livelihoods of Communities Around the Study Area

No	Districts	Sub-District	Village	Main Livelihood
1	Kepahiang	Ujan Mas	Bumisari	Rice and Vegetable Farmers
2		Merigi	Lubuk Penyamun	Rice Farmers
3	Rejang Lebong	Curup Selatan	Pungguk Lalang	Rice and Coffee Farmers
4		Curup	Dwi Tunggal	PNS (75%) and Rice Farmers
5		Curup Utara	Batupanco	Rice Farmers
6		Bermani Ulu Raya	Dataran Tapus	Coffee Farmers
7			Tebat Tenong Luar	Rice and Coffee Farmers
8	Lebong	Rimbo Pengadang	Rimbo Pengadang	Rice and Coffee Farmers
9		Lebong Selatan	Sukasari	Rice and Coffee Farmers

Source: In-depth interviews with village government representatives in the study area, 2018

At the time of land acquisition and vegetation activities, it will result in reduced farmer land ownership, changes in the type of farmer's work, reduced working hours of the farmer's family, reduced farmer family income from farming and reduced source of fulfillment of the main family (rice) food ingredients.



## 2) Decrease in Important Properties of Impact

To determine the important nature of the impact of disruption of community livelihoods can be seen from the impact criteria as follows:

### a. The amount of population that will be affected

The number of affected people is the population who work as owner farmers and cultivators whose land is made into tower sites, spread over 3 Districts, 8 sub-districts, and 30 villages namely Districts Lebong; Sub-District Lebong South there are 3 villages, namely Taba Anyar Village, Mangkoharjo Village, Sukasari Village, Rimbo Pengadang District has 4 villages, namely Talang Ratau Village, Rimbo Pengadang Village, Kuto Tik Village, Air Dingin Village (Bioa Sengok). Rejang Lebong District; Bermani Ulu Raya Sub district, there are 9 villages, namely Babakan Baru Village, Bangun Jaya Village, Air Bening Village, Tebat Tenong Luar Village, Pal VIII / Eight Village, Pal Tujuh Village, Pal Seratus Village, Bandung Marga Village, Dataran Tapus Village; Sub district Curup north has 5 villages, namely Tabarenah Village, Heroes Village, Suka Datang Village, Lubuk Kembang Village, Batupanco Village; Curup Subdistrict has 2 villages / villages, namely Talang Benih Village, Dwi Tunggal Village; Curup Selatan District has 3 villages, namely Punguk Lalang Village, Lubuk Ubar Village, Watas Marga Village; Kepahiang District; There are 2 villages in Merigi Sub district, namely Lubuk Penyamun Village, Bukit Barisan Village and Ujan Mas Sub-District. There are 2 villages, namely Burnisari and Pekalongan Villages. So the impact is important.

### b. Area of spread of impact

The estimated area of impact distribution covers the area around the tower site. Covering 3 District, 8 sub-districts, and 30 village that is Lebong; There are 3 villages in South Lebong Sub-District, namely Taba Anyar Village, Mangkoharjo Village, Sukasari Village, There are 4 sub-districts / villages in Rimbo Pengadang, namely Talang Ratau Village, Rimbo Pengadang Village, Kuto Tik Village, Air Digin Village (Bioa Sengok). Rejang Lebong District; Bermani Ulu Raya Sub district, there are 9 villages, namely Babakan Baru Village, Bangun Jaya Village, Air Bening Village, Tebat Tenong Luar Village, Pal VIII / Eight Village, Pal Tujuh Village, Pal Seratus Village, Bandung Marga Village, Dataran Tapus Village; Curup North Sub district has 5 villages, namely Tabarenah Village, Heroes Village, Suka Datang Village, Lubuk



Kembang Village, Batupanco Village; Curup Subdistrict has 2 villages / villages, namely Talang Benih Village, Dwi Tunggal Village; Curup Selatan District has 3 villages, namely Punguk Lalang Village, Lubuk Ubar Village, Watas Marga Village; Kepahiang Regency; There are 2 villages in Merigi District, namely Lubuk Penyamun Village, Bukit Barisan Village and Ujan Mas Sub-District. There are 2 villages, namely Burnisari and Pekalongan Villages. So the impact is important.

**c. The intensity and duration of the impact takes place**

Land acquisition activities have been carried out since 2011, but until now all have not been completed. Thus the impact of activities will have an impact as long as the pre-construction activities take place and can continue to the next stage, so that the impact is important.

**d. The number of other environmental components that will be affected**

Other living components that will be affected are estimated to be the emergence of negative attitudes and perceptions of the community. So the impact is important.

**e. Cumulative nature of impact**

The impact on the disruption of people's livelihoods can be cumulative as long as the development activities take place, if the compensation process is still not finished, so the impact is important.

**f. Reversibility or irreversibility of the impact**

Impacts on livelihoods can be reversed if farmers obtain other jobs that are suitable for their expertise or obtain other land that is cultivated. So the impact is not important.

Based on the description of the criteria for this important impact, the impact of all land acquisition and vegetation activities in the pre-construction stage on the disruption of community livelihoods is categorized as an **important negative impact**.



### 3.1.2. The emergence of public attitudes and negative perceptions

#### A) Land Acquisition and Plants

##### 1) Estimated Impact Magnitude

Land, plant and building liberation and compensation activities will be carried out by the initiator, namely PT PLN (Persero) in accordance with the agreement with residents or landowners. Land acquisition for the construction of 131 150 kV transmission network towers Hululais-Pekalongan PLTP and related substations along  $\pm 46,337$  km with an area of  $\pm 3,6125$  hectares (= 36,125 m<sup>2</sup>); the area for GIs covering an area of 20,000 m<sup>2</sup> is within the PLTP area, which will be provided by the PLTP management, which will cover land owned by the community. Land and plant / plant acquisition will be carried out by the proponent in accordance with the agreement with the landowners based on consensus agreement.

During the period of socio-economic and cultural survey which was conducted to the community, the land acquisition activities were still ongoing. Even in the some villages, there were still no further confirmation as indicated in the following table.

Table 3. 2 Stages of Project Activities that Have Been Running in the Study Area

No	Districts	Sub-District	Village	Stages Of Project Activities
1	Kepahiang	Ujan Mas	Bumisari	Collection of land and house data due to the project
2		Merigi	Lubuk Penyamun	There is no activity and further information from the initiator
3	Rejang Lebong	Curup Selatan	Pungguk Lalang	There is no activity and further information from the initiator
4		Curup	Dwi Tunggal	Land survey permits from initiators have just entered the village
5		Curup Utara	Batupanco	Collection of land and house data due to the project
6		Bermani Ulu Raya	Dataran Tapus	Collection of land and house data due to the project
7			Tebat Tenong Luar	Collection of land and house data due to the project
8	Lebong	Rimbo Pengadang	Rimbo Pengadang	Collection of land and house data due to the project
9		Lebong Selatan	Sukasari	Collection of land and house data due to the project
10				

Source: In-depth interviews with village government representatives in the study area, 2018



If this is allowed to drag on, it is feared that negative attitudes and perceptions arise regarding the process of land acquisition and vegetation such as the antipathy of the community due to the length of the land acquisition process and the worry / anxiety that will lose the arable land.

During the field survey and interviews with the community, the concern of residents whose land was affected by the planned activity was a concern that the location of the business would be disrupted (17.6%) and agricultural land would decrease (2.9%). Thus, if this unrest is not managed by simultaneous socialization, it will further shape the negative attitudes and perceptions of the community.

## **2) Determination of Important Impacts**

To determine the important nature of the impact of the emergence of negative attitudes and perceptions of the community can be seen from the impact criteria as follows:

### **a. The amount of population that will be affected**

The number of affected people is the people who work as owner farmers and cultivators whose land is used as tower sites and the general population who live on the project site plan, which is spread in 3 Districts, 8 Districts, and 30 Villages namely Lebong Regency; There are 3 villages in South Lebong Sub-District, namely Taba Anyar Village, Mangkoharjo Village, Sukasari Village, There are 4 sub-districts/ villages in Rimbo Pengadang, namely Talang Ratau Village, Rimbo Pengadang Village, Kuto Tik Village, Air Dingin Village (Bioa Sengok). Rejang Lebong District; Bermani Ulu Raya District, there are 9 villages, namely Babakan Baru Village, Bangun Jaya Village, Air Bening Village, Tebat Tenong Luar Village, Pal VIII / Eight Village, Pal Tujuh Village, Pal Seratus Village, Bandung Marga Village, Dataran Tapus Village; Curup North Sub district has 5 villages, namely Tabarenah Village, Heroes Village, Suka Datang Village, Lubuk Kembang Village, Batupanco Village; Curup Subdistrict has 2 villages / villages, namely Talang Benih Village, Dwi Tunggal Village; Curup Selatan District has 3 villages, namely Punguk Lalang Village, Lubuk Ubar Village, Watas Marga Village; Kepahiang Regency; There are 2 villages in Merigi District, namely Lubuk Penyamun Village, Bukit Barisan Village and Ujan Mas Sub-District. There are 2 villages, namely Burnisari and Pekalongan Villages. So the impact is important.

**b. Area of spread of impact**

The area of impact distribution is estimated to cover the surrounding area which is used as a tower site. Includes 3 districts, 8 sub-districts, and 30 villages namely Kabuten Lebong; There are 3 villages in Lebong Selatan District, namely Taba Anyar Village, Mangkoharjo Village, Sukasari Village, Rimbo Pengadang Subdistrict. There are 4 villages, namely Talang Ratau Village, Rimbo Pengadang Village, Tik Kuto Village, Air Dingin Village (Bioa Sengok). Rejang Lebong Regency; Bermani Ulu Raya District, there are 9 villages, namely Babakan Baru Village, Bangun Jaya Village, Air Bening Village, Tebat Tenong Luar Village, Pal VIII / Eight Village, Pal Tujuh Village, Pal Seratus Village, Bandung Marga Village, Dataran Tapus Village ; Curup Utara District has 5 villages, namely Tabarenah Village, Heroes Village, Suka Datang Village, Lubuk Kembang Village, Batupanco Village; Curup Subdistrict has 2 villages / villages, namely Talang Benih Village, Dwi Tunggal Village; Curup Selatan District has 3 villages, namely Punguk Lalang Village, Lubuk Ubar Village, Watas Marga Village; Kepahiang Regency; There are 2 villages in Merigi District, namely Lubuk Penyamun Village, Bukit Barisan Village and Ujan Mas Sub-District. There are 2 villages, namely Burnisari and Pekalongan Villages. So the impact is important.

**c. The intensity and duration of the impact takes place**

Land acquisition activities have been carried out since 2011, but until now all have not been completed. Thus the impact of the activities will have an impact during the pre-construction activities and can continue to the next stage, so that the impact is important.

**d. The number of other environmental components that will be affected**

Other living components that will be affected are estimated to be the emergence of social conflict. So the impact is important.

**e. Cumulative nature of impact**

The impact on negative attitudes and perceptions can be cumulative as long as development activities take place, if the compensation process is still not finished, so the impact is important.



## f. Reversibility or irreversibility of the impact

Impacts on livelihoods can be reversed if the compensation provided is in accordance with a collective agreement. So the impact is not important.

Based on the description of the criteria for important impacts, the impact of all land acquisition and vegetation activities in the pre-construction stage on the emergence of negative attitudes and perceptions of the community is categorized as an **important negative impact**.

### 3.1.3. Potential for Social Conflict

#### A) Land Acquisition and Plants

##### 1) Estimated Impact Magnitude

Land, plant and building liberation and compensation activities will be carried out by the initiator, namely PT PLN (Persero) in accordance with the agreement with residents or landowners. Land acquisition for the construction of 138 150 kV transmission network towers Hululais-Pekalongan PLTP and related substations along  $\pm 46,337$  km with an area of  $\pm 3,6125$  hectares (= 36,125 m<sup>2</sup>); the area for GIs covering an area of 20,000 m<sup>2</sup> within the PLTP area will be provided by the PLTP management, which will cover land owned by the community. Land and plant / plant acquisition will be carried out by the proponent in accordance with the agreement with the landowners based on consensus agreement.

During the socio-cultural survey to the community, a series of land acquisition activities are still ongoing even there are still some villages that have no further confirmation as presented in the information in the following table.

Table 3. 3 Stages of Project Activities that Have Been Running in the Study Area

No	Districts	Sub-District	Village	Stage Of Project Activities
1	Kepahiang	Ujan Mas	Bumisari	Land and house data collection due to the project
2		Merigi	Lubuk Penyamun	There has been no activity and further information from the initiator
3	Rejang Lebong	Curup Selatan	Pungguk Lalang	There has been no activity and further information from the initiator
4		Curup	Dwi Tunggal	The land survey permit from the initiator just



No	Districts	Sub-District	Village	Stage Of Project Activities
				entered the village
5		Curup Utara	Batupanco	Land and house data collection due to the project
6		Bermani Ulu Raya	Dataran Tapus	Land and house data collection due to the project
7			Tebat Tenong Luar	Land and house data collection due to the project
8	Lebong	Rimbo Pengadang	Rimbo Pengadang	Land and house data collection due to the project
9		Lebong Selatan	Sukasari	Land and house data collection due to the project
10				

Source: In-depth interviews with village government representatives in the study area, 2018

If this is allowed to drag on, it is feared that negative attitudes and perceptions arise regarding the process of land acquisition and vegetation such as the antipathy of the community due to the length of the process of land acquisition and worry / anxiety will lose the arable land. The continued impact of negative public attitudes and perceptions if allowed to drag on food will potentially lead to social conflict, both between the community and land acquisition officers, as well as between the community itself if there is an average disparity in compensation.

Based on the results of the field survey and interviews with the community regarding the potential conflicts around the residence, information was obtained that the conditions of harmony among residents were reflected in the absence of disputes between residents (76.5% of respondents). However, as many as 8.8% of respondents said that sometimes disputes occurred and 14.7% of respondents said that there were frequent disputes between residents in the study area. The occurrence of such disputes is caused by land grabs and related work issues both involving fellow native citizens or involving between indigenous people and migrants. If associated with land and plant acquisition activities for the construction of 131 150 kV transmission network towers, Hululais-Pekalongan PLTP and related substations along  $\pm 46,337$  km with an area of  $\pm 3,6125$  hectares (= 36,125 m<sup>2</sup>), the estimated percentage of conflict will increase if the process of land and vegetation is not carried out with existing agreements and SOP.

## 2) Determination of Important Impacts

To determine the important nature of the impact of the emergence of potential social conflicts the community can be seen from the impact criteria as follows:





**a. The amount of population that will be affected**

The number of affected people is the people who work as owner farmers and cultivators whose land is used as tower sites, spread over 3 regencies, 8 sub-districts and 30 villages. So the impact is important.

**b. Area of spread of impact**

The estimated area of impact distribution covers the area around the tower site. Includes 3 districts, 8 sub-districts, and 30 villages namely Kabuten Lebong; There are 3 villages in Lebong Selatan District, namely Taba Anyar Village, Mangkoharjo Village, Sukasari Village, Rimbo Pengadang Subdistrict. There are 4 villages, namely Talang Ratau Village, Rimbo Pengadang Village, Tik Kuto Village, Air Dingin Village (Bioa Sengok). Rejang Lebong Regency; Bermani Ulu Raya District, there are 9 villages, namely Babakan Baru Village, Bangun Jaya Village, Air Bening Village, Tebat Tenong Luar Village, Pal VIII / Eight Village, Pal Tujuh Village, Pal Seratus Village, Bandung Marga Village, Dataran Tapus Village ,; Curup Utara District has 5 villages, namely Tabarenah Village, Heroes Village, Suka Datang Village, Lubuk Kembang Village, Batupanco Village; Curup Subdistrict has 2 villages / villages, namely Talang Benih Village, Dwi Tunggal Village; Curup Selatan District has 3 villages, namely Punguk Lalang Village, Lubuk Ubar Village, Watas Marga Village; Kepahiang Regency; There are 2 villages in Merigi District, namely Lubuk Penyamun Village, Bukit Barisan Village and Ujan Mas Sub-District. There are 2 villages, namely Burnisari and Pekalongan Villages. So the impact is important..

**c. The intensity and duration of the impact takes place**

Land acquisition activities have been carried out since 2011, but until now all have not been completed. Thus the impact of the activities will have an impact during the pre-construction activities and can continue to the next stage, so that the impact is important.

**d. The number of other environmental components that will be affected**

Other living components that will be affected are estimated to be the emergence of negative attitudes and perceptions of the community. So the impact is important.



### e. Cumulative nature of impact

The impact on negative attitudes and perceptions can be cumulative as long as development activities take place, if the compensation process is still not finished, so the impact is important.

### f. Reversibility or irreversibility of the impact

The impact on community social conflict can be reversed if the compensation given is in accordance with the collective agreement. So the impact is not important.

Based on the description of the criteria for important impacts, the impact of all land acquisition and vegetation activities in the pre-construction stage on the emergence of negative attitudes and perceptions of the community is categorized as an **important negative impact**.

## 3.2. Construction Phase

### 3.2.1. Livelihood

#### A) Labor Procurement

##### 1) Estimated Impact Magnitude

The number of workforce plans needed in the construction of the 150 kV SUTT Hululais-Pekalongan PLTP and the main substation at the construction stage amounts to  $\pm 207$  people including :

- Coarse / implementing staff = 108 people
- Middle power = 48 people
- Expert = 46 people
- The leadership element = 5 people

Tabulation of the amount of labor requirements planned for carrying out this activity in the following table.



Table 3. 4 Composition of workforce plans needed

No.	Description	Total (Person)	Education	% Origin *)	
				Local	Non Local
1	Site Manager/Team Leader	5	S1 Engineering	1	4
2	Expert / Trained staff	36	STM until S1 Engineering	10	26
3	Measurer	16	STM until D3 Engineering	5	11
4	Overseer / Supervisor	7	STM / equivalent	4	3
5	Operator / Driver	25	STM / equivalent	20	5
6	Carpenters, blacksmiths, masons	28	--	22	6
7	Daily labor	90	--	70	20
	<b>Total</b>	<b>207</b>		<b>132</b>	<b>75</b>
	<b>Percentage</b>			<b>63,77</b>	<b>36,23</b>

Note: \*) = Local is labor originating from the Bengkulu Province

Source: PT PLN (Persero) Sumatra Power Plant Development Unit.

The receipt and reduction of labor is carried out in stages in accordance with the volume and type of work. In the construction phase, it will affect the change in the livelihoods of the residents around the location of the activity, which is to become temporary / incidental daily / implementing personnel.

Based on the presentation of the table above, information can be obtained that the local population can be employed at the construction stage with a maximum number of 132 people (63.77% of the total construction workforce needs) with minimum vocational education requirements. So that the impact of this activity will provide a broad distribution outside the study area.

In line with employment opportunities as a construction workforce, the community hopes that job opportunities will be opened up. This is as obtained from the survey results, that the community's expectation of this project is for the initiators to prioritize the local community to work (30.9%). In line with the community's advice on the project that absorbs local labor (40.4%). Given the high expectations and suggestions of the community regarding employment opportunities for the local population, then the activities of labor presuppositions must really be fulfilled.



## 2) Determination of Important Impacts

To determine the important nature of the impact of labor procurement activities, employment opportunities can be seen from the impact criteria as follows:

### a. The amount of population that will be affected

The number of people who will be affected is 132 people who will be recruited as local labor, because employment is currently difficult to obtain so that the smallest opportunities can be utilized by the community so that the impact is important.

### b. Area of spread of impact

Labor procurement activities have the potential to involve labor from the villages around the project, therefore it is estimated that the impact is important.

### c. The intensity and duration of the impact takes place

The impact will be temporary, namely during construction with a small intensity, but will continue to the operation stage if it is not managed properly. Therefore the impact is important.

### d. The number of other environmental components that will be affected

Other environmental components affected are the emergence of attitudes and perceptions of the community, so the impact is important.

### e. Cumulative nature of impact

Impacts are cumulative with other activities during the construction phase, so they are important.

### f. Reversibility or irreversibility of the impact

The impact on the parameters of employment opportunities can be reversed, if construction activities have been completed because the workforce will be terminated. Therefore, it is important.

Based on the description of the criteria for this important impact, the impact of labor procurement activities on the openness of the surrounding community livelihoods is categorized as an **important positive impact**.



### **3.2.2. Community attitudes and perceptions**

**A) Procurement of Labor; B) Mobilization and Demobilization of Heavy Equipment and Construction Materials; C) Cleaning of Tower Tread and Free Space; D) Construction of foundations and towers; E) Construction of substations**

#### **1) Estimated Impact Magnitude**

The large number of local (local) laborers working on the project will lead to positive attitudes and perceptions of the community towards the project. Such conditions are based on the results of public consultations, namely the expectations of the community so much about the project that they can work. In addition, this is also reinforced by the results of the survey, that the community's expectation of the project is for the initiators to prioritize the local community to work (30.9%). In line with the community's advice, the project can absorb local workers (40.4%). Given the high expectations and suggestions of the community regarding employment opportunities for the local population, then the activities of labor presuppositions must really be fulfilled. If not, positive attitudes and perceptions of the community can turn negative. This negative perception attitude will also arise from residents who are not involved in project activities.

In addition to the procurement of labor, other activities in the construction phase are also predicted to lead to negative attitudes and perceptions of the community. Among other activities are mobilization and demobilization of heavy equipment and construction materials, cleaning of tower sites and free space, construction of foundations and towers, and construction of substations. The emergence of negative attitudes and perceptions of the community is a derivative impact of the physical effects of chemicals that occur around the project site, such as increasing dust, decreasing water quality, and noise arising from a series of construction activities.

This is in line with community concerns / complaints about the project. The community is worried that the project will damage the road (2.9%), the land that is not freed is feared to be damaged due to the process of mobilizing construction materials (2.9%), worried that there will be interference when mobilizing building materials (5.9%).

#### **2) Determination of Important Impacts**

To determine the important nature of the impact of the emergence of negative attitudes and perceptions of the community can be seen from the impact criteria as follows:



**a. The amount of population that will be affected**

The number of people affected are people living in the project site plan spread over 3 District, 8 sub-districts and 30 villages. So the impact is important.

**b. Area of spread of impact**

The estimated area of impact distribution covers the area around the tower site. Includes 3 districts, 8 sub-districts, and 30 villages namely Kabuten Lebong; There are 3 villages in Lebong Selatan District, namely Taba Anyar Village, Mangkoharjo Village, Sukasari Village, Rimbo Pengadang Subdistrict. There are 4 villages, namely Talang Ratau Village, Rimbo Pengadang Village, Tik Kuto Village, Air Dingin Village (Bioa Sengok). Rejang Lebong Regency; Bermani Ulu Raya District, there are 9 villages, namely Babakan Baru Village, Bangun Jaya Village, Air Bening Village, Tebat Tenong Luar Village, Pal VIII / Eight Village, Pal Tujuh Village, Pal Seratus Village, Bandung Marga Village, Dataran Tapus Village; Curup Utara District has 5 villages, namely Tabarenah Village, Heroes Village, Suka Datang Village, Lubuk Kembang Village, Batupanco Village; Curup Subdistrict has 2 villages / villages, namely Talang Benih Village, Dwi Tunggal Village; Curup Selatan District has 3 villages, namely Punguk Lalang Village, Lubuk Ubar Village, Watas Marga Village; Kepahiang Regency; There are 2 villages in Merigi District, namely Lubuk Penyamun Village, Bukit Barisan Village and Ujan Mas Sub-District. There are 2 villages, namely Burnisari and Pekalongan Villages. So the impact is important.

**c. The intensity and duration of the impact takes place**

The impact will be temporary, namely during construction but with relatively low intensity. Therefore the impact is not important.

**d. The number of other environmental components that will be affected**

Other environmental components that are affected are social conflict, the impact is important.

**e. Cumulative nature of impact**

Impacts are cumulative, so they are important.



#### **f. Reversibility or irreversibility of the impact**

The impact will be reversed, because the impact of construction activities on community attitudes and perceptions can be reversed if socialization of activities continues and continues with the provision of feed backs that are proactive to the reactions of the majority that arise such as the involvement of local communities and others. Therefore, its nature is not important.

Based on the description of the criteria for this important impact, the impact of all activities at the construction stage on the emergence of negative attitudes and perceptions of the community is categorized as an **important negative impact**.

### **3.2.3. Social conflict**

#### **A) Cleaning of Tower Tread and Free Space**

##### **1) Estimated Impact Magnitude**

The intended cleaning of the tower / tower site and free space is to clean the location of the tower site from plants and other disturbances before the foundation building work begins. This activity includes land clearing, land leveling and soil compaction for the preparation of tower foundation construction. In this activity, trees / trees were cut down on the tower site and stands that entered the ROW (right of way) along the SUTT 150 kV construction line of the Hululais-Pekalongan PLTP. It also includes making temporary / emergency roads for the purpose of smooth transportation of materials and equipment to the work location.

The activity of cleaning the tower / tower site and free space is predicted to cause potential social conflict in the community. The emergence of social conflict is a derivative impact of the impact on the disruption of people's livelihoods and unrest that is not managed properly. In addition, this social conflict is also a derivative impact of the physical effects of chemicals that occur around the project site, such as increasing dust, decreasing water quality, and noise arising from a series of construction activities.

Based on the results of field surveys and interviews with the community regarding the potential for conflict around the residence, information was obtained that the conditions of harmony among residents were reflected in the absence of disputes between residents



(76.5% of respondents). However, as many as 8.8% of respondents said that sometimes disputes occurred and 14.7% of respondents said that there were frequent disputes between residents in the study area. The occurrence of such disputes is caused by land grabbing and related work problems whether involving fellow native citizens or involving between indigenous people and migrants. If it is associated with the existence of towers and free space cleaning activities, it is estimated that the percentage of conflicts will increase if the process of cleaning the tower and free space is not carried out with existing agreements and SOPs.

## **2) Determination of Important Impacts**

To determine the important nature of the impact of the emergence of community social conflict can be seen from the impact criteria as follows :

### **a. The amount of population that will be affected**

The number of affected people is the people who work as owner farmers and cultivators whose land is used as tower sites, spread over 3 regencies, 8 sub-districts and 30 villages. So the impact is important.

### **b. Area of spread of impact**

The estimated area of impact distribution covers the area around the tower site. Includes 3 districts, 8 sub-districts, and 30 villages namely Kabuten Lebong; There are 3 villages in Lebong Selatan District, namely Taba Anyar Village, Mangkoharjo Village, Sukasari Village, Rimbo Pengadang Subdistrict. There are 4 villages, namely Talang Ratau Village, Rimbo Pengadang Village, Tik Kuto Village, Air Dingin Village (Bioa Sengok). Rejang Lebong Regency; Bermani Ulu Raya District, there are 9 villages, namely Babakan Baru Village, Bangun Jaya Village, Air Bening Village, Tebat Tenong Luar Village, Pal VIII / Eight Village, Pal Tujuh Village, Pal Seratus Village, Bandung Marga Village, Dataran Tapus Village; Curup Utara District has 5 villages, namely Tabarenah Village, Heroes Village, Suka Datang Village, Lubuk Kembang Village, Batupanco Village; Curup Subdistrict has 2 villages / villages, namely Talang Benih Village, Dwi Tunggal Village; Curup Selatan District has 3 villages, namely Punguk Lalang Village, Lubuk Ubar Village, Watas Marga Village; Kepahiang Regency; There are 2 villages in Merigi District, namely Lubuk Penyamun Village, Bukit Barisan Village and Ujan Mas Sub-District. There are 2 villages, namely Burnisari and Pekalongan Villages. So the impact is important.





**c. The intensity and duration of the impact takes place**

The impact will be temporary, namely during construction but with relatively low intensity. Therefore the impact is not important.

**d. The number of other environmental components that will be affected**

There are no other environmental components affected, so the impact is not important.

**e. Cumulative nature of impact**

Impacts are cumulative, so they are important.

**f. Reversibility or irreversibility of the impact**

The impact will be reversed, because the impact of construction activities on social conflict can be reversed if the socialization of activities continues and continues with the provision of feed backs that are proactive to the reactions of the majority that arise such as the involvement of local communities and others. Therefore, its nature is not important.

Based on the description of the criteria for this important impact, the impact of tower site cleaning and free space activities on the construction phase on the emergence of social conflict in the community is categorized as an **important negative impact**.

### **3.2.4 Decreasing Air Quality**

#### **A) Mobilization of Heavy Equipment and Construction Materials**

##### **1) Estimated Impact Magnitude**

Mobilization of heavy equipment and construction materials will cause an increase in local dust. This is due to the use of vehicles and heavy equipment to transport equipment and materials for construction.

##### **Distribution of Dust Particles**

Dust will spread and cause disruption to the activities of surrounding communities, especially during the dry season. Another impact of derivatives is the potential for Acute Respiratory Infections (ARI) due to inhaled dust and entering the respiratory system. To estimate how far the distribution of dust particles, fluid-particle dynamics equations are used from Stoke's Law.

The speed of particles falling to the surface of the soil is determined by the equation:



$$V = g\rho_p(d_p)^2/18\mu_a$$

information:

$$d_p = \text{diameter of dust particles} = 40 \mu\text{m}$$

$$g = \text{gravitational acceleration} = 9,8 \text{ m/det}^2$$

$$\rho_p = \text{density of dust particles} = 144,14 \text{ lb/ft}^3$$

$$\mu_a = \text{air viscosity} = 0,0000121 \text{ lb/ft-det}$$

Using the data and formula above, the particle velocity falling is 0.3665 ft / sec. The time needed for particles to fall with a height difference from the ground is 2 meters (6.56 ft) (This value is assumed to calculate the height of exhaust fumes from vehicles into the air) is:

$$t = (\text{the height of the particle falls}) : (\text{the speed of particles falling})$$

$$= 6,56 \text{ ft} : 0,3665 \text{ ft/sec}$$

$$= 17,9 \text{ sec}$$

Then, horizontal distance is falling particles:

$$S = (\text{the length of time particles fall}) \times (\text{wind velocity})$$

$$= 17,9 \text{ sec} \times 1,05 \text{ m/sec}$$

$$= 18,8 \text{ m}$$

The results of these calculations show that a radius of 18.8 m from the source of heavy equipment mobilization activities and construction materials will be exposed to dust. Calculations to estimate the radius of distribution of dust come from one source (i.e. vehicle) and do not take into account other sources. Dust distribution is the radius of the vehicle until the vehicle passes the road during the mobilization process, so that the distribution will take place along the road.

To predict dust resuspension caused by the movement of heavy equipment in the work area, the equation of the AP42 (The U.S. Environmental Protection Agency (EPA) compilation of air pollution emission factors, volume 1, 5th edition is used :

$$e_u = 5,9 (s/12) (S/30) (W/7)^{0,7} (w/4)^{0,5} (d/365)$$

information :  $e_u$  = jumlah debu per panjang area (lb/mile)

$$s = \text{silt content (\%)}$$

$$S = \text{vehicle speed (mile / hour)}$$



- $W$  = vehicle weight (tons)  
 $w$  = number of vehicle wheels  
 $d$  = the number of days does not rain in one year

If silt content is known to be 6%, the speed of the machine at maneuver is 10 km / h (6.21 miles / hour), the machine weight is 30 tons, the number of wheels is 4 pieces, the number of 1 year rainy days is 187.4 days, so the speed of the spread of dust that will be lifted into the air as a result of the movement of the wheels of the vehicle through the air is:

$$\begin{aligned}
 e_u &= 5,9 (6/12) (6,21/30) (30/7)^{0,7} (4/4)^{0,5} (177,6/365) \\
 &= 0,82 \text{ lb/mile} \approx 0,51 \text{ lb/km}
 \end{aligned}$$

If the width of the work area of the machine is 100 m and the stirring height (dust puff) is 2 m, then the concentration of the distribution of dust from the prepared land is:

$$\begin{aligned}
 C &= e_u / (\text{width} \times \text{height work area dust}) \\
 &= (0,51 \times 0,4536 \times 10^9) / (100 \times 2 \times 1.000) \\
 &= 1.159,03 \text{ } \mu\text{g/m}^3
 \end{aligned}$$

Based on the calculations above, it shows that the concentration of dust in the ambient air when the machine is operating for mobilization and demobilization of heavy equipment and construction materials reaches 1,159.03  $\mu\text{g/m}^3$ . While the concentration of dust at the location of the current residential area (baseline) reached 90.94  $\mu\text{g/m}^3$ , resulting in an increase of about 1.8 times. And when compared with the standards in accordance with Government Regulation Number 41 of 1999, the TSP quality standard is 230  $\mu\text{g/m}^3$ , the TSP value of this activity is higher than the standard. This high concentration is expected to be reduced during the transportation process which is carried out in turn every one truck. But it is still important because there are people who have passed the mobilization of tools and materials, especially residents in the village of Dataran Tapus, Pal Delapan, and Bangun Jaya.

## 2) Determination of Important Impacts

To determine the important nature of the impact of a decrease in air quality can be seen from the impact criteria as follows:



**a. The amount of population that will be affected**

The number of people affected by the spread of dust particles is the population within an 18.8 m radius from the road, especially the settlements passed by vehicles, especially residents in the villages of Dataran Tapus, Pal Delapan, Bangun Jaya dan, and Taba Anyar Village for GI locations the impact is important.

**b. Area of spread of impact**

The distribution area of the impact covers a radius of about 18.8 m from the location of construction activities, especially in settlements that are close to the entry access that is passed by the vehicle, so the impact is important.

**c. The intensity and duration of the impact takes place**

Low impact intensity and takes place only when mobilization of heavy equipment and construction materials is carried out, so that the impact is not important.

**d. Many other components of life will stay**

Other environmental components affected are health problems (ARI) due to exposure to dust in concentrations exceeding the quality standard (230 ug / m<sup>3</sup>) which is sucked in by residents near access to activities located at the location where the vehicle passes at a radius of 18.8 m. The impact on ISPA is predicted to be not permanent because the incubation period of ARI is generally around 2-4 years depending on the receptor health conditions and the quantity of dust sucked, while the duration of exposure is only (temporary), so the impact is considered to be non-essential.

**e. Cumulative nature of impact**

Changes in environmental quality that occur are temporary, will not accumulate because it will stop when the activity stops. Thus the impact is considered insignificant.

**f. Reversibility or irreversibility of the impact**

The impact is reversed because the exposure time is relatively short, the impact occurs when the activity takes place, so the impact is not important.

Based on these considerations, the impact of heavy equipment and material mobilization activities on air quality degradation, especially dust, is considered an **important negative impact**.



### 3.2.5. Increased Noise Intensity

#### A. Mobilization and Demobilization of Heavy Equipment and Construction Materials

##### 1) Estimated Impact Magnitude

The impact caused by the mobilization and demobilization of heavy equipment and construction materials on the increase in noise was sourced from the vehicles used, namely materials transported by trucks in the amount of 1-2 trucks / day. Sources of noise caused by these vehicles include intermittent types. To predict the pattern of noise distribution from vehicles traveling on the path of mobilization and demobilization of heavy equipment and construction materials to the surrounding environment, it is assisted through the following mathematical calculations.

##### Moving source

$$I_t = I_o + 10 \log(N_i/v_i \cdot T) + 10 \log(15/d)^{1,5} - 13$$

information:  $I_t$  = Noise intensity at the receiving location (receptor)

$I_o$  = Noise intensity at the source

$N_i$  = The number of vehicles passing simultaneously

$v_i$  = Speed of a passing vehicle

$T$  = The length of exposure

$d$  = Distance of noise source to receiver (receptor).

Figures 15, 1.5, 13 are correction factors (constant)

The approach taken is that the sound emitted by the vehicle is taken at an average of 90 dBA at the source (estimated high intensity for mobilization activities causes high noise, and estimated noise values for vehicles from trucks based on literature and similar activities), average vehicle speed is 40 km/hr, while the initial baseline noise level around the study area is 45, 80 - 51.08 dBA, the forecast of noise distribution during heavy equipment mobilization and demobilization activities and construction material is shown in the following table.

Table 3. 5 Results of Calculation of Noise Distribution sourced from Vehicles Mobilization and Demobilization of Heavy Equipment and Construction Materials

Radius (m)	Kebisingan	
	Kontribusi Kendaraan (dBA)	Total Kebisingan (dBA)
10	70.61	70.67
25	64.64	64.88
50	60.13	60.77
75	57.48	58.61
100	55.61	57.24
125	54.16	56.29
150	52.97	55.60
175	51.96	55.08
200	51.10	54.68
225	50.33	54.36
250	49.64	54.10
500	45.13	52.96

Source: Calculation Results, 2017

Description: Noise quality standards based on KEPMENLH No. KEP-48 / MENLH / 11/1996, 70 dBA Road Allocation, 55 dBA Settlements

Based on the table above, the results of vehicle contribution calculations use the noise intensity formula for moving sources, while the total noise is the sum of background noise of 45, 80 - 51.08 dBA, and noise from vehicles measured from the point of activity to the point receptors based on noise addition rules. It appears in the table, that the radius of the distribution of noise receptors, especially residents, will occur within a radius of 175 m from the sound source, while after the 175 meter radius has met the standards, but with passing vehicle project activities, the sound will be felt when the vehicle passes through the settlement.

## 2) Determination of Important Impacts

To determine the important properties of the impact of increased noise can be seen from the impact criteria as follows:

### a. The amount of population that will be affected

The number of people affected by the distribution of noise is the population within a 175 m radius of road location used for mobilization and demobilization of heavy equipment and construction materials, especially residents near the access area,



activities that are passed by vehicles, especially residents in Dataran Tapus Village, Pal Eight, and Bangun Jaya, so the impact is important.

**b. Area of spread of impact**

The distribution area of the impact covers a radius of about 175 m from the road that the vehicle passes in settlements, especially residents in the villages of Dataran Tapus, Pal Delapan, Bangun Jaya, and Talang Donok Village so that the impact is important.

**c. The intensity and duration of the impact takes place**

The intensity of the impact is quite low, taking place only when the mobilization of heavy equipment and construction materials is carried out with an intensity of 1 -2 rhy / day, so that the impact is important.

**d. The number of other environmental components that will be affected**

Komponen lingkungan hidup lain yang terkena dampak adalah timbulnya sikap dan persepsi masyarakat menjadi negatif akibat kenyamanan penduduk terganggu, sehingga dampaknya dianggap bersifat penting.

**e. Cumulative nature of impact**

Impact will not accumulate because the noise that arises is temporary. Therefore the impact is considered to be non-essential.

**f. Reversibility or irreversibility of the impact**

The impact will be reversed because the impact is not permanent, so the impact is not important.

Based on the description of the criteria for important impacts, the impact of the mobilization and demobilization of heavy equipment and construction materials on noise increases is categorized as an **important negative impact**.

### **3.2.6. Traffic Safety Disorders**

#### **A. Mobilization and Demobilization of heavy equipment and construction materials**

##### **1) Estimated Impact Magnitude**

The mobilization and demobilization activities of construction tools and materials will have an impact on traffic in the form of disruption to traffic safety. The number of heavy equipment to be transported is not too large, but the condition of the road to the location of



the activity is a village road that is relatively not too crowded and is relatively narrow to be passed by vehicles carrying tools and materials for. Transportation will be carried out by car truck and pickup according to the quality of the road and the location that allows for transportation by vehicle.

Transportation of equipment and materials is carried out during the construction period of about 1-2 years using the state-province-district-sub-district and village road. Transport by vehicle can be done with a relay tailored to the ability and type of road that must be passed.

To find out the impact of traffic, the calculation of the degree of saturation (DS) is calculated or the ratio between the volume and the capacity of the existing road, by comparing the conditions at the time of the study with predictions of increasing vehicle volume during the construction phase (Table).

Predictions on the increase in traffic flow volume were carried out at two location points on the road to be traversed on equipment transportation and SUTT and GI materials, namely the Curup-Tes and Tes-Taba Anyar sections, with results presented in Table.

Based on the table, there will be an increase in DS on the two road sections when construction is carried out for one year, namely on the Curup-Tes and Tes-Taba sections, respectively. traffic during construction is still far below the existing road capacity around the project site.

Table 3. 6 Traffic impact estimates based on road capacity values (C) and the degree of traffic saturation (DS)

No.	Uraian	number of towers (pieces)	Weight (tons)	number of rit @ 6 tons	Amount of rit per day (300 and 150 days)	number of vehicles / 12 hours	Vehicle / hour
<i>I</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>
<b>A.</b>	<b>Jln Curup-Tes (Ds Dataran tapus)</b>						
1	-Material SUTT + GI (truck 7 ton)	103	30191	5032	16,77	33,54	2,795
2	-Minibus (operating manager)	-	-	-	-	2	0,167
3	-Pickup (transport assistance)	-	-	-	-	4	0,333
	<b>Total</b>						<b>3,30</b>
<b>B.</b>	<b>Jln Tes-Taba Anyar (Kel. Tes)</b>						
1	-Material SUTT + GI (truck 7 tons)	39	4622	769	5,12	10,25	0,854
2	-Minibus (operating manager)	-	-	-	-	2	0,167
3	-Pickup (transport assistance)	-	-	-	-	4	0,333
	<b>Total</b>						<b>1,35</b>





## Advanced

No.	Uraian	EMP (*)	Vol. the rise of traffic	Current Vol	Total	Capacit y	DS (***)		Increas e the DS
							with the proj ect	Curre ntly	
1	2	9	10-13			14	15	16	
<b>A.</b>	<b>Jln Curup-Tes (Ds Dataran tapus)</b>								
1	-Material SUTT + GI (truck 7 ton)	1,3	<b>3,63</b>	-	-	-	-	-	-
2	-Minibus (operating manager)	1,0	0,17	-	-	-	-	-	-
3	-Pickup (transport assistance)	1,0	0,33						
	<b>Total</b>		<b>4,13</b>	<b>161</b>	<b>165,13</b>	<b>2593,5</b>	<b>0,06 37</b>	<b>0,062</b>	<b>0,0017</b>
<b>B.</b>	<b>Jln Tes-Taba Anyar (Kel. Tes)</b>								
1	-Material SUTT + GI (truck 7 tons)	1,3	<b>1,11</b>	-	-	-	-	-	-
2	-Minibus (operating manager)	1,0	0,17	-	-	-	-	-	-
3	-Pickup (transport assistance)	1,0	0,33						
	<b>Total</b>		<b>1,61</b>	<b>151</b>	<b>152,61</b>	<b>2454,3</b>	<b>0,06 22</b>	<b>0,062</b>	<b>0,0002</b>

Source : 2012 field observation, and data processing based on MKJI (1997).

Information :

\*) = EMP : Equivalent of Passenger Cars, namely: constants to equalize the overall use of space jenis kendaraan.

\*\*) = SMP / hour: Passenger Car Unit, i.e.: unit produced from the process of equating space usage.

\*\*\*) = Degree of Saturation/DS = Degree of saturation or also called V/C Ratio.

While on both roads, namely: Curup-Tes and Tes-Taba Anyar at this time based on data collection carried out still has a relatively small DS value, both of them are 0.062 or 6.2%, with an average traffic flow volume sequential average of 161 and 151 SMP / hour (passenger car units per hour) or 260 and 244 vehicles / hour.

Congestion is predicted to occur when the transport vehicle passes the access road intersection of the relatively busy GI location, so it is feared that there will be a disruption to traffic safety.

## 2) Determination of Important Impacts

To determine the important nature of the impact of disruption of traffic safety can be seen from the impact criteria as follows:

### a. The amount of population that will be affected

The number of people affected is the population who are in the access road to the construction site of the tower, will pass Jalan Curup until Jalan Tes, then Road Test to



Taba Anyar. Access to the tower construction site passes through Dataran Tapus Village, Pal Delapan, Bangun Jaya, and Talang Donok Village so that the impact is important.

**b. Area of spread of impact**

The distribution of the impact of the disruption of traffic safety includes the Curup road to Jalan Tes (Dataran Tapus Village), then Jalan Tes to Taba Anyar is mainly crossed, before the entrance to the construction site, and Jalan Tes access to the substation so that the impact is important.

**c. The intensity and duration of the impact takes place**

The intensity for tower construction is small because the number of rites at peak time is 17 rhy/day, the activity period is relatively long, which is around 150-300, so the impact is important.

**d. The number of other environmental components that will be affected**

Disruption of traffic safety will also have an impact on the emergence of negative attitudes and perceptions of the community due to disturbed comfort. Therefore the impact is important.

**e. Cumulative nature of impact**

The impact does not accumulate because it takes place in a relatively increasing time, which is  $\pm 1$  year, so that the impact is not important.

**f. Reversibility or irreversibility of the impact**

The impact will be reversed because the impact is not permanent and will stop when the activity is completed, so the impact is not important.

Based on the description of the criteria for important impacts, the impact of the mobilization of heavy equipment and materials on the disruption of traffic safety is categorized as an **important negative impact**.



### 3.2.7. Road Damage Occurred

#### A. Mobilization and Demobilization of heavy equipment and construction materials

##### 1) Estimated Impact Magnitude

The mobilization and demobilization activities of construction tools and materials will have an impact on traffic that causes damage to the road. The number of heavy equipment to be transported is too large, but the road to the location of village activities is relatively not too dense and relatively dense for vehicles carrying equipment and materials, and is not intended for heavy vehicles, especially sub-district and village roads. which requires condensation of broken asphalt or even a dirt road. The Curup-Test and Taba Anyar sections will affect volume b traffic for one year when this activity is carried out at 4.13 and 1.61 SMP / hour, respectively.

Based on the road conditions and current road capacity, especially on the roads above, there is a relatively small increase in traffic generation due to this activity, however, because the road is relatively narrow and the direction of departure / work is the ramp, it is quite potential to cause traffic accidents and furthermore, it can also be damage to the road.

Road damage can occur in sub-district and village road locations, some of which are still in the form of land, because this road will be traversed by trucks or pickups transporting materials and equipment. A small vehicle will be used in transporting equipment and materials to the location point where the truck car cannot enter again, and then by motorbike transportation, carts or on the shoulders, up to the location of the tower site.

Roads and paths can be used for transportation equipment for equipment and tower materials, using existing roads and paths and with the help of the local community as a signpost. But in general this transmission line is not far from the location of the highway so it is estimated that the location of the existing tower sites is still affordable in transportation, so that potential damage to the road or the area near the road can be minimized.

Road damage is also expected to occur when the vehicle transporting the fuel material enters the GI construction access road which is a road access to the garden by the community.



## 2) Determination of Important Impacts

To determine the important properties of the impact of road damage can be seen from the impact criteria as follows:

### a. The amount of population that will be affected

The number of people affected is the population who are in the access road to the construction site of the tower, will pass Jalan Curup to Jalan Tes (Desa Dataran Tapus) and then Test to Taba Anyar. Access to the tower construction site passes through Dataran Tapus Village, Pal Delapan, Bangun Jaya, and Talang Donok Village so that the impact is important.

### b. Area of spread of impact

The distribution of the impact of the disruption of traffic safety includes the Curup road to Jalan Tes (Dataran Tapus Village), then Jalan Tes to Taba Anyar is mainly crossed, before the entrance to the construction site, and Jalan Tes access to the substation so that the impact is important.

### c. The intensity and duration of the impact takes place

The intensity for tower construction is small because the number of rites at peak time is 17 rhy / day, the activity period is relatively long, which is around 150-300, so the impact is important.

### d. The number of other environmental components that will be affected

Disruption of traffic safety will also have an impact on the emergence of negative attitudes and perceptions of the community because of their disturbed comfort. Therefore the impact is important.

### e. Cumulative nature of impact

The impact does not accumulate because it takes place in a relatively short time, which is 3 months, so the impact is not important.

### f. Reversibility or irreversibility of the impact

The impact will be reversed because the impact is not permanent and will stop when the activity is completed, so the impact is not important.



Based on the description of the criteria for this important impact, the impact of the mobilization of heavy equipment and materials on the occurrence of damage is categorized as an **important negative impact**.

### **3.3. Operation Phase**

#### **3.3.1. Livelihood**

##### **A) Maintenance of Transmission Lines and Substations**

###### **1) Estimated Impact Magnitude**

Maintenance of transmission line transmission is closely related to the continuity of electricity distribution. This activity is carried out regularly, including tower maintenance, transmission cables (including equipment) and ROW. Maintenance activities along the SUTT line are also in the form of logging of stands / trees that will enter the ROW, cleaning around the tower site and repairs due to technical and non-technical disturbances. With the abundance of paddy fields or dry land entering the free space, it is predicted that the maintenance activities of the transmission lines and substations will disrupt the activities of the population, especially residents who work as rice farmers / gardeners.

###### **2) Determination of Important Characteristics of the Impacts**

###### **a. Number of Affected Inhabitants**

The number of people affected is the population who work as owner farmers and cultivators whose land is made into tower site, Includes 3 districts, 8 sub-districts, and 30 villages namely Kabuten Lebong; There are 3 villages in Lebong Selatan District, namely Taba Anyar Village, Mangkoharjo Village, Sukasari Village, Rimbo Pengadang Subdistrict. There are 4 villages, namely Talang Ratau Village, Rimbo Pengadang Village, Tik Kuto Village, Air Dingin Village (Bioa Sengok). Rejang Lebong Regency; Bermani Ulu Raya District, there are 9 villages, namely Babakan Baru Village, Bangun Jaya Village, Air Bening Village, Tebat Tenong Luar Village, Pal VIII / Eight Village, Pal Tujuh Village, Pal Seratus Village, Bandung Marga Village, Dataran Tapus Village; Curup Utara District has 5 villages, namely Tabarenah Village, Heroes Village, Suka Datang Village, Lubuk Kembang Village, Batupanco Village; Curup Subdistrict has 2 villages / villages, namely Talang Benih



Village, Dwi Tunggal Village; Curup Selatan District has 3 villages, namely Punguk Lalang Village, Lubuk Ubar Village, Watas Marga Village; Kepahiang Regency; There are 2 villages in Merigi District, namely Lubuk Penyamun Village, Bukit Barisan Village and Ujan Mas Sub-District. There are 2 villages, namely Burnisari and Pekalongan Villages. So the impact is important.

**b. Area of spread of impact**

The area of impact distribution is estimated to cover the surrounding area which is used as a tower site. Includes 3 Regencies, 8 Subdistricts, and 30 Villages namely Lebong Regency; There are 3 villages in Lebong Selatan District, namely Taba Anyar Village, Mangkoharjo Village, Sukasari Village, Rimbo Pengadang Subdistrict. There are 4 villages / villages, namely Talang Ratau Village, Rimbo Pengadang Village, Tik Kuto Village, Cold Water Village (Bioa Sengok). Rejang Lebong Regency; Bermani Ulu Raya District, there are 9 villages, namely Babakan Baru Village, Bangun Jaya Village, Air Bening Village, Tebat Tenong Luar Village, Pal VIII / Delapan Village, Pal Tujuh Village, Pal Seratus Village, Bandung Marga Village, Dataran Tapus Village; Curup Utara District has 5 villages, namely Tabarenah Village, Heroes Village, Suka Datang Village, Lubuk Kembang Village, Batupanco Village; Curup Subdistrict has 2 villages / villages, namely Talang Benih Village, Dwi Tunggal Village; Curup Selatan District has 3 villages, namely Punguk Lalang Village, Lubuk Ubar Village, Watas Marga Village; Kepahiang Regency; There are 2 villages in Merigi District, namely Lubuk Penyamun Village, Bukit Barisan Village and Ujan Mas Sub-District. There are 2 villages, namely Burnisari and Pekalongan Villages. So the impact is important.

**c. The intensity and duration of the impact takes place**

Impact will take place during the operation of transmission networks with relatively high intensity, therefore the impact is important.

**d. The number of other environmental components that will be affected**

The other environmental components affected are non-existent, so the impact is not important.

**e. Cumulative nature of impact**

Impacts are cumulative, so they are important.



#### **f. Reversibility or irreversibility of the impact**

The impact is difficult to turn around for a long time during the operation of the transmission network, so the impact is not important.

Based on the description of the criteria for this important impact, the impact of the maintenance activities of the transmission and substation lines at the operational stage on the disruption of people's livelihoods is categorized as an **important negative impact**.

### **3.3.2. Decreasing Land Asset Value**

#### **A) Electricity distribution and operation of substations.**

##### **1) Estimated Impact Magnitude**

The source of the impact on the decline in land assets is the distribution of electricity along the transmission network. As a result of the transmission network, the land under it will not be able to be planted with annual crops such as timber which have a height exceeding the provisions because there are special restrictions in accordance with the Minister of Mining and Energy Regulation 975.K / 47 / MPE / 1999, namely a free space along the transmission line. with a width of 17 m to the right and 17 m to the left of the vertical axis of the tower which is the ROW (Right of Way) of the transmission network, as well as the height of the building and plants from the maximum ground surface of 9 m. Under the regulation there will be changes in land use that must adjust to these provisions, which causes limited use of land under the electricity network, so that the sale value of the land will be much cheaper than before the transmission network.

##### **2) Determination of Important Impacts**

To determine the important nature of the impact of decreasing the value of land assets can be seen from the impact criteria as follows:

###### **a. The amount of population that will be affected**

The number of affected people is the people who work as owner farmers and cultivators whose land is used as tower sites, which are spread in Lebong District; There are 3 villages in Lebong Selatan District, namely Taba Anyar Village, Mangkoharjo Village, Sukasari Village, Rimbo Pengadang Subdistrict. There are 4 villages, namely Talang Ratau Village, Rimbo Pengadang Village, Tik Kuto Village,



Air Dingin Village (Bioa Sengok). Rejang Lebong Regency; Bermani Ulu Raya District, there are 9 villages, namely Babakan Baru Village, Bangun Jaya Village, Air Bening Village, Tebat Tenong Luar Village, Pal VIII / Eight Village, Pal Tujuh Village, Pal Seratus Village, Bandung Marga Village, Dataran Tapus Village; Curup Utara District has 5 villages, namely Tabarenah Village, Heroes Village, Suka Datang Village, Lubuk Kembang Village, Batupanco Village; Curup Subdistrict has 2 villages / villages, namely Talang Benih Village, Dwi Tunggal Village; Curup Selatan District has 3 villages, namely Punguk Lalang Village, Lubuk Ubar Village, Watas Marga Village; Kepahiang Regency; There are 2 villages in Merigi District, namely Lubuk Penyamun Village, Bukit Barisan Village and Ujan Mas Sub-District. There are 2 villages, namely Burnisari and Pekalongan Villages. So the impact is important.

**b. Area of spread of impact**

The estimated area of impact distribution covers the area around the tower site. Includes 3 districts, 8 sub-districts, and 30 villages namely Kabuten Lebong; There are 3 villages in Lebong Selatan District, namely Taba Anyar Village, Mangkoharjo Village, Sukasari Village, Rimbo Pengadang Subdistrict. There are 4 villages, namely Talang Ratau Village, Rimbo Pengadang Village, Tik Kuto Village, Air Dingin Village (Bioa Sengok). Rejang Lebong Regency; Bermani Ulu Raya District, there are 9 villages, namely Babakan Baru Village, Bangun Jaya Village, Air Bening Village, Tebat Tenong Luar Village, Pal VIII / Eight Village, Pal Tujuh Village, Pal Seratus Village, Bandung Marga Village, Dataran Tapus Village; Curup Utara District has 5 villages, namely Tabarenah Village, Heroes Village, Suka Datang Village, Lubuk Kembang Village, Batupanco Village; Curup Subdistrict has 2 villages / villages, namely Talang Benih Village, Dwi Tunggal Village; Curup Selatan District has 3 villages, namely Punguk Lalang Village, Lubuk Ubar Village, Watas Marga Village; Kepahiang Regency; There are 2 villages in Merigi District, namely Lubuk Penyamun Village, Bukit Barisan Village and Ujan Mas Sub-District. There are 2 villages, namely Burnisari and Pekalongan Villages. So the impact is important.

**c. The intensity and duration of the impact takes place**

The impact lasts for more than 40 years, because of that the impact is important.





**d. The number of other environmental components that will be affected**

Other environmental components that are affected are the emergence of negative public perceptions due to fears of decreasing the value of land assets, so that the impact is important.

**e. Cumulative nature of impact**

The impact will accumulate because it will continue throughout the operation of the transmission network, so that the impact is important.

**f. Reversibility or irreversibility of the impact**

The impact is difficult to turn around, because the decline in land assets lasts for a long time but during the operation of the transmission network for a long time so the impact is important.

Based on the description of the criteria for this important impact, the impact of the activities of electricity distribution and the operation of the substation to decrease the value of land assets is categorized as an **important negative impact**.

### **3.3.3. The Emergence of Public Attitudes and Negative Perceptions**

#### **A) Electricity Distribution and Operation of Substation; B) Maintenance of Transmission Lines and Substations**

##### **1) Estimated Impact Magnitude**

The activity of electricity distribution and operation of substations and maintenance of transmission has the potential to cause public unrest which is a derivative impact of increased noise, the presence of electric and magnetic fields and a decrease in the value of land assets which are important impacts. The impact will take place during the operation of the transmission and substation network, if not managed it will make changes in the attitude of public perception to be negative towards the project.

##### **2) Determination of Important Impacts**

To determine the important nature of the impact of the emergence of negative attitudes and perceptions of the community can be seen from the impact criteria as follows:



**a. The amount of population that will be affected**

The number of affected people is the population who work as owner farmers and cultivators whose land is used as tower sites and the general public who live around the tower site, Includes 3 districts, 8 sub-districts, and 30 villages namely Kabuten Lebong; There are 3 villages in Lebong Selatan District, namely Taba Anyar Village, Mangkoharjo Village, Sukasari Village, Rimbo Pengadang Subdistrict. There are 4 villages, namely Talang Ratau Village, Rimbo Pengadang Village, Tik Kuto Village, Air Dingin Village (Bioa Sengok). Rejang Lebong Regency; Bermani Ulu Raya District, there are 9 villages, namely Babakan Baru Village, Bangun Jaya Village, Air Bening Village, Tebat Tenong Luar Village, Pal VIII / Eight Village, Pal Tujuh Village, Pal Seratus Village, Bandung Marga Village, Dataran Tapus Village; Curup Utara District has 5 villages, namely Tabarenah Village, Heroes Village, Suka Datang Village, Lubuk Kembang Village, Batupanco Village; Curup Subdistrict has 2 villages / villages, namely Talang Benih Village, Dwi Tunggal Village; Curup Selatan District has 3 villages, namely Punguk Lalang Village, Lubuk Ubar Village, Watas Marga Village; Kepahiang Regency; There are 2 villages in Merigi District, namely Lubuk Penyamun Village, Bukit Barisan Village and Ujan Mas Sub-District. There are 2 villages, namely Burnisari and Pekalongan Villages. So the impact is important.

**b. Area of spread of impact**

The estimated area of impact distribution covers the area around the tower site. Includes 3 districts, 8 sub-districts, and 30 villages namely Kabuten Lebong; There are 3 villages in Lebong Selatan District, namely Taba Anyar Village, Mangkoharjo Village, Sukasari Village, Rimbo Pengadang Subdistrict. There are 4 villages, namely Talang Ratau Village, Rimbo Pengadang Village, Tik Kuto Village, Air Dingin Village (Bioa Sengok). Rejang Lebong Regency; Bermani Ulu Raya District, there are 9 villages, namely Babakan Baru Village, Bangun Jaya Village, Air Bening Village, Tebat Tenong Luar Village, Pal VIII / Eight Village, Pal Tujuh Village, Pal Seratus Village, Bandung Marga Village, Dataran Tapus Village; Curup Utara District has 5 villages, namely Tabarenah Village, Heroes Village, Suka Datang Village, Lubuk Kembang Village, Batupanco Village; Curup Subdistrict has 2 villages / villages, namely Talang Benih Village, Dwi Tunggal Village; Curup Selatan District has 3 villages, namely Punguk Lalang Village, Lubuk Ubar Village, Watas Marga Village; Kepahiang Regency; There are 2 villages in Merigi District, namely



Lubuk Penyamun Village, Bukit Barisan Village and Ujan Mas Sub-District. There are 2 villages, namely Burnisari and Pekalongan Villages. So the impact is important.

**c. The intensity and duration of the impact takes place**

Impact will take place during the operation of transmission networks with relatively high intensity, therefore the impact is important.

**d. The number of other environmental components that will be affected**

The other environmental components affected are non-existent, so the impact is not important.

**e. Cumulative nature of impact**

Impacts are cumulative, so they are important.

**f. Reversibility or irreversibility of the impact**

The impact is difficult to turn around for a long time during the operation of the transmission network, so the impact is not important.

Based on the description of the criteria for important impacts, the impact of all activities at the operational stage on the emergence of negative attitudes and perceptions of the community is categorized as an **important negative impact**.

### **3.3.4. Social conflict**

#### **A) Electricity Distribution and Operation of Substation**

##### **1) Estimated Impact Magnitude**

As a result of the transmission network, the land under it will not be able to be planted with annual crops such as timber which have a height exceeding the provisions because there are special restrictions in accordance with the Minister of Mining and Energy Regulation 975.K / 47 / MPE / 1999, namely a free space along the transmission line. with a width of 17 m to the right and 17 m to the left of the vertical axis of the tower which is the ROW (Right of Way) of the transmission network, as well as the height of the building and plants from the maximum ground surface of 9 m. Under the regulation there will be changes in land use that must adjust to these provisions, which causes limited use of land under the



electricity network, so that the sale value of the land will be much cheaper than before the transmission network.

Based on the results of the field survey and interviews with the community regarding the potential conflicts around the residence, information was obtained that the conditions of harmony among residents were reflected in the absence of disputes between residents (76.5% of respondents). However, as many as 8.8% of respondents said that sometimes disputes occurred and 14.7% of respondents said that there were frequent disputes between residents in the study area. The occurrence of such disputes is caused by land grabs and related work issues both involving fellow native citizens or involving between indigenous people and migrants. If it is associated with the existence of electricity distribution activities and the operation of substations, it is estimated that the percentage of disputes / conflicts will increase if the impact on people's negative attitudes and perceptions is not managed well.

## **2) Determination of Important Impacts**

### **a. The amount of population that will be affected**

The number of affected people is the population who work as owner farmers and cultivators whose land is used as tower sites, spread over 3 regencies, 8 sub-districts and 30 villages namely Lebong Regency; There are 3 villages in Lebong Selatan District, namely Taba Anyar Village, Mangkoharjo Village, Sukasari Village, Rimbo Pengadang Subdistrict, there are 4 villages / villages, namely Talang Ratau Village, Rimbo Pengadang Village, Kuto Tik Village, air dingin Village (Bioa Sengok). Rejang Lebong Regency; Bermani Ulu Raya District, there are 9 villages, namely Babakan Baru Village, Bangun Jaya Village, Air Bening Village, Tebat Tenong Luar Village, Pal VIII / Delapan Village, Pal Tujuh Village, Pal Seratus Village, Bandung Marga Village, Dataran Tapus Village,; Curup Utara District has 5 villages, namely Tabarenah Village, Pahlawan Village, Suka Datang Village, Lubuk Kembang Village, Batupanco Village; Curup Subdistrict has 2 villages / villages, namely Talang Benih Village, Dwi Tunggal Village; Curup Selatan District has 3 villages, namely Punguk Lalang Village, Lubuk Ubar Village, Watas Marga Village; Kepahiang Regency; There are 2 villages in Merigi District, namely Lubuk Penyamun Village, Bukit Barisan Village and Ujan Mas Sub-District. There are 2 villages, namely Burnisari and Pekalongan Villages. So the impact is important.

**b. Area of spread of impact**

The estimated area of impact distribution covers the area around the tower site. Includes 3 Regencies, 8 Subdistricts and 30 Villages namely Lebong Regency; There are 3 villages in Lebong Selatan District, namely Taba Anyar Village, Mangkoharjo Village, Sukasari Village, Rimbo Pengadang Subdistrict. There are 4 villages / villages, namely Talang Ratau Village, Rimbo Pengadang Village, Tik Kuto Village, air dingin Village (Biao Sengok). Rejang Lebong Regency; Bermani Ulu Raya District, there are 9 villages, namely Babakan Baru Village, Bangun Jaya Village, Air Bening Village, Tebat Tenong Luar Village, Pal VIII / Eight Village, Pal Tujuh Village, Pal Seratus Village, Bandung Marga Village, Dataran Tapus Village ; Curup Utara District has 5 villages, namely Tabarenah Village, Pahlawan Village, Suka Datang Village, Lubuk Kembang Village, Batupanco Village; Curup Subdistrict has 2 villages, namely Talang Benih Village, Dwi Tunggal Village; Curup Selatan District has 3 villages, namely Punguk Lalang Village, Lubuk Ubar Village, Watas Marga Village; Kepahiang Regency; There are 2 villages in Merigi District, namely Lubuk Penyamun Village, Bukit Barisan Village and Ujan Mas Sub-District. There are 2 villages, namely Burnisari and Pekalongan Villages. So the impact is important.

**c. The intensity and duration of the impact takes place**

Impact will take place during the operation of transmission networks with relatively high intensity, therefore the impact is important.

**d. The number of other environmental components that will be affected**

The other environmental components affected are non-existent, so the impact is not important.

**e. Cumulative nature of impact**

Impacts are cumulative, so they are important.

**f. Reversibility or irreversibility of the impact**

The impact is difficult to turn around for a long time during the operation of the transmission network, so the impact is not important.

Based on the description of the criteria for this important impact, the impact of the activities of electricity distribution and the operation of the substation at the operational



stage towards the emergence of potential social conflicts are categorized as **significant negative impacts**.

### 3.3.5. Increased Noise Intensity

#### 1) Estimated Impact Magnitude

Electricity distribution in the GI transmission and operation network will cause noise levels to increase in the environment. Based on several incidents that when high humidity occurs, a buzzing sound occurs along the transmission line and its surroundings. The voice can reach the nearest settlement, namely the closest settlement to the tower location.

To predict noise distribution patterns from operating activities in the surrounding environment, this is supported through mathematical calculations as follows:

- i. Sound source of equipment used = 50 dBA
- ii. Noise environmental tone = 45, 80 - 51.08 dBA
- iii. Noise distribution does not experience obstacles
- iv. Area of noise distribution in the form of flat land

Modeling noise distribution using formulas :

$$LP2 = LP1 - 20 \log \frac{r2}{r1}$$

information: LP1 = Noise level at distance r1 (dBA)

LP2 = Noise level at distance r2 (dBA)

r1 = Distance measurement from noisy source = 1 meter

r2 = Distance measurement from noise source (meter)

Distance of the noise receiver is calculated from the distance of the location of the activity as the distance of the noise source. Based on these assumptions, the results of noise modeling in the accumulated environment are shown in the following table.



Table 3. 7 Results of Calculation of Noise Distribution in the Neighborhood Around the Activity Location

Radius (meter)	Noise (dBA)	
	Sound Source	Total Noise
5	66,02	66,20
25	52,04	55,12
50	46,02	53,12
60	44,44	52,85
70	43,10	52,69
80	41,94	52,57
90	40,92	52,49
100	40,00	52,44
150	36,48	52,30
200	33,98	52,25
250	32,04	52,22
500	26,02	52,19

Source: Calculation Results, 2016

Ket: Noise quality standards based on KEPMENLH No. KEP-48 /  
MENLH / 11/1996, Settlement Environment 55 dBA

Based on the table above, the results of vehicle contribution calculations use noise intensity formula for sound sources, while total noise is the sum of background noise of 45, 80 - 51.08 dBA, and noise from sound sources measured from the location of the activity to receptor point based on noise addition rules. The table shows that the radius of the distribution of noise receptors, especially residents, will occur within a radius of 25 m from the sound source, while after a 25 meter radius it meets the standard. The impact occurs when there is wind so that it makes a humming sound. The location closest to the settlement is  $\pm 100$  m so that there is no impact on the residential area.

## 2) Penentuan Sifat Penting Dampak

To determine the important properties of the impact of increased noise can be seen from the impact criteria as follows:

### a. The amount of population that will be affected

there were no affected people because the closest population distance was  $\pm 100$  m farther than the distribution area of the impact, so the impact was of an insignificant nature.

**b. Area of spread of impact**

The distribution of impacts covers a radius of about 25 m from the location of the activity, and the closest settlement is at a distance of  $\pm 100$  m from the location of the activity, so that the impact is not important.

**c. The intensity and duration of the impact takes place**

Each facility is designed with a total noise level less than the bakumutu value. Therefore, the impact is not significant.

**d. The number of other environmental components that will be affected**

Other environmental components that are affected are the emergence of negative perceptions of the community due to the disturbed comfort of the population in a high enough intensity, but because the distance of the settlement is far from the distribution of impacts so that the impact is not important.

**e. Cumulative nature of impact**

The impact will accumulate because it will continue continuously during the operation of the transmission network, but because the distance of the settlement is far from the distribution area of the impact so that the impact is not important.

**f. Reversibility or irreversibility of the impact**

The impact is difficult to turn around, because exposure lasts for a long time but because the distance of the settlement is far from the distribution of impacts so the impact is not important.

Based on the description of the criteria for this important impact, the impact of the activities of electricity distribution and the operation of the substation to increase noise are categorized as **negative impacts not important**.

**3.3.6. The emergence of magnetic fields and electric fields****1) Estimated Impact Magnitude**

The trial of high voltage electric power distribution on the transmission network that has been built will cause the generation of electric fields and magnetic fields around the transmission network. Electric fields and magnetic fields will be safe for human life if they





are fulfilled the provisions of minimum load and free space according to SNI 04 6918-2002; SNI 04 6950-2003; IRPA, 1990, and Regulation of the Minister of Energy and Mineral Resources No. 27 of 2018.

Electric fields and magnetic fields have existed since our earth was formed. Clouds containing water potential, there is an electric field between 3000 - 30,000 V / m. Likewise the earth naturally has electricity (100 - 500 V / m) and has magnetic fields (0.004 - 0.007 mT). In the house, at work, in the office or in the workshop there is an electric field and an artificial magnetic field. These electric fields and magnetic fields usually come from installations and electrical equipment, among others, from: installation systems in homes, refrigerators, air conditioners, fans, water pumps, televisions, electronic typewriters, photocopying machines, computers and printers, welding machines, compressors, low / medium voltage airways (SUTR / M), etc., etc. In a voltage and current installation system an electric field always arises. But this electric field has weakened because the distance is quite far from the source. Therefore, in the SUTT 150 kV the Hululais-Pekalongan PLTP in this study will certainly cause an electric and magnetic field that is still far below the safe threshold allowed.

The exposure of the magnetic field and electric field if it lasts relatively long, it will affect the health of the community. There is no transmission network that passes through settlements, but the transmission network will pass through the activities of the population, especially farmers who operate under the transmission network.

## 2) Determination of Important Impacts

To determine the important nature of the impact of the emergence of electric fields and magnetic fields can be seen from the impact criteria as follows:

**a. The amount of population that will be affected** There are no affected settlements because the closest distance of the population is  $\pm 100$  m further than the distribution area of the impact, but the activity of farmers in the garden will be expected to expose the magnetic field and electric field so that the impact is important.

### **b. Area of spread of impact**

The distribution area of the impact includes the free space radius along the transmission line with a width of 17 m to the right and 17 m to the left of the tower's vertical axis which is the ROW (Right of Way) of the transmission network, which is



46,337 km. At the radius there are no settlements, the closest settlement is at a distance of  $\pm 100$  m from the location of the activity. However, under the transmission network there are farmer activities in the form of gardens, mostly rice fields, mixed gardens and coffee gardens, so that the impact is important.

**c. The intensity and duration of the impact takes place**

The impact will last for more than 40 years, the activity time is not a full day. Therefore, the impact is not important.

**d. The number of other environmental components that will be affected**

Other environmental components that are affected are the emergence of negative public perceptions due to concerns about the existence of magnetic fields and electric fields, so that the impact is important.

**e. Cumulative nature of impact**

The impact will accumulate because it will continue continuously during the operation of the transmission network, but because the distance of the settlement is far from the broad distribution of the intensity of the activities of the farmers under the relatively low transmission network with the activity time not a full day so the impact is not important.

**f. Reversibility or irreversibility of the impact**

The impact is difficult to turn around, because the exposure lasts for a long time but because the distance of settlements is far from the broad distribution of the intensity of the activities of farmers who are under a relatively low transmission network with activities not a full day so the impact is not important.

Based on the description of the criteria for this important impact, the impact of the activities of electricity distribution and the operation of substations on the magnetic field and electric field are categorized as negative **impacts are not important**.



Table 3. 8 Evaluation Matrix for Potential Impacts of Activity Plans on Environmental Components

TYPE OF ACTIVITY  COMPONENT ENVIRONMENT	TRUCK PRACTICES				CONSTRUCTION					OPERATION	
	Permit Management	Land and Path Survey	Dissemination of Activity Plans	Land Acquisition and Plants	Labor Procurement	Mobilization and Demobilization Heavy Equipment and Construction Materials	Cleaning of Tread Tower and Free Space	Foundation and Construction Tower	Construction of substations	Electricity Distribution and Operation of the Substation	Transmisi Line Maintenance and Substation
	1	2	3	4	5	6	7	8	9	10	11
<b>A. FISIK-KIMA</b>											
1. Air Quality						DPH	DTPH	DTPH	DPH		
2. Noise						DTPH	DTPH	DTPH	DTPH	DPH	
3. Water Quality							DPH	DPH	DPH		
4. Land Use							DPH			DPH	
5. Magnetic Field and Medan Electricity										DTPH	
6. Traffic											
a. Smooth Traffic						DTPH					
b. Road Damage						DTPH					
<b>B. BIOLOGY</b>											
7. Flora (Vegetasi)							DTPH				
8. Fauna							DTPH				
9. Water Biota							DPH	DPH	DPH		
<b>C. SOCIAL ECONOMIC CULTURE</b>											
10. Livelihood				DPH	DPH						DPH
11. Decreasing Land Assets										DPH	
12. Attitudes and Perceptions Society	DTPH	DTPH	DTPH	DPH	DPH	DPH	DPH	DPH	DPH	DPH	DPH
13. Social Conflict				DPH	DPH		DPH			DPH	
<b>D. PUBLIC HEALTH</b>											
14. Environmental Health										-	-
15. Morbidity Figures										-	-

Description: DPH: Important Hypothetic Impact, DTPH: Hypothetic Not Important Impact

**CHAPTER IV  
HOLISTIC EVALUATION  
ON ENVIRONMENTAL IMPACT**

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## CHAPTER IV

# HOLISTIC EVALUATION ON ENVIRONMENTAL IMPACT

Plans for Construction of a 150kV transmission network from the Hululais - Pekalongan PLTP and related substations by PT. PLN (Persero) The Parent Unit for the Construction of the Sumatra Plant is expected to have an important impact on the environment. Important impacts caused by project activities at each stage, namely the pre-construction, construction, operation and post-operation stages if not managed properly will cause disruption to the physical-chemical, and socio-economic components of the community.

Important impact studies are intended to test important hypothetical impacts that have been more comprehensively identified by considering the relationship between impacts and other impacts. Environmental components that become receptors for changes and environmental impacts can basically be units of interrelated entities, mutual influence, and form one unit of impact.

### 4.1. Review of Predicted Environmental Impacts

Every impact classified as Important Hypothetic Impact (DPH) described in the Chapter of Important Impact Prediction was previously used as further evaluation material. The various DPHs discussed in the evaluation even though they are not important because they will consider the space and time of the impact from the start of the stage, the operation of construction and post-operation. The impact is described based on the highest number of DPH in Table 4.1 and the number of impact lines shown in Figure 4.1



Tabel 4. 1 Evaluation Matriks for Potential Impacts of Activity Plans on Environmental Components

TYPE OF ACTIVITY  COMPONENT ENVIRONMENT	PRE CONSTRUCTION				CONSTRUCTION					OPERATION	
	Permit Management	Land and Path Survey	Ssocialization of the Activity Plan	Land Acquisition and Plants	Labor Procurement	Mobilization and Demobilization Heavy Equipment and Construction Materials	Cleaning of Tower Tread and Free Space	Construction of Foundations and Towers	Construction of Substations	Electricity Distribution and Operation of Substation	Maintenance of Transmission Lines and Substations
	1	2	3	4	5	6	7	8	9	10	11
<b>A. PHYSICAL-CHEMISTRY</b>											
1. Air quality						DPH	DTPH	DTPH	DPH		
2. Noise						DTPH	DTPH	DTPH	DTPH	DPH	
3. Water quality							DPH	DPH	DPH		
4. Land Use							DPH			DPH	
5. Magnetic Field and Electric Field										DTPH	
6. Traffic											
a. Smooth Traffic						DTPH					
b. Road Damage						DTPH					
<b>B. BIOLOGY</b>											
7. Flora (Vegetation)							DTPH				
8. Fauna							DTPH				
9. Aquatic biota							DPH	DPH	DPH		
<b>C. SOCIAL ECONOMIC CULTURE</b>											
10. Livelihood				DPH	DPH						DPH
11. Decreasing Land Assets										DPH	
12. Community attitudes and perceptions	DTPH	DTPH	DTPH	DPH	DPH	DPH	DPH	DPH	DPH	DPH	DPH
13. Social Conflict				DPH	DPH		DPH			DPH	
<b>D. PUBLIC HEALTH</b>											
14. Environmental Health											
15. Morbidity Figures											

Description: DPH: Important Hypothetic Impact, DTPH: Hypothetic Not Important Impact

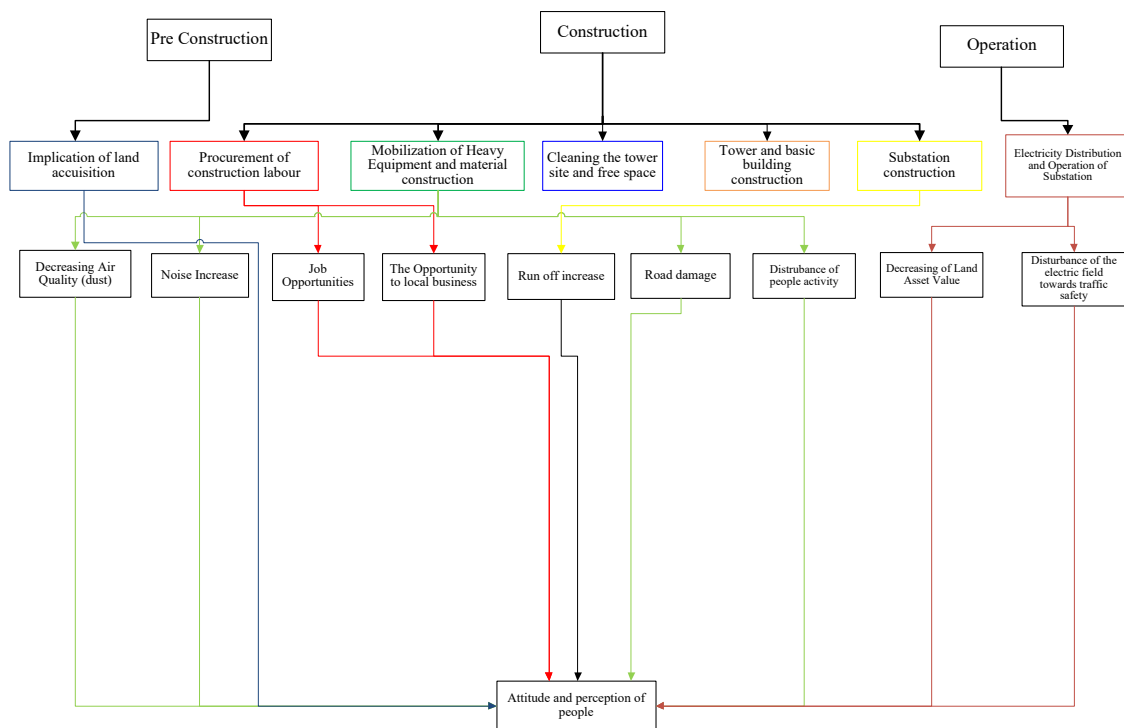


Figure 4. 1 Important Impact Evaluation



#### 4.1.1. Impacts that Occur in the Same Space and Time

Based on Table 4.1 Figure 4.1 above, it can be seen that the number of impacts that occur in the space (location) and the same time are 5 important impacts (DP) that occur during the construction phase because there are activities that cause impacts simultaneously, however, in the operation phase there are also impacts that can accumulate. These impacts consist of primary impacts and secondary impacts which lead to the emergence of negative attitudes and perceptions of the community. These various impacts are:

- 1) Decreasing air quality for dust is a primary impact arising from mobilization and demobilization of construction tools and materials during the construction phase which will have a derivative impact on the emergence of negative attitudes and perceptions.
- 2) Increased noise intensity is the primary impact arising from the mobilization and demobilization of construction tools and materials during the construction phase which will cause derivative impacts on and the emergence of negative attitudes and perceptions of the community.
- 3) Decrease in water quality is the primary impact arising from the construction of substations in the construction phase which can cause further impacts on the emergence of negative attitudes and perceptions of the community.
- 4) The emergence of magnetic fields and electric fields is the primary impact arising from the commissioning (testing) of electric current that can cause further impacts on the emergence of negative attitudes and perceptions of the community.
- 5) Disruptions to land traffic safety are the main impacts arising from mobilizing and demobilizing construction tools and materials which will cause derivative impacts on the emergence of negative attitudes and perceptions of the community.
- 6) The occurrence of road damage is the primary impact arising from the activities of mobilizing and demobilizing construction tools and materials which will cause a derivative impact on the emergence of negative attitudes and perceptions of the community.
- 7) The existence of Job Opportunities is the primary impact of labor procurement activities and activities that will cause derivative impacts on the emergence of positive attitudes and perceptions of the community.



- 8) The existence of business opportunities is the primary impact of labor procurement activities and activities that will cause derivative impacts on the emergence of positive attitudes and perceptions of the community.
- 9) The emergence of negative and positive attitudes and perceptions of the community is the estuary of almost all the impacts arising from the pre-construction, construction and operation stages.

#### **4.1.2. The Most Impactful Components of Activities**

The most influential component of activity is mobilization and demobilization of construction tools and materials, impacts which consist of impacts on decreasing air quality, increased noise, disruption to traffic safety, road damage and negative attitudes and perceptions of the community. The impacts caused are primary impacts and secondary impacts.

- 1) Decreasing air quality for dust as a primary impact will have a derivative impact on the emergence of negative attitudes and perceptions of the community.
- 2) Increased noise intensity as a primary impact will have a derivative effect on the emergence of negative attitudes and perceptions of the community.
- 3) The existence of traffic disturbances in the primary impact will cause a derivative impact on the emergence of negative attitudes and perceptions of the community.
- 4) The occurrence of damage to the road is a primary impact will cause a derivative impact on the emergence of negative attitudes and perceptions of the community.
- 5) The emergence of attitudes and negative perceptions of the community is a derivative impact of all the effects of the impacts.

#### **4.1.3. Areas that need attention**

Areas that need important attention are the tool and material transportation lane that passes through settlements because the area is the location of the impact source and the area directly affected by the impact.

## **4.2. Direction for Management of Environmental Impacts**

Based on the results of the study, it can be seen that the planned construction of a 150kV transmission network from the Hululais - Pekalongan PLTP and related substations by PT



PLN (Persero), the Main Unit for the Construction of Sumatra Power Plants will have an impact on the environment. The impacts that will occur are quite significant, especially the impact on the physical - chemical components due to a decrease in air quality, increased noise, lowering water quality, social, economic and cultural components, so that the primary impact must be properly considered and managed wisely so that impacts negatives of these activities can be minimized or addressed.

Impacts that may arise from the planned construction of a 150kV transmission network from the Hululais - Pekalongan PLTP and related substations by the PT PLN (Persero) Sumatra Power Plant Development Unit include the impact of activities in the construction and operation stages. In the construction phase the impact is temporary, while the impact of the operation phase is long-term.

#### **4.2.1. Pre-Construction Phase**

In the pre-construction stage, the impact will consist of tertiary impacts. Tertiary impacts caused are attitudes and perceptions of the community from the implications of land acquisition.

#### **4.2.2. Construction Phase**

In the construction phase, the impact will consist of primary impacts, secondary impacts and tertiary impacts. The primary impact caused by a decrease in air quality, especially dust, increased noise intensity, decreased water quality and the existence of employment opportunities and business opportunities. The secondary and tertiary impacts caused by the emergence of negative attitudes and perceptions of the community.

##### **1) Decreasing Air Quality for Dust**

The decrease in air quality during construction was mainly in the form of increased local dust. The subsequent impact of high local dust in ambient air will have a further impact on the decrease in environmental sanitation due to the sticking of dust on the surface of buildings and plants. The impact of the increase in local dust can be minimized through the arrangement of vehicles both speed and interval, as well as giving coverings of tarpaulin or plastic cloth on trucks when transporting soil material, so that it is not scattered on the road especially around the settlements that are passed.

## **2) Increased Noise Intensity**

The increase in noise intensity during construction will give a further impact on the disturbance of residents' comfort due to the noise generated from the vehicles transporting the equipment and material. The impact of an increase in noise can be minimized through the arrangement of vehicles both speed and interval, when transporting soil materials, on the road around the settlements that are passed.

## **3) Decreasing Water Quality**

Decreasing Water Quality during construction activities will also have a further impact on residents' comfort disturbances due to contamination of surface water. The impact of decreasing actual water quality can be overcome because the reach of the construction site is quite far around 10 meters.

## **4) Interference with Traffic Safety**

Interference with traffic safety is caused by the mobilization of heavy equipment and construction materials. The management carried out is by limiting the speed of the transport vehicle and placing the officers in the lane that is passed by the transport vehicle, especially in the intersection close to the settlement in collaboration with the Transportation Service of Bengkulu Province.

## **5) Road Damage Occurred**

Road damage at the activity site is caused by the mobilization of heavy equipment and construction materials. The management carried out is to limit the tonnage of transport vehicles according to road capacity and repair damaged roads according to the level of damage by collaborating with the Highways or Transportation Agency in Bengkulu Province.

## **6) The emergence of public attitudes and perceptions**

The emergence of this community perception is a derivative impact of the primary impacts that occur during construction activities. The existence of good management by the company on the impacts that arise will have a positive effect on the community, so that negative attitudes and perceptions of the community towards the planned company activities do not arise. Therefore, coordination with the community, head of the village,



sub-district head must always be done. Also the socialization of the activity plan must be carried out during the activity.

By carrying out management on these primary impacts, the secondary and tertiary impacts generated by themselves will be managed. Besides management with a technology approach can also be added through a social approach, for example by continuing to disseminate information to the community around the location of the activity plan, providing guidance to contractors to prioritize local communities to work on projects according to qualifications and workforce needs and to be carried out transparently requirements and methods of acceptance and dissemination to the public when conducting all stages of activities.

### **4.2.3. Operation Phase**

At the operating stage, the primary impact that is generated is, increase in noise intensity, emergence of magnetic fields and electric fields, decreasing the value of land assets. The secondary and tertiary impacts caused include the emergence of negative attitudes and perceptions of the community.

#### **1) Increased Noise Intensity**

Increased noise intensity during construction will have a further impact on residents' comfort disturbances due to noise generated from transmission networks. The impact of increased noise can be minimized through maintenance of transmission networks.

#### **2) The emergence of magnetic fields and electric fields**

The presence of an electric and magnetic field during the operation will have a further impact on the disruption of the comfort of the population due to radiation caused. The impact of increasing noise can be minimized through network maintenance in accordance with provisions in accordance with SNI 04-6918-2002; SNI 04-6950-2003; IRPA, 1990, Regulation of the Minister of Energy and Mineral Resources No.18/2015 and Regulation of the Minister of Energy and Mineral Resources No.27/2018.

#### **3) Decreasing Land Asset Value**

Decreasing land assets will make negative attitudes and perceptions of the community towards the company's planned activities. Therefore, coordination with the community,

head of the village, sub-district head must always be done. Also the socialization of the activity plan must be carried out during the activity.

#### **4) The emergence of public attitudes and perceptions**

The emergence of this community perception is a derivative impact of the primary impacts that occur during construction activities. The existence of good management by the company on the impacts that arise will have a positive effect on the community, so that negative attitudes and perceptions of the community towards the planned company activities do not arise. Therefore, coordination with the community, head of the village, sub-district head must always be done. Also the socialization of the activity plan must be carried out during the activity.

### **4.3. Recommended Environmental Feasibility**

Plans for Construction Activities The 150kV transmission network will cause a variety of important impacts on the environment. After reviewing the planned activities of the various affected environmental components, the planned construction of a 150kV transmission network from the Hululais - Pekalongan PLTP and related substations by PT PLN (Persero) Sumatra Power Plant Development Unit is environmentally feasible. The environmental feasibility assessment takes into account the following eligibility criteria:

Location of the 150 kV Transmission Network construction activities Hululais-Pekalongan PLTP and Substation Related to the PT PLN (Persero) Sumatra Power Plant Development Unit, in principle, must be in accordance with the regional spatial plan. The planned development activities are in three regencies, namely: Lebong Regency, Rejang Lebong and Kepahiang, Bengkulu Province. To see the location of the planned development activities in accordance / not in conflict with its designation in Bengkulu Province, the suitability of the location with the spatial plan refers to the Regional Regulation of Bengkulu Province No.02 of 2012 concerning the Bengkulu Province Regional Spatial Plan for 2012-2032.

The suitability of the location of the planned development activities is seen in terms of spatial planning, which includes spatial planning, space utilization and control of spatial use. Based on the Bengkulu Provincial Regulation No.02 of 2012 concerning the Bengkulu



Province Regional Spatial Plan for 2012-2032, the space rules for the location of the planned development activities are included in the administrative area of Bengkulu Province as follows:

### 1. Spatial Planning

- Based on Article 23 paragraph (1) letter c, in the Bengkulu Province Energy Network System Plan there is a plan to construct a new power plant, including the Hululais Geothermal Power Plant (PLTP);
- Furthermore, in Article 24, for the Energy Network System Criteria, namely:
  - 1) Development of energy infrastructure is intended to increase the capacity of electricity generation by criteria:
    - a. Support the availability of electric power supplies for interests in urban, rural and small islands;
    - b. Supporting the use of high technology that is able to produce energy to reduce dependence on non-renewable energy sources;
    - c. Being in a location safe from natural hazards and safe from other activities.
  - 2) Development of electrical energy network infrastructure is determined by criteria:
    - a. Support the availability of electricity supply for interests in urban, rural and small islands;
    - b. Crossing residential areas, river areas, the sea, forests, agriculture, and transportation routes;
    - c. Supporting the use of high technology that is able to produce energy to reduce dependence on non-renewable energy sources.

Based on the explanation above, that the location of the planned 150 kV Transmission Network development plan for the Hululais - Pekalongan PLTP and the Substation Related to the PT PLN (Persero) Sumatra Power Plant Development Unit, is in accordance with the direction of the spatial structure plan of the 2012 Local Regulation provisions about the Bengkulu Province RTRW. In addition, the development plan has received a letter from the Office of Public Works and Spatial Planning Number 503 / 13.618 / XI / B.II-DPU-TR / 2017 regarding RTRW Recommendation Construction of 150 kV Transmission Network Hululais PLTP - Pekalongan and Substation.

## 2. Use of Space

In Chapter VIII the Direction for the Use of Provincial Spatial Space Article 54 paragraph (6) is the realization of the development of an energy and mineral resource infrastructure system carried out through:

- a. Construction of a new power plant installation;
- b. Increased electricity generated from alternative energy to meet rural electricity needs, including electricity based on renewable energy natural resources such as geothermal energy, solar energy and wind;
- c. Operation of distribution plants;
- d. Biodiesel energy development for community needs;
- e. Geothermal energy development in the Bengkulu Province.

Based on the description above, the planned construction activities of the 150 kV Transmission Network Hululais - Pekalongan PLTP and the Substation Related to the PT PLN (Persero) Sumatra Power Plant Development Unit, are in accordance with the directions for existing space utilization in the Bengkulu Province area.

## 3. Control of Use of Space

In CHAPTER IX Directives for the Use of Space Article 93, there are indications of zoning regulations on the energy infrastructure network system which stipulate that residential buildings are not allowed under SUTT and SUTET, except in SUTT and SUTET in accordance with statutory regulations. This needs to be done in order to achieve efforts in realizing an orderly spatial structure and in order to preserve the environment.

- 1) The activity also refers to Government Regulation Number 13 of 2017 concerning Amendments to Government Regulation Number 26 of 2008 concerning National Regional Spatial Planning, especially articles 114 and 114A.



- 2) The enactment of regulations and legislation related to policies in the field of protection and management of the environment and natural resources in planning activities.
- 3) Activities for the construction of a 150kV transmission network from Hululais - Pekalongan Geothermal Power Plant does not disturb / cause an impact on national or regional defense security interests.
- 4) Based on PERMENLH No. 5 of 2012, that the construction of a 150kV transmission network from the Hululais - Pekalongan PLT by PT. PLN (Persero) Main Unit for the Construction of Sumatra Electric Power Plant is categorized as obligatory to have an Environmental Impact Analysis (EIA), so that accurate estimates of the magnitude and importance of impacts from physical-chemical, and social aspects - Economic aspects in the pre-construction phase, construction and operation obtained. then the evaluation is carried out, this impact can be managed and monitored.
- 5) The results of a holistic evaluation of all important impacts as an interrelated and influencing entity are known to balance important positive and social and economic aspects (employment opportunities and business opportunities) with those that are negative to the physical-chemical aspects manageable.
- 6) PT. PLN (Persero) Sumatran PLTU Development Unit is willing and able to handle the important impacts of each activity both positive and negative. Important impacts caused by various project activities on these environmental components can be managed through technological, social and institutional approaches and the application of environmental management systems.
- 7) Business plans and/or activities do not interfere with social values or community views, because based on public consultation activities and socialization of activities with the community there is an interaction of mutual openness.
- 8) Plans for activities will not affect and/or disturb ecological entities:
  - a. The location of the activity has not changed, namely the location of activities is cultivated land in the form of agricultural land which is mostly sugar cane plantations, which can be turned into rice fields, or other crops that are ecologically less important, and after the operation there are not many change still as agricultural land.



- b. Based on data from biological surveys and secondary data in the location of planned activities there are no key species, namely species that have a major impact on the environment so that it can affect the ecosystem.
  - c. The location of the planned activity is not in the natural forest area and is not in a protected area but is located in a cultivation area that has been used for a long time for the agricultural area, so that the location of the activity plan has no scientific value.
- 9) The plan of activities does not cause interference with the business and/or activities that have been around the planned location of the activity. The location of the activity is agricultural land, while the planned activity is the electricity industry.
- 10) Not exceeding the carrying capacity and carrying capacity of the environment from the location of planned activities, because the impact of the activities will be managed and monitored, and periodic monitoring will be carried out and reported every 6 months to the competent authorities, related to the activities to be carried out.

From the results of a review of the activity plan for various environmental components that will be affected which are summarized in the above 10 eligibility criteria, the plan for the Activities Plan for the Construction of a 150kV transmission network from the Hululais - Pekalongan PLTP by PT. PLN (Persero) Sumatra Parent Development Unit is considered environmentally feasible.



Table 4. 2 Summary of Impact Analysis

No.	DPH	Early Environmental Hue	Impact Prediction Results	Impact Evaluation Results
<b>A. Pre-Construction Phase</b>				
1.	Implications of land acquisition		<p><u>Magnitude of the impact:</u> There are fears of non-conformity in compensation or compensation for land acquisition, as well as inaccuracies in boundary measurement, which can lead to public unrest. Unrest in the community can be triggered if previously there is hope that the community is not well accommodated.</p> <p><u>Important properties of impact:</u> The impact is categorized as important because at the time of the public consultation there were still concerns among some people about the non-transparent compensation process which would cause disputes that could disturb the community.</p>	Impacts are categorized as important so they need to be managed and monitored
<b>B. Construction Phase</b>				
1.	Decreasing Air Quality for TSP Dust	Measurements were made to determine ambient air quality parameter values, namely dust (TSP) TSP concentrations were still far below the quality standard threshold, ranging from 35.66 - 90.94 $\mu\text{g}/\text{Nm}^3$ .	<p><u>Magnitude of the impact:</u> Pestimated dust distribution with a radius of 18.8 m from the road</p> <p><u>Important properties of impact:</u> Impacts are categorized as important because the mobilization of heavy equipment and material will pass through settlements, so it needs to be managed and monitored</p>	Impacts are categorized as important so they need to be managed and monitored
2.	Increased intensity of confusion	The current level of approval at the activity location is 45, 80 - 51.06	<p><u>Magnitude of the impact:</u> The noise receptor distribution radius,</p>	Impacts are categorized as important so they need to be managed and monitored



No.	DPH	Early Environmental Hue	Impact Prediction Results	Impact Evaluation Results
		dBA this value still meets the 55 dBA quality standard (resident settlements)	especially the population, will occur within a radius of 175 m from the sound source <u>Important properties of impact:</u> Impacts are categorized as important because the mobilization of heavy equipment and material will pass through settlements, so it needs to be managed and monitored	
3.	Traffic Safety Disruption	In general, the traffic performance on weekdays and holidays on the Jalan Raya road is still good, besides the VC ratio is still good, which is below 0.75 and the speed of traffic on the road is still good (Highways, average vehicles travel around 60 - 80 km/h while, the average speed of the vehicle is 20-40 km/h) and the vehicle has not experienced queues and delays which means.	<u>Magnitude of the impact:</u> The condition of the road to the location of the activity is a relatively crowded village road and is relatively narrow to be passed by vehicles transporting tools and materials, so it is feared there is a disruption to traffic safety <u>Important properties of impact:</u> Potential to cause traffic safety disruption when mobilizing heavy equipment and materials	Impacts are categorized as so important that they need to be managed and monitored
4.	Road Damage Occurred	Paved road conditions	<u>Magnitude of the impact:</u> The impact intensity is high because the load conditions and road conditions are not suitable. <u>Important properties of impact:</u> Important, it does not have the potential to cause damage to the road when the vehicle maneuvers in and out of the location of the activity.	Impacts are categorized as important so they need to be managed and monitored
6.	employment Opportunity	the percentage of productive population in eight sub-districts in general is relatively large, which is in	<u>Magnitude of the impact:</u> Availability of job vacancies for local	Impacts are categorized as important, so they need to be managed and monitored



No.	DPH	Early Environmental Hue	Impact Prediction Results	Impact Evaluation Results
		the range of 64.51%. 68.39%. This shows that the employment potential is quite large.	communities <u>Important properties of impact:</u> It is important, even though the number of workers recruited is small compared to the population of the productive age, but the current conditions of work are difficult to come by so that the slightest opportunity benefits the community	
7.	The Opportunity to Try	the percentage of productive population in six sub-districts is generally relatively large, namely in the range of 64.51% to 68.39%. This shows that the employment potential is quite large.	<u>Magnitude of the impact:</u> Availability of business opportunities for the local community  <u>Important properties of impact:</u> Penting, meningkatkan ekonomi lokal bermanfaat bagi masyarakat	Impacts are categorized as important, so they need to be managed and monitored
8.	The emergence of attitudes and perceptions of the community	As a result of public consultations and surveys conducted, the community generally supports the planned activities.	<u>Magnitude of the impact:</u> Activities in the construction phase will cause an increase in local dust and noise in the residential environment, traffic safety disruption, which results from several activities in the construction phase in the form of both primary and derivative impacts. In addition, the small number of workers recruited for construction will cause public unrest.  <u>Important properties of impact:</u> Important, because it has a major impact when construction activities will cause unrest. People tend to carry out activities on the smoothness and continuity of operational projects.	Impacts are categorized as important, so they need to be managed and monitored
<b>C. Operation Phase</b>				



No.	DPH	Early Environmental Hue	Impact Prediction Results	Impact Evaluation Results
1.	Increased noise	The current noise level at the activity location is 45, 80 - 51.06 dBA, the value still meets the 55 dBA quality standard (resident settlement)	<p><u>Magnitude of the impact:</u> The noise receptor distribution radius, especially the population, will occur within a radius of 175 m from the sound source</p> <p><u>Important properties of impact:</u> Impacts are categorized as important because the mobilization of heavy equipment and material will pass through settlements, so it needs to be managed and monitored</p>	Impacts are categorized as not important but are still managed and monitored with planned management
2.	The emergence of magnetic fields and electric fields		<p><u>Magnitude of the impact:</u> Electricity distribution in the GI transmission and operation network will cause the electric and magnetic fields around the transmission and GI networks to increase. Electric fields and magnetic fields will be safe for human life if they are fulfilled the provisions of minimum clearances and free space in accordance with SNI 04-6918-2002; SNI 04-6950-2003; IRPA, 1990, ESDM Minister Regulation No.18 / 2015 and ESDM Minister Regulation No. 27/2018.</p> <p><u>Important properties of impact:</u> It is important, because the many impacts when operating activities will cause community unrest as a result of activities will affect the smoothness and continuity of project operations.</p>	Impacts are categorized as important so they need to be managed and monitored



No.	DPH	Early Environmental Hue	Impact Prediction Results	Impact Evaluation Results
3.	Decrease in value of land assets		<p><u>Magnitude of the impact:</u> As a result of the transmission network, the land under it will not be able to be planted with annual crops such as timber which have a height exceeding the provisions because there are special restrictions in accordance with the Minister of Mining and Energy Regulation 975.K / 47 / MPE / 1999, namely a free space along the transmission line. with a width of 17 m to the right and 17 m to the left of the vertical axis of the tower which is the ROW (Right of Way) of the transmission network, as well as the height of the building and plants from the maximum ground surface of 9 m. Under the regulation there will be changes in land use that must adjust to these provisions.</p> <p><u>Important properties of impact:</u> Causing limited land use under the electricity network, so that the sale value of the land will be much cheaper than before the transmission network.</p>	Impacts are categorized as important so they need to be managed and monitored
10.	The emergence of attitudes and perceptions of the community	As a result of public consultations and surveys conducted, the community generally supports the planned activities.	<p><u>Magnitude of the impact:</u> Activities at the operation stage will cause an increase in noise in the residential environment, disruption of electric and magnetic fields, decrease in the value of land assets caused by several activities in the construction phase in the form of primary and derivative impacts.</p> <p><u>Important properties of impact:</u> It is important, because the many impacts when operating activities will cause</p>	Impacts are categorized as important so they need to be managed and monitored



No.	DPH	Early Environmental Hue	Impact Prediction Results	Impact Evaluation Results
			community unrest as a result of activities will affect the smoothness and continuity of project operations.	