CHAPTER II

RONA ENVIRONMENT

2.1. Geophysical-Chemical Components

2.1.1. Micro climate

a. Air temperature

Several factors affect the climate including temperature, humidity and rainfall. Temperatures in Bengkalis vary considerably each month in 2014. The average air temperature in 2013 was 27,95°C, while the average air temperature maximum is 32,71°C during the day and age is 23,18°C at night. Generally, the average air temperature maximum and minimum is highest in September and July. Data temperatures in the study area are presented in Table 2.1. explain in detail the state of the temperature in the study area in 2014.

Table 2. 1.
Temperatures in the state of Study Areas Bengkalis 2014

Month	Air temperature (ºC)			Wind	
	Max.)	Minimum.)	Average	Directions	Speed (M / Sec)
January	29,8	22,9	26.35	BL	2,57
February	32,3	23,1	27.7	BL	2,21
March	33,4	23,0	28.2	U	2,01
April	33,4	23,3	28.35	U	1,55
May	33,9	23,6	28.75	TG	1,85
June	33,3	22,9	28.1	TG	1,75
July	33,0	22,6	27.8	TG	2,18
August	33,1	22,9	28	TG	3,13
September	32,7	22,8	27.75	TG	3,62
October	33,4	23,1	28.25	T	2,70
November	32,2	24,8	28.5	BL	1,98
December	32,0	23,2	27.6	BL	1,76
Average / yr	32,71	23,18	27.95	TG	2,27

Source: BMKG Simpang Tiga, 2014

b. Humidity

Air humidity average in 2014 is 76.39%, while the average air humidity is 94.3% maximum in the evening and the minimum was 58.5% during the day. Generally, the average air humidity maximum or minimum is highest in April and March. For more details, please refer to the table below.

c. Rainfall and Rainy Day

Rainfall is the monthly average in the study area reached 177.2 mm, while the highest was reached in October is 621.0 mm, and the lowest was reached in August is 120.0 mm. Generally the rainy season in May and October that precipitation monthly

average of 100 mm (wet season), while the dry season occurs from June to September, the precipitation monthly average below 100 mm (dry months) (Table 2.2)

.Table 2. 2.
Humidity in the Study Area Bengkalis 2014

No.	Month	Humidity (%)		
		Maksimum	Minimum	Rata-rata
1.	January	89,3	61,7	75.5
2.	February	94,5	57,2	75.85
3.	March	93,8	54,4	74.1
4.	April	95,8	57,4	76.6
5.	May	94,8	56,1	75.45
6.	June	93,7	57,1	75.4
7.	July	94,9	56,5	75.7
8.	August	93,7	57,9	75.8
9.	September	94,6	59,0	76.8
10.	October	95,1	55,5	75.3
11.	November	95,6	69,9	82.75
12.	December	95,5	61,4	78.45

Source: BMKG Simpang Tiga, 2014

Table 2. 3.
Total Rainfall and Rainy Day in Study Areas 2014

No.	Month	Rainfall (mm)	Rainy Day (Day)
1.		187,0	15
2.	January	151,0	9
3.	February	309,0	10
4.	March	487,0	15
5.	April	624,0	9
6.	May	120,0	8
7.	June	-	
8.	July	120,0	9
9.	August	145,0	8
10.	September	621,0	12
11.	October	-	
12.	November	-	
Total		2.764	95

Source: BMKG Simpang Tiga, 2014

d. Speed and Wind Direction

Wind speed annual average in the study area were recorded during 2014 was 2.27 m/sec. Wind speed average monthly during the rainy season is 1.99 m/sec which occurred in November-May, while in the dry season was 2.75 m/sec which occurred in June-September. The dominant wind direction is the annual average of the Northwest, the rainy season is from the Northwest, while the dry season is opposite that of the Southeast.

Table 2. 4.
Wind direction and speed in the Village Study Area 2014

Month	Wind	
	Direction	Speed. (M/ Second)
January	BL	2,57
February	BL	2,21
March	U	2,01
April	U	1,55
May	TG	1,85
June	TG	1,75
July	TG	2,18
August	TG	3,13
September	TG	3,62
October	T	2,70
November	BL	1,98
December	BL	1,76
Average / Year	TG	2,27

Source: BMKG Simpang Tiga, 2014

2.1.2. Air Quality and Noise

A. Air Quality Emissions

Results of air quality emission measurements performed on nine (9) point measurements on Power Plant PLTG/MG Duri before any increase in capacity (160 MW), as shown in Table 2.5.

Table 2. 5.
Results Measurement of Air Quality Emission Power Plant PLTG/PLTMG Duri
In observations in December 2013 and March 2014

No	locations	Parameter	Unit	Measurement results		NAB
				December 2013	March 2014	
I	Chimney Genset PP (PLTMG-01) N:01°08'34,2" E:101°27'60,6"	SO_2	mg/Nm^3	Belum beroperasi	98	150
		NO_2	mg/Nm^3		135	400
		Total Partikulat	mg/Nm^3		21	30
		CO	mg/Nm^3		78	-
		Opasitas	%		0	-
		Flow rate	m/det		14,7	-
II	Chimney Genset PP (PLTMG-02) N:01°08'34,2" E:101°27'60,8"	SO_2	mg/Nm^3	87	74	150
		NO_2	mg/Nm^3	190	146	400
		Total Partikulat	mg/Nm^3	19	11	30
		CO	mg/Nm^3	81	90	-
		Opasitas	%	0	0	-
		Flow rate	m/det	14,60	14,1	-
III	Chimney Genset PP	SO_2	mg/Nm^3	Belum beroperasi	65	150
		NO_2	mg/Nm^3		177	400

No	locations	Parameter	Unit	Measurement results		NAB
				December 2013	March 2014	
	(PLTMG-03) N:01°08'30,8" E:101°27'48,2"	Total Partikulat	mg/Nm^3		20	30
		CO	mg/Nm^3		81	-
		Opasitas	%		0	-
		Flow rate	m/det		14,2	-
IV	Chimney Genset PP (PLTMG-04) N:01°08'32,1" E:101°27'54,7"	SO_2	mg/Nm^3	50	67	150
		NO_2	mg/Nm^3	165	189	400
		Total Partikulat	mg/Nm^3	20	12	30
		CO	mg/Nm^3	98	93	-
		Opasitas	%	0	0	-
		Flow rate	m/det	16,80	15,1	-
V	Chimney Genset PP (PLTMG-05) N:01°08'30,8" E:101°27'48,2"	SO_2	mg/Nm^3	68	78	150
		NO_2	mg/Nm^3	160	189	400
		Total Partikulat	mg/Nm^3	21	16	30
		CO	mg/Nm^3	98	88	-
		Opasitas	%	0	0	-
		Flow rate	m^3/dt	15,70	15,2	-
VI	Chimney Genset PP (PLTMG-06) N:01°08'30,8" E:101°27'42,8"	SO_2	mg/Nm^3	52	87	150
		NO_2	mg/Nm^3	114	132	400
		Total Partikulat	mg/Nm^3	24	17	30
		CO	mg/Nm^3	98	46	-
		Opasitas	%	0	0	-
		Flow rate	m^3/dt	13,90	14,7	-
VII	Chimney Genset PP (PLTMG-07) N:01°08'32,1" E:101°27'54,6"	SO_2	mg/Nm^3	Belum beroperasi	82	150
		NO_2	mg/Nm^3		158	400
		Total Partikulat	mg/Nm^3		16	30
		CO	mg/Nm^3		64	-
		Opasitas	%		0	-
		Flow rate	m^3/dt		13,9	-
VIII	Chimney Genset PLN (D/G-01) N:01°07'11,5" E:101°28'25,7"	SO_2	mg/Nm^3	112	99	150
		NO_2	mg/Nm^3	130	129	400
		Total Partikulat	mg/Nm^3	22	20	30
		CO	mg/Nm^3	51	37	-
		Opasitas	%	0	0	-
		Flow rate	m^3/dt	14,60	12,5	-
IX	Chimney Genset PLN (D/G-02) N:01°07'12,0" E:101°28'26,3"	SO_2	mg/Nm^3	102	112	150
		NO_2	mg/Nm^3	132	142	400
		Total Partikulat	mg/Nm^3	21	23	30
		CO	mg/Nm^3	39	41	-
		Opasitas	%	0	0	-
		Flow rate	m^3/dt	15,80	13,1	-

Source: Implementation Report RKL-RPL Power Plant PLTG/MG Duri (March 2014)

Information :

TLV: Threshold Limit Value

*): Candy LH No. 21 Year 2008 Annex II A

Table above shows the results of laboratory analysis of air emissions measured in the chimney Power Plant PLTG which includes paremeter SO_2,NO_2, particulates,CO, and

opacity quite varied and all the measured parameters is still in accordance with the quality standards established Candy Environment No. 21 Year 2008 Annex II A.

The average wind speed at the location of the study is 2:27 m/s well in the rainy season and the dry season showed that the atmospheric stability conditions are in class B (unstable) up to C (slightly unstable) this will affect the distribution of emissions.

In this model, it is assumed the dimensions of the chimney with a diameter of 0.2 m and a height of 20 m. Assuming the gas exit velocity of 14.7 m/s wind speed and 2:27 m/s, high cause smoke to 34.6 m.

The rate of emission is obtained from the calculation of the emission concentration at the chimney in accordance with Head of the Environmental Impact Management Agency 09/1995, wherein the concentration of dust emissions from the parameters at 21 mg/Nm^3, SO_2 by 98 mg/Nm. NO_2 at 135 mg/Nm^3 and CO at 78 mg/Nm^3.

The rate of emission is obtained from the calculation of the emission concentration at the chimney in accordance with Head of the Environmental Impact Management Agency 09/1995, the Bernoulli formula for fluid flow:

$$Q = A \times v \times C_{emisi}$$

Where :

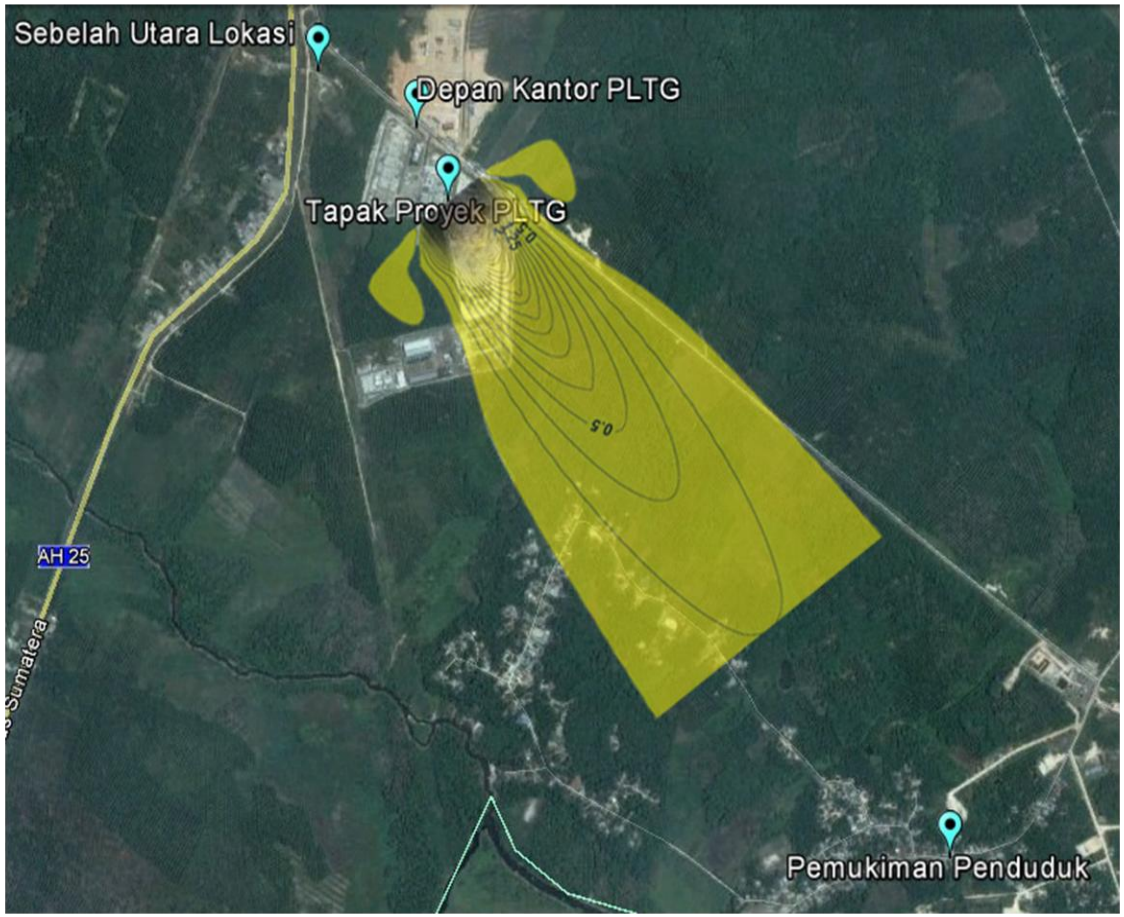
Q = Rate of emission, g/sec

A = Cross-sectional area of the chimney, m^2

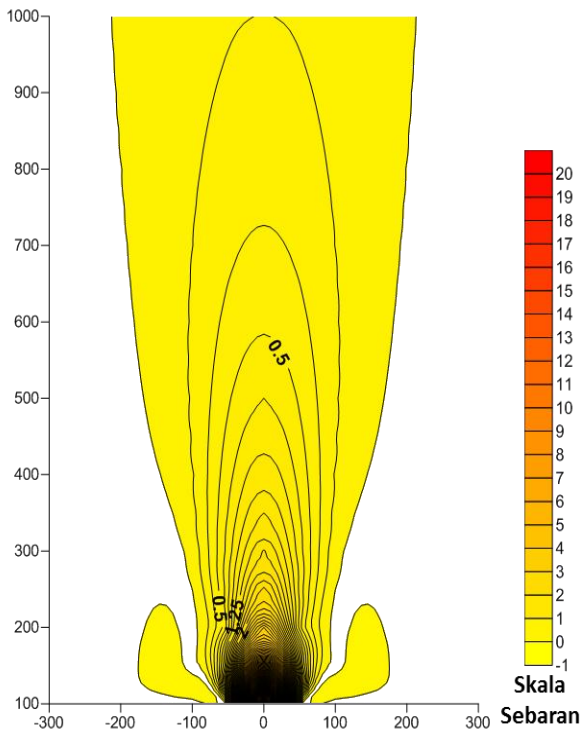
V = Exit gas velocity, m/s

C = Concentration of emissions in the chimney, mg/Nm^3

The results of modeling using Gaussian method Disperssion shows the emission rate to dust is 9693.18 g/s, for SO_2 amounted to 45.234.84 g/s, then for NO_2 is 63,313.3 ug/s and CO at 36,003.24 ug/s. With the pace of these emissions, and a height of 2 m from the ground spread to a distance of 1000 m for the parameters dust, SO_2 and NO_2, and 700 m for the CO as shown in Figure 2.2., 2.3, 2.4. and 2.5. In each of these images show if distribution with a distance of 1000 m parameter values of the concentration of dust, SO_2, and NO_2 and CO with a distance of 700 m showing a concentration smaller as the distance increases distribution. Thus the distribution of emissions from PLTG/MG Duri did not give a great impact to the surrounding environment, primarily residential areas, in addition to the value of the concentration of each parameter are also still far below the quality standard.

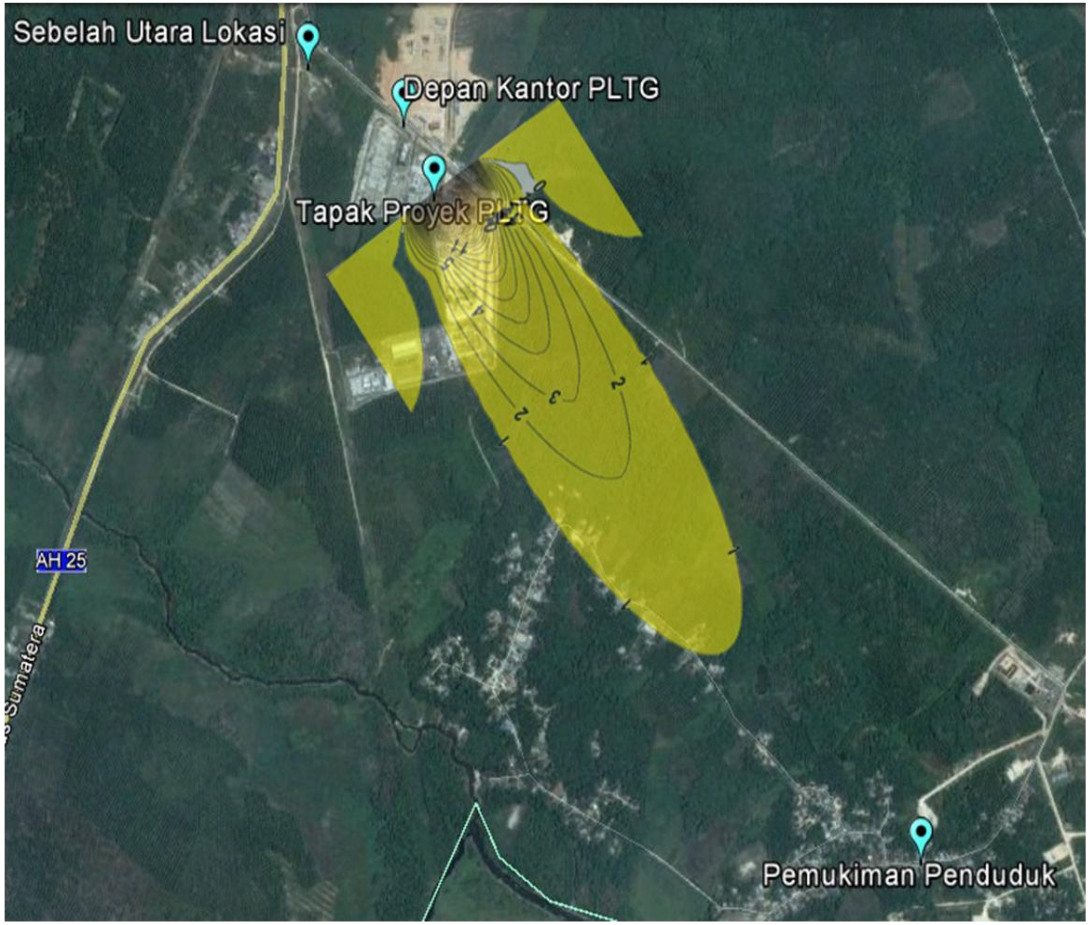


Simulasi Sebaran Parameter Debu di Lokasi Kegiatan

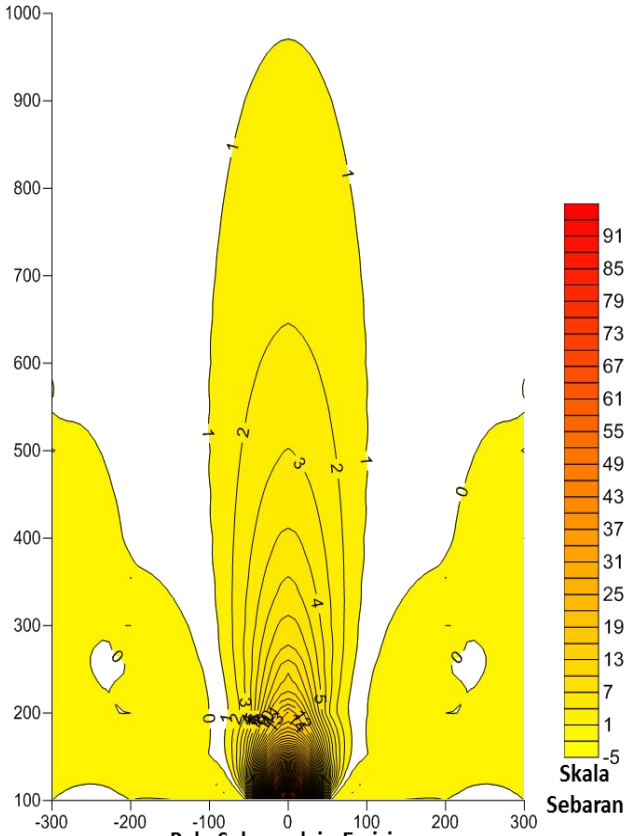


Pola Sebaran laju Emisi Parameter Debu

Figure 2.2.
Distribution and Distribution Pattern Simulation Dust Emission rate at the Power Plant PLTG/MG Duri Area

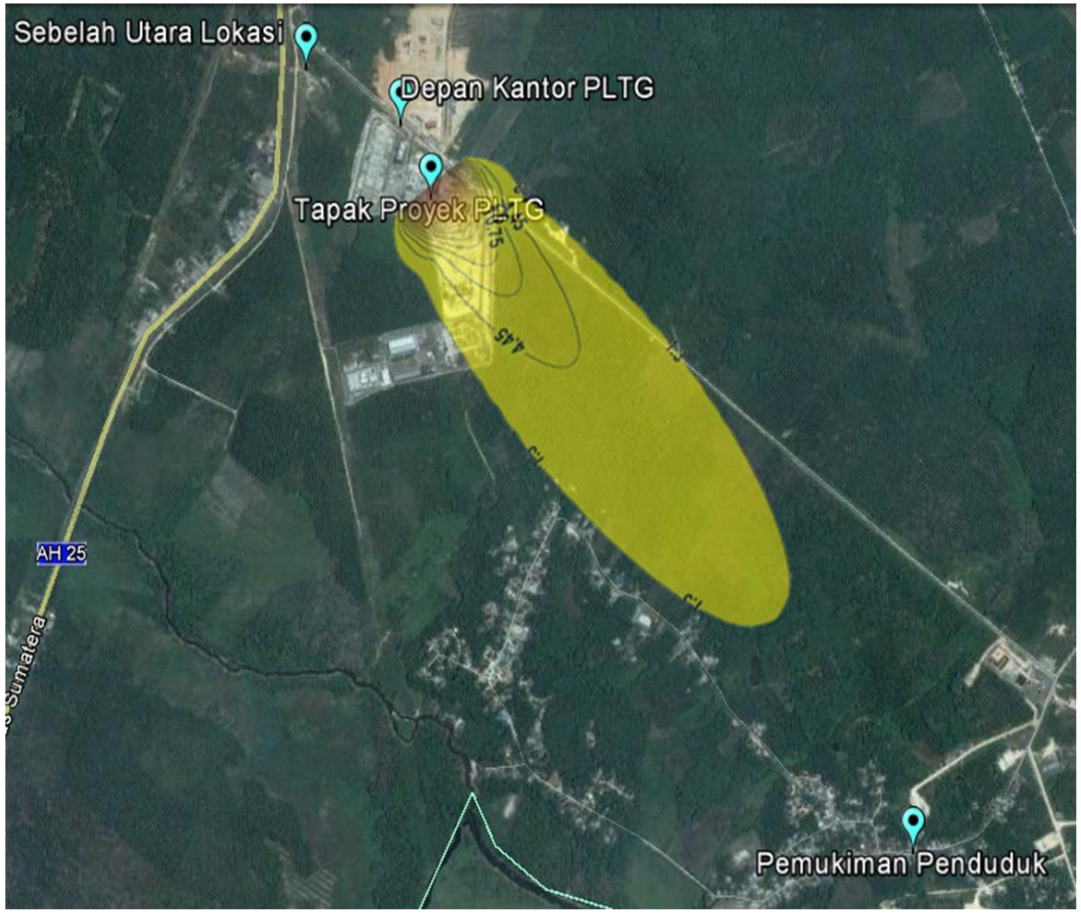


Simulasi Sebaran Parameter SO_2 di Lokasi Kegiatan

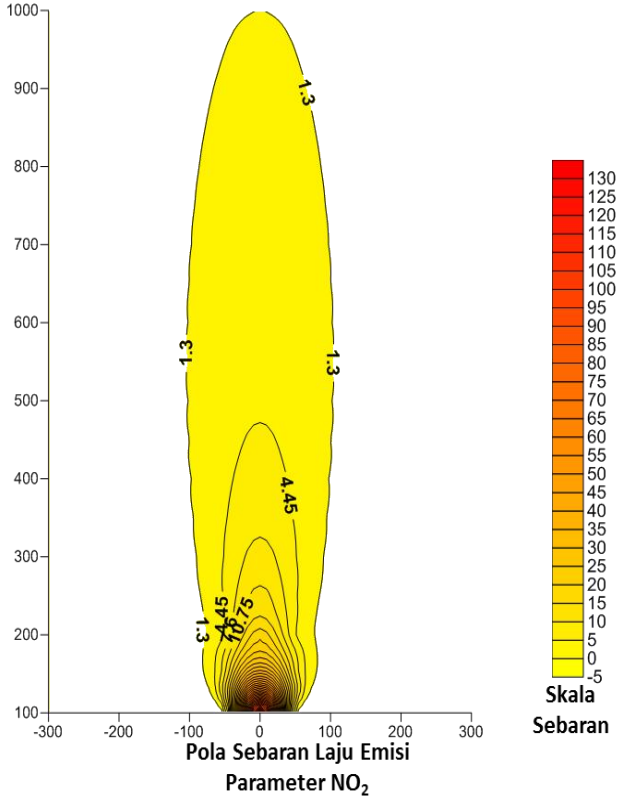


Pola Sebaran laju Emisi Parameter SO_2

Figure 2. 3.
Distribution Pattern and Simulation Distribution Rate of SO_2 emissions at the Power Plant PLTG/MG Duri Area

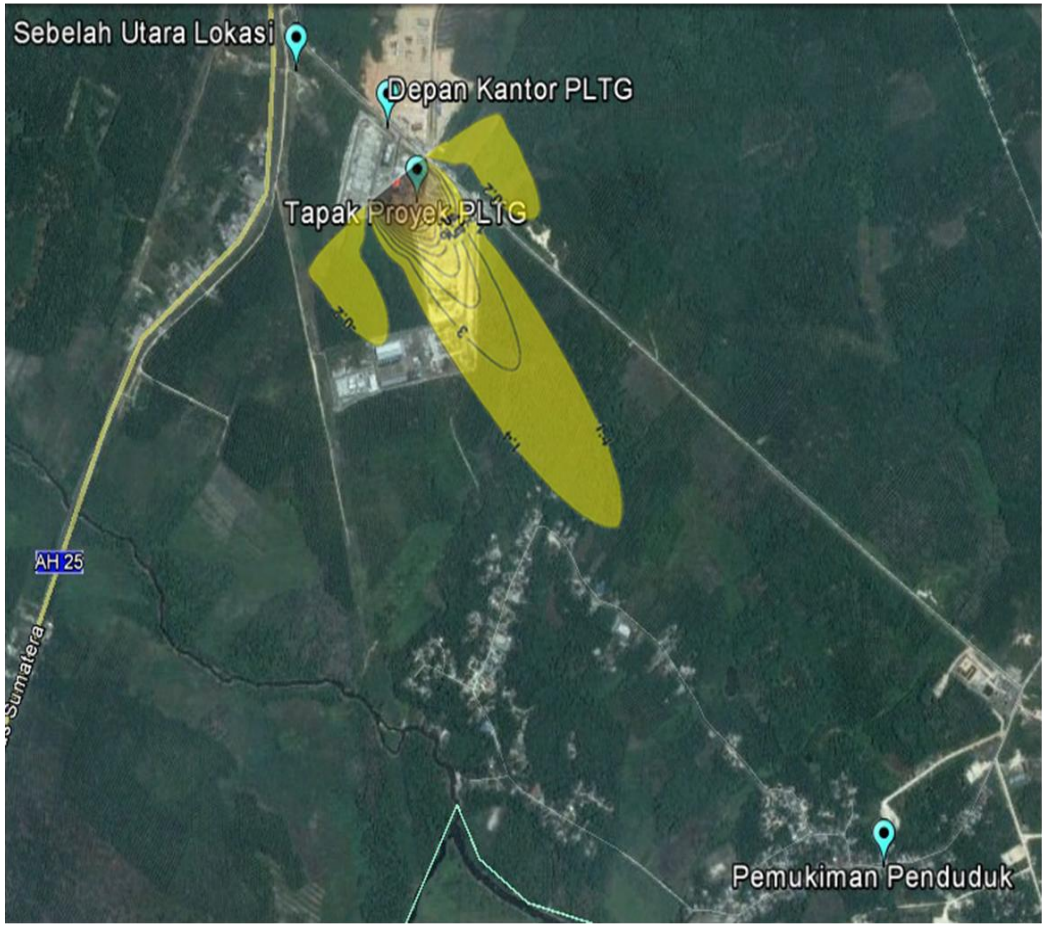


Simulasi Sebaran Parameter NO_2 di Lokasi Kegiatan

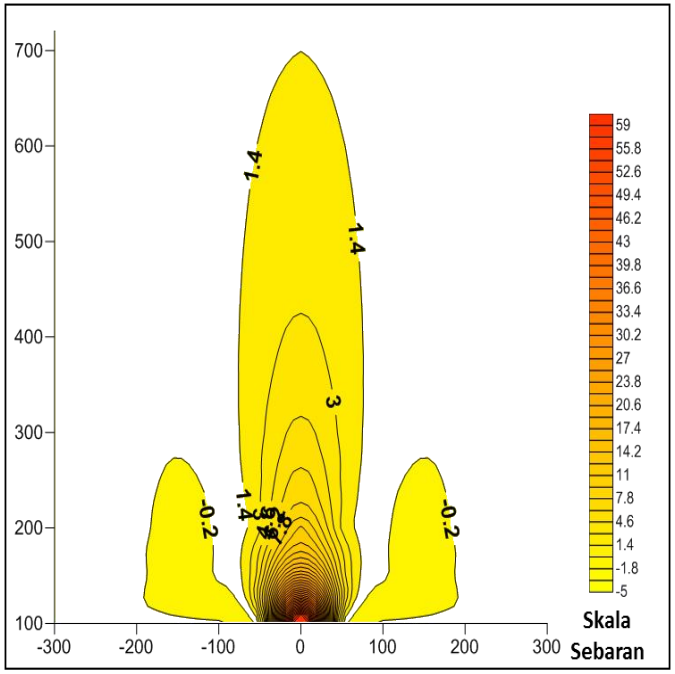


Pola Sebaran Laju Emisi Parameter NO_2

Figure 2. 4.
Distribution Pattern and Simulation Distribution rate of NO_2 emissions in the Power Plant PLTG/MG Duri Area



Simulasi Sebaran Parameter CO di Lokasi Kegiatan



Pola Sebaran Laju Emisi Parameter CO

Gambar 2. 1.
Distribution Pattern and Simulation Distribution Rate of CO emissions at the Power Plant PLTG/MG Duri Area

B. Ambient Air Quality and Noise

The results of the measurement of ambient air quality and noise made in 4 (four) the measurement point in the area of the Power Plant PLTG/MG Duri and settlements closest to the plant site, as shown in Table 2.6.

Table 2. 6.
Measurement results Ambient Air and Noise In the Power Plant PLTG/MG Duri and Human Settlements What's With Plant Location Observation Month In December 2013 and March 2014

No	locations	Parameter	Unit	Measurement results		Rona Home	NAB
				December 2013	March 2014		
I	Home Office PLN N:1° 4'30.44" E:101°16'50.28	Dust	μg /Nm^3	112	173	156	230
		Noise	dB (A)	66,7	58	67,8	70
		Pb	μg/m^3	<0.001	0,002	<0.001	2,0
		SO_x	mg/Nm^3	22.40	Ttd	24.60	900
		NO_x	mg/Nm^3	78.30	0,55	76.10	400
		O_3	μg/m^3	2.90	0,2	3.91	235
		CH_4	μg /Nm^3	2,10	-	1,29	160
		CO	mg/Nm^3	105	-	1200	30.000
II	Tread Project N:1° 4'24.54" E:101°16'52.93"	Dust	μg /Nm^3	105	27	142	230
		Noise	dB (A)	65,9	60	69,3	70
		Pb	μg/m^3	0,40	0,002	0,08	2,0
		SO_x	mg/Nm^3	12,70	1,66	23,10	900
		NO_x	mg/Nm^3	69,80	0,868	56,20	400
		O_3	μg/m^3	4,40	0,25	5,89	235
		CH_4	μg /Nm^3	3,40	-	8,34	160
		CO	mg/Nm^3	164	-	2000	30.000
III	Human Settlements The South PLTG N:1° 3'32.60" E:101°17'35.42"	Dust	μg /Nm^3	68	29	103	230
		Noise	dB (A)	54,3	56	48,2	70
		Pb	μg/m^3	0,003	Ttd	0,007	2,0
		SO_x	mg/Nm^3	25,70	2,23	35,0	900
		NO_x	mg/Nm^3	44,30	0,33	78,0	400
		O_3	μg/m^3	2,70	0,03	3,12	235
		CH_4	μg /Nm^3	1,60	-	5,78	160
		CO	mg/Nm^3	106	-	1100	30.000
IV	Northern Area PLTG N:1° 4'34.86" E:101°16'41.94"	Dust	μg /Nm^3	25,80	23	99,0	230
		Noise	dB (A)	54	52	46,8	70
		Pb	μg/m^3	<0,001	Ttd	0,03	2,0
		SO_x	mg/Nm^3	1,70	9,15	25,80	900
		NO_x	mg/Nm^3	9,40	0,56	46,20	400
		O_3	μg/m^3	3,50	0,14	4,98	235
		CH_4	μg /Nm^3	1,50	-	4,27	160
		CO	mg/Nm^3	180	-	600	30.000

Source: Implementation Report RKL-RPL Power Plant PLTG/MG Duri (March 2014)
Information :
PP No. 41/1999 on the Air Pollution Control
**) : LH Decree No. Kep-48/MENLH/11/1996 on Standards of Noise Level