No.

Preparatory Survey for Indramayu Coal-fired Power Plant Project in Indonesia

Final Report

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Japan International Cooperation Agency (JICA)

Tokyo Electric Power Services Co., LTD

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Chapter 1 Preface

1.1 Background of the Study

According to RUPTL (The Master Plan of Electric Power Supply) 2009-2018, the power system in Java-Bali is expected to have an average power growth of 9.5% and an average peak load growth of 9.5% in ten years. Also, the installed capacity in Java-Bali is expected to have an average growth of 2,500 MW. In consideration of the recent financial crisis, it is necessary for the power system in Java-Bali that there is an average power growth of 6.0% and an average capacity growth of 1,500 MW in ten years.

Under these circumstances, the Indramayu Coal-fired Power Plant (hereinafter referred to as "IR_B") is an important project because of the following reasons.

(1) The Indramayu site is close to the maximum power demand area in Indonesia (Jakarta area).
(2) The existing 500kV transmission line has limited capacity and therefore a new 500kV transmission line will need to be built.

1.2 Objectives of the Study and Scope of the Study

1.2.1 Objectives of the Study

The purpose of Preparatory Survey for the Indramayu Coal-fired Power Plant Project (hereinafter referred to as "the Study") is to assess the feasibility of the development of the proposed 1,000 MW coal -fired thermal power plant.

The Study mentions the technical, environmental and financial feasibility of constructing the IR_B1 in the Indramayu District in the West Java Province of Indonesia. The study will also include the consideration of the installation of various types of equipment (i.e. Super-critical or Ultra-super-critical boiler, Electrostatic precipitator, Flue gas desulphurization system, etc.) to reduce environmental impacts, the use of various coal types and supply sources, and the impacts to the existing Java-Bali system.

Objectives of the study are as follows.

(1) To execute the Preparatory Study for Indramayu Coal-fired Power Plant Project including introduction of Clean Coal Technology in Indonesia.
(2) To supply electric power having stable frequency and voltage, and to promote the Indramayu Coal-fired Power Plant project.

Concerned departments in Indonesia are as follows.

・ PT. PLN (Persero) (hereinafter referred to as "PLN")

The areas to be studied are as follows.

(1) Indramayu and its surrounding places.
(2) Jakarta and its surrounding places.
(3) The area between Indramayu and Jakarta.

1.2.2 Scope of the Study

The following works are conducted in this Preparatory Survey.

(1) Confirmation of Background and Necessity
- Power Demand and Supply Situation
- Power Development Plan

(2) Confirmation of Basic Data and Information
- Geologic and Soil Data
- Meteorological and Sea Data
- Social and Economical Data

(3) Verification of Development Scale and Site Selection, etc. related to Indramayu Coal-fired Power Plant Development Plan

(4) Study of Fuel Supply Plan
- Fuel for generation
- Fuel Supply Method and Plan
- Analysis of Coal Characteristic

(5) Confirmation of Realization and Introduction related to relevant CCT (Clean Coal Technology) Technology Assistance

(6) Power System Analysis (Analysis of System Actability and Power Flow)

(7) Confirmation of Yen Credit Project Outline
- Verification of Project Scope and Design Criteria related to Power Plant, Substation, Transmission Line, other Auxiliaries, including study of Possibility of Applying CCT Technology and STEP Application
- Estimation of Project Cost and ODA Loan Amount
- Study of Project Implementation Schedule
- Study of Project Implementation and Project Management and Organization
- Financial and Economical Analysis (FIRR, EIRR, Operation Effectiveness Index and Possibility of Introducing IPP for PLTU Indramayu Coal-Fired Power Plant 1,000 MW Unit 2 (hereinafter referred to as "IR_B2")

(8) Environmental and Social Consideration

1.2.3 Duration of the Study

Schedule of the Study is shown in the next page.

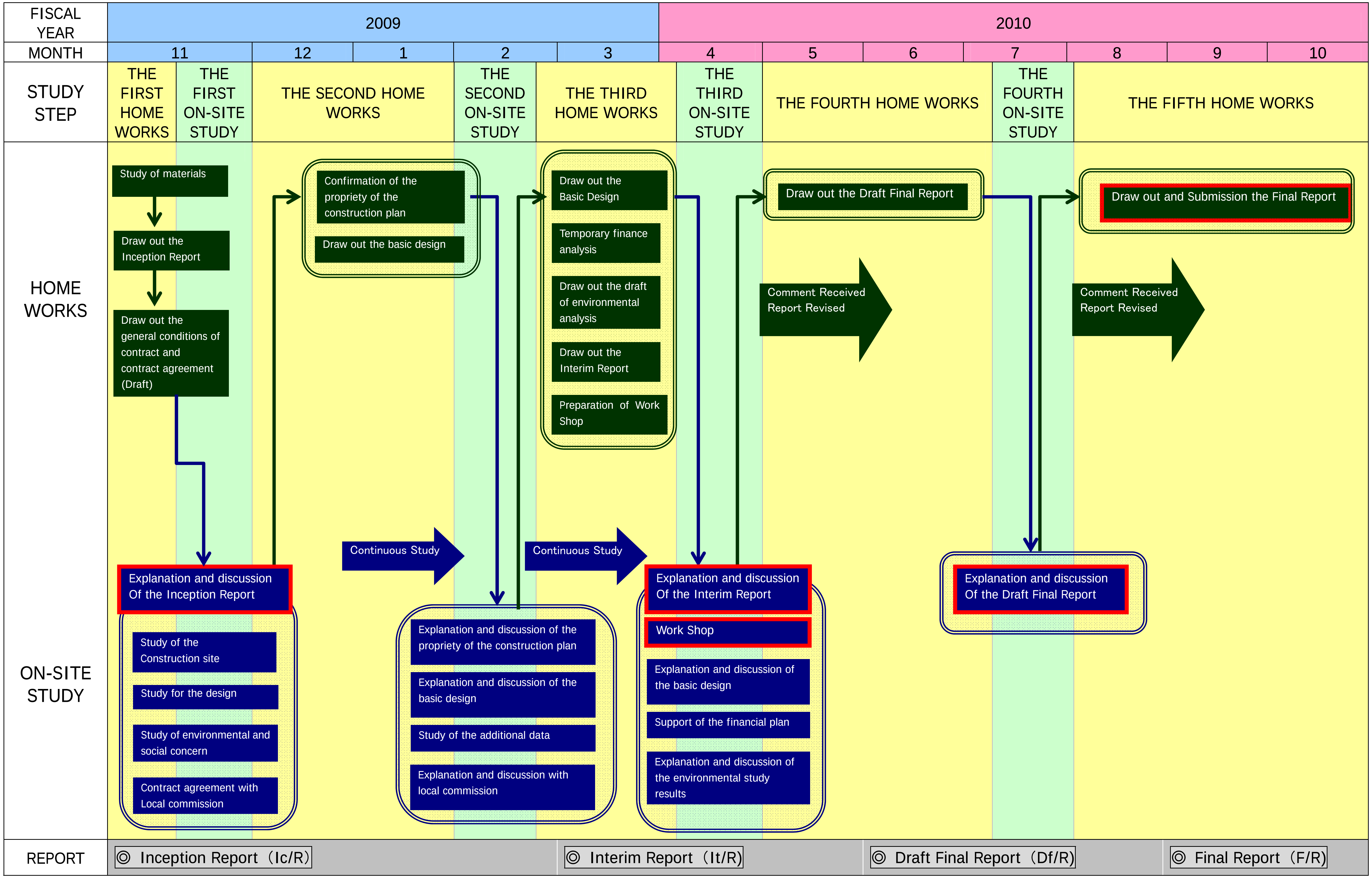


Figure 1.2.3.1 Flow of the Study Works

Chapter 2 Social /Economic Situation in Indonesia

2.1 Overview

After the serious economic damage in the late 1990's, the Indonesian economy has been on a moderate growth path. The annual GDP growth rate of Indonesia is the highest among the four neighboring ASEAN countries of Malaysia, Thailand and the Philippines. However, having the highest inflation rate of 18.3% among the four countries, required the government of Indonesia to increase subsidies on the basic needs in order to compensate the rising food and fuel prices. On the other hand, because of the lower population growth and the moderate economic growth, GNI per capita of the country reached USD 2,010, which is higher than the Philippines.

The Indonesian government has managed the budget deficit and the public debt at acceptable levels from the point of debt sustainability. While the budget deficit in GDP of Indonesia is almost the same level as the for the Philippines, the total debt in GDP of Indonesia is much lower than the Philippines.

Indonesia attained the highest level of primary completion rate among the four countries and improved the coverage of basic education. However, having the highest unemployment rate indicates that the country has been facing challenges on formal employment creation.

Energy use per capita of Indonesia is one third of that of Malaysia and a half of that of Thailand. On the other hand, following Thailand, Indonesia produced the second largest volume of electricity.

Table 2-1 Key Indicators of Indonesia and ASEAN Countries

Key Indicators	Year	Indonesia	Malaysia	Thailand	Philippines
GNI per capita (US$)	2008	2,010	6,970	2,840	1,890
GDP growth rate (annual, %)	2008	6.1%	4.6%	2.6%	3.8%
Average annual population growh (%)	2008	1.2%	1.7%	0.6%	1.8%
Inflation (GDP deflator) (annual, %)	2008	18.3%	10.3%	3.6%	7.5%
Budget Balance of Central Government (Cash surplus or deficit, % of GDP)	2007	-1.1%	-	0.1%	-1.5%
Total Debt % of GDP	2007	28.8%	-	26.2%	77.7%
Unemployment (%)	2004-07	10.8%	3.4%	1.1%	6.0%
Primary Completion Rate (%)	2007	105.0%	98%* (2005)	101.0%	94.0%
Energy Use per capita (kilograms of oil equivalent)	2006	803	2,617	1,630	498
Electricity Production (billion kWhs)	2006	133.1	91.6	138.7	56.7

Source: World Bank, "World Development Indicators 2009"

2.2 Socio-economic Conditions

2.2.1 Population

Indonesia had a population of more than 231 million in 2009, which is nearly twice that of the populations in 1971. The Java region has the largest population in the country of approximately 134 million, which accounts for 58% of the total population. The total population in the Jawa and Bali region accounts for 60% of the total population of the country.

The Jawa region is highly populated having the highest population density of 1,027 persons/km2. In particular, the population density of DKI Jakarta, the capital city of the country, is 12,355 persons/km2 which is ten times larger than the national level of 123 persons/km2.

The population growth of the country has slowed down for the last four decades. Average annual population growth rate dropped from 2.39% for 1971-1980 to 0.64% for 2000-2009. As the country trend, the population growth in the Jawa and Bali region decreased from 2% to 0.63% for the same period.

Table 2-1 Population Trends (1971-2000)

	1971 Population	%	1980 Population	%	1990 Population	%	1995 Population	%	2000 Population	%	2009 Popluation	%
Jawa	**76,086,327**	**64%**	**91,269,528**	**62%**	**107,581,306**	**60%**	**114,733,486**	**59%**	**121,352,608**	**59%**	**134,160,100**	**58%**
DKI Jakarta	4,579,303	4%	6,503,449	4%	8,259,266	5%	9,112,652	5%	8,389,443	4%	9,223,000	4%
Jawa Barat	21,623,529	18%	27,453,525	19%	35,384,352	20%	39,206,787	20%	35,729,537	17%	41,501,600	18%
Jawa Tengah	21,877,136	18%	25,372,889	17%	28,520,643	16%	29,653,266	15%	31,228,940	15%	32,864,600	14%
DI. Yogyakarta	2,489,360	2%	2,750,813	2%	2,913,054	2%	2,916,779	1%	3,122,268	2%	3,501,900	2%
Jawa Timur	25,516,999	21%	29,188,852	20%	32,503,991	18%	33,844,002	17%	34,783,640	17%	37,286,200	16%
Banten	-	-	- -		-	-	-	-	8,098,780	4%	9,782,800	4%
Bali	**2,120,322**	**2%**	**2,469,930**	**2%**	**2,777,811**	**2%**	**2,895,649**	**1%**	**3,151,162**	**2%**	**3,551,000**	**2%**
Jawa & Bali	**78,206,649**	**66%**	**93,739,458**	**64%**	**110,359,117**	**62%**	**117,629,135**	**60%**	**124,503,770**	**60%**	**137,711,100**	**60%**
Sumatera	20,808,148	17%	28,016,160	19%	36,506,703	20%	40,830,243	21%	43,309,707	21%	49,615,400	21%
Kalimantan	5,154,774	4%	6,723,086	5%	9,099,874	5%	10,470,843	5%	11,331,558	5%	13,065,800	6%
Sulawesi	8,526,901	7%	10,409,533	7%	12,520,711	7%	13,732,449	7%	14,946,488	7%	16,767,700	7%
Nusa Tenggara, Maluku & Papua	6,511,757	5%	8,046,711	5%	10,144,791	6%	11,252,328	6%	12,173,072	6%	14,209,600	6%
Total of 33 Provinces	**119,208,229**	**100%**	**147,490,298**	**100%**	**179,378,946**	**100%**	**194,754,808**	**100%**	**206,264,595**	**100%**	**231,369,600**	**100%**

Source: Badan Pusat Staistik (BPS) website (http://dds.bps.go.id/eng/tab-sub/, as of February, 2010/02/01), and "Trends of the Selected Socio-economic Indicators of Indonesia", p.11, Table 2.3, March 2009

Note1: The number of total population of provinces for 1980, 1990 and 1995 are not identical to the aggregated number of provincial populations.

Note2: The population data for 2009 are from "Population Projection of Provinces in Indonesia 2005-2015" by BPS

Table 2-2 Average Annual Population Growth Rate by Region

	1971-1980	1980-1990	1990-2000	2000-2009
Jawa	2.04%	1.66%	1.21%	0.63%
Bali	1.71%	1.18%	1.27%	0.94%
Jawa & Bali	2.03%	1.65%	1.21%	0.63%
Sumatera	3.36%	2.68%	1.72%	0.66%
Kalimantan	3.00%	3.07%	2.22%	0.88%
Nusa Tenggara, Maluku & Papua	2.38%	2.34%	1.84%	0.88%
Total of 33 Provinces	2.39%	1.98%	1.41%	0.64%

Source: BPS data and the author's calculation

2.2.2 Labor Force Structure

The population over the age of 15 is increasing and the labor force has expanded by 9% during the period between 2004 and 2009. Presently, Indonesia has a labor force of more than 113 million in the country. While the labor force participation rate remains stable around 67%, the unemployment rate declined from 20% to 8% during the last five years.

The number of unemployed persons also decreased from 11 million in 2006 to 9.3 million in 2009.

Sixty percent (60%) of the labor force of the country is concentrated in the Jawa region. The labor force in the region is almost evenly distributed in rural and urban areas. The total labor force in the region is approximately 69 million.

The traditional employment sector of Indonesia is agriculture. Agriculture used to absorb more than 40% of the labor force in the country. While the employment share of agriculture has been gradually declining for the period from 2004 to 2009, the services in the other sectors increased their share in employment. The share of manufacturing and mining in employment remain at the same level at 12% and 1%, respectively.

Table 2-3 Labor Force in Indonesia

Type of activity	2004	2005 (Feb)	2006 (Feb)	2007 (Feb)	2008 (Feb)	2009 (Feb)
Population 15+	153 923 648	155 549 724	159 257 680	162 352 048	165 565 992	168 264 448
Labor Force	103 973 387	105 802 372	106 281 795	108 131 058	111 477 447	113 744 408
Labor Force Participation Rate(%)	67.55	68.02	66.74	66.6	67.33	67.6
Unemployment	10 251 351	10 854 254	11 104 693	10 547 917	9 427 590	9 258 964
Unemployment Rate(%)	9.86	10.26	10.45	9.75	8.46	8.14

Source: Badan Pusat Staistik (BPS) website (http://dds.bps.go.id/eng/tab-sub/, as of February, 2010/02/01)

Table 2-4 Labor Force by Province (2008)

	Rural	Urban	Total	%
Jawa	34,450,397	32,231,764	66,682,161	60%
DKI Jakarta	-	4,559,108	4,559,108	4%
Jawa Barat	9,135,177	9,292,065	18,427,242	17%
Jawa Tengah	10,394,722	6,945,951	17,340,673	16%
DI. Yogyakarta	874,550	1,108,982	1,983,532	2%
Jawa Timur	12,180,486	7,936,759	20,117,245	18%
Banten	1,865,462	2,388,899	4,254,361	4%
Bali	1,058,688	1,036,009	2,094,697	2%
Jawa & Bali	35,509,085	33,267,773	68,776,858	62%
Sumatera	15,044,071	7,388,959	22,433,030	20%
Kalimantan	4,193,721	2,012,411	6,206,132	6%
Sulawesi	5,334,413	2,073,116	7,407,529	7%
Nusa Tenggara, Maluku & Papua	5,082,954	1,570,944	6,653,898	6%
Total of 33 Provinces	**65,164,244**	**46,313,203**	**111,477,447**	100%

Source: Ministry of Manpower and Transmigration, "National Labour Force Survey 2008"

Table 2-5 Employment by Sector

(Unit: '000)

	2003	2004	2005	2006	2007	2008	% of Total Labor Force
Employed	92,811	93,722	93,958	95,177	97,583	102,553	91.6%
Agriculture	43,042	40,608	42,323	40,136	42,609	41,332	36.9%
Manufacturing	11,496	11,070	11,953	11,578	11,890	12,549	11.2%
Mining	733	1,035	904	924	1,021	1,071	1.0%
Others [b]	37,540	41,009	38,778	42,539	42,063	47,601	42.5%
Unemployed	9,820	10,251	11,899	11,105	10,548	9,395	8.4%
Total Labor Force	102,631	103,973	105,857	106,282	108,131	111,947	100.0%

Source: Asian Development Bank, "Key Indicators for Asia and the Pacific 2009"

2.2.3 Household Economy

In comparison with the national level, the Jawa and Bali region has the larger share of population in higher income levels and the smaller share of population in lower income levels. The share of population in the lowest quintile is less than 20% in all the sub-regions. On the other hand, except Jawa Timur, more than 20% of the population in the sub-regions is classified in the highest quintile. In particular, in Jakarta, more than 60% of the population is in the highest quintile while only 0.3% of the population is in the lowest quintile.

Table 2-6 Percent Distribution of Population by Wealth Quintile (2007)

Province	Wealth Quintile					Total	No. of Population ('000)
	Lowest	Second	Middle	Forth	Highest		
DKI Jakarta	0.3	3.4	8.0	25.1	63.2	100.0	7,342
Jawa Barat	9.7	14.3	20.7	27.8	27.5	100.0	27,052
Jawa Tengah	15.0	21.3	25.1	22.6	15.9	100.0	27,012
DI Yogyakarta	5.4	16.4	25.7	24.3	28.3	100.0	2,946
Jawa Timur	13.3	24.5	21.0	21.2	20.0	100.0	28,017
Banten	13.5	15.1	20.2	17.6	33.6	100.0	6,752
Bali	5.3	13.9	18.4	26.7	35.7	100.0	2,713
INDONESIA	**20.0**	**20.0**	**20.0**	**20.0**	**20.0**	**100.0**	**167,002**

Source: Badan Pusat Staistik (BPS), "Indonesia Demographic and Health Survey 2007", p.21, Table 2.9

The poverty incidence of Indonesia has been gradually declining. At the country level, the share of population below the poverty line dropped from 16.6% in 2007 to 14.2% in 2009. The total population in poverty was 32.5 million in 2009. The poverty incidence in the rural areas is higher than urban areas: The share of poor population in the rural areas is 17.4% while 11.7% of the urban population is below the poverty line.

The situations in poverty in the Jawa and Bali region differ by the sub-regions. In Jakarta, Banten and Bali, the poverty headcount ratios are much lower than the national level: 3.6%, 7.6% and 5.1%, respectively. On the other hand, Jawa Tengah, Yogyakarta and Jawa Timur, have a higher poverty incidence than the national level. In particular, the share of rural poverty in those sub-regions is more than 20%.

Table 2-7 Population under the Poverty Line

Province	2007			2008			2009					
	% of Population			% of Population			% of Population			No. of Population ('000)		
	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
DKI Jakarta	4.61	-	4.61	4.29	-	4.29	3.62	-	3.62	323.2	-	323.2
Jawa Barat	11.21	16.88	13.55	10.88	16.05	13.01	10.33	14.28	11.96	2 531.4	2 452.2	4 983.6
Jawa Tengah	17.23	23.45	20.43	16.34	21.96	19.23	15.41	19.89	17.72	2 420.9	3 304.8	5 725.7
DI Yogyakarta	15.63	25.03	18.99	14.99	24.32	18.32	14.25	22.60	17.23	311.5	274.3	585.8
Jawa Timur	14.71	25.02	19.98	13.15	23.64	18.51	12.17	21.00	16.68	2 148.5	3 874.1	6 022.6
Banten	6.79	12.52	9.07	6.15	11.18	8.15	5.62	10.70	7.64	348.7	439.3	788.1
Bali	6.01	7.47	6.63	5.70	6.81	6.17	4.50	5.98	5.13	92.1	89.7	181.7
INDONESIA	**12.52**	**20.37**	**16.58**	**11.65**	**18.93**	**15.42**	**10.72**	**17.35**	**14.15**	**11 910.5**	**20 619.4**	**32 530.0**

Source: Badan Pusat Staistik (BPS) website (http://dds.bps.go.id/eng/tab-sub/, as of February, 2010)

For the status of household facilities and assets, there is regional differences between rural and urban areas.

The share of households with piped water in the country is very limited: 23% in urban area, 6.6% in rural area and 13% in the whole of the country. For sanitation, 75% of urban households have private toilets compared to only 33% of rural households.

The urban and rural gap in the share of households with electricity is relatively smaller than the other facilities: 98% of urban households and 86% of rural households have electricity.

Among the durable goods, television is the most popular in the Indonesian households: 85% of urban households and 57% of rural households have television. The use of refrigerators, which are electricity consuming durable goods, is still limited in the country. Even in the urban areas, only 43% of households have refrigerators.

Table 2-8 Household Characteristics

	Urban	Rural	Total
Facility			
With Electricity	98.2%	86.1%	91.1%
With Piped Water	23.1%	6.6%	13.4%
With Private Toilet	75.4%	33.1%	56.5%
Durable Goods			
Radio	58.3%	42.3%	49.0%
Television	84.9%	57.2%	68.7%
Telephone/mobile phone	61.3%	28.5%	42.1%
Refrigerator	43.1%	12.6%	25.2%
No. of Households ('000)	**16,883**	**23,818**	**40,701**

Source: Badan Pusat Staistik (BPS), "Indonesia Demographic and Health Survey 2007", p.16, p.18 and p.22

2.2.4 Socio-economic Indicators

Education attainment of the Indonesian population has been gradually improving during 2000's. The literate rate of the population aged 10 years and over increased from 90% in 2000 to 93% in 2008. While the share of population without schooling declined from 9.7% in 2000 to 7.6% in 2007, the share of population with secondary education increased from 15% to 17.5% for the same period. The share of population with primary education slightly decreased from 32% to 31% whilst the share of population obtaining higher education at a high school more significantly increased from 18% to 23%.

At the national level, the illiteracy rate dropped from 10% in 2003 to 7.8% in 2008. The same trends in the illiteracy rate at the sub-regional level in the Jawa and Bali region was observed. However, there are significant gaps among the sub-regions in the Jawa and Bali region. The illiteracy rates in Jakarta, Jawa Barat and Banten are lower than the national level while the illiteracy prevails at more than 10% in other sub-regions.

Table 2-9 Education Attainment of Population Aged 10 Years and Over (%)

Selected Indicators	2000	2001	2002	2003	2004	2005	2006	2007	2008
No schooling	9.66	10.3	8.64	8.5	8.98	7.82	7.43	7.57	-
Some Elementary School	24.29	24.11	22.63	21.87	15.31	21.46	20.77	20.37	-
Elementary School	32.45	32.66	33.3	33.42	31.87	32.34	31.67	31.19	-
Junior High School	15.28	14.87	15.92	16.65	20.12	17.06	17.56	17.49	-
At least senior High School	18.32	18.06	19.53	19.56	23.72	21.32	22.56	23.37	-
Proportion of population 10 years of age and over who were literate	89.92	89.2	90.71	90.93	91.47	91.91	92.39	92.74	93.05

Source: Badan Pusat Staistik (BPS) website (http://dds.bps.go.id/eng/tab-sub/, as of February, 2010)

Table 2-10 Illiteracy Rate of Population over 15 Years of Age (%)

	2003	2004	2005	2006	2007	2008
DKI Jakarta	1.59	1.69	1.68	1.77	1.24	1.30
Jawa Barat	6.17	6.04	5.35	5.09	4.68	4.47
Jawa Tengah	14.21	13.28	12.59	11.76	11.38	10.76
Dista Yogyakarta	14.25	14.22	13.28	13.57	12.22	10.54
Jawa Timur	16.63	15.46	14.16	12.90	12.58	12.69
Banten	6.22	6.02	4.37	4.99	4.76	4.79
B a l i	15.56	14.48	13.78	14.21	14.02	13.06
Whole Country	10.21	9.62	9.09	8.55	8.13	7.81

Source: Badan Pusat Staistik (BPS) website (http://dds.bps.go.id/eng/tab-sub/, as of February, 2010/02/01)

The net enrollment rates by educational level did not change significantly during the period between 2006 and 2008. The sub-regional gaps in the net enrollment rate of elementary school are ignorable: the lowest net enrollment rate is 93.7% in Jakarta and the highest rate is 95.2% in Jawa Tengah.

On the other hand, the gaps in the net enrollment rates of secondary and higher education are considerable at the sub-regional level. Yogyakarta has the highest net enrollment rates of secondary and higher education, which are 74% and 58%, respectively. The lowest rates are 58% in Banten for junior high school and 37% in Jawa Barat for senior high school.

Table 2-11 Net Enrollment Rate (%)

Province	2006			2007			2008		
	Elementary School	Junior High School	Senior High School	Elementary School	Junior High School	Senior High School	Elementary School	Junior High School	Senior High School
DKI Jakarta	90.78	71.41	52.82	93.27	71.26	49.58	93.71	71.35	49.74
Jawa Barat	94.21	62.13	37.84	94.16	66.90	37.88	94.09	67.21	37.28
Jawa Tengah	94.05	67.67	42.36	94.78	68.84	43.81	95.12	69.14	43.51
Dista Yogyakarta	94.38	72.30	55.85	93.53	74.48	57.88	94.28	74.42	57.72
Jawa Timur	94.20	70.28	46.35	94.45	69.02	47.60	94.53	68.90	47.02
Banten	94.83	66.56	41.44	92.97	58.41	38.44	93.34	58.28	37.54
B a l i	93.33	70.15	53.54	94.43	66.63	55.64	94.82	67.03	55.04
Whole Country	93.54	66.52	43.77	93.75	66.64	44.56	93.98	66.75	44.22

Source: Badan Pusat Staistik (BPS) website (http://dds.bps.go.id/eng/tab-sub/, as of February, 2010/02/01)

In Indonesia, the health conditions also improved during the last two decades. According to the Indonesia Demographic and Health Survey (IDHS) the infant mortality rate dramatically dropped from 66 per 1,000 births in 1994 to 39 in 2007. There is also a sub-regional gap in the infant mortality rate: the lowest rate in 2007 was 19 per 1,000 births in Yogyakarta and the highest rate was 46 per 1,000 births in Banten.

Table 2-12 Infant Mortality Rate (per 1000 births)

Province	IDHS 1994 (1985-1994)	IDHS 1997 (1988-1997)	IDHS 2002-03 (1994-2003)	IDHS 2007 (1998-2007)
DKI Jakarta	30	26	35	28
Jawa Barat	89	61	44	39
Jawa Tengah	51	45	36	26
DI Yogyakarta	30	23	20	19
Jawa Timur	62	36	43	35
Banten	N.A.	N.A.	38	46
Bali	58	40	14	34
INDONESIA	**66**	**52**	**43**	**39**

Source: Badan Pusat Staistik (BPS), “Indonesia Demographic and Health Survey 2007”, p.121, Table 10.4

2.3 Macroeconomic Conditions

2.3.1 Economic Growth and Structure

The Indonesian economy kept steady growth for the period from 2004 to 2008: the average GDP growth rate for the five years was around 5.5%. The driving force for the economic growth was the service sector, including transportation and communications. For the years of 2007 and 2008, the utility sector, including electricity, gas, and water supply, recorded double digit growth. The growth rates of electricity alone for the same years were 7.6% and 6.7%, respectively. The growth of utilities was attributed to the expansion of gas usage by 30% since PLN switched to gas from more expensive fuels, as well the promotion of shifting from subsidized kerosene to nonsubsidized liquefied petroleum gas for consumers. GDP without oil and gas showed a higher growth rate than the growth rate with oil and gas.

Production of the natural resource sector, including mining and oil has been seriously stagnant despite rising fuel prices. The oil and gas sector showed negative growth for the period between 2004 and 2008. In particular, oil and gas production considerably fell by 5.7%. The crude oil production of the country decreased by 40% from 1.4 million barrels a day in 2000 to 0.846 million barrels a day in the first half of 2008. In 2009, it recovered to 0.957 million barrels per day, which still did not reach the level of 2000. The slump of the oil sector, due to the lack of investment for years, resulted in Indonesia, as an oil-producing country, remaining as a net oil importer.

Table 2-13 GDP Growth by Industrial Origin (%)

	2004	2005	2006	2007	2008
Agriculture	2.28	2.72	3.36	3.43	4.77
Mining and Quarrying	-4.48	3.20	1.70	2.02	0.51
Manufacturing Industry	6.38	4.60	4.59	4.67	3.66
Oil and Gas	-1.95	-5.67	-1.66	-0.06	-0.33
Non-Oil and Gas	7.51	5.86	5.27	5.15	4.05
Electricity, Gas & Water Supply	5.30	6.30	5.76	10.33	10.92
Electricity	**5.13**	**6.68**	**6.36**	**7.64**	**6.65**
Construction	7.49	7.54	8.34	8.61	7.31
Trade, Hotel & Restaurants	5.70	8.30	6.42	8.41	7.23
Transport and Communication	13.38	12.76	14.23	14.04	16.69
Finance, Real Estate & Business Services	7.66	6.70	5.47	7.99	8.24
Services	5.38	5.16	6.16	6.60	6.45
General Government	1.65	1.90	3.96	5.43	4.46
Private	8.96	8.09	8.02	7.55	8.03
GDP	**5.03**	**5.69**	**5.50**	**6.28**	**6.06**
GDP without Oil and Gas	**5.97**	**6.57**	**6.11**	**6.87**	**6.52**

Source: Badan Pusat Staistik website, http://dds.bps.go.id/eng/tab-sub/, as of February, 2010
Note1: Data of 2007 are provisional figures.
Note2: Data of 2008 are very provisional figures.

The main contributor to the Indonesian economy is the manufacturing sector, including non-oil and oil industries, which produced added values of more than 1,380 trillion rupiahs in 2008. The manufacturing sector accounted for 27-28% of the GDP for the five years from 2004 to 2008 inclusive. Despite the negative growth, the oil and gas sector kept 5% of GDP.

The second largest sectors are agriculture, and trade, hotel & restaurants. The agriculture sector has stable production around 14% of GDP, although the sector has been affected by commodity markets as well as natural conditions. The GDP share of trade, hotel and restaurants declined from 16% in 2004 to 14% in 2008.

Utilities, including electricity, accounted for around 1% in GDP. The GDP share of electricity alone slightly decreased from 0.8% to 0.5% for the same period.

Table 2-14 GDP by Industrial Origin (Current Market Price)

	2004		2005		2006		2007		2008	
	Amount	% in GDP	Amount	% in GDP	Amount	% in GDP	Amount	% in GDP	Amount	% in GDP
Agriculture	329,124.6	14%	364,169.3	13%	433,223.4	13%	541,592.6	14%	713,291.4	14%
Mining and Quarrying	205,252.0	9%	309,014.1	11%	366,520.8	11%	441,006.6	11%	543,363.8	11%
Manufacturing Industry	644,342.6	28%	760,361.3	27%	919,539.3	28%	1,068,653.9	27%	1,380,731.5	28%
Oil and Gas	94,263.4	4%	138,440.9	5%	172,094.9	5%	182,324.3	5%	242,061.4	5%
Non-Oil and Gas	550,079.2	24%	621,920.4	22%	747,444.4	22%	886,329.6	22%	1,138,670.1	23%
Electricity, Gas & Water Supply	23,730.3	1.0%	26,693.8	1.0%	30,354.8	0.9%	34,724.6	0.9%	40,846.7	0.8%
Electricity	**17,503.2**	**0.8%**	**19,175.1**	**0.7%**	**21,203.5**	**0.6%**	**23,051.5**	**0.6%**	**25,774.5**	**0.5%**
Construction	151,247.6	7%	195,110.6	7%	251,132.3	8%	305,215.6	8%	419,321.6	8%
Trade, Hotel & Restaurants	368,555.9	16%	431,620.2	16%	501,542.4	15%	589,351.8	15%	692,118.8	14%
Transport and Communication	142,292.0	6%	180,584.9	7%	231,523.5	7%	264,264.2	7%	312,454.1	6%
Finance, Real Estate & Business Services	194,410.9	8%	230,522.7	8%	269,121.4	8%	305,213.5	8%	368,129.7	7%
Services	236,870.3	10%	276,204.2	10%	336,258.9	10%	399,298.6	10%	483,771.3	10%
General Government	121,129.4	5%	135,132.8	5%	167,799.7	5%	205,343.9	5%	257,547.7	5%
Private	115,740.9	5%	141,071.4	5%	168,459.2	5%	193,954.7	5%	226,223.6	5%
GDP	**2,295,826.2**	**100%**	**2,774,281.1**	**100%**	**3,339,216.8**	**100%**	**3,949,321.4**	**100%**	**4,954,028.9**	**100%**
GDP without Oil and Gas	**2,083,077.9**	**91%**	**2,458,234.3**	**89%**	**2,967,040.3**	**89%**	**3,532,807.7**	**89%**	**4,426,384.7**	**89%**

(Units:Rp.million)

Source: Badan Pusat Staistik website, http://dds.bps.go.id/eng/tab-sub/, as of February, 2010

Note1: Data of 2007 are provisional figures.

Note2: Data of 2008 are very provisional figures.

By region, approximately 60% of outputs are concentrated in Jawa. The gross regional product (GRP) of the Jawa region was 2,425 trillion rupiahs in 2008, which accounted for 58% of GDP. In particular, the three sub-regions, Jakarta, Jawa Barat and Jawa Timur, had almost 80% of the GRP in the Jawa region.

The region with the second largest GRP is Sumatra. The GRP of the Sumatra region in 2008 was 977 trillion rupiahs which accounted for 23% of GDP being 40% of the GRP of the Jawa region. The other regions had only limited outputs of less than 20% of the national economy.

Table 2-15 Gross Regional Product (GRP) (Current Market Prices)

	2004		2005		2006		2007		2008	
	Amount	% in GDP	Amount	% in GDP	Amount	% in GDP	Amount	% in GDP	Amount	% in GDP
Jawa	**1,311,503.1**	**59%**	**1,570,892.4**	**59%**	**1,854,680.9**	**59%**	**2,080,822.7**	**59%**	**2,424,986.0**	**58%**
DKI Jakarta	375,561.5	**17%**	433,860.3	**16%**	501,584.8	**16%**	566,449.4	**16%**	677,445.2	**16%**
Jawa Barat	305,703.4	**14%**	389,244.7	**15%**	473,187.3	**15%**	526,608.8	**15%**	602,420.6	**14%**
Jawa Tengah	193,435.3	**9%**	234,435.3	**9%**	281,996.7	**9%**	312,428.8	**9%**	362,938.7	**9%**
DI. Yogyakarta	22,023.9	**1%**	25,337.6	**1%**	29,417.3	**1%**	32,916.7	**1%**	38,102.1	**1%**
Jawa Timur	341,065.3	**15%**	403,392.4	**15%**	470,627.5	**15%**	534,919.3	**15%**	621,582.0	**15%**
Banten	73,713.8	**3%**	84,622.3	**3%**	97,867.3	**3%**	107,499.7	**3%**	122,497.5	**3%**
Bali	**28,986.6**	**1%**	**33,946.5**	**1%**	**37,388.5**	**1%**	**42,336.4**	**1%**	**49,922.6**	**1%**
Jawa & Bali	**1,340,489.7**	**61%**	**1,604,838.9**	**60%**	**1,892,069.4**	**61%**	**2,123,159.1**	**60%**	**2,474,908.7**	**59%**
Sumatera	495,523.7	**22%**	590,479.6	**22%**	694,471.1	**22%**	808,150.7	**23%**	976,745.4	**23%**
Kalimantan	209,782.3	**9%**	266,935.8	**10%**	296,453.7	**10%**	333,202.1	**9%**	441,501.2	**11%**
Sulawesi	92,036.5	**4%**	108,545.1	**4%**	125,887.0	**4%**	145,017.2	**4%**	176,989.4	**4%**
Nusa Tenggara, Maluku & Papua	72,986.1	**3%**	99,176.0	**4%**	109,240.0	**4%**	127,268.3	**4%**	134,214.8	**3%**
Total of 33 Provinces	**2,210,818.4**	**100%**	**2,669,975.4**	**100%**	**3,118,121.1**	**100%**	**3,536,797.4**	**100%**	**4,204,359.4**	**100%**

(Units: Rp. million)

Source: Badan Pusat Staistik website, http://dds.bps.go.id/eng/tab-sub/, as of February, 2010

Note1: Data of 2007 are provisional figures.

Note2: Data of 2008 are very provisional figures.

Regional economic growth is moderate compared to economic outputs. For the period from 2005 to 2008, Jawa, the region with the largest GRS in the country, had an average annual GRS growth rate of 5.78%. Within the Jawa region, Jakarta steadily grew at the highest average growth rate of 6% per annum. Even the lowest growth rate, being for Yogyakarta, had an annual average of 4.4%.

The region with the highest economic growth is Sulawesi. The regional economy of Sulawesi grew at the average annual rate of 7.6%. Due to the less development, Kalimantan and Nusa Tenggara, Maluku & Papua grew slowly at 3.4% and 2.4%, respectively.

Table 2-16 % Growth Rate of Gross Regional Product GRP) (at Constant Price in 2000)

	2004	2005	2006	2007	2008	Average 2005-2008
Jawa	**5.40**	**5.75**	**5.77**	**6.19**	**5.88**	**5.78**
DKI Jakarta	5.65	6.01	5.95	6.44	6.18	6.01
Jawa Barat	4.77	5.60	6.02	6.48	5.83	5.72
Jawa Tengah	5.13	5.35	5.33	5.59	5.46	5.35
DI. Yogyakarta	5.12	4.73	3.70	4.31	5.02	4.46
Jawa Timur	5.83	5.87	5.77	6.11	5.90	5.89
Banten	5.63	5.88	5.57	6.04	5.82	5.78
Bali	**4.62**	**5.56**	**5.28**	**5.92**	**5.97**	**5.34**
Jawa & Bali	**5.38**	**5.75**	**5.76**	**6.18**	**5.89**	**5.77**
Sumatera	2.93	3.57	5.26	4.95	4.92	4.18
Kalimantan	3.01	3.92	3.80	3.53	5.26	3.57
Sulawesi	10.30	6.28	6.83	6.88	7.72	7.57
Nusa Tenggara, Maluku & Papua	-5.26	13.97	-4.03	5.06	2.40	2.43
Total of 33 Provinces	**4.44**	**5.38**	**5.18**	**5.67**	**5.59**	**5.17**

Source: Badan Pusat Staistik website, http://dds.bps.go.id/eng/tab-sub/, as of February, 2010/02/01
Note1: Data of 2007 are provisional figures.
Note2: Data of 2008 are very provisional figures.

2.3.2 Inflation and Monetary Policy

For the period from 2000 to 2008, inflation in Indonesia was volatile due to the changes in global fuel and commodity prices. After moderate inflation in 2003 and 2004, the rising global fuel prices pushed domestic prices up in the country from 2005 to 2006. The higher food prices caused by the sharp rise of energy prices induced an increase in domestic food prices in Indonesia.. After 2007, the price indexes went up and down. In July 2009, since the global prices of fuel and commodities dropped, inflation fell down to 2.6%.

In order to cope with inflation pressure, the Indonesian monetary authorities controlled their interest rate policy. The Bank Indonesia, the central bank of the country, cut the reference interest rate in 2004 to promote investment. Due to the high pressure of inflation, the interest rate was raised up in 2005 and remained at that level until May 2006. The tight monetary policy slowed down the growth of money supply (M2) from 16.4% in 2005 to 14.9% in 2006. However, the money supply sharply grew to 18.9% in 2007 due to a sharp increase in net foreign assets of the banking system that expanded their external reserves. Also, the private sector credit grew quickly since Bank Indonesia cut the policy interest rate from 12.75% to 8% with less inflation pressure. In 2008, the growth of M2 dropped down because of the slowdown of the economy affected by the global financial crisis.

Table 2-17 Annual Changes in Price Indexes and Money Supply

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Price Indexes (annual change, %)									
Consumer price index	9.3	12.5	10.0	6.8	6.1	10.5	13.1	6.4	9.8
Food price index	2.7	7.3	10.8	0.8	5.9	10.0	14.8	11.4	16.9
Money supply (M2) (annual change, %)	15.6	13.0	4.7	8.1	8.1	16.4	14.9	18.9	14.6

Source: Asian Development Bank, "Key Indicators for Asia and the Pacific 2009"

2.3.3 Balance of Payments and Foreign Exchange Rate

Since 2004, both exports and imports rapidly grew in Indonesia. Since the prices of fuel and commodities produced by Indonesia were strong in the international market, along with the depreciation of the rupiah, merchandise exports increased. Although the import growth was faster than the export growth, Indonesia maintained a trade surplus. However, the trade surplus sharply decreased to 77.8 billion US dollars in 2008 from 396.2 billion US dollars in 2007 because of declining international prices of trade commodities as well as the stagnant global trade.

The current account balance also continuously recorded a surplus. For 2006 and 2007, due to growing remittances from migrant workers from the country, the current account surplus was over 10 billion US dollars. The share of current account surplus in GDP was in a downward trend from 4.8% in 2000 to 0.1% in 2005. Although recovering to 3.0% in 2006 and 2.4% in 2007, it dropped again to 0.1% in 2008.

The overall balance also kept a surplus for the period from 2000 to 2007 except in 2001. Owing to larger inflows of foreign direct and portfolio investments as well as loan disbursements to the private sector, the overall surplus reached 14.5 billion US dollars, 4% of GDP in 2006, and 12.7 billion US dollars, 2.9% of GDP in 2007.

The exchange rate of the national currency has been reflecting domestic and international conditions. In 2005, the rupiah had considerably depreciated against the US dollars since its lowest level in 2003. The exchange rate appreciated by 9% in 2006 and slightly depreciated in 2007. The appreciation of the rupiah in 2006 was attributed to the remarkable expansion of trade and current account surplus and the increase in foreign reserves. In the last three months of 2008, the rupiah depreciated by approximately 15%.

Table 2-18 Balance of Payment and Foreign Exchange Rate

(Unit: Million USD)

	2000	2001	2002	2003	2004	2005	2006	2007	2008
EXTERNAL TRADE									
Trade balance	28,609	25,359	25,930	29,441	23,534	27,959	39,612	39,627	7,776
External Trade (annual change, %)									
Exports	27.7	-9.3	1.5	9.4	11.5	22.9	17.5	13.3	20.1
Imports	39.6	-7.6	0.9	5.9	39.6	24.9	5.9	21.9	73.5
BALANCE OF PAYMENTS									
Current account	7,991	6,900	7,822	8,106	1,564	278	10,859	10,492	606
Overall balance	3,918	(3)	5,027	3,653	309	444	14,510	12,715	(1,945)
Balance of Payments (% of GDP)									
Current account balance	4.8	4.2	4.0	3.5	0.6	0.1	3.0	2.4	0.1
Overall balance	2.4	-0.0	2.6	1.6	0.1	0.2	4.0	2.9	-0.4
EXCHANGE RATES (Rupia per US$)									
End of period	9,595	10,400	8,940	8,465	9,290	9,830	9,020	9,419	10,950
Average of period	8,422	10,261	9,311	8,577	8,939	9,705	9,159	9,141	9,699

Source: Asian Development Bank, "Key Indicators for Asia and the Pacific 2009"

2.4 Government Finance and External Debt

2.4.1 Government Finance

The total revenue and expenditure continuously increased since 2002 and reached 981 trillion rupiahs and 985 trillion rupiahs in 2009, respectively. The share of current expenditure in total expenditure decreased from 81% in 2000 to 58% in 2002, and then increased to 94% in 2005. However, it decreased to 91-93% between 2006 and 2008. On the other hand, the share of capital expenditure dropped to 6% in 2005 from 42% in 2002.

The government of Indonesia has been facing an overall budget deficit due to the large capital account deficit. Depending on domestic and foreign financing, capital expenditure causes a deficit of the capital account. However, fiscal performance of Indonesia improved after 2001.

The amount of budget deficit reduced from 40 trillion rupiahs to 14 trillion rupiahs for the period between 2001 and 2005. Although the budget deficit dramatically expanded to 48.7 trillion rupiahs in 2007, it diminished by more than 90% to 4.2 trillion rupiahs in 2008. The budget deficit declined from 2.4% of GDP in 2001 to 0.1% in 2008.

The heavy fiscal burden for Indonesia is due to the cost of subsidies, mainly for fuel and electricity. The fuel and electricity subsidies increased to 4.4% of GDP in 2005. Spending on food, fuel and electricity subsidies expanded in 2006 and 2007 in order to reduce the impacts of rising fuel and commodity prices.

Table 2-19 Government Finance

(Unit: Billion Rupiah)

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Total revenue and grants	204,942	301,077	300,186	341,396	403,367	495,224	637,987	708,495	981,031
Current revenue	204,942	300,600	299,886	340,928	403,105	493,919	636,153	706,791	978,721
Total expenditure	219,936	341,562	327,863	376,505	427,176	509,633	667,129	757,245	985,271
Current expenditure	177,342	218,923	189,069	307,258	365,726	476,744	612,177	692,838	912,992
Capital expenditure	42,594	122,639	138,794	69,247	61,450	32,889	54,952	64,407	72,279
Current account balance	27,600	81,677	110,817	33,670	37,379	17,176	23,976	13,953	65,730
Capital account balance	(42,594)	(122,639)	(138,794)	(69,247)	(61,450)	(32,889)	(54,952)	(64,407)	(72,279)
Overall budgetary balance	**(14,993)**	**(40,485)**	**(27,677)**	**(35,109)**	**(23,809)**	**(14,408)**	**(29,142)**	**(48,750)**	**(4,240)**
Financing									
Domestic borrowing	18,900	30,218	20,561	34,562	51,866	24,680	55,709	72,674	74,615
Foreign borrowing	9,554	10,267	7,116	548	(28,057)	(10,272)	(26,567)	(23,924)	(19,100)
Government Finance (% of GDP)									
Total revenue	14.7	17.8	16.5	16.9	17.6	17.8	19.0	17.9	19.8
Total expenditure	15.8	20.3	18.0	18.7	18.6	18.4	20.0	19.1	19.9
Overall budgetary balance	-1.1	-2.4	-1.5	-1.7	-1.0	-0.5	-0.9	-1.2	-0.1

Source: Asian Development Bank, “Key Indicators for Asia and the Pacific 2009”

2.4.2 External Debt

The debt management of Indonesia has improved since 2005. The external debt was reduced from 93.6% of GNI in 2000 to 33.9% in 2007. The total debt outstanding and disbursed expanded from 130.8 billion US dollars in 2003 to 140.8 US billion dollars in 2007.

For the period 2000 to 2008 long-term debt accounted for around 75% of the total debt. The total long-term debt outstanding was 105.8 million US dollars in 2007. The share of public and publicly guaranteed debt in the total long-term debt sharply increased to 75% in 2005 and then declined to 65% in 2007.

The amount of debt service increased from 12.3 billion US dollars in 2001 to 18.5 billion US dollars in 2004. After reducing to 13.2 billion US dollars in 2007, it increased again in 2008 to 17.2 billion US dollars. Because of growing exports, the debt service ratio improved from 25.7% in 2003 to 10.5% in 2007.

Table 2-20 External Debt

(Unit: Million USD)

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Total debt outstanding and disbursed	144,286	133,817	132,966	136,845	139,555	132,794	130,800	140,783	…
Long-term debt	110,816	102,899	101,298	103,667	105,369	95,387	97,800	105,840	…
Public and publicly guaranteed	69,647	68,494	71,272	73,913	71,822	71,729	67,117	68,708	…
External debt (% of GNI)	93.6	86.6	70.1	60.6	56.9	48.8	37.5	33.9	…
Total long-term debt (% of total debt)	76.8	76.9	76.2	75.8	75.5	71.8	74.8	75.2	…
Debt service									
Principal repayments on long-term debt	9,267	7,851	10,516	12,893	14,617	11,263	10,598	9,617	13,156
Interest on long-term debt	5,672	4,537	3,118	3,406	3,913	2,962	2,979	3,676	4,168
Debt service (% of exports of goods and services)	22.4	23.5	24.7	25.7	23.6	15.3	18.6	10.5	…

Source: Asian Development Bank, “Key Indicators for Asia and the Pacific 2009”

Chapter 3 Power Sector in Indonesia

3.1 Brief of Power Sector in Indonesia

PLN owns and manages the electric power supply facilities which cover power plants, transmission lines and distribution lines in Indonesia. The largest amount of electric power is from Coal-fired Power Plants (PLTU). In line with the policy to increase the generating capacity, and to reduce dependency on oil fuel consumption, PLN is currently developing additional PLTU plants through a Fast Track Program, starting in 2010, for 10,000 MW of power.

(1) Power generation facilities

The peak demand demands are for the Jawa-Bali and Whole of Indonesia systems are shown in Table 3.1.1. The load factor is improved only by the existing policy of power use limitation at the time of peak load by big consumers and the application of multipurpose tariffs for controlling new customers.

Table 3.1.1 Peak demand for the Jawa-Bali and Whole of Indonesia systems

	2006	2007	2008
Java-Bali system [MW]	15,400	16,257	16,307
Whole Indonesia system [MW]	20,350	21,306	21,120

(source) PLN System planning

In 2007, the installed capacity of power plants of PLN in Java-Bali system was 22,236 MW.
During 2007 and 2008, the realization of additional power plants in Java-Bali system was only small, namely Geothermal Power Plant (PLTP) Darajat of 110 MW and PLTP Kamojang of 60 MW.
By the small addition of new power plants in Java-Bali system and by continuously increasing peak load, the reserve margin in 2008 was predicted to decrease to 27%.
Detailed capacities of power plants in the Java-Bali system by the type of power plant and their management are shown in Table 3.1.2.

Table 3.1.2 Installed Capacity of Power Plants of Java-Bali System in 2007

Type of Power Plant		IP (PT Indonesia Power)	PJB (PT Pembangkitan Jawa Bali)	PLN	IPP	Total	
						MW	%
PLTA	Hydro	1,103	1,283		150	2,536	11.4
PLTU	Coal	3,400	800	1,320	3,050	8,570	38.5
	CNG/Oil		1,000			1,00	4.5
	Oil	500	300			800	3.6
PLTGU	Gas						
	CNG/ Oil	1,180	2,087	740		4,007	18
	Oil	1,496	640			2,136	9.6
PLTG	GT						
	CNG/ Oil	40	62		150	252	1.1
	Oil	806	320	858		1,984	8.9
PLTD	Diesel	76				76	0.3

Type of Power Plant		IP (PT Indonesia Power)	PJB (PT Pembangkitan Jawa Bali)	PLN	IPP	Total	
						MW	%
PLTP	Geothermal	360			515	875	3.9
Total		8,961	6,492	2,918	3,865	22,236	100.0

(source) RUPTL 2009-2018

(2) Power transmission facilities

For Java-Bali, PLN has an interconnected transmission system of 500 kV and 150 kV, while for outside Java-Bali a separate system for the transmission of 150 kV and 70 kV is used..
The progress of development of the power transmission facilities for the last 5 (five) years is shown in the following Table 3.1.3.

Table 3.1.3 Power transmission facilities of PLN in Java-Bali system

		2004	2005	2006	2007	2008
Transmission Line	kms	30,793	30,945	31,195	31,612	32,472

(source) PLN Annual Report 2008

The progress of development of the Power substation facilities for the last 5 (five) years is shown in the Table 3.1.4.

Table 3.1.4 Power substation facilities of PLN in Java-Bali system

		2004	2005	2006	2007	2008
Sub Station	MVA	54,128	53,976	54,409	54,649	55,989

(source) PLN Annual Report 2008

3.2 Organization of Power Sector in Indonesia

The Operational Coverage of PLN encompasses almost the entire Indonesian territories that consist of more than 13,000 islands.
In order to overcome the obstacles for management, a management decentralization authority is needed. In their growth as the National Electric Power Supplier, PLN has established subsidiaries and one joint venture company namely:

PT PLN (Persero) Jasa Engineering
The Engineering Services Business Unit of PT PLN has a great number of experts with a variety of expertise in technology and a wealth of experience in working in partnership with International Consultants.

PT Indonesia Power (hereinafter refered to as ”IP”)
Jl. Jend. Gatot Subroto Kav.18
South Jakarta 12950
PT Indonesia Power deals with the business of electricity generation and other related businesses. It was established on October 3rd, 1995 under the name of PT PJB and subsequently changed its title to PT Indonesia Power on September 1st, 2000, operating in power plants and other related sectors.

Subsidiaries of PT Indonesia Power are:
• PT Cogindo Daya Bersama operating in the cogeneration sector, distributing, generation and

operation & maintenance service.

- PT Artha Daya Coalindo operating in the trading sectors and coal transportation service.
- PT Indo Pusaka Berau operating in power supply from Steam Power Supply (PLTU) Lati at Berau, East Kalimantan.

PT Pembangkitan Jawa Bali (PT PJB)
Jl. Ketintang Baru No.11
Surabaya 60231
PT Pembangkitan Jawa Bali (hereinafter referred to as "PT PJB") deals with business in electric power generation and other related business. It was established on October 3rd, 1995 under the name of PT PJB II and subsequently changed its title to PT PJB on September 22nd, 2000. Operating in power plants and other related sectors, PT PJB owns a subsidiary that operates in the operational and maintenance sectors, namely PT Pembangkitan Java Bali Services, located in Surabaya.

PT Pelayanan Listrik Nasional Batam (PT PLN Batam)
Jl. Engku Putri No.3
Batam Center, Batam 29432
Established on October 3rd, 2000 operates in the power supply business providing electric power for the public in the region of Batam Island.

PT Prima Layanan Nasional Enjiniring
Jl. Aipda K.S Tubun 1/2
Jakarta 11420
It operates in the business of engineering consultancy. The company was established on October 3, 2002.

Figure 3.2.1 shows the PLN Organization.

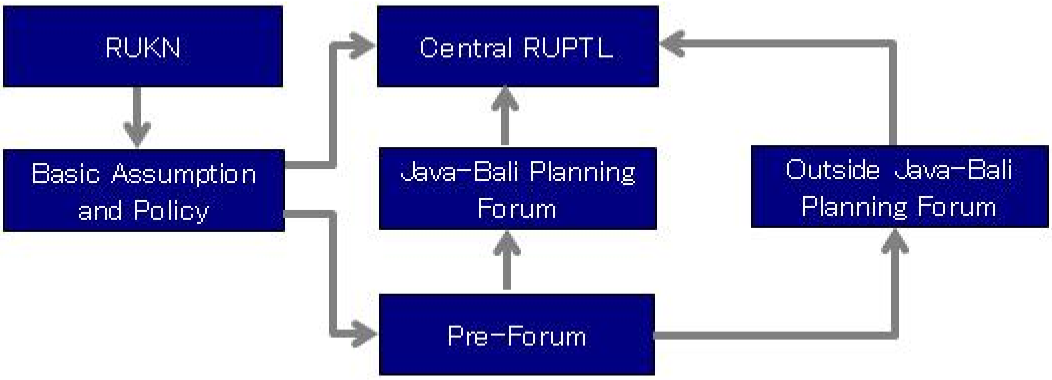
3.3 Power Demand Forcast

3.3.1 The Way of Thinking for the Power Demand Forecast

RUPTL (the Master Plan of Electric Power Supply) is prepared by the following process:

- RUKN (the National Electrification General Plan) is used as the guideline and reference, particularly on the Government's policy in electrification planning, policy in primary energy utilization for power plant, policy in environment protection, policy in reserve margin, economic growth assumption and estimated electric power requirement.
- PLN Head Office specifies the policies and basic assumption as the formulation of RUKN and other Government policies.
- Evaluation is conducted on the basic assumption and its realization in the preceding RUPTL period in the Pre-Forum of Planning.
- By using the Government's basic assumptions such as the macro economic growth and the elasticity of electric power growth knowledge of PLN Head Office, the demand forecast, generating plan, transmission & main powerhouse (GI) plan, distribution plan and plan for isolated areas are prepared. This preparation is conducted by the Business Units and PLN Head Office, according to their respective responsibilities. The demand forecast, main powerhouse plan and distribution plan are prepared by Distribution/Area PLN. The transmission plan is prepared by the Distribution and Load Regulating Center PLN (P3B) and Area PLN, that has responsibility for transmission. The generating plan for big systems is conducted by PLN Head Office.
- The Planning Forum preceded by Planning Pre-Forum is performed at least once a year, in order to verify and agree with the electrification system development planning product produced by PLN Business Units.
- The combination of system planning product from the respective PLN Business Units and its ratification shall be conducted by PLN Head Office, and RUPTL shall further serve as the reference for making the Company's annual Work Program and Budget (RKAP)

The RUPTL preparation process is shown in Figure 3.3.1.1.



(source) RUPTL 2009-2018

Figure 3.3.1.1 RUPTL Preparation Process

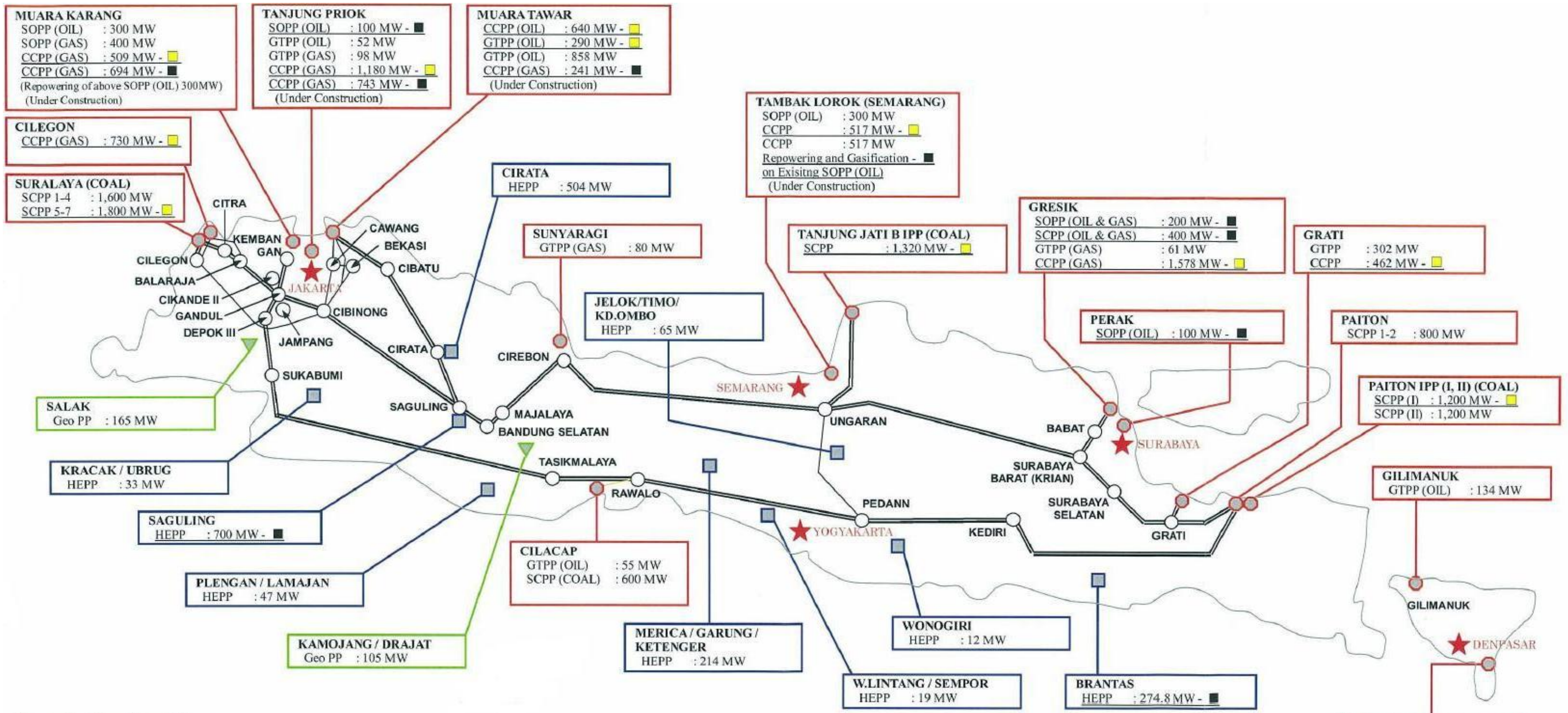
In the Planning Pre-Forum, PLN Business Units conduct an evaluation of the planning realization of the preceding period, and discuss and approve basic assumptions. Further, PLN Business Units (Area/Distribution/Kitlur/P3B) conduct their respective simulation and analysis of the planning to be completed within the following two months.

The initial results of PLN Business Units planning are then discussed in the Planning Forum. This forum re-discusses the regional optimization in order to obtain the optimum planning result by corporation. After the Planning Forum has been completed, PLN Units shall conduct sharpening of system development plan, and prepare the Business Unit system development plan document. At the same time, PLN Head Office shall conduct consolidation of system development plans prepared by PLN Business Units, and prepare the Company RUPTL. The distribution of RUPTL preparation responsibility is shown in Table 1.1.
The Indonesian government approves the National Electric Power General Plan referred to as RUKN and reviews it every year under the supervision of the Ministry of Energy and Mineral Resources. RUKN includes the forecast for power demand over the forthcoming 10 years, the primary energy potential that is available for power generation in each region or area, the power supply targets and the required amount of investment. RUKN is being used as the guideline that the central government, local governments and business entities should comply with when they implement electric power promotion or development projects.
The National Electric Power Supplier (PLN) and licensed general electric power producers are required to prepare a RUPTL (the Master Plan of Electric Power Supply) to satisfy power demand in each region, and the national RUKN should be referenced in the course of preparation.
In accordance with the above procedures, PLN determined RUPTL 2009-2018 for the whole of Indonesia, including Java-Bali System.
According to RUPTL 2009-2018 prepared by PLN, besides explaining the system development plan, RUPTL is also intended to meet the mandate specified in Law No.15/1985 on electrification, Government Regulation No.10/1989 on Electric Power Supply and Utilization, and Government Regulation No.3/2005 on Amendment to Government Regulation No.10/1989. This Law and Government Regulations instruct the players in the electric power supply business to prepare a RUPTL in their respective areas by referring to RUKN. As a result, power demand is supposed to be able to be forecasted based on RUPTL.

3.3.2 Justification of Power Demand Forecast in RUPTL

For the Java-Bali system, the RUPTL advises that PLN will start using Coal PLTU power plants with the unit capacity of 1,000 MW and using supercritical boiler technology for obtaining better efficiency and lower emission levels. The use of units of this size is also encouraged by the increasing difficulty in obtaining land for developing large-scale power plants centers on the island of Java.

The Indonesian government approves RUKN and reviews it every year under the supervision of the Ministry of Energy and Mineral Resources. RUKN includes the forecast for power demand over the forthcoming 10 years, the primary energy potential that is available for power generation in each region or area, the power supply targets and the required amount of investment. RUKN is being used as the guideline that the central government, local governments and business entities should comply with when they implement electric power promotion or development projects.
The outline of major power stations and 500kV transmission line system in Java-Bali is shown in Figure 3.3.2.1. Thermal power generation is dominant and hydroelectric power is supplementary in Indonesia. The thermal power stations are dependent on coal and natural gas as fuel.
The maximum power demand, 16,376 MW (Net)/16,785 MW (Gross), was newly recorded on April 29th, 2009. As of 2009, PLN has a total power generating capacity of 20,645 MW (Net).
The Daily Demand / Supply Situation is calculated in Table 3.3.2.1 below.



Generating Capacity and Type

No.	Type of Power Plant	PT INER MW	PT INER %	PT PJB MW	PT PJB %	IPP and Others MW	IPP and Others %	Total MW	Total %
1	Hydro PP	1,103.0	12.3	1,283.0	19.8	150.0	2.2	2,536.0	11.4
2	Coal Fired SPP	3,400.0	37.9	800.0	12.3	4,370.0	64.4	8,570.0	38.5
3	Gas Fired SPP			1,000.0	15.4			1,000.0	4.5
4	Oil Fired SPP	500.0	5.6	300.0	4.6			800.0	3.6
5	Gas Fired C/C PP	1,180.0	13.2	2,087.0	32.1	740.0	10.9	4,007.0	18.0
6	Oil Fired C/C PP	1,496.0	16.7	640.0	9.9			2,136.0	9.6
7	Gas Fired GTPP	40.0	0.4	62.0	1.0	150.0	2.2	252.0	1.1
8	Oil Fired GTPP	806.0	9.0	320.0	4.9	858.0	12.6	1,984.0	8.9
9	Diesel PP	76.0	0.8					76.0	0.3
10	Geothermal PP	360.0	4.0			515.0	7.6	875.0	3.9
	Total	8,961.0	40.3	6,492.0	29.2	6,783.0	30.5	22,236.0	100.0

Note : The capacity of IPPs is included PLN unit business such as Tanjung Jati B, Muara Tawar Block3,4 and Cilegon

Data Source: PLN system planning, new forecast was approved by Board of Director on May 12, 2009

Figure 3.3.2.1 Outline of major power stations and 500kV transmission line system in Jawa-Bali (May, 2009)

Table 3.3.2.1 Daily Demand / Supply Situation at Java-Bali System in 2009

Total power generating capacity (Net)	20,645MW
Reduce by degradation	- 645MW
Reduce by hydropower in dry season	- 423MW
Reduce by maintenance period	- 1,758MW
Reduce by outage period	- 811MW
Supply capacity	17,008MW
Demand	16,325MW
Reserve	683MW

Source: PLN

PLN needs to carry out emergency load shedding (SIAGA) when the reserve capacity falls below 600MW being equivalent to the maximum unit capacity of the Suralaya power station. It has to, because PLN can't maintain the balance of the demand and supply when the maximum capacity tripped accidentally.

PLN carried out SIAGA once in 2004, forty-two times in 2005, thirty-two times in 2006, thirteen times in 2007 and thirty-five times in 2008.

PLN did not carry out SIAGA until March in 2009 because of the high availability of major hydro powers for rain season. However supply shortage will become obvious at the end of the rain season.

Under these circumstances, the objective of this Preparatory Survey is to study the feasibility of constructing a Super-critical pressure coal fired thermal power plant in the Indramayu district in West Java, near Jakarta, having a capacity of 1,000 MW and, which can be connected to the existing 500kV substation, and to conduct a project formation study as a yen credit candidate project.

PLN and licensed general electric power producers are required to prepare a RUPTL to satisfy power demand in each region, and the national RUKN should be referenced to in the course of preparation of the RUPTL.

In accordance with the above procedures, PLN determined the Master Plan of Electric Power Supply (RUPTL) (2008-2018) for the whole of Indonesia, including Java-Bali System.

The Review Electric Power Supply Business Plan (2009-2018) (hereinafter referred to as RUPTL) in Table 3.3.2.2 and Table 3.3.2.3 includes the electrical power demand forecast and the power plant development plan for the Java-Bali System.

Table 3.3.2.2 Demand / Supply Plan Java-Bali System（RUPTL 2009-2018）

No.	Supply & demand		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
1	***Demand***												
	Sales	GWh	100,942	107,910	118,952	131,168	144,598	159,357	174,874	191,830	210,156	229,755	250,920
	(Growth)	%	5.6	6.8	10.3	10.3	10.2	10.2	9.7	9.7	9.6	9.3	9.2
	Production	GWh	117,354	124,694	137,313	151,186	166,500	183,340	201,020	220,325	241,174	262,465	286,644
	Load factor	%	76.0	75.5	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0
	Gross Peak Load	MW	17,627	18,854	20,900	23,012	25,343	27,906	30,597	33,535	36,708	39,949	43,629
	(Growth)	%	4.7	7.0	10.9	10.1	10.1	10.1	9.6	9.6	9.5	8.8	9.2
2	***Supply***	MW											
	Installed capacity	MW	22,236	21,936	21,503	21,327	21,327	21,327	21,327	21,327	21,327	21,327	21,327
	PLN	MW	18,371	18,071	17,638	17,462	17,462	17,462	17,462	17,462	17,462	17,462	17,462
	IPP	MW	3,865	3,865	3,865	3,865	3,865	3,865	3,865	3,865	3,865	3,865	3,865
	Retired		0	-300	-433	-176	0	0	0	0	0	0	0
3	***Additional Capacity***												
	3.1 PLN												
	Ongoing Project	MW		2890	5,218	900	-	-	-	-	-	-	-
	Plan												
	Upper Cisokan PS	PS		-	-	-	-	-	1,000	-	-	-	-
	Muara Tawar Add-on 2,3,4	PLTGU		-	-	150	1,050	-	-	-	-	-	-
	Bojonegara (LNG Terminal)	PLTGU		-	-	-	-	-	-	750	750	750	-
	New Combined Cycle PP	PLTGU		-	-	-	-	-	-	-	1,500	-	1,500
	New Turbine PP	PLTG		-	-	-	-		-	1,400	-	1,200	-
	New Coal Thermal PP	PLTU		-	-	-	1,000	2,000	-	1,000	-	-	2,000
	Kesamben	PLTA		-	-	-	-	-	-	-	-	37	-
	Kalikonto-2	PLTA		-	-	-	-	-	-	-	62	-	-
	Matenggeng PS	PS		-	-	-	-	-	-	-	-	885	-
	Grindulu PS	PS		-	-	-	-	-	-	-	-	-	1,000
	3.2 IPP												
	Ongoing Project	MW	60	260	130	910	-	-	-	-	-	-	-
	Plan												
	Banten	PLTU	-	-	-	-	-	-	660	-	-	-	-
	Madura	PLTU	-	-	-	-	100	100	-	-	-	-	-
	East Bali (Infrastructure)	PLTU	-	-	-	-	-	200	-	-	-	-	-
	Sumatra Mulut Tambang	PLTU	-	-	-	-	-	-	-	-	1,800	1,200	-
	Central Java Steam PP (Infrastructure)	PLTU	-	-	-	-	-	-	1,000	1,000	-	-	-
	Paiton #3-4 Exp (IPP)	PLTU	-	-	-	-	800	-	-	-	-	-	-
	Tanjung Jati B Exp (IPP)	PLTU	-	-	-	660	660	-	-	-	-	-	-
	West Java Steam PP (Ex.Tj Jati A)	PLTU	-	-	-	-	-	660	660	-	-	-	-
	Geothermal	PLTP	-	-	-	-	225	415	505	40	140	640	945
	Rajamandala	PLTA	-	-	-	-	-	-	-	-	30	-	-
	Jatigede	PLTA	-	-	-	-	-	-	-	-	-	110	-
4	***Total Supply***		22,296	25,146	30,061	32,505	36,340	39,715	43,540	47,730	52,012	56,834	62,279
5	*Reserve*	%	26	33	44	41	43	42	42	42	42	42	43

Source: PLN system planning, 2010-2018 forecast was approved by Board of Director on May 12, 2009

Table 3.3.2.3 PLN'S latest energy and load demand forecast Java-Bali system as of May 2009

DEMAND FORECAST		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
1. ENERGY DEMAND:												
- NEW (2009-2018)	MWh	101,207	107,016	115,317	125,639	137,502	150,607	165,015	180,764	197,447	215,627	235,307
- RUPTL 2009-2018	MWh	100,942	107,810	118,952	131,168	144,598	159,357	174,874	191,830	210,156	229,755	250,920
2. PEAK LOAD SYSTEM												
- NEW (2009-2018)	MWh	16,301	17,681	19,608	21,730	24,073	26,521	29,033	31,778	34,681	37,770	41,217
- RUPTL 2009-2018	MWh	17,627	18,854	20,900	23,012	25,343	27,906	30,597	33,535	36,708	39,949	43,629

Source: PLN system planning, 2010-2018 forecast was approved by Board of Director on May 12, 2009

It is expected that the electric power demand will continue to increase and, even if all the electric power plants currently under construction in Indonesia start to operate according to their respective construction schedules, it is likely that a deficiency in the available electric power supply will still exist.

According to the RUPTL, it is assumed that the electric power demand will increase at a rate of 9.5% on average for the next ten years, and that the maximum power demand will also increase at a rate of 9.5% on average for the next ten years. That being the case it is necessary to construct 2,500 MW of new power generating capacity every year.

There is a likelihood that this value might have been overestimated to take into account the influence of the financial crisis.

If it is assumed that the electric power demand and that the maximum power demand will increase at a rate of 6.0%, under consideration of the influence of the financial crisis, it would be necessary to construct 1,500 MW of new power generating capacity every year.

PLN is not in a position to and can't satisfy the demand to construct new power stations after 2013, in addition to power stations already under construction.

Although the electric power demand in Indonesia has decreased temporarily due to the economic crisis in 1997, the power demand is continuing to increase as a result of the economic recovery. If the power demand increases at the assumed rate mentioned above, a serious power supply shortage is anticipated for Indonesia from the year 2008 onward.

In order to avoid such a situation, PLN and the Indonesian government have advised of their intention to develop additional power generation facilities, the so-called "Crash Program" and the early materialization of new Independent Power Producer (IPP) projects.

In addition, due to the abrupt rise in the price of oil, the generation costs of power stations which use crude oil and diesel oil have also risen and are considered expensive. In order to suppress such a burden, additional thermal power plants using coal as an alternative source of energy are being planned as a government measure.

Not only will PLTU Indramayu Coal-Fired Power Plant 1,000 MW Unit 1 (hereinafter referred to as "IR_B1") contribute to the mitigation of the shortage of electric power, but it is also consistent with the government measure of using coal to lower the generation cost.

In accordance with the above, IR_B1 is considered to be one of the most realistic and effective projects for both PLN and the Indonesian government to address the anticipated power shortage and the measures of lowering the generation costs. IR_B1 shall be completed in 2015 if the project goes smoothly.

Capacity of IR_B1 1,000 MW will account for 2.1% in Java-Bali power grid system so that influence upon the power grid by IR_B1 will be small enough at that moment. AlsoIR_B1 will introduce supercritical coal-fired boiler because of the high performance, operability and wide fuel range.

3.4 Power Generation Development Planning

3.4.1 Existing Power Generation Facilities

In 2007, the installed capacities of all power plants of PLN was 22,236 MW in Java-Bali system, 4,300 MW in Sumatera and 2,669 MW in other systems.

During 2007 and semester 1/2008, the realization of additional power plants in Java-Bali system was only small, namely PLTP Darajat of 110 MW and PLTP Kamojang of 60 MW.

By the small addition of new power plants in the Java-Bali system and the continuously increasing peak load, the reserve margin in 2008 was predicted to decrease to 27%. Furthermore, operational problems such as the slow supply of oil and coal, the declining gas supply, and the derating of and damaged power plants caused the Java-Bali system, during the peak load times, to have power and energy shortages in the past. To maintain the balance of supply and demand of electric power, blackouts had to be implemented.

Detailed capacities of power plants in Java-Bali system by the type of power plant and their management are shown in Table 3.4.1.1.

Table 3.4.1.1 Installed Capacity of Power Plants of Java-Bali System in 2007

No.	Type of Power Plant		IP	PJB	PLN	IPP	Total	
							MW	%
1.	PLTA	Hydro	1,103	1,283		150	2,536	11.4
2.	PLTU	Coal						
		Coal	3,400	800	1,320	3,050	8,570	38.5
		Oil		1,000			1,00	4.5
		Oil	500	300			800	3.6
3.	PLTGU	Gas						
		Oil	1,180	2,087	740		4,007	18
		Oil	1,496	640			2,136	9.6
4.	PLTG	GT						
		Oil	40	62		150	252	1.1
		Oil	806	320	858		1,984	8.9
5.	PLTD	Diesel	76				76	0.3
6.	PLTP	Geothermal	360			515	875	3.9
Total			8,961	6,492	2,918	3,865	22,236	100.0

(source) RUPTL 2009-2018

Table 3.4.1.2 Existing and Committed Thermal Power Plant in Java System

Plant Name	Type	#	Fuel	[MW]	COD	Owner
Suralaya	PLTU	1	coal	381	1985	IP
	PLTU	2	coal	381	1989	
	PLTU	3	coal	381	1989	
	PLTU	4	coal	381	1997	
	PLTU	5	coal	579	1997	
	PLTU	6	coal	579	1997	
	PLTU	7	coal	579	1998	
Cilegon	PLTGU	1	gas	250	2006	IP
	PLTGU	2	gas	250	2006	
	PLTU	1	gas	240	2006	
Muara Karang	PLTGU	1	gas	100	1992	PJB
	PLTGU	2	gas	100	1992	
	PLTGU	3	gas	100	1992	
	PLTGU	1	gas	165	1995	
	PLTU	1	oil	84	1979	
	PLTU	2	oil	84	1979	
	PLTU	3	oil	84	1979	
	PLTU	4	gas	165	1981	
	PLTU	5	gas	165	1982	
Tanjung Priok	PLTGU	1	gas	125	1993	IP
	PLTGU		gas	125	1993	
	PLTGU		gas	125	1993	
	PLTU		gas	185	1993	
	PLTGU	2	gas	125	1994	
	PLTGU		gas	125	1994	
	PLTGU		gas	125	1994	
	PLTU		gas	185	1994	
	PLTU	1	oil	48	1972	
	PLTU	2	oil	48	1972	
	PLTG	1	HSD	20	1976	

Plant Name	Type	#	Fuel	[MW]	COD	Owner
	PLTG	2	HSD	20	1976	
Muara Tawar	PLTGU	1	HSD	140	1997	PJB
	PLTGU		HSD	140	1997	
	PLTGU		HSD	140	1997	
	PLTGU		HSD	185	1997	
	PLTGU	2	HSD	138	1997	
	PLTGU	3	HSD	138	1997	
	PLTG	1	HSD	143	2004	PMT
	PLTG	2	HSD	143	2004	
	PLTG	3	HSD	143	2004	
	PLTG	4	HSD	143	2004	
	PLTG	5	HSD	143	2004	
	PLTG	6	HSD	143	2004	
Cikarang Listrindo	PLTG	1	gas	34	1997	IPP
	PLTG	2	gas	34	1997	
	PLTG	3	gas	41	1997	
	PLTG	4	gas	41	1997	
Kamojang	PLTP	1	geothermal	26	1982	IP
	PLTP	2	geothermal	47	1987	
	PLTP	3	geothermal	47	1987	
	PLTP	4	geothermal	60	2009	
Gunung Salak	PLTP	1	geothermal	52	1994	IP
	PLTP	2	geothermal	52	1994	
	PLTP	3	geothermal	52	1997	
	PLTP	4	geothermal	52	1997	IPP
	PLTP	5	geothermal	52	1998	
	PLTP	6	geothermal	52	1998	
Darajat	PLTP	1	geothermal	44	1994	IP
	PLTP	2	geothermal	70	1999	IPP
	PLTP	3	geothermal	110	2007	
Wayang Windu	PLTP	1	geothermal	110	1999	IPP
	PLTP	2	geothermal	110	2009	
Sunyaragi	PLTG	1	gas	18	1976	IP
	PLTG	2	gas	18	1976	
	PLTG	3	HSD	20	1976	
	PLTG	4	HSD	20	1976	
Cilacap	PLTG	1	HSD	22	1996	IP
	PLTG	2	HSD	22	1996	
	PLTU	1	coal	300	2006	IPP
	PLTU	2	coal	300	2006	
Dieng	PLTP	1	geothermal	60		IP
Tambak Lorok	PLTGU	1	HSD	106	1993	IP
	PLTGU		HSD	106	1993	
	PLTGU		HSD	106	1993	
	PLTGU		HSD	178	1993	
	PLTGU	2	HSD	106	1996	
	PLTGU		HSD	106	1996	
	PLTGU		HSD	106	1996	

Plant Name	Type	#	Fuel	[MW]	COD	Owner
	PLTGU		HSD	178	1997	
	PLTU	1	HSD	41	1978	
	PLTU	2	HSD	41	1978	
	PLTU	3	HSD	192	1983	
Tanjung Jati B	PLTU	1	coal	660	2006	IPP
	PLTU	2	coal	660	2006	
	PLTU	3	coal	660		
	PLTU	4	coal	660		
Gresik	PLTU	1	gas	85	1981	PJB
	PLTU	2	gas	85	1981	
	PLTU	3	gas	175	1988	
	PLTU	4	gas	175	1988	
	PLTGU	1	gas	100	1992	
	PLTGU		gas	100	1992	
	PLTGU		gas	100	1992	
	PLTGU		gas	180	1992	
	PLTGU	2	gas	100	1992	
	PLTGU		gas	100	1992	
	PLTGU		gas	100	1992	
	PLTGU		gas	180	1993	
	PLTGU	3	gas	100	1993	
	PLTGU		gas	100	1993	
	PLTGU		gas	100	1993	
	PLTGU		gas	180	1993	
	PLTG	1	gas	16	1978	
	PLTG	2	gas	16	1984	
	PLTG	3	gas	16	1984	
Perak	PLTU	3	oil	48	1978	IP
	PLTU	4	oil	48	1978	
Grati	PLTGU	1	HSD	99	1996	IP
	PLTGU		HSD	99	1996	
	PLTGU		HSD	99	1996	
	PLTGU		HSD	165	1997	
	PLTGU	2	HSD	100	2002	
	PLTGU		HSD	100	2002	
	PLTGU		HSD	100	2002	
Paiton	PLTU	1	coal	370	1993	PJB
	PLTU	2	coal	370	1993	
	PLTU	5	coal	610	1999	JP
	PLTU	6	coal	610	2000	
	PLTU	7	coal	615	1998	PEC
	PLTU	8	coal	615	1999	
Gilimanuk	PLTG	1	HSD	133	1997	IP
Pemaron	PLTG	1	HSD	48	2007	IP
	PLTG	2	HSD	48	2007	
Pesanggaran	PLTG	1	HSD	20	1985	IP
	PLTG	2	HSD	20	1993	
	PLTG	3	HSD	40	1994	

Plant Name	Type	#	Fuel	[MW]	COD	Owner
	PLTG	4	HSD	40	1994	
	PLTD	1	HSD	5.08	1974	
	PLTD	2	HSD	5.08	1974	
	PLTD	3	HSD	5.08	1974	
	PLTD	4	HSD	5.08	1974	
	PLTD	5	HSD	4.14	1980	
	PLTD	6	HSD	6.77	1982	
	PLTD	7	HSD	6.77	1982	
	PLTD	8	HSD	6.52	1983	
	PLTD	9	HSD	6.52	1983	
	PLTD	10	HSD	12.4	1989	
	PLTD	11	HSD	12.4	1989	
Gilitimur	PLTG	1	HSD	16		PJB
	PLTG	2	HSD	16		

PLTU	Steam coal power plant	PLTA	Hydro electric power plant
PLTGU	Combined cycle power plant	PLTD	Diesel power plant
PLTG	Gas turbine power plant	OIL	Medium Fuel Oil
PLTP	Geothermal power plant	HSD	High Speed Diesel

(source) PLN Headquarters

3.4.2 Current Situation of Demand – Supply Balance

In 2007, the installed capacity of the power plants of PLN in the Java-Bali system was 22,236 MW.

During 2007 and semester 1/2008, the realization of additional power plants in Java-Bali system was only small, namely PLTP Darajat of 110 MW and PLTP Kamojang of 60 MW.

3.4.3 Power Generation Development Planning

The development of power plant capacity is directed to meet the planned growth of load, and in some certain areas is prioritized to settle the crisis of electric power supply. The development of power plant capacity is also intended to increase the desired reserve margin, by prioritizing the utilization of local energy sources, including renewable energy.

The development of power plant capacity is conducted optimally by the principle of least cost of electric power supply, while continuing to meet the desired reliability level. The least supply cost is achieved by minimizing net present value of all electric power supply costs, namely capital/investment cost, fuel cost, operational and maintenance cost, and energy not served cost. The reliability level of generating system is measured by the criteria of Loss of Load Probability (LOLP) and reserve margin. Lease power plant and excess power are not calculated in making the capacity development plan.

However, parallel to the Government’s policy to develop and utilize more renewable energies in areas having renewable energy potentials, especially geothermal and hydro, the criterion of least cost is not fully applied. In that area, some geothermal and hydro projects are planned to be constructed in RUPTL, although the development cost is higher than that of the conventional thermal power plant.

The implementation of power plant projects planned in RUPTL is adjusted to PLN’s financing capacity. Considering the high cost of loans assumed by PLN, related to the development of coal power plant acceleration projects of Presidential Regulation 71/2006, for the next few years PLN is unable to fully finance new power plant projects. Hence the Government is expected to play the role in financing some new power plant projects, and some others will be conducted by private electric power organizations as independent power producers (IPP).

RUPTL assumes that there is no gas supply obstacle for the existing power plants and new power plants commencing from 2012, particularly for the Java-Bali system. While for outside Java-Bali, gas power plants will only be designed in cases of gas supply certainty. The consequence of this assumption is that PLN, supported by the Government, will attempt its best to obtain as many gas supplies of the required volume as it can. If gas supplies are not obtained or gas prices are very high, power plants carrying medium loads, such as PLTGU, will not be developed. As a consequence some basic load power plants, namely coal PLTU, will also be operated as medium load carriers with relatively low capacity factors.

The development of small-scale coal PLTU is an alternative for replacing power plants using oil fuel to minimize the system operational cost. The development of small-scale coal PLTU plants is also directed to substituting the role of some PLTDs outside Java. The PLTU plants can be well developed by PLN or privately.

For the Java-Bali system, in RUPTL, PLN will start using Coal PLTU with the unit capacity of 1,000 MW by supercritical boiler technology for obtaining better efficiency and less emission level, including for IPP projects. The use of units of this size is also encouraged by the increasing difficulty in obtaining land for developing large-scale power plants in Java. Another consideration is that in 2012, the peak load of the Java-Bali system is predicted to have exceeded 25 GW.

In general, the selection of power plant locations should be attempted to meet the regional balance principle. Regional balance is a situation in which the electric power demand of a region is mostly fulfilled by the power plant available in that region and does not rely much on power supply from other regions by interconnecting transmission lines. By this principle, the transmission requirement will be minimal.

However, this policy of regional balance does not limit PLN in developing power plants in remote locations and transmitting the energy to the load centre by transmission lines, in so far as it is technically and economically feasible. This is reflected from the existing plan to develop a large-scale pit mouth PLTU plant in South Sumatera and to transmit substantial part of electric power to Java island by high voltage direct current transmission/HVDC.

In the Java-Bali system, the candidate power plants considered for the development plan are supercritical coal PLTU 1,000 MW, subcritical coal PLTU 600 MW, subcritical coal PLTU 300 MW, LNG PLTGU 750 MW, natural gas PLTGU 600 MW, PLTG carrying peak load 200 MW and Pumped Storage unit PLTA 500 MW (referring to design of Pumped Storage Upper PLTA Cisokan). Besides these there may be some PLTPs and PLTAs.

The techno-economic parameters of the candidate power plants and the fuel price assumptions are shown in Table 3.4.3.1 and Table 3.4.3.2. Particularly for pump PLTA, the optimizing calculation will be considered just from 2013, since the PLTA construction period is 5 years.

Table 3.4.3.1 Parameters of Candidate Power Plants for Java-Bali System

No.	Type of Power Plant	Capacity	Capital Cost	Development	Heat Rate
		MW	USD/kW	Year	Kcal/kWh
1	Coal PLTU	1,000	1,400	4	1,911
2	Coal PLTU	600	1,190	4	2,388
3	LNG PLTGU	750	90	3	1,741
4	Gas PLTGU	750	930	3	1,800
5	Oil PLTG	200	550	2	3,440
6	Pump PLTA	250	860	6	-
7	PLTP	55	1,370	3	-

(source) RUPTL 2009-2018

Table 3.4.3.2 Assumption of Fuel Prices

Type of Primary Energy	Price	Calorific Value
Coal	USD 90/Ton	5,300 kcal/kg
Natural Gas	USD 6/MMBTU	252,000 kcal/MMBTU
LNG	USD 10/MMBTU	252,000 kcal/MMBTU
HSD	USD 140/Barel	11,000 kcal/kg
OIL	USD 110/Barel	10,000 kcal/kg
Uranium	USD 200/kg	

(source) RUPTL 2009-2018

The candidate power plants applied in the simulation of power plants additions outside Java-Bali are quite varying, depending on the system capacity. For example, for Sumatera the candidates are coal PLTUs 200 MW and 400 MW, PLTG carrying peak load 50 MW, whereas for the Kalimantan system, the candidates are coal PLTU 65 MW, PLTG carrying peak load 35 MW. Other systems use smaller power plants candidates. The candidate power plants for systems Outside Java-Bali are provided in Table 3.4.3.3.

Table 3.4.3.3 Parameters of Candidate Power Plants for System Outside Java-Bali

No.	Type of Power Plant	Capacity	Capital Cost	Construction Period	Heat Rate	FOR
		MW	USD/kW	Year	Kcal/kWh	%
1	Coal PLTU	65-200	1,300	3	2,867-2,646	10
2	Coal PLTU	7 – 50	1,300	2	3,440-2,867	12
3	Gas PLTGU	150	1,000	2	2,400	7
4	Oil PLTG	50 – 100	600	2	3,640-3,110	5
5	PLTA	>10	2,000	3 – 5		-
6	PLTMH	<10	3,000	2	-	-
7	PLTP	10 - 55	1,200	2	-	-

(source) RUPTL 2009-2018

By Presidential Regulation No.71/2006, the Government assigned PLN to develop coal-fired power plants of approximately 10,000 MW to improve the fuel mix, and at the same time to meet the electric power demand throughout Indonesia. Based on the assignment, today PLN is developing a number of power plant projects with the capacities and the planned commencement of operation years as shown in Table 3.4.3.4. This program is known as “fast track power plant project of 10,000 MW” or fast track projects.

Table 3.4.3.4 List of Accelerated Power Plant Project of 10,000 MW
(Presidential Regulation No. 71/2006)

Name of Power Plant	Capacity (MW)	Year of Operation
PLTU Labuhan	2X315	2009- 2010
PLTU Indramayu	3X330	2009- 2010
PLTU Suralaya # 8	1X625	2010
PLTU Lontar/TelukNaga	3X315	2010
PLTU Pelabuhan Raty	3X350	2010
PLTU Rembang	2X315	2009
PLTU Cilacap	1X600	2011
PLTU Pacitan	2X315	2010
PLTU Paiton Baru	1X660	2010
PLTU Tanjung Awar-awar	2X300	2010
PLTU Meulaboh	2X100	2010
PLTU Pangkalan Susu	2X200	2010
PLTU Bengkalis	2X7	2010
PLTU Selat Panjang	2X5	2010
PLTU Tanjung Balai	2X7	2010
PLTU Bangka Baru	2X10	2009
PLTU Air Anyer	2X25	2010
PLTU Belitung Bau	2X15	2010
PLTU Sumbar pesisir	2X100	2010
PLTU Tarahan Baru	2X110	2010
PLTU Parit Baru	2X50	2010
PLTU Singkawang Baru	2X25	2010
PLTU Pulau Pisau	2X60	2010
PLTU Asam-asam	2X65	2010
PLTU Amurang	2X25	2009
PLTU Gorontalo	2X25	2009
PLTU Ternate	2X7	2010
PLTU Jayapura	2X10	2010
PLTU Timika	2X7	2010
PLTU Ambon	2X15	2010
PLTU Kendari	2X10	2010
PLTU Baru	2X50	2010
PLTU Jiranjang	2X30	2009
PLTU Ende	2X7	2010

Name of Power Plant	Capacity (MW)	Year of Operation
PLTU Kupang	2X15	2010
PLTU Bonto	2X10	2010

Remark: Project in Italic not yet contracted for construction on November 2008
(source) RUPTL 2009-2018

Since the power plants included in the Power Plant Fast Track Program 10,000 MW (Presidential Regulation No.71/2006) are predicted to be entirely absorbed by consumers until 2011, additional new capacities outside the program of Presidential Regulation No.71/2006 will be required commencing from 2012. This program for additional power plant capacities, commencing from 2012, shall hereinafter be referred to as Fast Track Power Plant Program Phase 2.
RUPTL 2009-2018 has accommodated the above Fast Track Power Plant Program Phase 2. The Fast Track Power Plant Program Phase 2 is designed by considering the use of renewable energy, however, since the readiness of the potentials of renewable energy projects is still immature, the projects in the Fast Track Power Plant Program Phase 2 are still dominated by coal PLTU.
The summary of Fast Track Power Plant Program Phase 2 is as follows:
Java-Bali System: coal PLTU 5x1,000 MW, PLTP 1,145 MW and PLTGU 1,200 MW.
Outside Java-Bali: coal PLTU 2,616 MW of various sizes, PLTA 174 MW, PLTP 980 MW, and PLTGU 240 MW.
Indonesia: coal PLTU 7,616 MW, PLTA 174 MW, PLTP 2,125 MW and PLTGU 1,440 MW, grand total 11,355 MW.
The selection of the size of a coal PLTU unit for Java-Bali of 1,000 MW per unit is based on consideration of the size of Java-Bali electric power system, for which the peak load nearly exceeds 25,000 MW.
The Fast Track Power Plant Program Phase 2 of 11,355 MW is composed of 7,649 MW as PLN project and 3,708 MW as IPP project. Nevertheless, the project allocation of Fast Track Power Plant Program Phase 2 will continue to depend on the result of a study on PLN's financial capacity in making new loans.

3.5 Financial Standing of PLN

3.5.1 Business Performance

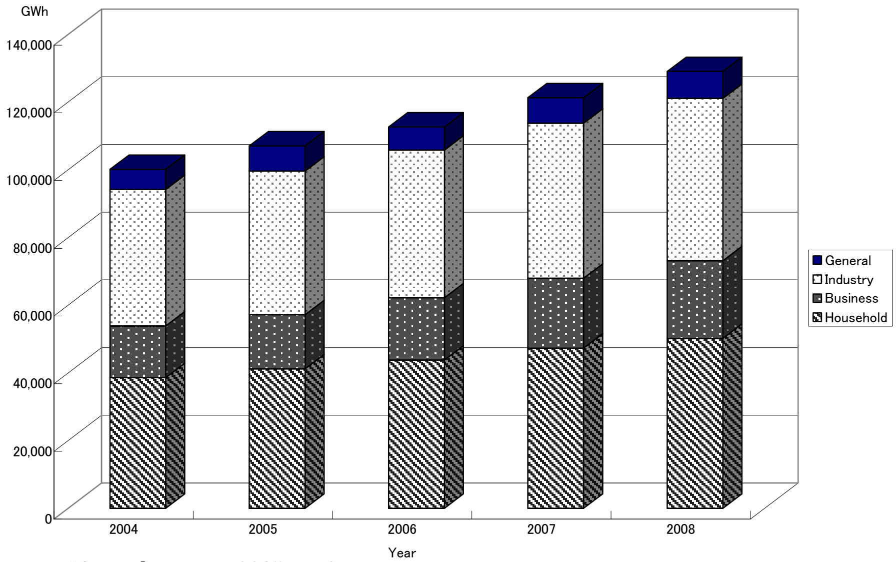
The number of customers of PLN has been continuously increasing. The total number of customers in 2008 was 38.8 million, which annually increased by 4%. The largest customer segment of PLN is households which account for 93% of the total number of customer.

Table 3-1 Number of Customers (in Thousand)

Customer Segment	2004	2005	2006	2007	2008
Household	31,096	32,171	33,118	34,684	36,025
Business	1,382	1,456	1,655	1,611	1,716
Industry	47	46	46	47	48
General	841	896	931	992	1,055
Total	33,366	34,559	35,751	37,334	38,844

Source: PT PLN, "Annual Report 2008", p.72

As the number of customer has been expanding, the sales volume of electricity by PLN also grew by an average of 7.4% for the period from 2004 to 2008. The total sales volume in 2008 reached 129,019 GWh. Approximately 80% of electricity sold by PLN was consumed by the household and the industry sectors while the business sector increased the electricity consumption by more than 10% annually for the same period.



Source: PT PLN, “Annual Report 2008”, p.70

Figure 3-1 Electricity Sales Volume by Customer Segment

The revenue from electricity sales also steadily grew from 58 billion rupiahs to 84 billion rupiahs. The average annual growth rate was around 10% during the period between 2004 and 2008. As to the composition of electricity sales volume, 73-76% of the total revenue from electricity is derived from households and industries.

Table 3-2 Electricity Sales Revenue by Customer Segment

(Unit: Rp million)

Customer Segment	2004	2005	2006	2007	2008
Household	21,636	23,189	24,988	27,058	32,815
Business	10,411	11,826	14,074	15,920	14,991
Industry	22,547	24,190	27,226	28,458	31,364
General	3,638	4,041	4,447	4,844	5,188
Total	58,232	63,246	70,735	76,280	84,358

Source: PT PLN, "Annual Report 2008", p.71

3.5.2 Financial Position

While the electricity revenue steadily increased by the annual average growth of 10%, the growth of fuel cost exceeded the revenue growth for the period from 2004 to 2008. As a result, the profit of PLN dropped drastically from 2004 to 2006. Even in 2006, PLN ran at a loss of 500 billion Rupiah. However, in 2007 PLN returned to profitability at the same profit level as in 2004. That was because of the government subsidy paid to PLN to compensate for the low electricity tariffs which did not cover the generation costs.

The fuel cost considerably increased by 4.4 times from 24 trillion Rupiah in 2004 to more than 107 trillion Rupiah in 2008. The share of fuel cost in the total operation cost also increased from 41% to 67% for the same period. Until 2007, the fuel cost has been less than the electricity revenue. However, in 2008, it exceeded the revenue from electricity sales.

The significant growth of fuel cost increased the electricity subsidy by the Indonesian Government from 3.4 trillion Rupiah in 2004 to 78.6 trillion Rupiah in 2008. While the share of electricity sales in the total operation revenue decreased from 94% in 2004 to 51% in 2008, the share of electricity subsidy surprisingly expanded from 6% to 67% for the same period.

Due to the expensive fuel costs, PLN has no choice but to be reliant on the government subsidy in order to gain profit however, the Government of Indonesia has been forced to reduce other expenditures to save its budget for the subsidy.

Table 3-3 Profit and Loss of PLN

(Unit: billion Rp)

	2004	2005	2006	2007	2008
Operation Revenue					
Electricity Sales	58,232.00	63,246.22	70,735.15	76,286.20	84,249.73
Connection Fee	387.08	439.92	479.99	535.27	589.62
Government Subsidy	3,469.92	12,510.96	32,909.15	36,604.75	78,577.39
Others	184.06	346.23	602.25	616.47	791.77
Total Operation Revenue	62,273.06	76,543.32	104,726.54	114,042.69	164,208.51
Operation Cost					
Electricity Purchase	11,970.81	13,598.17	14,845.42	16,946.73	20,742.91
Fuel & Lubricant Oil	24,491.05	37,355.45	63,401.08	65,559.98	107,782.84
Maintenance	5,202.15	6,511.00	6,629.07	7,269.14	7,619.85
Personnel	5,619.38	5,508.07	6,719.75	7,064.32	8,344.22
Depreciation	9,547.56	9,722.32	10,150.99	10,716.24	11,372.85
Others	2,879.82	3,328.60	3,481.85	3,949.56	4,735.08
Total Operation Cost	59,710.77	76,023.60	105,228.15	111,505.96	160,597.75
Profit (Loss) from Operation	2,562.29	519.72	-501.61	2,536.73	3,610.76

Source: PT PLN, "PLN Statistics 2007", p.60, Table 63, and "Annual Report 2008", p.77

The total assets of PLN increased by 36% from 211.79 trillion Rupiahs in 2004 to 289.08 trillion Rupiahs in 2008. The non-current assets also grew by 30% for the same period mostly because of continuous investment in power development and system. It is particularly notable that the Work in Progress increased by 1.3 times, from 23 trillion Rupiahs in 2007 to 53 trillion Rupiahs, in 2008 due to the implementation of the crash program.

The current assets decreased in 2008 by 28% compared to the previous year. That was because of decreases in cash and deposit, and temporary investments. The cash position of PLN fluctuated during the period between 2005 and 2008. After reaching more than 16 trillion Rupiah in 2007, the amount of cash and deposit sharply reduced to 6 trillion Rupiahs in 2008.

While the amount of equity decreased from 142 trillion Rupiahs in 2004 to 127 trillion Rupiahs in 2008, the amount of total liabilities increased from 64 trillion Rupiahs to 156 trillion Rupiahs for the same period. In 2004, the amount of equity was larger than the total amount of liabilities. However, the total liabilities exceeded the amount of equities in 2008. That was mainly due to an increase in long-term liabilities.

Table 3-4 Balance Sheet of PLN

(Unit: billion Rp)

	2004	2005	2006	2007	2008
Non Current Assets	**199,114.20**	**203,177.54**	**219,096.55**	**230,128.51**	**259,643.31**
Fixed Assets (Net)	179,783.78	177,391.35	200,383.26	198,763.39	197,014.71
Gross Fixed Assets	217,604.61	224,680.44	257,695.82	266,745.80	275,651.27
Accumlated Depreciation	(37,820.83)	(47,289.09)	(57,312.56)	(67,982.41)	(78,636.56)
Work in Progress	13,603.54	19,674.78	11,286.32	23,430.26	53,120.35
Other Assets	5,190.19	5,740.84	6,770.56	7,195.33	8,972.84
Long Term Investment	521.15	362.21	591.46	694.66	526.64
Deferred Tax Assets	15.54	8.36	64.95	44.87	8.77
Current Assets	**12,679.41**	**17,665.19**	**28,821.28**	**43,213.00**	**31,075.63**
Cash & Bank Deposit	6,073.06	5,361.75	12,968.42	16,290.78	6,387.63
Government Subsidy	992.85	3,660.31	7,261.21	9,823.18	7,294.36
Temporary Investment	523.96	1,415.19	981.86	7,214.61	5,207.01
Receivable	1,824.70	1,873.84	2,362.13	2,340.51	2,181.39
Inventoris	2,187.13	3,765.98	4,188.36	6,774.21	9,091.14
Other Current Assets	1,077.71	1,588.12	1,059.30	769.71	914.13
Total Assets	**211,793.60**	**220,842.74**	**247,917.82**	**273,479.94**	**290,718.94**
Short Term Liabilities	**17,191.62**	**25,956.19**	**27,698.41**	**40,276.25**	**40,653.69**
Long Term Liabilities	**47,108.57**	**49,274.80**	**74,129.09**	**89,874.58**	**115,522.04**
Deferred Tax	3,173.99	5,369.98	7,426.58	8,847.46	8,273.88
Long Term Liabilties	18,489.36	18,384.51	16,269.89	17,324.48	32,352.80
Bond Payable	2,090.09	2,091.06	12,775.26	25,454.10	28,508.46
Customer Deposit	3,350.14	3,795.91	4,128.33	4,440.92	5,401.14
Lease Liablities	232.98	1,521.18	13,230.36	13,641.68	18,563.76
Taxes Payable on Revaluation	1,941.41	0.00	0.00	0.00	0.00
Electricity Purchase Payable	7,182.77	7,460.45	8,708.40	6,825.45	7,754.91
Employee Benefit Obligation	10,647.83	10,651.72	11,590.28	12,398.98	12,968.87
Other Non-current Liabilities	0.00	0.00	0.00	941.51	1,698.22
Deferred Revenue	5,144.57	5,858.06	6,252.38	6,916.38	7,556.64
Equity	**142,348.84**	**139,753.68**	**139,837.95**	**136,412.74**	**126,986.57**
Total Liabilities & Equity	**211,793.60**	**220,842.74**	**247,917.82**	**273,479.94**	**290,718.94**

Source: PT PLN, “PLN Statistics 2007”, p.59, Table 62, and “Consolidated Financial Statement for the Year Ended December 31, 2008”, p.3-4

3.5.3 Financial Ratios

Most of the financial ratios deteriorated in 2008.
Liquidity of PLN sharply went down in 2008 compared to the previous year due to the significant decrease in cash and deposit and the increase in current liabilities. Cash ratio and current ratio dropped to 15.7% from 40.5%, and to 76% from 107%, respectively.
The corporate profitability is very fragile. The gross profit margin, including the government subsidy, fluctuated year by year because the profit of PLN was affected by fuel costs and the level of government subsidy. The ROI and ROE have been negative, and even sharply declined in 2008 due to the loss of exchange rate.
Solvency of PLN also declined for the period between 2004 and 2008. Debt to equity ratio deteriorated from 45% to 123%, and debt to total asset ratio also increased 30% to 53%. That was mainly because of the increase in liabilities.

Table 3-5 Financial Ratio of PLN

	2004	2005	2006	2007	2008
Liquidity (%)					
Cash Ratio	35.33	20.66	46.82	40.45	15.71
Current Ratio	73.75	68.60	104.05	107.29	76.44
Profitability (%)					
Gross Profit Margin	4.40	0.82	-0.71	3.33	4.29
Return on Investment (ROI)	-0.95	-2.23	0.78	-2.06	-4.23
Return on Equity (ROE)	-1.42	-3.52	-2.90	-4.14	-9.69
Solvency (%)					
Debt to Equity Ratio (%)	45.17	53.83	72.82	95.41	122.99
Debt to Total Asset (%)	30.36	34.07	41.07	47.59	53.72

Source: PT PLN, “Annual Report 2008”, p.81-82

3.6 Electricity Tariff

3.6.1 Electricity Tariff

The trend of electricity tariff by PLN has been in uptrend though the tariff level could not cover the generation cost since 2006.
The total average electricity tariff was raised by 12% from 581.75 Rupiahs/kWh in 2004 to 653.84 Rupiahs/kWh in 2008. By customer segment, whilst the tariff for the Business sector reduced 15% during the period between 2004 and 2008, the tariff for the Industry sector and the Household sector increased by 17% and 14%, respectively.

On the other hand, the average power generation cost of PLN increased more than the rise of electricity tariff. The generation cost in 2004 was 351.34 Rupiahs/kWh which was below the tariff of 581.75 Rupiahs/kWh. However, it increased to more than 700 Rupiahs/kWh in 2006, mainly because of the higher fuel costs. Although there was a sharp increase in the generation cost, the electricity tariff slightly raised since 2006.

Table 3-6 Average Electricity Tariff by Customer Segment

(Unit: Rp/kWh)

Customer Segment	2004	2005	2006	2007	2008
Household	557.76	563.05	571.12	571.76	653.89
Business	682.32	694.71	764.25	772.51	653.89
Industry	559.15	569.87	624.23	621.32	653.84
General	568.65	569.90	585.30	574.08	653.40
Total	581.75	590.91	628.14	629.18	653.84

Source: Author's calculation based on data of "PLN Statistics 2007" and "PT PLN Annual Report 2008"

Table 3-7 Average Unit Cost of Power Generation

(Unit: Rp/kWh)

	2004	2005	2006	2007
Hydro	123.26	114.71	143.19	118.80
Steam	273.46	316.72	389.48	405.91
Diesel	673.34	925.18	1,631.36	2438.47*
Gas	862.66	953.79	1,999.15	2,155.67
Geothermal	415.62	514.70	579.74	615.10
Combied Cycle	370.27	560.78	889.33	873.80
Average	351.34	469.78	705.96	706.62

Source: PT PLN, "PLN Statistics 2007", p.62, Table 68
Note: *Including diesel gas power plant

3.6.2 Tariff Policy

The electricity tariff of PLN is defined by the decree of the president of Indonesia. In the decree, the government considers justice, ability of public purchasing power, production cost and the company's efficiency, scale and interconnection of system used in the sales price of electricity. Primarily, the cost of electricity is determined by the political aspects rather than the economical or financial aspects.

As a result, the revenue of PLN is composed of not only sales revenue but also the government electricity subsidy to compensate for the Public Service Obligation (PSO) of PLN. The electricity subsidy includes a profit margin for PLN, which makes up the PLN's operating profit. The current PSO margin for PLN is 5%.

The expanding electricity subsidy requirements, due to the higher generation costs, have resulted in a tightening of the national government budget on the basis that the burden of the electricity subsidy exceeded the government's fiscal capacity. The PLN proposal for an increase in electricity tariff was rejected due to political reason, and the tariff has remained at an unprofitable level, However, in March 2010, the Ministry of Finance announced an increase of 15% in the electricity tariff, effective in the coming July, in order for PLN to cope with the increase in the generation costs and to provide an increase in the PSO margin to 8%. However, it is unclear whether the revision of electricity tariff will be implemented or not since it requires an approval from the parliament.

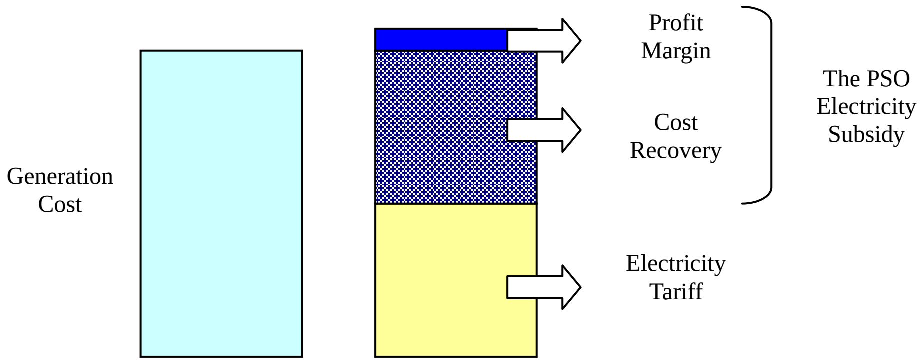


Chart3-2 Mechanism of Electricity Tariff and PSO Electricity Subsidy

3.6.3 The Electricity Tariff of Independent Power Producer (IPP)

PLN has Power Purchase Agreements (PPAs) with Independent Power Producers (IPPs) in order to purchase electricity from Independent Power Producers (IPPs). The standard contract period of a PPA is 30 years. The standard electricity purchasing price from IPPs is determined by considering their generation cost as well as their return on investment.

The variable generation cost, including fuel cost, should be covered by the electricity purchasing price by PLN. In addition the PPA ensures the return on investment of the IPP at a fixed price of 3 cents/kWh.

Chapter 4　Site conditions

4.1　General

The candidate site for Indramayu Coal-Fired Power Plant 1,000MW x 2 (hereinafter referred to as IR_B1&2) is located at Sumuradem Viuage, Sukra District in Indramayu Regency along the north-west coast of Java Island approximately 180km from Jakarta, the capital city of Indonesia. The candidate site is located in a tropical area near the sea and will be subjected to a warm, coastal and humid climate. To access to IR_B1&2, it takes about two and half hours driven from Jakarta (Figure 4.1.1).

The reasons why Indramayu is selected as the candidate site is as follows.

- This region is near Jakarta that is the greatest electric power demand area in Indonesia.
- It is possible to connect with the existing 500kV substation.
- IR_B is a position of extension of PLTU Jawa Barat Indramayu Coal-Fired Power Plant 330MW x 3 (hereinafter referred to as IR_A1-3) under construction.

IR_A1-3 is under construction at Desa Sumuradem, Kabupaten Indramayu, West Java. IR_B1&2 will be located on the east side (Site A) or west side (Site B) of IR_A1-3.

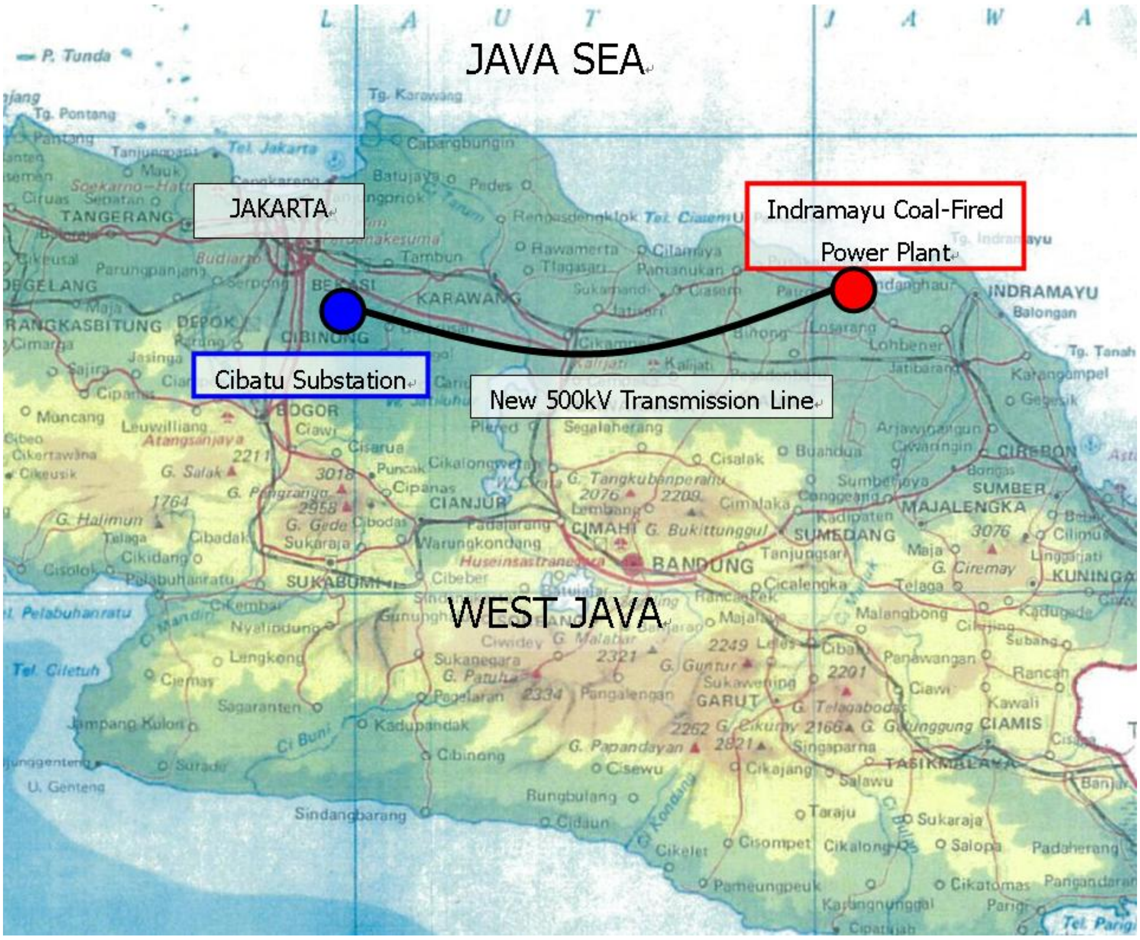


Figure 4.1.1 Location Map of Indramayu Coal-Fired Power Plant

4.2 Site Selection

The candidate construction sites considered are:

- Site A : East side of PLTU IR_A1-3
- Site B : West side of PLTU IR_A1-3

The comparison of the site A and site B is as shown below.

Table 4.2.1 Comparison of Site A and Site B

Item		Site A	Site B
Area of IR_B1&2 (Power House, Coal Storage, Switchyard, Ash Disposal)		approx. 300 ha	approx. 300 ha
Land Acquisition		manageable	manageable
Resettlement		small number	slightly large number
Marine Facilities	Length of Berth Facilities	2,000 m	3,000 m
	Length of Intake Facilities	1,500 m	2,300 m
	Construction, Operation and Maintenance Cost	Base	Higher
Environmental Impact		negligible	negligible
Transmission and Sub-Station		Base	Same
Recommendation		Yes	-

While there are no structures that need to be removed within the construction site of IR_B1&2, in undertaking the construction, excavation, reclamation, leveling and banking of the land are required.

There are rice fields, a chicken farm and a small residential area at Site A. On the other hand, there are not only rice fields and chicken farms but also a larger residential area (Melanlong Village) at Site B. It means land acquisition for Site B will be more difficult than for Site A.

Concerning the cooling water intake, IR_ B1&2 will include a deep water intake tower, similar to that at the Tanjung Jati B coal-fired power plant, because of the gentle slope from the coastline.

Also, the planning will allow for the berthing of 12,500 DWT bulk carriers (Berthing depth approximately 9m).

The sea area in front of IR_B1&2 is shallow to a considerable distance from the coastline (Seabed gradient 1/320) and, for a 60,000 DWT bulk carrier, the required berthing depth is approximately 15m. The length of the berth facilities would need to be approximately 5km and therefore 12,500 DWT will be selected for IR_B1&2.

Comparing the sea areas in front of Site A and Site B, Site B is shallower than Site A and therefore, the berth and intake facilities for Site B are longer than for Site A.

Therefore, Site A is selected for this project.

The location map of Site A and Site B is shown in Figure 4.2.1.

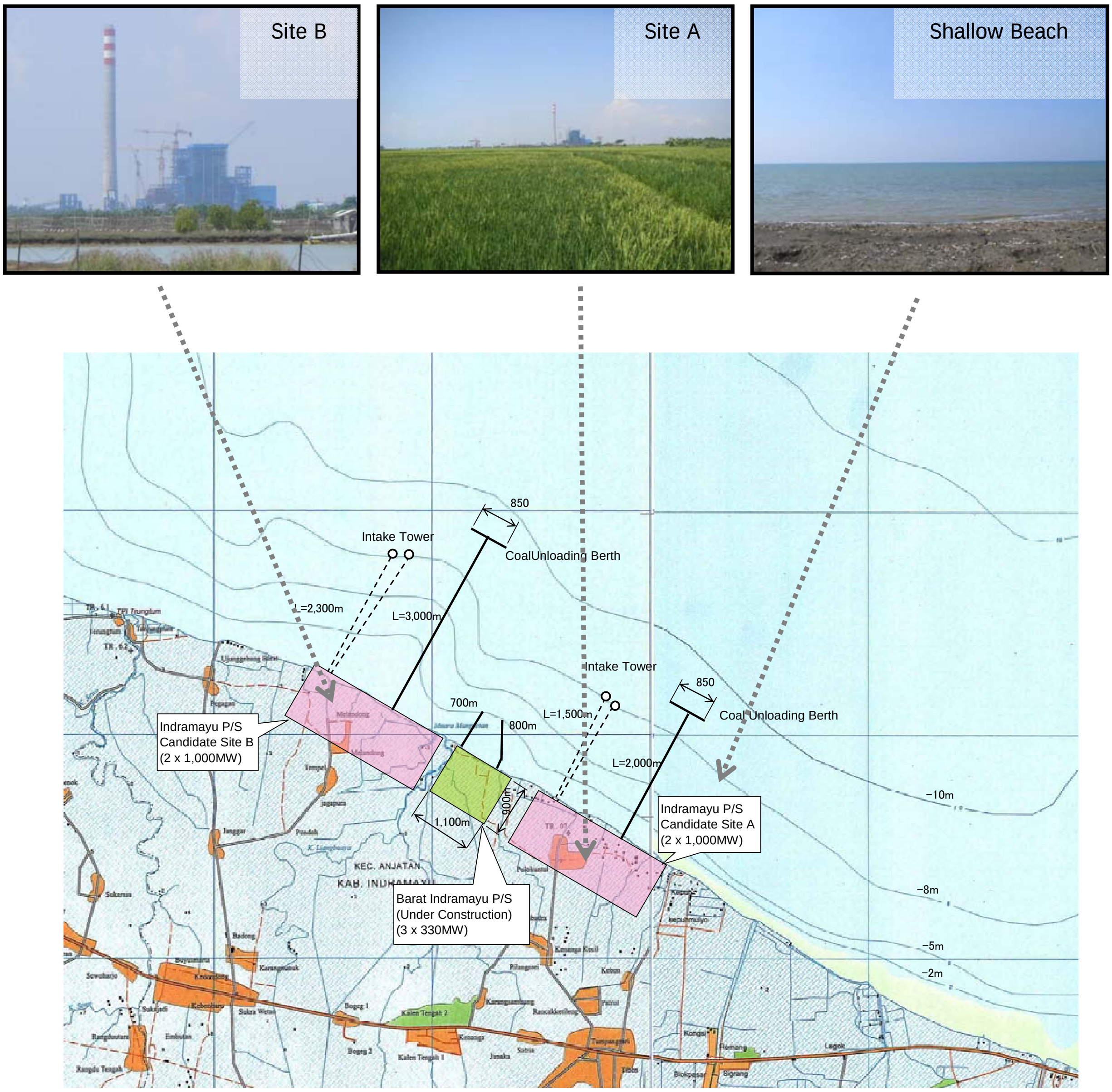


Figure 4.2.1 Location Map of Site A and Site B

4.3 Site Conditions

4.3.1 Weather

The climatic data of the site are as shown below.

Table 4.3.1.1 Climate Data (January. 2006 - March.2010)

Item	Data
Mean Monthly Temperature	27.2 ºC
Average Monthly Temperature Range	20.4-33.7 ºC
Mean Monthly Relative Humidity	80.4 %
Average Monthly Relative Humidity Range	67.5-90.0 %
Average Monthly Rainfall	115.6 mm
Mean Monthly Rainfall Range	0.0-529.5 mm
Mean Monthly Average Wind Speed Range	4.0-9.7 km/h
Mean Average Wind Speed Direction	S

(source) SUKAMANDI RESEARCH INSTITUTE

4.3.2 Geology

(1) Regional Geology

The Indramayu Coal-fired Thermal Power Plant Project is located in the West Java Region. The IR_B1&2 site exists within the northern part of the geological regions shown on the Regional Geology Maps, Geology of Indramayu (Quadrangle No. 1309-04, by D.Sudana and A. Achdan) and Geology of Pamanukan (Quadrangle No. 1209-06, by H.Z. Abidin and Sutrisno), scale 1:100,000, published by Geological Research and Development Centre, Bandung. A part of those maps is shown in Figure 4.3.2.1.

1) Physiography

The project area and its vicinity physiographically exist in Low Land area of the North Coast Java Trench (Bemmelen, 1949). Morphologically this area can be divided into two morphological Units; those which are Undulated Low Ridges and Low Land Area.

- Undulated Low Ridges

  The Undulated Low Ridges occupy a narrow area in the South West of map sheet. The range of ridge height is six to eight meters from sea level, and its slope is gentle and the stream pattern is generally subparallel.

- Low Land Area

  The Low Land Area occupies most of the map sheet. The elevation is not more than six meter from sea level. The river stream patterns are dendritic and anastomatic, that is, the pattern consists of meander cut and branches near the river mouth, especially common in delta areas.

  There are two kinds of coastal areas developing at Indramayu; one is developing such as exits around Eretan and another is abrasion, such as exists on the Karang Ampel coast.

2) Stratigraphy

In the Project Area and its vicinity, all of the exposed stratigraphic units are Quaternary Age.

The oldest unit is a Pleistocene terrestrial facies of Conglomerate and Tuffaceous Sandstone (Qav). That unit is underlain by Alluvium of Holocene Age of Flood Plain Deposits (Qaf), Coastal Deposits (Qac), Coastal Plain Deposits (Qbr), River Deposits (Qa) and Delta Deposits (Qad).

In respect of the project area, the part of Regional geology Map as mentioned above, is as shown on Figure 4.3.2.1 below.

- The exposed stratigraphic units in this project area, from oldest to youngest, are:Flood Plain Deposits (Qaf)

The Flood Plain Deposits (Qaf) consist of: Sandy Clay, Organic Clay, grayish brown, brown to black, southward this unit is more tuffaceous and the color more reddish. The contact with the underlain unit is erosion plain.

- Coastal Plain Deposits (Qbr)

The Coastal Plain Deposits (Qbr) consist of: fine to coarse sand and clay with mollusk content.

- Coastal Deposits (Sac)

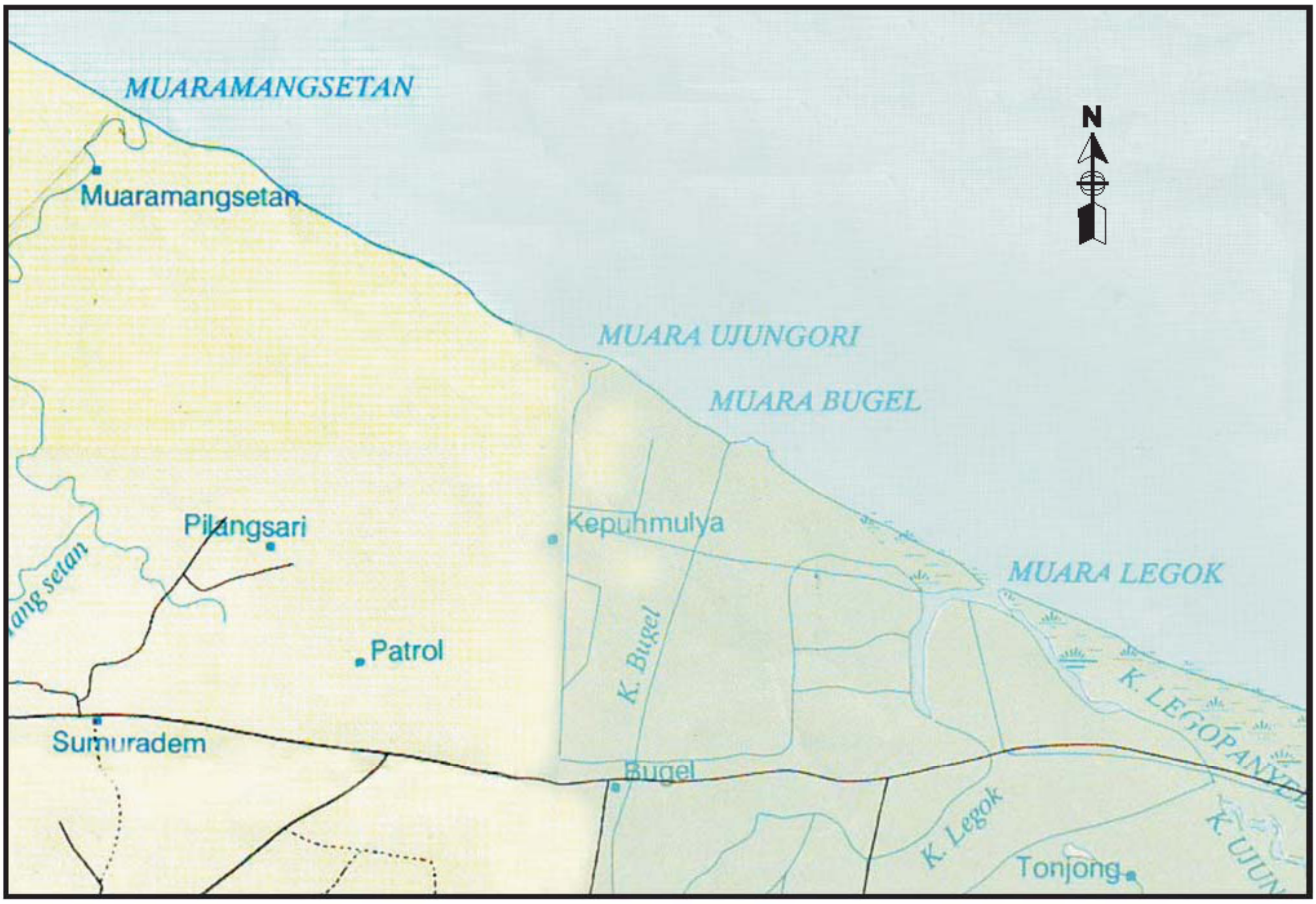
The Coastal Deposits (Qac) consist of: silt, clay and sand with mollusk fragment content.

- Deltas Deposits (Qad)

The Deltas Deposits (Qad) consist of: silt and clay blackish brown colored with trace mollusk, and micro fossils content.

- River Deposits ((Qa)

The River Deposits ((Qa) consist of: sand, silt and clay brown colored.



Regional Geology Map
Under
Preparatory Study for Indramayu Coal Fired Thermal Power Plant Project

SCALE
0 1 2 3 4 5 KM

KETERANGAN *EXPLANATION*

Qaf	ENDAPAN DATARAN BANJIR	: Lempung pasiran - humusan, pasir lempungan sebagian tufan.
	FLOOD PLAIN DEPOSITS	: *Sandy - humic clay, clayey sand, party tuffaceous*

Kampung / *Village*
Jalan Raya / *Road*
Sungai / *River*
Jalan Keretaapi / *Rail way*
Rawa / *Swamp*

Source: Geological Map Of The Indramayu Quadrangle & Geological Map Of The Pamanukan Quadrangle, Jawa Geoligical Research and Development Centre
By: A. Achdan and D.Sudana & H.Z. Abidin and Sutrisno, 1992

Figure 4.3.2.1 Regional Geology Map of Project Area and its Surrounding Area

(2) Investigation Results

1) Field Work Results

a) Drilling

Core drilling has been conducted in six boreholes with a combined total depth of 381.64 m. The deepest hole is 100.39 m and the shallowest one is 30 m. The information about those boreholes, includes borehole number, depth of bore, location in site area, period of boring, coordinates and the ground surface elevation, as shown in Table 4.3.2.1. The Geological Drilling Logs for each boreholes are shown below.

Table 4.3.2.1 Pilling List

Bore hole No.	Depth (m)	Location	Period of Boring	Coordinate		Elevation (m)
				x	y	
BH – 1	60.45	Coal Storage Area	Jan. 26, 09 – Feb. 02, 10	830227.638	9304687.376	**1.570**
BH – 2	100.35	Power Plant Area	Feb. 07, 10 – Feb. 16, 10	830282.012	9305076.153	**1.024**
BH – 3	100.39	Power Plant Area	Jan. 15, 09 – Feb. 06, 10	830134.452	9304778.967	**1.093**
BH – 4	60.45	Coal Storage Area	Jan. 15, 09 – Jan. 23, 09	829982.789	9304475.088	**2.289**
BH – 5	30.00	Ash Disposal Area	Jan. 14, 09 – Jan. 20, 09	830549.096	9304142.734	**2.706**
BH – 6	30.00	Ash Disposal Area	Jan. 23, 09 – Jan. 24, 09	830959.425	9303914.321	**2.578**

b) Site Condition

According to the Regional Geological Map published by Geological Research and Development Centre, the Project Area of Indramayu Coal Fired Thermal Power Plant Project is located above Coastal Deposits (Qac).

The Coastal Deposits (Qac) consisting of silt, clay and sand with molluscs fragment content is interbedded with Delta Deposits (Qad) which consists of silt and clay blackish brown colour with trace mollusc, and micro fossils content. In the scattered areas are found lenses of Coastal Plain Deposits (Qbr) that consist of fine to coarse sand and clay with molluscs content.

c) Geological Cross Section and Stratification

The Sub-surface condition, up to 100 meters depth, is known from the six (6) drilled borelog holes. The deepest hole is 100 meters and the lowest hole is 30 meter. The distances from one hole to another range from 250 meters to 900 meters.

The vertical sequence of sub-surface layers are grouped into several layers based on similarity of lithologic characteristics exposured in the core drilling samples. Whereas, horizontal correlation of one hole to another has been estimated due to the hole distances being far apart from one to the other.

The geological cross-sections to depict the subsurface conditions are shown on the Geological Cross-sections 1, 2 and 3 in Figure 4.3.2.3.

Geological Cross-section 1 depicts the correlation of BH-2, BH-3 and BH-4; Geological Cross-section 2 shows the correlation among BH- 5 and BH-6, and Geological Cross-section 3 shows the correlation of BH-1 and BH-2.

In general, there are four layers that exist in the project area. Every layer consists of some unit or lens of lithology with some variations among one location to another, but having the same sequence of sedimentation and being deposited in the same environment. The descriptions of each layer from the older (bottom part) to the youngest (upper part) are as follow:

- First Layer – Interbedded Black Sand and Fine Mixtures

This first layer is the lowest of the of litholgical sequence found in the project area. It was found at a core drill depth of 90 meters and continued to the end of drilling at 100 meters. The layer is composed of interbedded black sand, slit and clay (SM/OL). This bedding contains some organic matter and is featured by wet, low plasticity, slow to non dilatancy, low thoughness, and dominantly black colour, and the relative density is very dense. The in-situ tests done in this layer were only Standard Penetration Tests (SPT) with a resulting N value range of approximately 34 to more than 50 blows/foot.

- Second Layer – Lean Clay (CL) Layer

Overlain on the First Layer is the Second Layer. This Layer is composed by Lean Clay (CL). At some part in this layer was found lenses of clay with elastic silt and trace sand (CL/MH), Black clay (CL/OL) and poorly graded sand (SP- SC).

The Lean Clay (CL) has thick bedding with various colours such as light brown, light grey, greyish brown and white spotted reddish brown at some part, medium plasticity, no dilatancy, and medium toughness. The N value of SPT ranged from 20 to 33 blows/foot, meaning the consistency of this bedding is very stiff.

The clay with elastic silt and trace sand (CL/MH) lenses are of medium plasticity, moist, no dilatancy, and low toughness features. The N value of these lenses ranged from 22 to 28, meaning the consistency is very stiff.

The black clay lenses are of low plasticity, no dilatancy, low toughness, and very stiff (N value of SPT ranged from 28 to 33).

The poorly graded Sand (SP – SC) is the lens with medium plasticity, no dilatancy low toughness, and being non plastic and lithified in some parts. The N value of SPT ranged from 33 to more than 50, or dense to very dense). This layer was found from a core drill depth of 50 meters until 90 meters.

- Third layer – Interbeded of Sand (SW – SM) and Lean Clay(CL)

This layer is dominantly composed of Lean Clay (CL) with sand, as lenses of sand, found at a depth 37 meters from surface up to 51 meters from surface.

The Lean Clay (CL) contains elastic silt and has medium plasticity, no dilatancy, medium toughness, light greyish brown, and consistency is hard (N value of SPT range from 34 to 50).

The elastic silt with sand lenses (MH), contains fines and is of medium plasticity, with fine grained sand. The consistency is hard (N value of SPT ranges from 34 to 38)

Sand with fines (SW – SM), consist of coarse sand and fines about 25 % hard, non plastic, brown coloured. (N value of SPT ranges from 22 to 28).

- Forth layer – Fat Clay (CH) and Lean Clay (CL)

This layer is the upper most of the stratigraphic sequence that is exposured in the project area. The depth of this layer is about 37 meters from the ground surface. The main components are Fat Clay (CH) up to Lean Clay (CL). In both beds sand lenses are found.

Fat clay (CH) mainly is found on the upper part of this layer and has high plasticity, no dilatancy, low toughness, is light grey – grey and has a soft to medium consistency.

The Lean Clay (CL) with elastic silt is medium of plasticity, no dilatancy, low toughness, and medium consistency.

The black clay is of low plasticity, no dilatancy, low toughness, and stiff consistency.

As for detail, please refer to Table 4.3.2.4 "Geological Boring Logs" and the attached drawing.

(3) Seismicity

There are two seismicity codes used for design in Indonesia. The seismicity code (SNI 03-1726-2002) that is mainly for buildings designed for earthquakes on the basis of a 500 years return period and the seismic code for dams and embankments where the design earthquake magnitude varies depending on the return period. Of course, the determination of the return period of an earthquake depends on the acceptable risk and the probability of occurrence. However, even after the design acceleration is determined in the bedrock, the magnitude of acceleration needs to be corrected for amplification due to the actual soil conditions.

The second earthquake load criteria, usually produces a bigger acceleration then the first one. Kertapati (1999) proposed a design earthquake magnitude, which is similar to SNI 1726-2003.

The formulae for the design acceleration calculation is as follows:

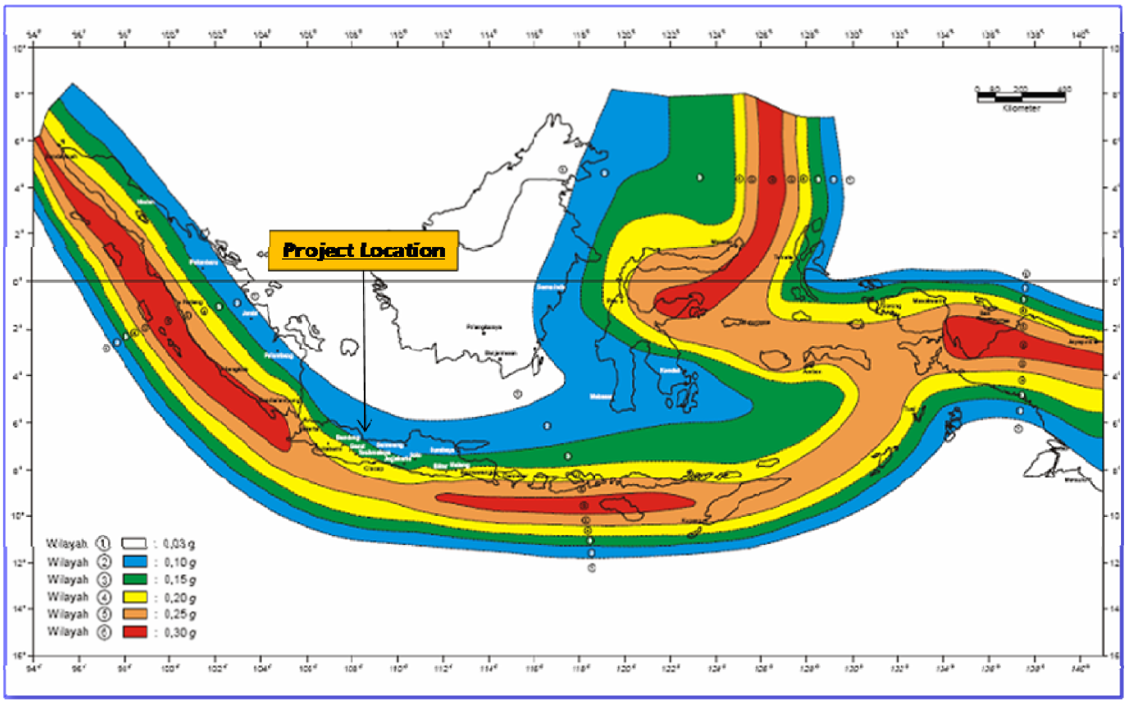
$$a_d = Z \times ac \times v$$

Where, ***Z*** is zone coefficient, ***a*c** is acceleration on the bedrock related to certain return period and ***v*** is correction factor for soil condition. Based on the above explanation, it is suggested to use seismic load as follows:

For buildings and power plant, → use SNI 1726-2002

For breakwaters and slopes, → use a range from 0.55 to a max 1.00 depending on the height.

Based on the above explanation, the seismic load for the IR_B1&2 siteit is recommended to use 0.15 g on the base rock. SNI 1726-2002 requires magnification factor based on the local soil condition.



Source : SNI 1726-2003

Figure 4.3.2.2 Indonesia Earthquake Region with peak acceleration of base rock in 500 years return period

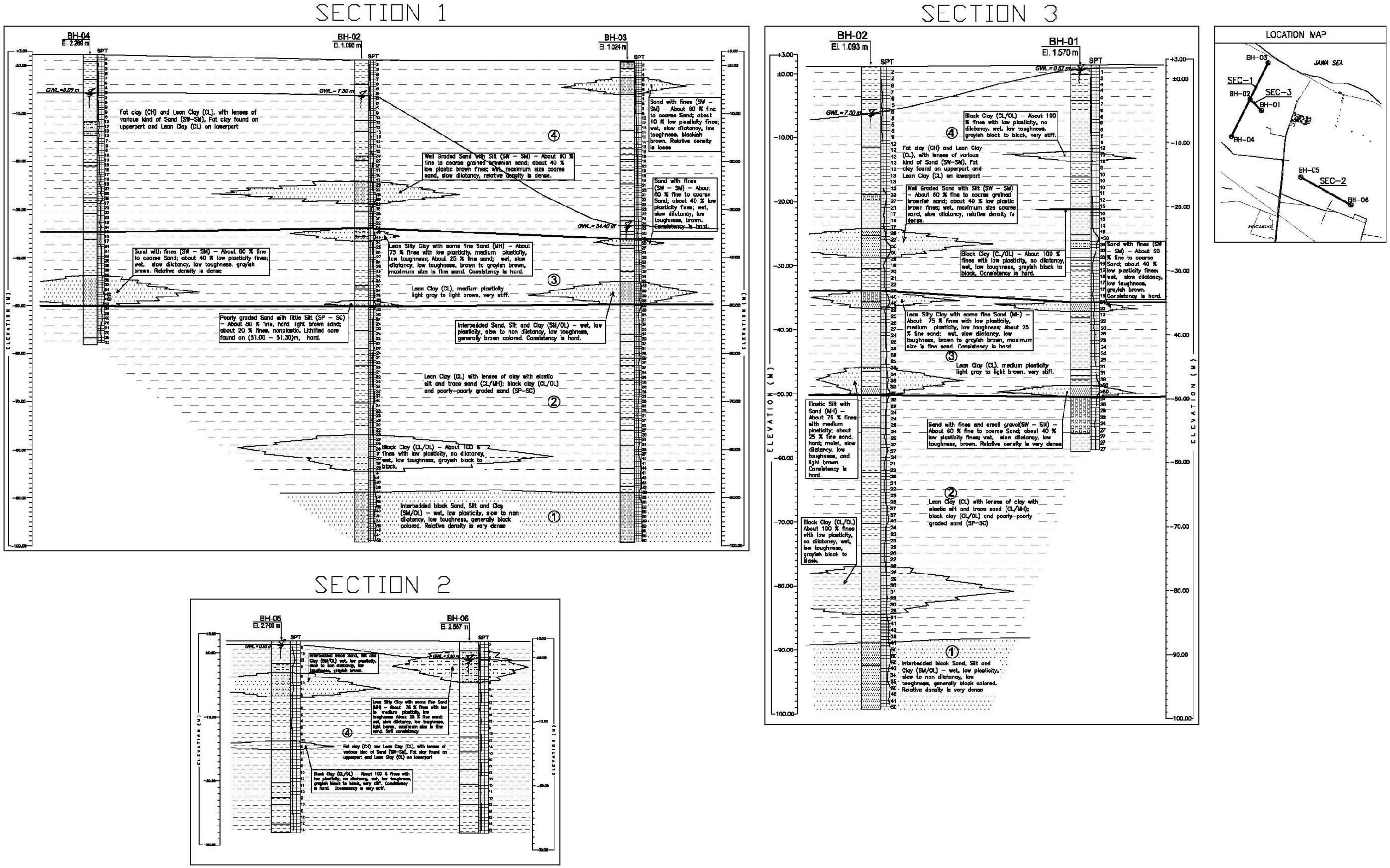


Figure 4.3.2.3 Soil Profiles

4.3.3 Topography

The topographic survey was performed from January to March 2010

(1) Station

- Level: Bench-mark: TTG 543 (Elevation = 6.282 m)
- Coordinate: N0001 Bakosurtanal, located in Cibinong East Java as a National Control Point used in Indonesia.
  The coordinate of that point are **6^{0}29’27.79580”S ; 106^{0}50’56.07500”E**

(2) Establishment of Benchmarks

The following benchmarks were established in the survey area.

Table 4.3.3.1 List of Benchmarks

Station	Coordinates		Elevation (m)
	Longitude (S)	Latitude (E)	
TEPC-01	6^{0}16’33.20554”	107^{0}58’45.06577”	3.307
TEPC-02	6^{0}16’33.64483”	107^{0}58’48.47747”	2.991
TEPC-03	6^{0}17’22.30764”	108^{0}00’03.27286”	4.043
TEPC-04	6^{0}17’23.45510”	108^{0}00’08.72739”	4.505
TEPC-05	6^{0}17’48.35902”	107^{0}59’38.02551”	2.480
TEPC-06	6^{0}17’52.69751”	107^{0}59’36.98745”	2.652
TEPC-07	6^{0}17’10.79804”	107^{0}58’33.08429”	4.569
TEPC-08	6^{0}17’18.48230”	107^{0}58’29.10482”	5.184

(3) Mapping

The total area to be mapped for the power plant site of this project is about 3.9 km^2 (3 km x 1.3 km)

(4) Results of survey

- Altitude is EL＋2.5 m～3.0 m and is almost flat inside the power plant area

- In the power plant area there is farmland, a paddy field and an aquaculture farm for shrimps, approximately 500 m x 300 m in size (PT. INTAN WIDYA INDS)

- The river is an irrigation canal and provides irrigation water at three (3) locations on the site, that is near the east side boundary, the center of a site and the site of east side, exist.

- There are footpaths throughout the site and a 3 metre wide road across the center of the site, along which two cars can pass.

For details, please refer to the attached drawing, Figure 4.3.4.1 MAP FOR TOPOGRAPHIC / BATHYMETRIC SURVEY

4.3.4 Seabed Bathymetric Survey

The bathymetric survey was performed in January 2010. A local boat was utilized as a survey boat and equipment with an EchoTrac MK 2 single beam echo sounder and Veripos Differential GPS complete with a navigation computer having Hydro-Pro software.

The coverage the proposed survey was an area of 3 km x 5.5 km, and sixty three (63) main lines and three (3) cross line were programmed.

The results of the survey showed that the seabed around this area is shallow beach. The depth contour lines of the coastline are almost parallel and, as for offshore, the seabed has a gentle slope.

- Coastline (0 m) ～1 km (－6.5 m) Slope: Approx 1/165
- 1 km from coastline (－6.5 m) ～2 km (－9.0 m) Slope: Approx 1/400
- 2 km from coastline (－9.0 m) ～3 km (－10.5 m) Slope: Approx 1/700

In addition, this surrounding ocean area is sandy coast, and coastline is retreating selectively and is considered to be eroding beach.
As for details, please refer to the attached drawing Figure 4.3.4.1 MAP FOR TOPOGRAPHIC / BATHYMETRIC SURVEY.

MAP FOR TOPOGRAPHIC / BATHYMETRIC SURVEY

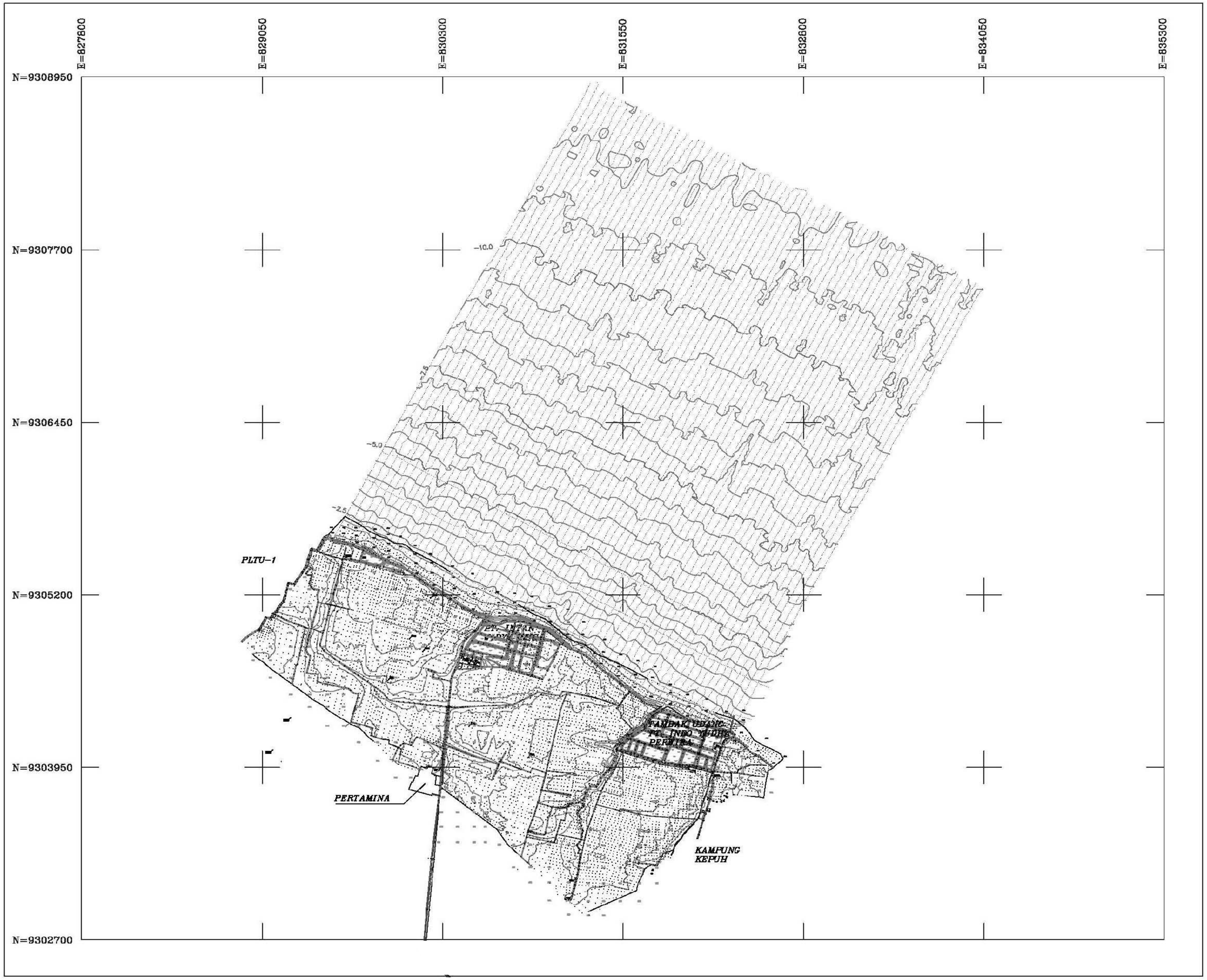


Figure 4.3.4.1 MAP FOR TOPOGRAPHIC / BATHYMETRIC SURVEY

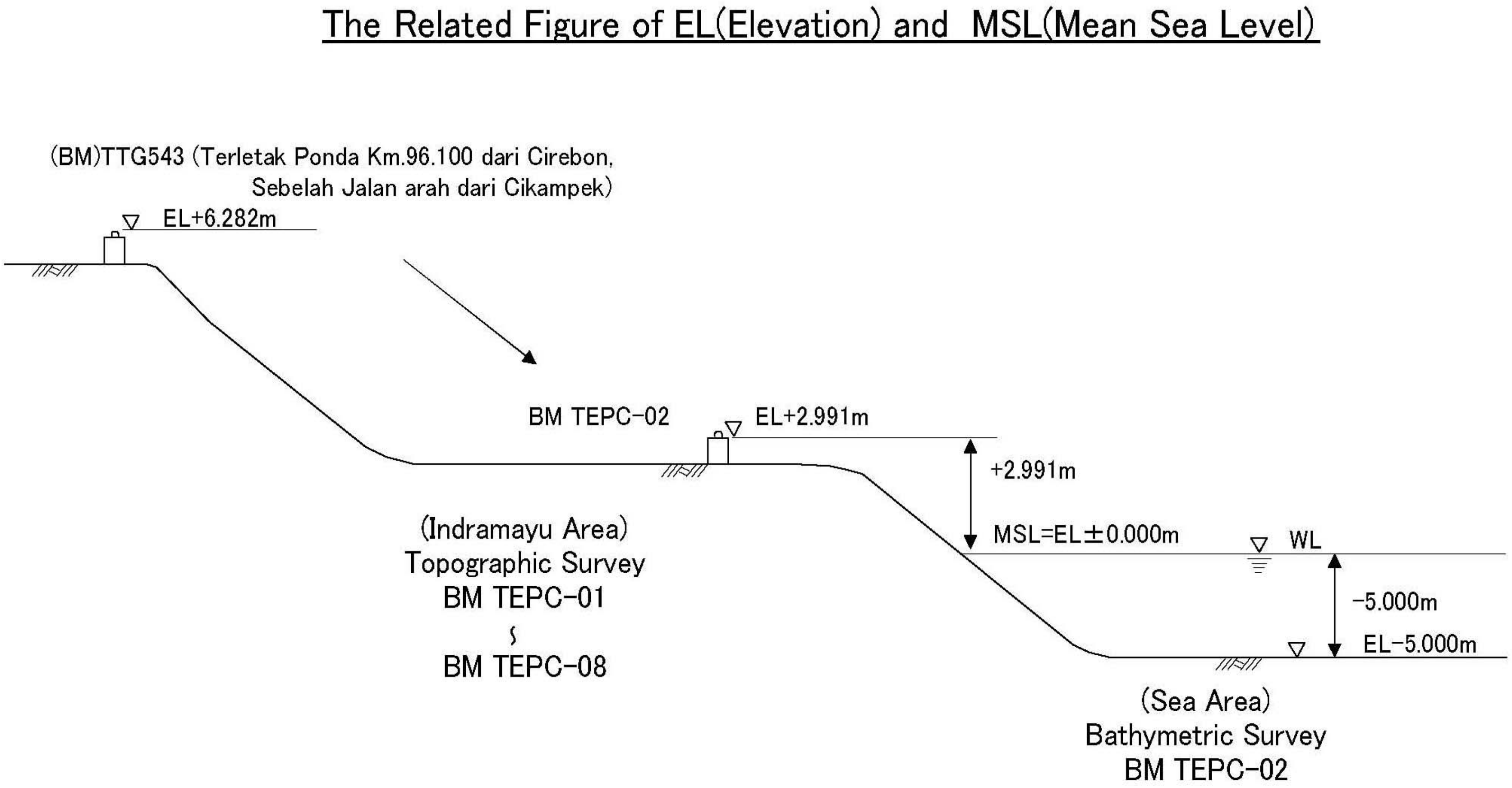


Figure 4.3.4.2 Related Figure of EL and MSL

4.3.5 Tidal

Concerning the tide levels, there are two (2) sets of data, one was measured at the time of the bathymetric survey (over a 2 week period) and the other was taken from the tidal table for Cirebon (Year 2010).

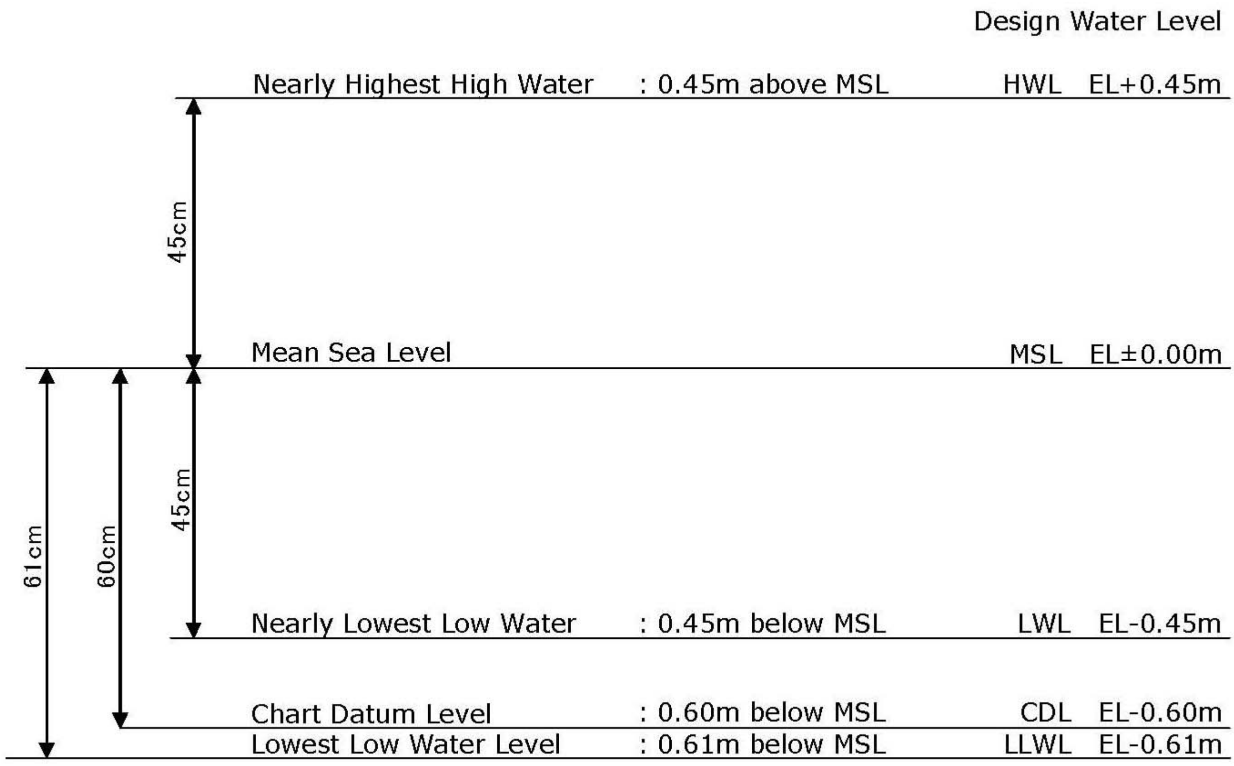
The comparison of the two (2) sets of data is as follows:

- Differential MSL is 0.106m
- Highest High Tide Water Level
  - Cirebon Tidal Table: 45 cm
  - Observation data analysis: 48 cm
- Lowest Low Water Level
  - Cirebon Tidal Table: 61 cm
  - Observation data analysis: 72 cm

As a result of arranging/analyzing the above data, the following tidal levels shall be adopted for the project based on the tidal table for Cirebon which shows that the tidal level differences are almost the same as determined from the measured data collected during the two (2) week observation period..

- HWL: EL+0.45m
- MSL: EL±0.45m
- LWL: EL-0.45m
- LLWL: EL-0.61m

As for details, please refer to the attached drawings Figure 4.3.5.1 "Tidal Conditions at Cirebon" and Figure 4.3.5.2 "Tidal Conditions of 2 Weeks Tide Observation at Site".



Tide Tables 2010 : Cirebon

Tidal Constants (cm)	M2	S2	N2	K2	K1	O1	P1	M4	MS4	Z0
	16	10	6	5	14	5	5			60

Lowest Low Water Level ≒ (M2+S2+N2+K2+K1+O1+P1+M4+MS4) below MSL

≒ 61 cm below MSL

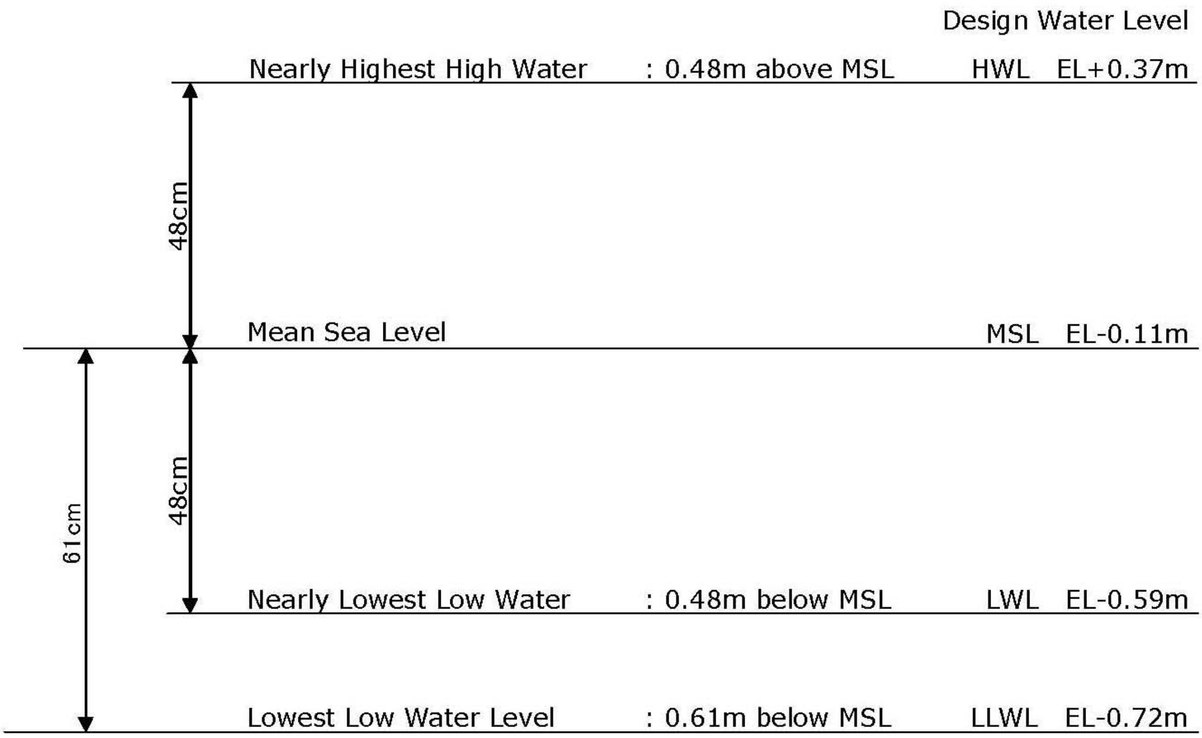
Nearly Lowest Low Water ≒ (M2+S2+K1+O1) below MSL

≒ 45 cm below MSL

Nearly Highest High Water ≒ (M2+S2+K1+O1) above MSL

≒ 45 cm above MSL

Figure 4.3.5.1 Tidal Conditions at Cirebon



Tide Observation : Indramayu Power Plant Site (2 WEEKS)

Tidal Constants (cm)	M2	S2	N2	K2	K1	O1	P1	M4	MS4	Z0
	12.68	1.85	2.49	0.50	25.42	8.47	8.39	1.12	0.29	48.42

Lowest Low Water Level ≒ (M2+S2+N2+K2+K1+O1+P1+M4+MS4) below MSL

≒ 61 cm below MSL

Nearly Lowest Low Water ≒ (M2+S2+K1+O1) below MSL

≒ 48 cm below MSL

Nearly Highest High Water ≒ (M2+S2+K1+O1) above MSL

≒ 48 cm above MSL

Figure 4.3.5.2 Tidal Conditions of 2 Weeks Tide Observation at Site

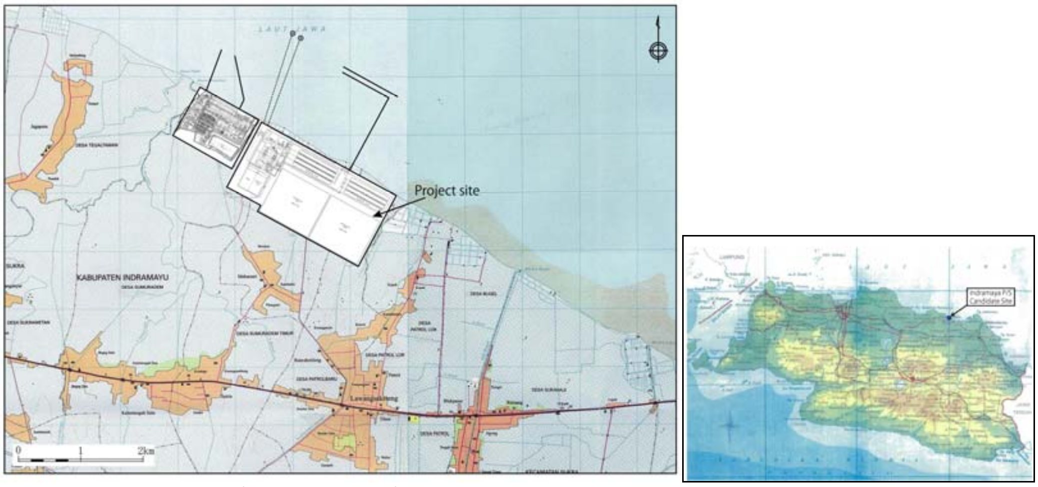
Chapter 9 Environmental and Social Consideration

9.1 Outline of the proposed site (Outline of natural and social environment)

9.1.1 Location of the proposed site

(1) Power plant and coal unloading jetty

Indramayu Coal-Fired Power Plant 1,000MW x 1 (hereinafter referred to as IR_B1) will be built at Sumurandem, Mekarsari, and Patrolbaru villages, Sukra district, Indramayu regency along the north –west coast of Java Island approximately 180km from Jakarta, the capital city of Indonesia. There is Jawa Barat Indramayu Coal-Fired Power Plant (330MW x 3 power units; hereinafter referred to as IR_A1-3) adjacent north-west side of project site (Figure 9.1.1).



Note: The location is 6° 16’ 33” S, 107° 58’ 60”E

Figure 9.1.1 Location map of IR_B1

(2) Transmission line

500kV transmission line route about 110 km from IR_B1 to Cibatu substation are planned in accordance with development of IR_B1. As results of the investigation and consideration, the transmission line route was selected the section to be along with the national road and the expressway, because of less inhabited areas, easy construction and convenience for maintenance work. Figure 9.1.2 shows the route of the proposed transmission line which traverses five districts, and these districts traversed by transmission line consist on sub- districts, villages as shown in Table 9.1.1.Land situation traversed transmission line is shown in Table 9.1-2.

The route is aligned behind villages where habitats exist. Terrain surrounding the route is mostly flat or very gently waved, and covered by bushes, or paddy field, cropland, thin forest. The total number of towers is estimated about 210 units from Indramayu power station to Cibatu substation.

The line section from IR_B1 to the national road at Chikampek was selected on the south side of the national road. The reasons are flat land, less trees and less houses comparing with other sides of the road (Figure 9.1.3(1) - (3)).

The line section from the National Road at Cikampek to Cibatu substation was selected on the southern side of the expressway, since the lands are mostly flat, in addition, trees are not tall and houses are few (Figure 9.1.3(4), (5)).

Overview of the selected transmission line route is as follow:

- From IR_B1 to the national road at Chikampek

(a) The transmission line route starts from the switching yard of IR_B1 and runs over about 8 km forward the southeast and crosses over the national road. This crossing point is very important, because the almost surroundings of the road are heavy build-up area.

(b) After crossing the national road, it runs about 60 km to Cikampek on the south side of the road. On the way to Cikampek, the route has few heavy angle towers to avoid residential areas in Ranka Udik Village. Moreover, the route has two crossing points of the existing 150 kV transmission lines in Jatibaru Village and in Rancabango Village. As for the route on the south side of the national road, many houses exist in Ranka Udik Village and in Champaka area, but terrain surrounding the route is mostly flat and covered by paddy field or cropland.

- From the national road at Cikampek to Cibatu substation

(a) The line crosses the National Road at Cikampek where is about 1 km north from Cikampek entrance of the expressway. This crossing point is deiced to avoid the vast private land belong to Suharto family exists on the south area of the expressway. In addition surrounding of this crossing point is heavy build-up area. The line runs toward the east over 4 km by avoiding residential areas and crosses over the expressway.

(b) The line runs about 35 km along the southern side of the expressway and achieves to Cibatu substation. On the way to Cibatu substation, the line has few heavy angle towers to avoid residential areas in Clurug Village and in Pasirranji Village. Moreover, since the line have to traverse the land developing area for a new factory near Cibatu substation, it is necessary to select the line in parallel with the existing 500 kV line in this area.

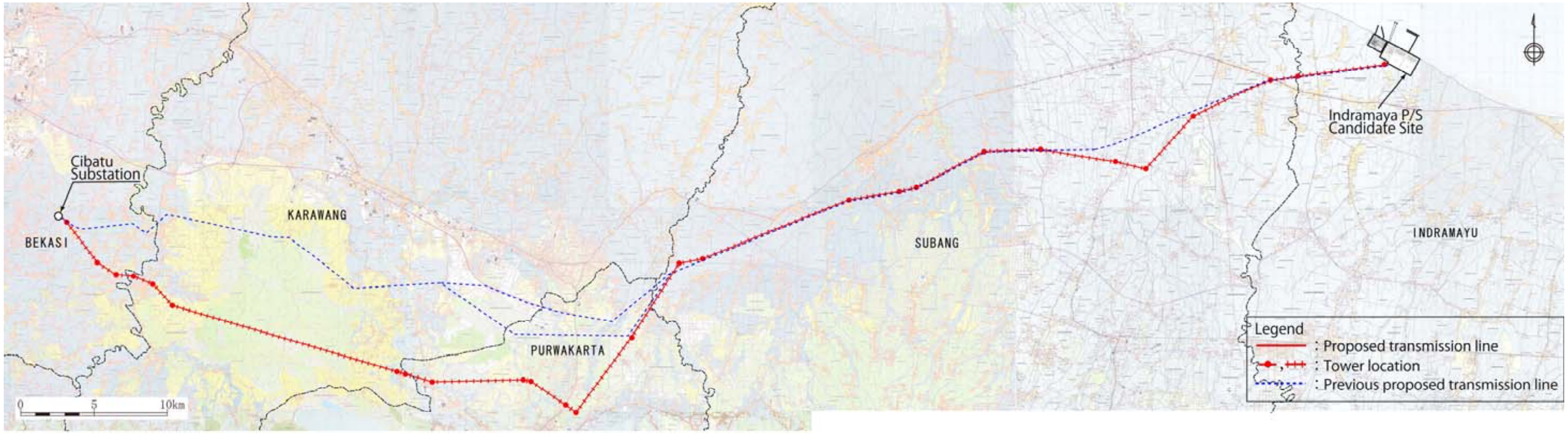


Figure 9.1.2 Map of outline of 500 kV transmission line route

Indramayu district	Indramayu district is along the north coast of Java Island in West Java province, which lies between 107°36'-107°52'E, 06°14'-06°40'S. The total area of this district is 2,040.11 km^2.	Karawang district	Karawang district located in the north of West Java province, which lies between 107°02'-107°40'E, 05°56'-06°34'S. Total area of Karawang district is 1,753.27 km^2, and 3.73 percent of the area of West Java Province.
Subang district	Subang district is geographically located in the northern part of West Java province, which lies between 107°31'-107°54'E, 06°11'-06°49'S. The total area of Subang district is 2,051.76 km^2.	Bekasi district	Bekasi district is the part of West Java province, which lies between 106°48'-107°27'E, 06°10'-6°30'S. The total area of Bekasi district is 1,273.88 km^2.
Purwakarta district	Purwakarta district is the part of West Java province, which lies between 107°30'-107°40'E, 06°25'-06°45'S. Total area of its district is 971.72 km^2.		

Table 9.1.1(1) Districts and villages traversed by transmission line

NO	District	Sub- District	Village
1	Indramayu	Patrol	Mekarsari
			Patrol Lor
		Sukra	Sumuradem
			Sukra
			Sukrawetan
2	Subang	Pusaka Jaya	Karanganyar
			Kebondanas
			Cigugur Kaler
			Bojong Jaya
			Pusaka Jaya
		Pusakanagara	Bojong Tengah
		Tambakdahan	Bojonegara
			Rancaudik
			Tambakdahan
			Kertajaya
			Mariuk
			Tanjung Rasa
			Bojongkeding
		Compreng	Jatimulya
		Binong	Wanajaya
		Ciasem	Jatibaru
			Dukuh
		Patok Beusi	Ranca Asih
			Rancabango
			Rancajaya
			Rancamulya
			Gempolsari
			Tjg Rasa Kidul
		Pabuaran	Pabuaran
			Siluman
			Cihambulu
3	Purwakarta	Campaka	Cisaat
			Cimahi
			Cikumpay
			Bungursari
			Campaka

Table 9.1.1(2) Districts and villages traversed by transmission line

NO	District	Sub- District	Village
3	Purwakarta	Purwakarta	Cibening
			Cigelam
			Cicadas
			Cilangkap
4	Karawang	Ciampel	Mulyasari
			Kutanegara
			Parungmulya
		Teluk Jambe Barat	Margamulya
			Margakaya
			Wanakerta
		Teluk Jambe	Mulyasejati
			Puseraya
5	Bekasi	Serang Baru	Nagasari
		Cikarang Pusat	Pasir Ranji
			Sukamahi
			Cicau (GITET)

Table 9.1-2 Land situation traversed transmission line

Item	Area (km^2)	Proportion (%)
Residential area	0.136(0.005)	3.6
Forest	0.476(0.019)	12.7
Farmland	3.128(0.116)	83.6

Note; Based on L+H+I (m) about 500kV double as the reference below, each extent is assumed.
The value in parentheses means the sum of tower foundation.

(Reference)

Transmission line	Distance between the center of tower to the conductor on the vertical axis L (m)	Horizontal swing width of the conductor H (m)	Width of the free zone I (m)	Total L+H+I (m)	(Rounding off)
500kV single	12.00	6.16	3.10	21.26	(22)
500kV double	7.30	6.16	3.10	16.56	(17)

Source：SNI04-6918-2002

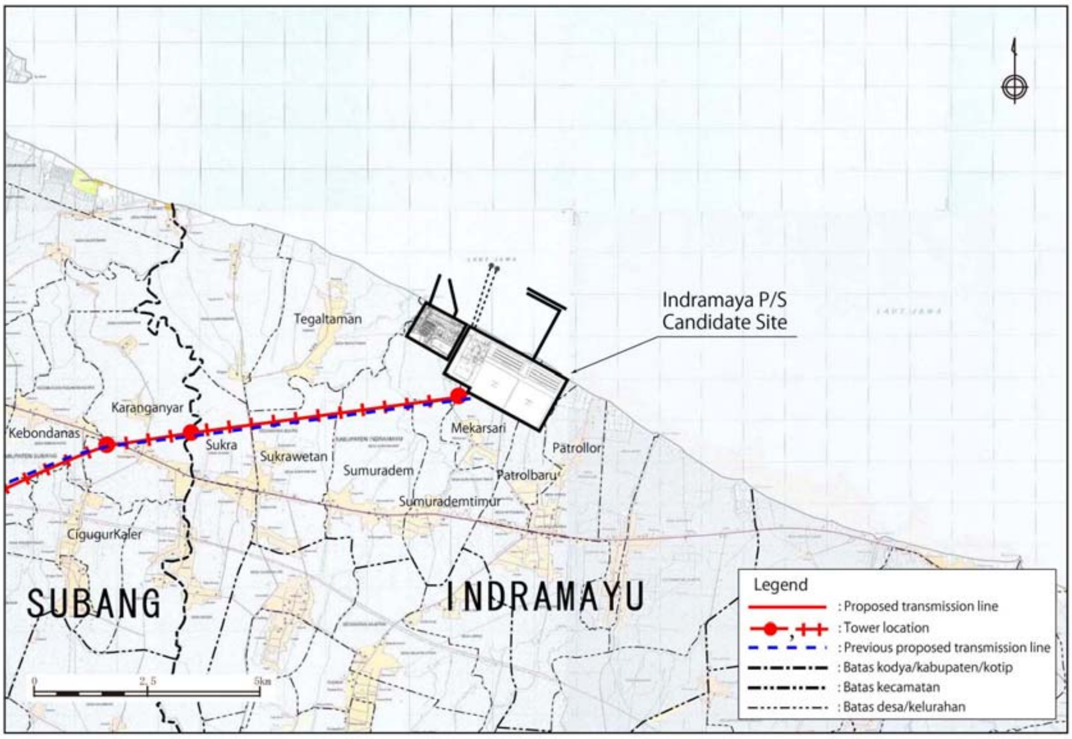


Figure 9.1.3(1) Map of outline of 500 kV transmission line route（Detail）

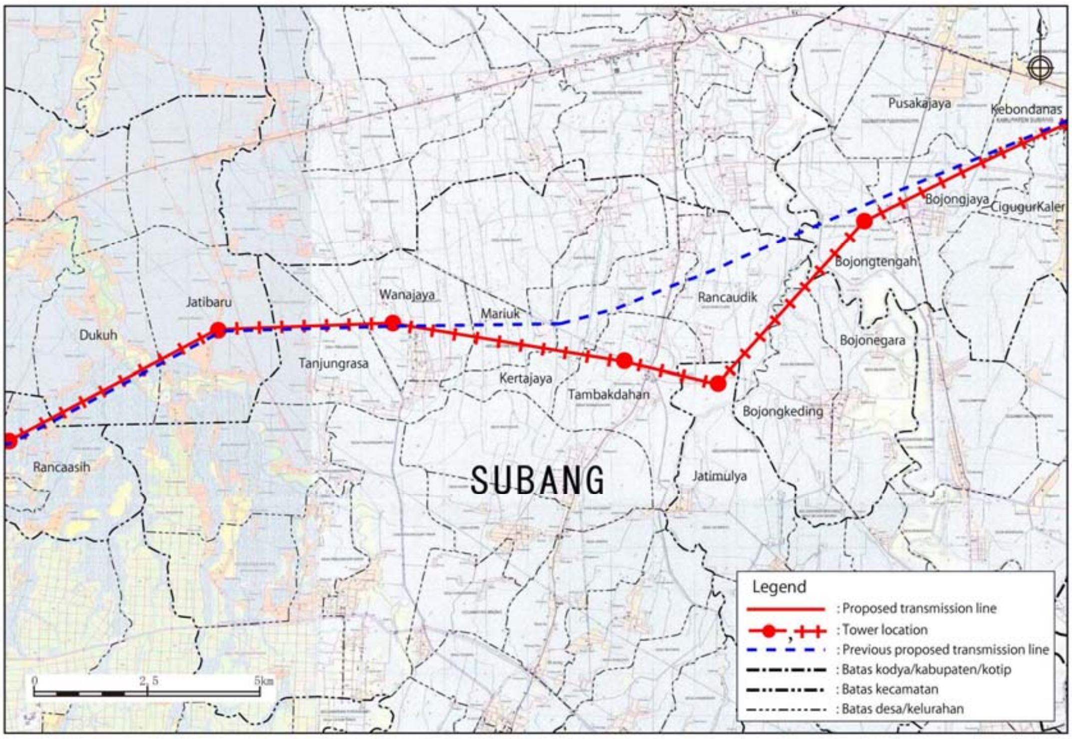


Figure 9.1.3(2) Map of outline of 500 kV transmission line route（Detail）

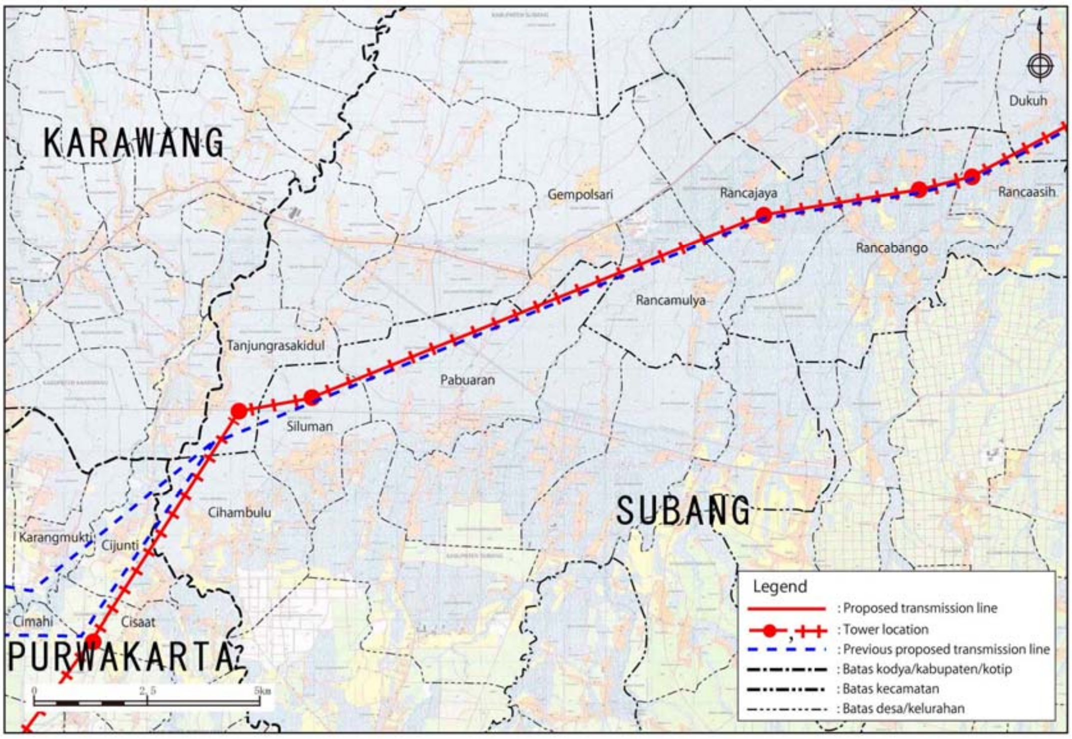


Figure 9.1.3(3) Map of outline of 500 kV transmission line route（Detail）

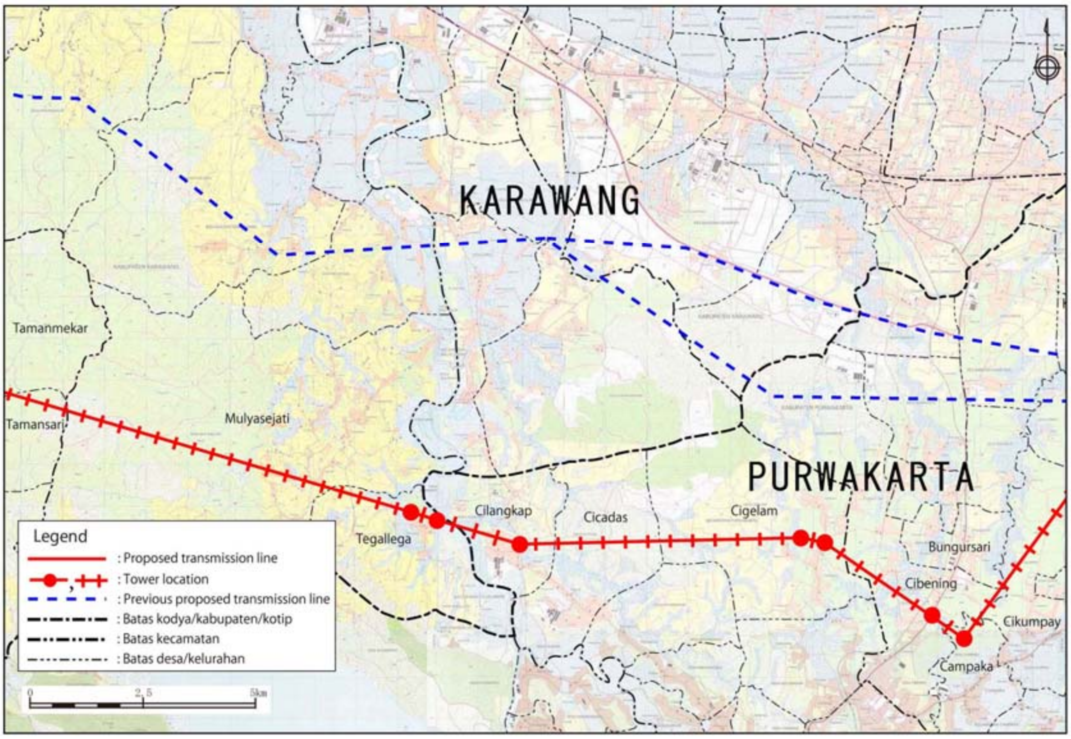


Figure 9.1.3(4) Map of outline of 500 kV transmission line route（Detail）

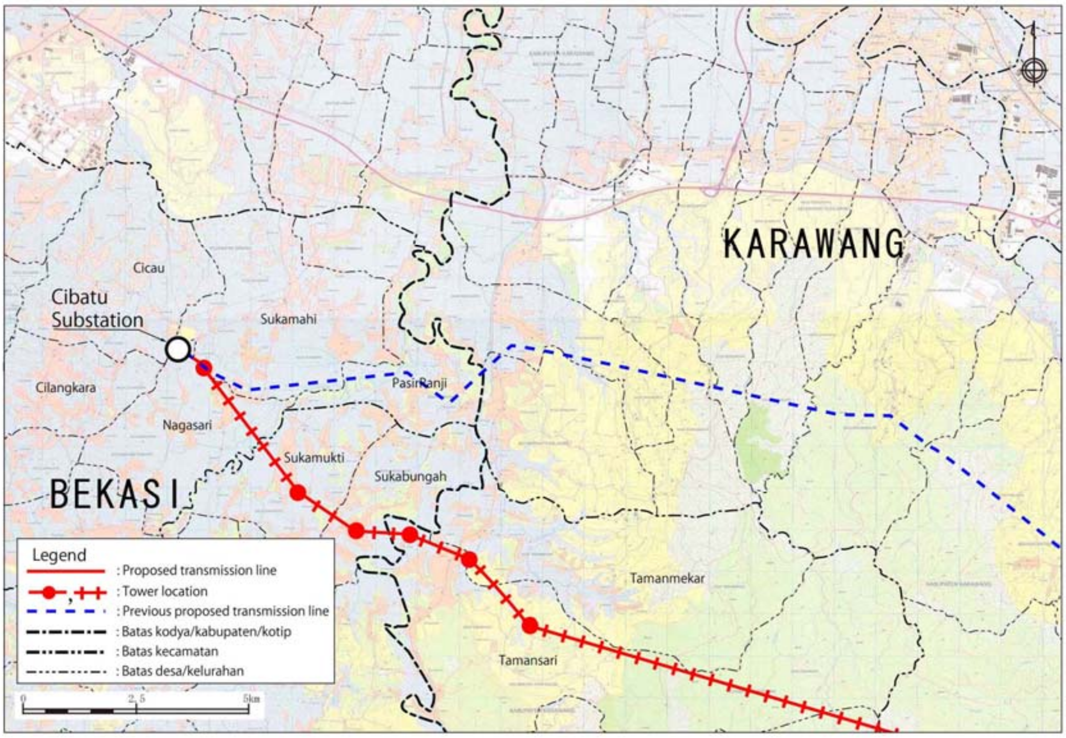


Figure 9.1.3(5) Map of outline of 500 kV transmission line route（Detail）

9.1.2 Outline of the natural environment

(1) Power plant and coal unloading jetty

1) Geophysics-chemistry component

(a) Climate

i) Rainfall

Based on data from Balai Penelitian Padi Sukamandi period 2006 - 2009, the rainfall in study area ranges from 979-1,670 mm/year, with higher rainfall from Jane to April and November, December, and lower rainfall from May to September as shown in Table 9.1.3.

Table 9.1.3 Monthly rainfall (period 2006-2009)

Year	Description	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2006	Precipitation (mm)	341	81	232	93	30	10	37	-	-	2	16	157	997
	Rainy day number(days)	17	8	12	12	5	2	1	-	-	3	5	12	77
2007	Precipitation (mm)	147	-	-	198	59	154	6	-	36	61	111	210	979
	Rainy day number(days)	12	-	-	14	8	5	3	-	1	7	10	17	77
2008	Precipitation (mm)	286	530	137	48	45	13	-	3	-	13	150	112	1335
	Rainy day number(days)	16	24	16	9	3	3	-	1	-	4	11	13	100
2009	Precipitation (mm)	374	366	203	179	72	8	-	-	10	6	208	244	1670
	Rainy day number(days)	17	19	15	11	9	2	-	-	1	2	11	11	98

ii) Ambient Temperature and humidity

Based on data from Balai Penelitian Padi Sukamandi period 2006 - 2009, annual average ambient temperature range is 26.9-27.5°C, annual max temperature range is s31.3-32.8°C and annual average humidity range is 77.6-82.3% as shown in Table 9.1.4 and Table 9.1.5.

Table 9.1.4 Monthly ambient temperature (period 2006-2009)

Year	Description	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2006	Average(°C)	26.6	26.9	27.2	28.1	28.2	27.0	26.8	26.9	27.3	28.2	29.0	27.8	27.5
	Minimum(°C)	29.9	30.4	30.8	31.6	31.8	31.9	31.7	31.9	32.8	33.7	33.3	31.4	31.8
	Maximum(°C)	22.4	22.2	22.9	23.0	23.0	21.2	21.3	20.4	20.7	22.4	23.5	23.3	22.2
2007	Average(°C)	27.5	-	-	27.7	27.7	27.4	27.1	26.6	27.1	26.4	27.2	26.9	27.2
	Minimum(°C)	31.6	-	-	31.3	31.6	31.9	31.8	31.8	32.3	31.0	31.7	30.7	31.6
	Maximum(°C)	22.1	-	-	23.4	22.7	22.1	21.2	21.2	21.4	21.5	22.5	23.0	22.1
2008	Average(°C)	26.7	24.6	26.8	27.5	27.9	26.3	26.4	27.1	27.9	28.2	27.5	26.7	26.9
	Minimum(°C)	30.9	28.6	31.1	31.2	32.2	30.3	31.5	32.1	33.3	33.2	31.2	30.1	31.3
	Maximum(°C)	22.2	22.0	22.5	22.9	22.4	21.8	20.9	22.0	22.3	24.0	24.3	23.8	22.6
2009	Average(°C)	26.1	26.3	27.2	28.7	27.7	27.6	27.1	27.2	27.7	28.3	27.8	27.4	27.4
	Minimum(°C)	29.3	29.3	31.4	32.7	31.8	30.8	32.1	31.9	32.9	33.5	33.0	32.2	31.7
	Maximum(°C)	23.1	23.5	23.6	24.8	23.9	22.5	21.5	22.9	23.9	24.1	24.0	24.4	23.5

Table 9.1.5Average monthly humidity (period 2006-2009)

(%)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2006	86.7	83.2	82.8	81.0	81.6	75.8	75.7	71.4	67.5	68.9	74.1	82.4	77.6
2007	82.3	-	-	83.1	81.7	80.4	77.0	75.2	75.6	77.0	82.2	84.1	79.9
2008	86.1	85.6	84.5	78.5	76.6	75.8	75.1	75.5	74.7	76.8	83.4	86.5	79.9
2009	88.5	86.4	83.6	89.5	83.6	81.0	76.1	76.9	77.1	77.4	82.1	85.6	82.3

iii) Wind Velocity

Based on data from Balai Penelitian Padi Sukamandi period 2006 - 2009 as shown in Table 9.1.6 and Table 9.1.7, and Figure 9.1.4, the wind pattern for Indramayu eastern coast and its surrounding can be categorized as below:

_ According to annual pattern, dominant wind direction is south with frequency of 25.0% and north with frequency of 13.5%. In addition, wind direction causing land and sea breeze is dominate. Dominant wind velocity is range 1.0-1.9 m/s with 30.3%.

_ According to rainy season pattern, dominant wind direction is west with frequency of 28.9% and south with frequency of 16.8%. Dominant wind velocity range is1.0-1.9 m/s with 30.4%.

_ According to dry season pattern, dominant wind direction is south with frequency of 29.3% and North with frequency of 14.9%. Dominant wind velocity range is 1.0-1.9 m/s with 29.8%.

_ According to day pattern, dominant wind direction is north during the morning, however from middle of the day to evening, dominant wind changes to opposite direction (south).

Dominant wind velocity is calm (<0.4m/s) during the morning, however in the daytime dominate wind velocity of range4.0-5.9m/s occurs.

Table 9.1.6 Annual occurrence ratio of wind speed (period 2006-2010)

(%)

Wind direction / Wind velocity	NE	E	SE	S	SW	W	NW	N	Total
0.5-0.9(m/s)	0.4	0.7	0.4	0.4	0.3	1.8	1.9	3.6	9.5
1.0-1.9(m/s)	1.5	2.3	1.8	7.1	2.8	4.5	1.3	8.7	30.0
2.0-2.9(m/s)	0.8	1.4	1.6	7.5	3.2	3.1	0.2	0.8	18.6
3.0-3.9(m/s)	0.1	0.5	0.8	2.3	0.8	1	0	0.2	5.7
4.0-5.9(m/s)	0.3	0.9	2	5.9	2.2	2.1	0	0.2	13.6
6.0-7.9(m/s)	0	0.5	0.7	1.6	0.8	0.5	0	0	4.1
8.0< (m/s)	0	0.4	0.6	0.2	0.1	0.1	0	0	1.4
Total	3.1	6.7	7.9	25.0	10.2	13.1	3.4	13.5	-
Calm(<0.4 m/s)									16.9

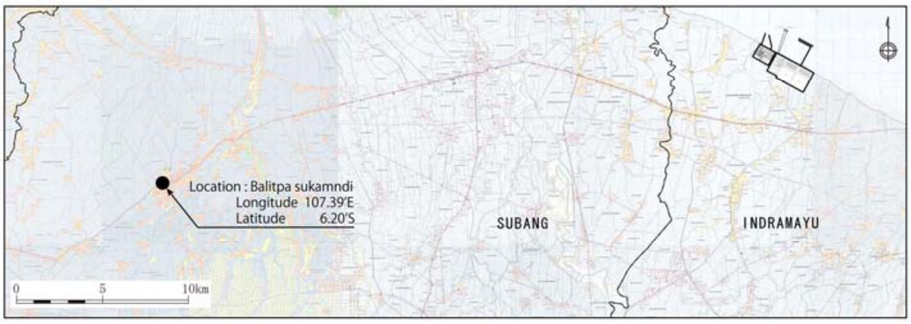
Source: Balai Penelitian Padi Sukamandi period 2006 – 2010

Table 9.1.7 Occurrence ratio of wind speed (period 2006-2010)

Month	Dominant Wind		Dominant Direction	
	Velocity(m/s)	%	Direction	%
January	1.0-1.9 4.0-5.9	30.2 15.3	Southeast East	34.9 24.2
February	1.0-1.9 2.0-2.9	30.0 18.9	Southeast East	29.1 23.4
March	1.0-1.9 2.0-2.9	26.6 20.1	South Southeast	27.1 16.8
April	1.0-1.9 2.0-2.9	40.6 19.5	South North	32.5 26.8
May	1.0-1.9 2.0-2.9	35.2 19.6	West South	25.2 17.7
June	1.0-1.9 <0.4	39.5 18.7	West North	35.6 14.9
July	1.0-1.9 2.0-2.9	30.3 21.1	West Southwest	32.0 17.2
August	<0.4 4.0-5.9	20.6 19.8	West Southwest	23.6 23.2
September	1.0-1.9 4.0-5.9	20.4 19.9	South Southwest	37.9 17.9
October	1.0-1.9 4.0-5.9	27.7 19.7	South North	39.7 16.4
November	1.0-1.9 <0.4	33.5 15.9	South North	38.6 21.6
December	1.0-1.9 2.0-2.9	28.7 18.3	South East	25.8 18.6
Annual	1.0-1.9 2.0-2.9	30.0 18.6	South North	25.0 13.5
Rainy season	1.0-1.9 <0.4	30.4 19.5	West South	28.9 16.8
Dry season	1.0-1.9 2.0-2.9	29.8 18.6	South North	29.3 14.9
During the morning	<0.4 1.0-1.9	44.7 31.4	North Northeast	31.1 5.4
In the middle of the day	4.0-5.9 2.0-2.9	33.3 22.1	South West	41.9 19.9
Early-evening	1.0-1.9 2.0-2.9	44.6 31.6	South West	32.6 17.1

Source: Balai Penelitian Padi Sukamandi period 2006 – 2010

Note: Observation location is shown in the following figure.



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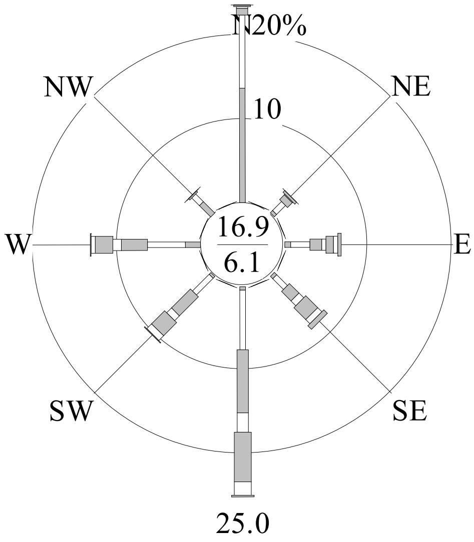
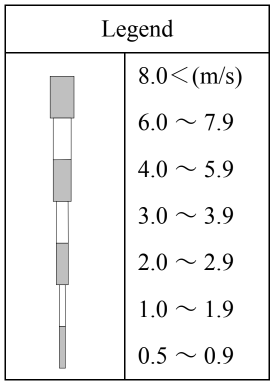


Note： The upper number shows the rate of calm(<0.4m/s)(%), and the lower number shows the rate of missing value (%) in the central circle of distribution of wind velocity.



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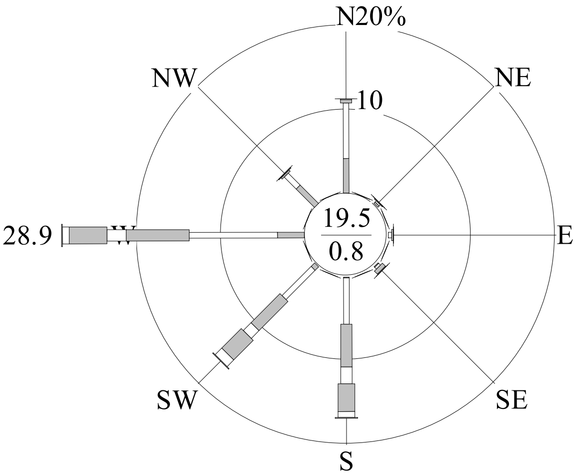

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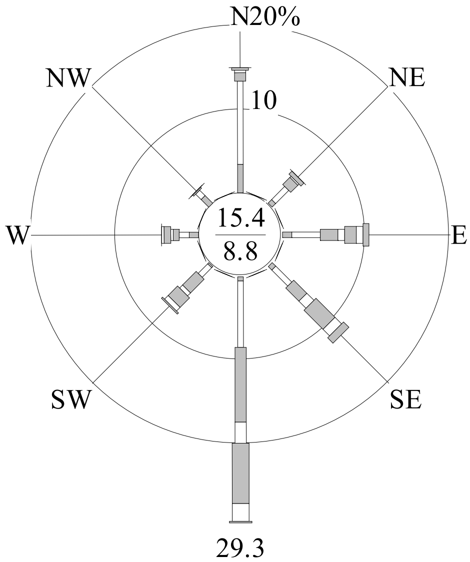

Figure 9.1.4(1) Distribution of wind velocity and direction (period 2006-2010)

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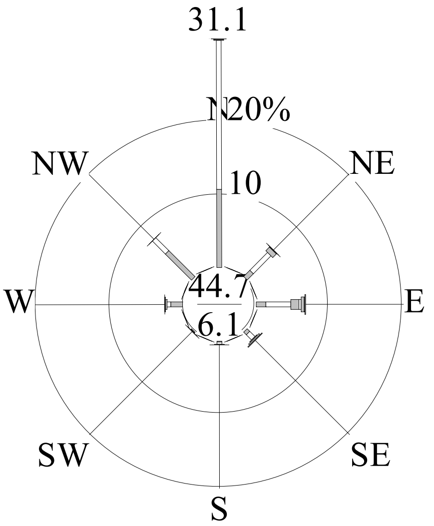

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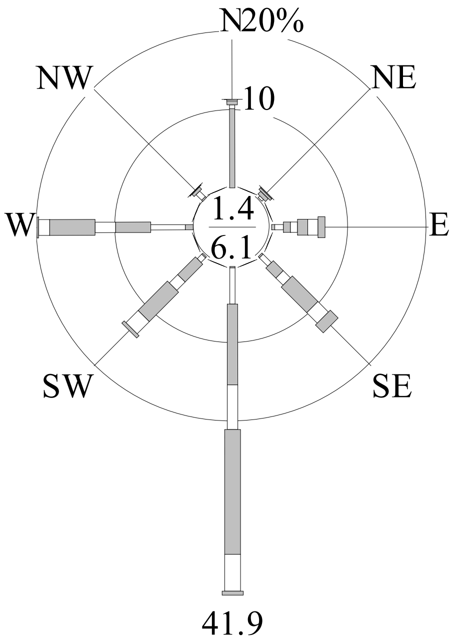

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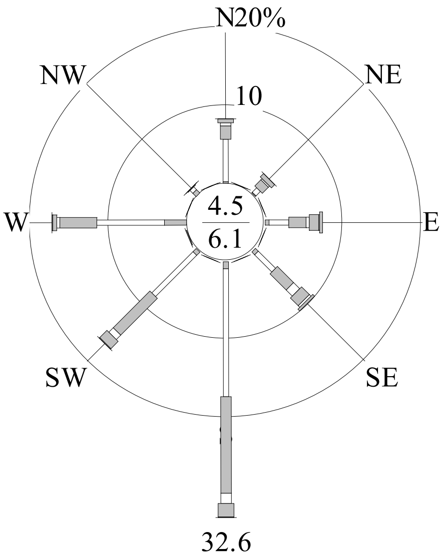


Figure 9.1.4(2) Distribution of wind velocity and direction (period 2006-2010)

(b) Air Quality

Sampling for air quality is conducted in 4 observation points, with locations as shown in Figure 9.1.5. Two points are nearby project site, others are 5km and 10km far way from project site

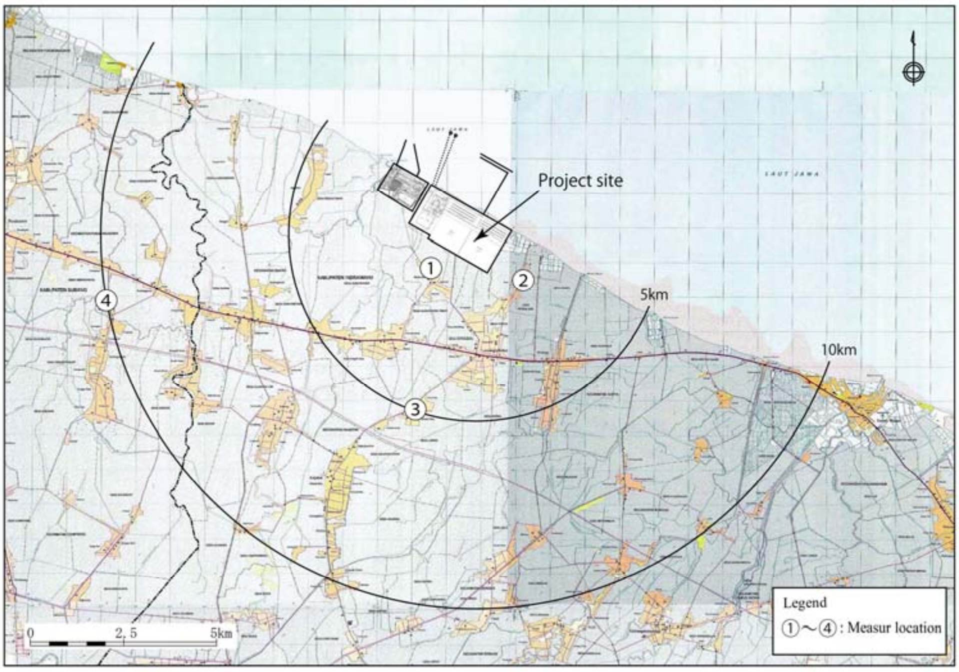


Figure 9.1.5 Sampling location for air quality

Air quality data is measured in project site and the surrounding area. Analysis method, equipments used in sampling and measured results are presented in Table 9.1.8. For example, background concentration (Date: 12-13 May) of NOx ranges between 1.0-31.9μg/m^{3,} SO2 ranges between ND-6.6μg/m^3 PM_{10} ranges between 48.6-91.0μg/m^3. Regarding the survey results in 21-22 June, NOx ranges between 5.2-18.0μg/m^{3,} SO2 ranges between ND-0.6μg/m^3 PM_{10} ranges between 31.9-64.1μg/m$^{3.}$

Table 9.1.8(1) Measure results for air quality

Survey date: 12-13 May 2010

No	Parameter	Unit	Station 1			Station 2		
			Residential area nearby project site			Residential area nearby project site		
			(06°16'59"S – 107°59'21"E)			(06°17'29"S – 108°00'17"E)		
			10:00	18:00	02:00	13:00	21:00	05:00
1	Nitrogen oxide(NO_x)	μg/m^3	14.59	5.15	13.39	15.45	1.03	31.94
2	Sulfur oxides(SO_2)	μg/m^3	ND	ND	ND	ND	ND	ND
3	Carbon monoxides(CO)	μg/m^3	840	756	504	1,260	1,512	1,008
4	Ozone(O_3)	μg/Nm^3	12.46	3.88	ND	11.79	5.46	2.3
5	Hydro carbon(HC)	μg/Nm^3	1.56	1.08	1.59	2.47	1.11	1.01
6	Particular matter(PM_{10})	μg/Nm^3	86	56	91	66	76	91
7	Total amount of suspended particular(TSP)	μg/Nm^3	111.7	59.4	111.5	72.9	84.5	97.9

No	Parameter	Unit	Station 3			Station 4		
			5 km from project site			10 km from project site		
			(06°19'26"S – 107°58'51"E)			(06°18'10"S – 107°54'16"E)		
			18:30	02:30	10:30	17:00	01:00	09:00
1	Nitrogen oxide(NO_x)	μg/m^3	8.24	25.75	19.57	17.31	14.42	18.54
2	Sulfur oxides(SO_2)	μg/m^3	ND	ND	6.66	ND	ND	ND
3	Carbon monoxides(CO)	μg/m^3	1,764	1,260	1,260	1,008	756	252
4	Ozone(O_3)	μg/Nm^3	14.95	5.46	14.95	14.95	7.04	10.21
5	Hydro carbon(HC)	μg/Nm^3	2.13	1.75	1.58	1.33	1.02	ND
6	Particular matter(PM)	μg/Nm^3	49	72	67	50	90	50
7	Total amount of suspended particular(TSP)	μg/Nm^3	58.9	80.7	166.3	132.1	115.7	82.5

Note, ND: Not detected

Table 9.1.8(2) Measure results for air quality

Survey date: 21-22 June 2010

No	Parameter	Unit	Station 1			Station 2		
			Residential area nearby project site			Residential area nearby project site		
			(06°16'59"S – 107°59'21"E)			(06°17'29"S – 108°00'17"E)		
			10:00	18:00	02:00	13:00	21:00	05:00
1	Nitrogen oxide(NO_x)	μg/m^3	13.73	13.73	5.15	13.73	6.87	12.02
2	Sulfur oxides(SO_2)	μg/m^3	ND	ND	0.61	ND	0.61	ND
3	Carbon monoxides(CO)	μg/m^3	1,260	840	840	1,260	1,470	1,260
4	Ozone(O_3)	μg/Nm^3	24.33	13.78	11.41	11.14	5.87	1.91
5	Hydro carbon(HC)	μg/Nm^3	1.08	1.39	ND	1.85	2.70	1.09
6	Particular matter(PM_{10})	μg/Nm^3	64.1	41.9	31.9	39.7	58.6	39.2
7	Total amount of suspended particular(TSP)	μg/Nm^3	135.1	91.3	59.6	61.3	145.0	60.8

No	Parameter	Unit	Station 3 5 km from project site (06°19'26"S – 107°58'51"E)			Station 4 10 km from project site (06°18'10"S – 107°54'16"E)		
			18:30	02:30	10:30	17:00	01:00	09:00
1	Nitrogen oxide(NO_x)	μg/m^3	14.59	5.15	18.03	13.73	6.01	13.74
2	Sulfur oxides(SO_2)	μg/m^3	ND	ND	ND	ND	ND	ND
3	Carbon monoxides(CO)	μg/m^3	840	1,260	1,890	1,050	2,100	1,890
4	Ozone(O_3)	μg/Nm^3	20.37	16.41	16.41	5.87	4.55	11.14
5	Hydro carbon(HC)	μg/Nm^3	1.02	ND	ND	2.53	1.05	2.47
6	Particular matter(PM)	μg/Nm^3	37.5	38.6	40.0	42.2	32.8	30.8
7	Total amount of suspended particular(TSP)	μg/Nm^3	56.0	75.6	98.6	60.7	69.8	98.7

Note, ND: Not detected

Air quality parameters such as NO_x, SO_2, and particulates (TSP, PM_{10}) are under the regulated threshold, referring to Government Regulation No.41/1999 on Air Pollution Control.

Table 9.1.9 Compare between air quality analysis and the regulation

Parameter	unit	Results from air quality analysis (4 sampling points)	Air quality standards (No.41/1999)	IFC guideline (General: 2007)
NO_2	μg/m^3	1.03 – 31.94	400 (1hr) 150 (24hr) 100 (1year)	200 (1hr: guideline) 40 (24hr: guideline)
SO_2	μg/m^3	ND – 6.66	900 (1hr) 365 (24hr) 60 (1year)	500 (10minute: guideline) 125 (24hr: interim target-1*) 50 (24hr: interim target-2*) 20 (24hr: guideline)
CO	μg/m^3	252 – 1,764	30,000 (1hr) 10,000 (24hr)	-
O_3	μg/m^3	ND – 14.95	235 (1hr) 50 (1year)	8-hour daily maximum 160 (interim target-1*) 100 (guideline)
HC	μg/m^3	ND – 2.47	160 (3hr)	-
PM_{10}	μg/m^3	50 - 91	150 (24hr)	150 (24hr: interim target-1*) 100 (24hr: interim target-2*) 75 (24hr: interim target-3*) 50 (24hr: guideline) 70 (1year: interim target-1*) 50 (1year: interim target-2*) 30 (1year: interim target-3*) 20 (1year: guideline)
TSP	μg/m^3	58.9 – 166.3	230 (24hr) 90 (1year)	-

Notes:

* : Interim targets are provided in recognition of the need for a staged approach to achieving the recommended guidelines

(c) Noise

Measure of noise is conducted in 4 observation points (2points are the nearest residential area from the project site, others are along the primary transportation route (Cirebon-Jakarta routes)), with locations as shown in Figure 9.1.6

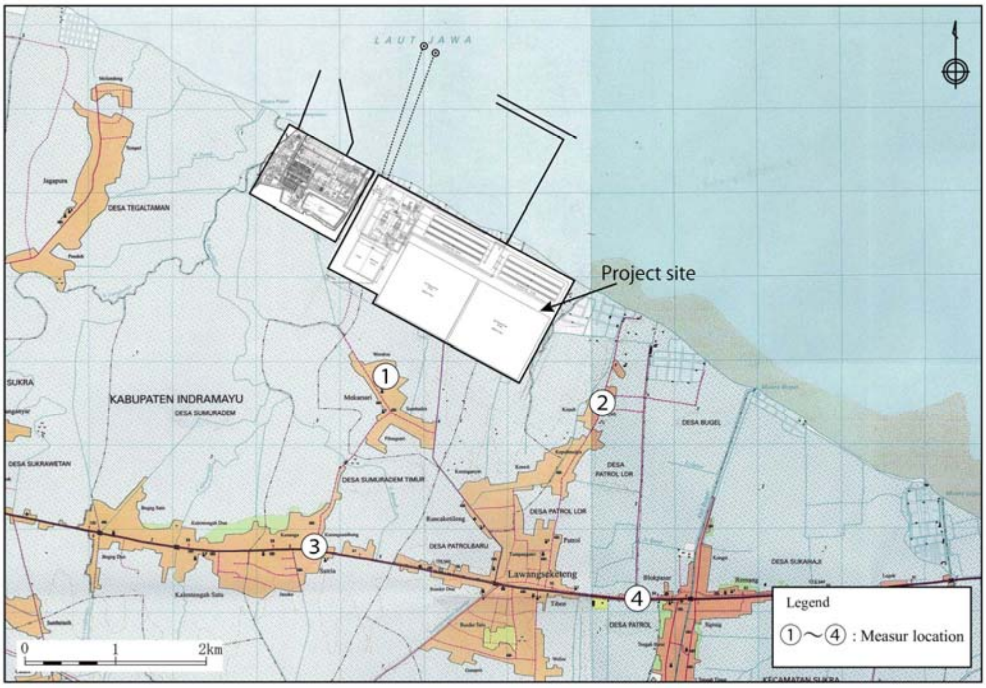


Figure 9.1.6 Sampling location for Noise

Noise data is shown in Table 9.1.10(1) (2). Noise level (L_{Aeq}) of the residential area vicinity of project site (Station 1 and 2) are 43-68dBA (Date: 12-13 May), 45-57dBA (Date: 21-22 June). Noise level (L_{Aeq}) along transportation route (Station 3 and 4) are 73-79dB (Date: 12-13 May), 73-78dBA (Date: 21-22 June). A part of the measured results exceeds the noise level threshold (housing and settlement; 55 dBA) mentioned in the Governor Decision of DKI Jakarta No. 551/2001.

Station 1and 2 are located within a residential area; station 1 being positioned along side a roadway. Vehicles (traffic), using this roadway, contributed to the measured noise level exceeding the relevant threshold (housing and settlement; 55 dBA), mentioned in the Governor Decision of DKI Jakarta No. 551/2001. Stations 3 and 4 are located within a commercial area, also along roadway (Cirebon-Jakarta routes). Traffic volumes again, caused some of the noise levels to exceed the relevant thresholds. The noise standards are shown in Table 9.1-10(3).

Table 9.1.10(1) Noise measure result

Survey date: 12-13 May 2010
Unit: dBA

Station 1	8:00 – 9:00	10:00 – 11:00	14:00 – 15:00	17:00. – 18:00	22:00 – 23:00	0:00 – 1:00	3:00 – 4:00
L_{Aeq}	60.2	67.7	57.5	61.9	52.6	48.6	50.2
L_{50}	54.6	57.9	53.3	59.2	50.9	48.2	49.9
L_{5}	67.3	74.4	64.4	66.9	53.1	50.8	51.8
L_{95}	46.9	50.9	48.8	53.7	49.6	46.0	46.4

Station 2	6:00 – 7:00	10:00 – 11:00	15:00 – 16:00	21:00. – 22:00	23:00 – 0:00	2:00 – 3:00	5:00 – 6:00
L_{Aeq}	43.3	47.3	57.2	48.6	48.8	48.3	50.7
L_{50}	42.4	44.2	43.3	48.1	48.0	48.0	50.2
L_{5}	46.8	53.3	51.4	50.4	50.3	50.3	53.7
L_{95}	40.8	39.7	40.2	45.8	46.0	45.6	47.5

Station 3	7:00 – 8:00	9:00 – 10:00	15:00 – 16:00	17:00. – 18:00	22:00 – 23:00	0:00 – 1:00	4:00 – 5:00
L_{Aeq}	73.0	75.5	76.8	73.5	74.4	75.4	73.4
L_{50}	71.9	73.1	74.0	72.5	72.3	71.8	72.3
L_{5}	76.6	80.0	82.0	77.3	80.3	81.1	77.7
L_{95}	67.8	67.1	69.9	69.4	67.9	67.9	68.6

Station 4	8:00 – 9:00	10:00 – 11:00	15:00 – 16:00	19:00. – 20:00	23:00 – 0:00	1:00 – 2:00	4:00 – 5:00
L_{Aeq}	79.0	75.3	76.1	73.2	74.2	74.6	73.3
L_{50}	76.6	71.2	74.1	72.2	73.3	74.1	72.4
L_{5}	83.3	79.9	81.7	77.1	78.1	78.5	77.3
L_{95}	69.5	63.1	67.8	67.9	68.9	70.0	69.7

Table 9.1.10 (2) Noise measure result

Survey date: 21-22 June 2010
Unit: dBA

Station 1	11:00 – 12:00	14:00 – 15:00	17:00 – 18:00	22:00. – 23:00	23:00 – 0:00	0:00 – 1:00	3:00 – 4:00
L_{Aeq}	56.9	53.9	56.7	51.2	52.6	48.6	50.2
L_{50}	48.9	51.3	55.4	51.2	50.9	48.2	49.9
L_5	61.9	60.3	61.8	53.0	53.1	50.8	51.8
L_{95}	45.6	45.7	50.1	48.7	49.6	46.0	46.4

Station 2	8:00 – 9:00	10:00 – 11:00	15:00 – 16:00	17:00. – 18:00	22:00 – 23:00	0:00 – 1:00	3:00 – 4:00
L_{Aeq}	53.4	45.1	48.0	49.5	47.6	49.8	47.0
L_{50}	42.0	40.2	47.5	48.5	47.2	48.7	45.5
L_5	61.0	52.5	52.0	53.6	50.3	53.5	51.8
L_{95}	38.6	37.7	42.8	43.4	42.8	42.8	41.1

Station 3	8:00 – 9:00	9:00 – 10:00	15:00 – 16:00	19:00. – 20:00	23:00 – 0:00	0:00 – 1:00	4:00 – 5:00
L_{Aeq}	72.8	78.2	75.9	73.2	73.0	75.7	73.2
L_{50}	72.1	75.6	74.0	72.5	72.1	74.2	71.5
L_5	76.5	83.5	81.3	76.6	76.7	81.2	77.8
L_{95}	67.5	69.0	68.8	67.5	67.5	67.8	68.0

Station 4	10:00 – 11:00	14:00 – 15:00	20:00 – 21:00	23:00. – 0:00	1:00 – 2:00	5:00 – 6:00	7:00 – 8:00
L_{Aeq}	75.1	76.6	75.4	74.0	74.3	73.9	72.5
L_{50}	73.7	74.2	73.4	73.2	73.5	72.5	71.2
L_5	79.8	81.7	80.8	77.8	78.1	77.5	77.6
L_{95}	68.9	67.4	68.3	68.9	68.5	67.6	67.5

Table 9.1.10(3) Noise standard

(unit : dBA)

Parameter	Noise standards No.48/ 1996	IFC Guideline (General: 2007)
1. Area		
- Residential area	55	55 (07:00-22:00) 45 (22:00-07:00)
- Commercial area and Service	70	70 (07:00-22:00) 70 (22:00-07:00)
- Office	65	
- Green space	50	
- Industry area	70	70 (07:00-22:00) 70 (22:00-07:00)
- Administrative institution and Community facility	60	
- Recreation area	70	
- Other area		
Train station	60	
Port	70	
2. Circumstance		
Medical facility	55	55 (07:00-22:00) 45 (22:00-07:00)
Educational facility	55	55 (07:00-22:00) 45 (22:00-07:00)
Worship facility	55	

(d) Sea water quality

Measure of water quality was conducted at 5 sampling points, with location as shown in Figure 9.1.7

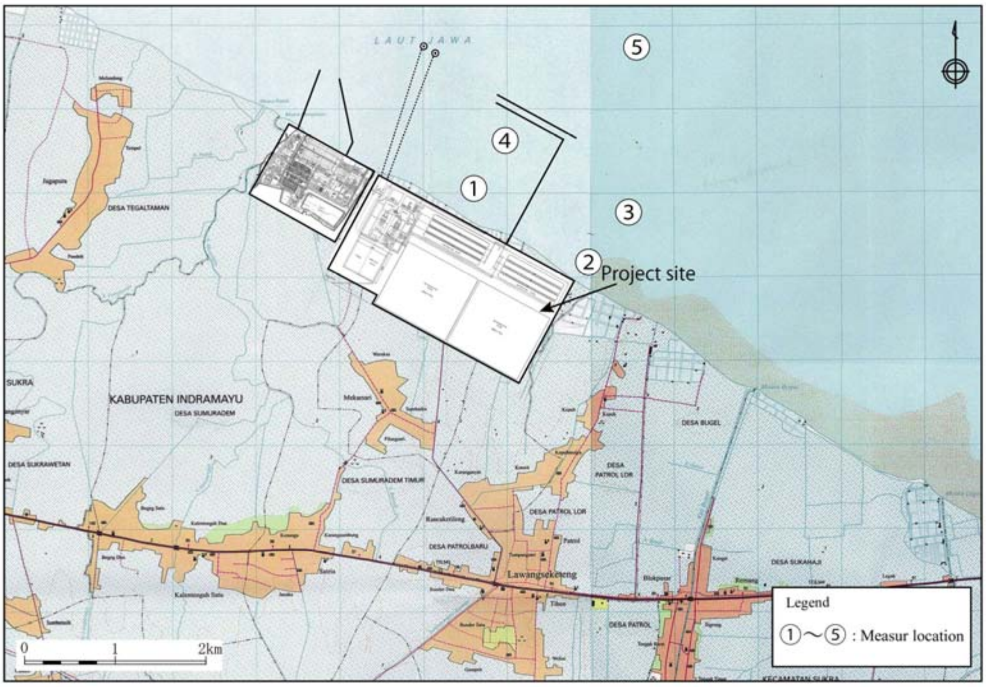


Figure 9.1.7 Sampling location for sea water quality

Water quality data is shown in Table 9.1.11 and Table 9.1.12 added ambient sea water quality standards (No.51/ 2004) according to port, recreation and biota. In addition, water quality such as heavy metals is not different due to the difference of water depth.

Measurement of temperature/ salinity in sea water according to depth/distance from coast was conducted at Kp. Mekarsari, Desa Mekarsari, Kecamatan Patrol, Kabupaten Indramayu from 23 June to 7 July 2010.

The survey stations are at two locations, offshore 500m and 3,000m from the coast. The temperature in all of the layers ranged from 27 ºC to 32 ºC (average about 30 ºC).Salinity in the surface layer widely ranges from 25 to 39 (average about 34), Meanwhile salinity of more than 5m depth ranges from 31 to 39 (average about 36)

Table 9.1.11(1) Water quality measure result <Surface layer>

Survey date: 14 May 2010

No.	Parameter	Unit	Method	Station					Ambient sea water quality standards(No.51/ 2004)		
				L1	L2	L3	L4	L5	Port	Recreation	Biota
Physical properties											
1	Transparency	m	-	> 2	> 2	> 2	> 2	> 2	> 3	> 6	
2	Odor	-	-	ND	ND	ND	ND	ND	ND	ND	ND
3	Suspended residue	mg/L	SNI 06.6989.27.05	2.4	8.3	8.4	14	2.3	80	20	20 (coral) 80 (mangrove) 20 (seaweed bed)
4	Dissolved residue	mg/L	SNI 06.69.89.27.05	24,890	22,960	24,580	25,500	26,580			
5	Turbidity	NTU	-	0.88	1.33	1.97	2.38	0.76		5	5
6	Temperature	ºC	SNI 06.6989.23.05	30.4	29.8	30.5	30.3	29.7	natural (< +2)	natural (< +2)	natural (< +2) 28- 30 (coral) 28 - 32 (mangrove) 28 - 30 (seaweed bed)
7	Oil content	Observation	-	ND	ND	ND	ND	ND	ND	ND	ND
8	Salinity	-	-	35.1	29.0	35.1	35.3	34.7	natural	natural	33-34 (coral) 34 (mangrove) 33-34 (seaweed bed)
9	Electrical conductivity	µmhos	SNI 06.6989.27.05	38,100	35,200	37,600	39,100	40,700			
Chemical properties											
1	pH	-	SNI 06.6989.11.04	7.9	8.1	8.2	7.7	7.9	6.5-8.5	7-8.5	7-8.5
2	BOD	mg/L	SNI M-69-1990-03	6.3	6.3	6.7	6.5	7.0		10	20
3	COD	mg/L	SNI M-70-1990-03	16	17	18	16	13			
4	DO	mg/L	SNI 06.6989.14.04	4.5	4.2	6.2	7.7	7.9		>5	>5
5	Phosphate	mg/L	APHA 4500.P.98	0.012	0.009	0.014	0.016	0.016		0.015	0.015
6	Nitrate	mg/L	SNI 06.6989.9.04	0.682	0.422	0.607	0.577	0.636		0.008	0.008 0.002
7	Ammonia	mg/L	SNI 06.6989.30.05	0.046	0.044	0.052	0.037	0.022	0.3	ND	0.3
8	Arsenic(As)	mg/L	SNI 06.6989.39.05	0.019	0.017	0.030	0.028	0.039		0.025	0.012 0.005

Survey date: 14 May 2010

No.	Parameter	Unit	Method	Station					Ambient sea water quality standards(No.51/ 2004)		
				L1	L2	L3	L4	L5	Port	Recreation	Biota
9	Cobalt (Co)	mg/L	SNI 06.2473.91	0.030	0.026	0.021	0.042	0.044			
10	Barium (Ba)	mg/L	SNI M-36-1990-03	0.642	0.610	0.756	0.736	0.801			
11	Boron(B)	mg/L	SNI 06.2481.1991	1.32	1.24	1.33	1.40	1.46			
12	Selenium (Se)	mg/L	SNI M-44-1990-03	0.002	0.002	0.002	0.002	0.002			
13	Cadmium (Cd)	mg/L	SNI 06.6989.37.05	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	0.01	0.002	0.001 0.015
14	Chromium (Cr^{6+})	mg/L	SNI 19.1132.91	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002		0.002	0.005 0.002
15	Copper (Cu)	mg/L	SNI 06.2517.91	0.019	0.009	0.022	0.026	0.021	0.05	0.050	0.008
16	Iron (Fe)	mg/L	SNI 06.6989.49.05	0.013	0.017	0.015	0.019	0.010			
17	Lead (Pb)	mg/L	SNI 06.6989.45.05	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	0.05	0.005	0.008
18	Mangan (Mn)	mg/L	SNI 06.6989.41.05	0.039	0.045	0.040	0.033	0.027			
19	Mercury (Hg)	mg/L	SNI 06.3605.94	0.0042	0.0052	0.0060	0.0039	0.0044	0.003	0.002	0.001 0.5
20	Zinc (Zn)	mg/L	SNI 06.2520.89	0.055	0.046	0.063	0.072	0.040	0.1	0.095	0.05
21	Cyanide (CN)	mg/L	SNI 06.6989.41.05	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001			0.5 0.05
22	Fluoride (F)	mg/L	SNI 06.2484.91	1.394	1.068	1.452	1.480	1.563			
23	Nitrite	mg/L	APHA 4500-NO_3E.98	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003			
24	SO_4^{2+}	mg/L	SNI 06.6989.20.04	9,740	9,090	9,680	9,980	10,400			
25	Free Chloride		SNI 06-4824-1998	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002			
26	H_2S	mg/L	SNI M-39-1990-03	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	0.03	ND	0.01
27	Oil and grease	µg/L	SNI 06.2502.1991	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	5	1	1
28	MBAS(detergent)	µg/L	SNI 19.2476.91	0.228	0.331	0.380	0.369	0.375	1	0.001	1
29	Phenol	µg/L	SNI 06.6989.21.04	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0.002	ND	0.002
Biological properties											
1	Fecal Coliform	SEL/100 ml	Tabung Ganda APHA 9221 A-C.Ed.20.1996	93	43	9	43	90			
2	Total Coliform	SEL/100 ml	Tabung Ganda APHA 9221 E.Ed.20.1998	240	93	23	93	230	1000	1000	1,000

Note, ND: Not detected

Table 9.1.11(2) Water quality measure result <Bottom layer>

Survey date: 14 May 2010

No.	Parameter	Unit	Method	Station					Ambient sea water quality standards(No.51/ 2004)		
				L1	L2	L3	L4	L5	Port	Recreation	Biota
Physical properties											
1	Transparency	m	-	-	-	-	-	-	> 3	> 6	
2	Odor	-	-	ND	ND	ND	ND	ND	ND	ND	ND
3	Suspended residue	mg/L	SNI 06.6989.27.05	1.3	3.7	4.2	10	1.6	80	20	20 (coral) 80 (mangrove) 20 (seaweed bed)
4	Dissolved residue	mg/L	SNI 06.69.89.27.05	25,180	23,600	24,800	25,900	26,800			
5	Turbidity	NTU	-	0.74	1.22	1.56	4.25	0.58		5	5
6	Temperature	ºC	SNI 06.6989.23.05	30.6	30.3	30.4	30.3	29.4	natural (< +2)	natural (< +2)	natural (< +2) 28- 30 (coral) 28 - 32 (mangrove) 28 - 30 (seaweed bed)
7	Oil content	Observation	-	ND	ND	ND	ND	ND	ND	ND	ND
8	Salinity	-	-	35.7	29.6	35.6	36.1	36.2	natural	natural	33-34 (coral) 34 (mangrove) 33-34 (seaweed bed)
9	Electrical conductivity	µmhos	SNI 06.6989.27.05	38,500	36,100	38,000	39,600	41,000			
Chemical properties											
1	pH	-	SNI 06.6989.11.04	7.9	8.2	8.2	8.0	7.2	6.5-8.5	7-8.5	7-8.5
2	BOD	mg/L	SNI M-69-1990-03	6.7	6.5	6.7	6.7	7.2		10	20
3	COD	mg/L	SNI M-70-1990-03	17	17	18	18	18			
4	DO	mg/L	SNI 06.6989.14.04	4.2	3.9	4.6	7.0	7.0		>5	>5
5	Phosphate	mg/L	APHA 4500.P.98	0.015	0.012	0.018	0.016	0.018		0.015	0.015
6	Nitrate	mg/L	SNI 06.6989.9.04	0.594	0.501	0.639	0.568	0.642		0.008	0.008 0.002
7	Ammonia	mg/L	SNI 06.6989.30.05	0.040	0.040	0.048	0.040	0.039	0.3	ND	0.3
8	Arsenic(As)	mg/L	SNI 06.6989.39.05	0.015	0.017	0.033	0.030	0.037		0.025	0.012 0.005

Survey date: 14 May 2010

No.	Parameter	Unit	Method	Station					Ambient sea water quality standards(No.51/ 2004)		
				L1	L2	L3	L4	L5	Port	Recreation	Biota
9	Cobalt (Co)	mg/L	SNI 06.2473.91	0.027	0.033	0.025	0.040	0.040			
10	Barium (Ba)	mg/L	SNI M-36-1990-03	0.662	0.882	0.760	0.730	0.825			
11	Boron(B)	mg/L	SNI 06.2481.1991	1.45	1.28	1.37	1.48	1.48			
12	Selenium (Se)	mg/L	SNI M-44-1990-03	0.002	0.002	0.002	0.002	0.002			
13	Cadmium (Cd)	mg/L	SNI 06.6989.37.05	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	0.01	0.002	0.001 0.015
14	Chromium (Cr^{6+})	mg/L	SNI 19.1132.91	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002		0.002	0.005 0.002
15	Copper (Cu)	mg/L	SNI 06.2517.91	0.022	0.013	0.027	0.020	0.017	0.05	0.050	0.008
16	Iron (Fe)	mg/L	SNI 06.6989.49.05	0.011	0.015	0.016	0.017	0.011			
17	Lead (Pb)	mg/L	SNI 06.6989.45.05	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	0.05	0.005	0.008
18	Mangan (Mn)	mg/L	SNI 06.6989.41.05	0.029	0.042	0.039	0.030	0.021			
19	Mercury (Hg)	mg/L	SNI 06.3605.94	0.0040	0.0040	0.0055	0.0052	0.0059	0.003	0.002	0.001 0.5
20	Zinc (Zn)	mg/L	SNI 06.2520.89	0.058	0.058	0.069	0.082	0.048	0.1	0.095	0.05
21	Cyanide (CN)	mg/L	SNI 06.6989.41.05	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001			0.5 0.05
22	Fluoride (F)	mg/L	SNI 06.2484.91	1.454	1.102	1.460	1.517	1.590			
23	Nitrite	mg/L	APHA 4500-NO_3E.98	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003			
24	SO_4^{2+}	mg/L	SNI 06.6989.20.04	9,850	9,120	9,740	10,060	10,530			
25	Free Chloride		SNI 06-4824-1998	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002			
26	H_2S	mg/L	SNI M-39-1990-03	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	0.03	ND	0.01
27	Oil and grease	μg/L	SNI 06.2502.1991	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	5	1	1
28	MBAS(detergent)	μg/L	SNI 19.2476.91	0.237	0.316	0.394	0.377	0.360	1	0.001	1
29	Phenol	μg/L	SNI 06.6989.21.04	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0.002	ND	0.002
Biological properties											
1	Fecal Coliform	SEL/100 ml	Tabung Ganda APHA 9221 A-C.Ed.20.1996	43	23	4	9	40			
2	Total Coliform	SEL/100 ml	Tabung Ganda APHA 9221 E.Ed.20.1998	93	43	9	23	90	1000	1000	1,000

Note, ND: Not detected

Table 9.1.12(1) Water quality measure result <Surface layer>

Survey date: 23 June 2010

No.	Parameter	Unit	Method	Station					Ambient sea water quality standards(No.51/ 2004)		
				L1	L2	L3	L4	L5	Port	Recreation	Biota
Physical properties											
1	Transparency	m	-	> 2	> 2	> 2	> 2	> 2	> 3	> 6	
2	Odor	-	-	ND	ND	ND	ND	ND	ND	ND	ND
3	Suspended residue	mg/L	SNI 06.6989.27.05	32	66	4.1	5.4	3.8	80	20	20 (coral) 80 (mangrove) 20 (seaweed bed)
4	Dissolved residue	mg/L	SNI 06.69.89.27.05	29,365	29,694	28,307	28,630	26,491			
5	Turbidity	NTU	-	19.7	28.4	2.75	2.80	1.44		5	5
6	Temperature	ºC	SNI 06.6989.23.05	29.5	29.5	29.4	29.4	29.1	natural (< +2)	natural (< +2)	natural (< +2) 28- 30 (coral) 28 - 32 (mangrove) 28 - 30 (seaweed bed)
7	Oil content	Observation	-	ND	ND	ND	ND	ND	ND	ND	ND
8	Salinity	-	-	34.7	35.1	35.1	35.2	35.2	natural	natural	33-34 (coral) 34 (mangrove) 33-34 (seaweed bed)
9	Electrical conductivity	μmhos	SNI 06.6989.27.05	44,000	44,500	42,400	42,900	39,700			
Chemical properties											
1	pH	-	SNI 06.6989.11.04	7.47	7.78	7.74	7.69	7.52	6.5-8.5	7-8.5	7-8.5
2	BOD	mg/L	SNI M-69-1990-03	6.4	6.1	5.6	5.4	5.2		10	20
3	COD	mg/L	SNI M-70-1990-03	19	18	16	16	15			
4	DO	mg/L	SNI 06.6989.14.04	5.0	4.5	5.6	4.1	6.2		>5	>5
5	Phosphate	mg/L	APHA 4500.P.98	0.012	0.019	<0.003	<0.003	<0.003		0.015	0.015
6	Nitrate	mg/L	SNI 06.6989.9.04	0.368	0.407	0.416	0.422	0.377		0.008	0.008 0.002
7	Ammonia	mg/L	SNI 06.6989.30.05	0.106	0.407	0.137	0.111	0.126	0.3	ND	0.3
8	Arsenic(As)	mg/L	SNI 06.6989.39.05	0.019	0.024	0.016	0.016	0.014		0.025	0.012 0.005

Survey date: 23 June 2010

No.	Parameter	Unit	Method	Station					Ambient sea water quality standards(No.51/ 2004)		
				L1	L2	L3	L4	L5	Port	Recreation	Biota
9	Cobalt (Co)	mg/L	SNI 06.2473.91	0.019	0.026	0.020	0.022	0.024			
10	Barium (Ba)	mg/L	SNI M-36-1990-03	0.588	0.590	0.437	0.440	0.603			
11	Boron(B)	mg/L	SNI 06.2481.1991	1.64	1.66	1.39	1.42	1.39			
12	Selenium (Se)	mg/L	SNI M-44-1990-03	0.002	0.002	<0.002	<0.002	<0.002			
13	Cadmium (Cd)	mg/L	SNI 06.6989.37.05	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	0.01	0.002	0.001 0.015
14	Chromium (Cr^{6+})	mg/L	SNI 19.1132.91	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002		0.002	0.005 0.002
15	Copper (Cu)	mg/L	SNI 06.2517.91	0.049	0.052	0.055	0.054	0.062	0.05	0.050	0.008
16	Iron (Fe)	mg/L	SNI 06.6989.49.05	0.537	0.564	0.211	0.209	0.166			
17	Lead (Pb)	mg/L	SNI 06.6989.45.05	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	0.05	0.005	0.008
18	Mangan (Mn)	mg/L	SNI 06.6989.41.05	0.053	0.039	0.027	0.033	0.029			
19	Mercury (Hg)	mg/L	SNI 06.3605.94	0.0038	0.0042	0.004	0.0036	0.0041	0.003	0.002	0.001 0.5
20	Zinc (Zn)	mg/L	SNI 06.2520.89	0.066	0.065	0.041	0.04	0.058	0.1	0.095	0.05
21	Cyanide (CN)	mg/L	SNI 06.6989.41.05	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001			0.5 0.05
22	Fluoride (F)	mg/L	SNI 06.2484.91	1,662	1,180	2,061	1,975	1,048			
23	Nitrite	mg/L	APHA 4500-NO_3E.98	0.009	0.009	0.006	0.008	0.011			
24	SO_4^{2+}	mg/L	SNI 06.6989.20.04	11,100	11,160	10,750	10,840	10,060			
25	Free Chloride		SNI 06-4824-1998	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002			
26	H_2S	mg/L	SNI M-39-1990-03	**tt**	**tt**	**tt**	**tt**	**tt**	0.03	ND	0.01
27	Oil and grease	μg/L	SNI 06.2502.1991	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	5	1	1
28	MBAS(detergent)	μg/L	SNI 19.2476.91	0.396	0.411	0.502	0.477	0.311	1	0.001	1
29	Phenol	μg/L	SNI 06.6989.21.04	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0.002	ND	0.002
Biological properties											
1	Fecal Coliform	SEL/100 ml	Tabung Ganda APHA 9221 A-C.Ed.20.1996	43	4	9	23	75			
2	Total Coliform	SEL/100 ml	Tabung Ganda APHA 9221 E.Ed.20.1998	93	9	23	43	150	1000	1000	1,000

Note, ND: Not detected

Table 9.1.12(2) Water quality measure result <Bottom layer>

Survey date: 23 June 2010

No.	Parameter	Unit	Method	Station					Ambient sea water quality standards(No.51/ 2004)		
				L1	L2	L3	L4	L5	Port	Recreation	Biota
Physical properties											
1	Transparency	m	-	-	-	-	-	-	> 3	> 6	
2	Odor	-	-	ND	ND	ND	ND	ND	ND	ND	ND
3	Suspended residue	mg/L	SNI 06.6989.27.05	3.7	74	20	3.8	42	80	20	20 (coral) 80 (mangrove) 20 (seaweed bed)
4	Dissolved residue	mg/L	SNI 06.69.89.27.05	28,233	28,246	30,750	27,890	27566			
5	Turbidity	NTU	-	1.4	32.3	11.4	1.74	21.5		5	5
6	Temperature	ºC	SNI 06.6989.23.05	29.5	29.5	29.4	29.4	29.3	natural (< +2)	natural (< +2)	natural (< +2) 28- 30 (coral) 28 - 32 (mangrove) 28 - 30 (seaweed bed)
7	Oil content	Observation	-	ND	ND	ND	ND	ND	ND	ND	ND
8	Salinity	-	-	35.0	35.2	35.4	35.3	35.3	natural	natural	33-34 (coral) 34 (mangrove) 33-34 (seaweed bed)
9	Electrical conductivity	μmhos	SNI 06.6989.27.05	42,300	42,300	46,100	41,800	41,300			
Chemical properties											
1	pH	-	SNI 06.6989.11.04	7.74	7.79	7.75	7.69	7.63	6.5-8.5	7-8.5	7-8.5
2	BOD	mg/L	SNI M-69-1990-03	5.3	6.6	6.4	5.5	6.3		10	20
3	COD	mg/L	SNI M-70-1990-03	15	19	18	15	19			
4	DO	mg/L	SNI 06.6989.14.04	5.7	5.0	5.8	6.8	6.7		>5	>5
5	Phosphate	mg/L	APHA 4500.P.98	<0.003	0.014	0.008	<0.003	0.014		0.015	0.015
6	Nitrate	mg/L	SNI 06.6989.9.04	0.386	0.408	0.527	0.292	0.304		0.008	0.008 0.002
7	Ammonia	mg/L	SNI 06.6989.30.05	0.108	0.274	0.311	0.277	0.401	0.3	ND	0.3
8	Arsenic(As)	mg/L	SNI 06.6989.39.05	0.019	0.025	0.019	0.011	0.014		0.025	0.012 0.005

Survey date: 23 June 2010

No.	Parameter	Unit	Method	Station					Ambient sea water quality standards(No.51/ 2004)		
				L1	L2	L3	L4	L5	Port	Recreation	Biota
9	Cobalt (Co)	mg/L	SNI 06.2473.91	0.020	0.035	0.019	0.022	0.019			
10	Barium (Ba)	mg/L	SNI M-36-1990-03	0.592	0.742	0.548	0.349	0.3			
11	Boron(B)	mg/L	SNI 06.2481.1991	1.43	1.55	2.09	1.42	1.33			
12	Selenium (Se)	mg/L	SNI M-44-1990-03	<0.002	<0.002	<0.002	<0.002	<0.002			
13	Cadmium (Cd)	mg/L	SNI 06.6989.37.05	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	0.01	0.002	0.001 0.015
14	Chromium (Cr^{6+})	mg/L	SNI 19.1132.91	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002		0.002	0.005 0.002
15	Copper (Cu)	mg/L	SNI 06.2517.91	0.068	0.054	0.074	0.033	0.029	0.05	0.050	0.008
16	Iron (Fe)	mg/L	SNI 06.6989.49.05	0.159	0.499	0.405	0.278	0.508			
17	Lead (Pb)	mg/L	SNI 06.6989.45.05	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	0.05	0.005	0.008
18	Mangan (Mn)	mg/L	SNI 06.6989.41.05	0.04	0.044	0.030	0.032	0.033			
19	Mercury (Hg)	mg/L	SNI 06.3605.94	0.0028	0.0052	0.0046	0.0019	0.0019	0.003	0.002	0.001 0.5
20	Zinc (Zn)	mg/L	SNI 06.2520.89	0.062	0.033	0.021	0.040	0.027	0.1	0.095	0.05
21	Cyanide (CN)	mg/L	SNI 06.6989.41.05	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001			0.5 0.05
22	Fluoride (F)	mg/L	SNI 06.2484.91	1,852	1,975	2,011	1,803	1,711			
23	Nitrite	mg/L	APHA 4500-NO_3E.98	0.014	0.009	0.019	0.020	0.008			
24	SO_4^{2+}	mg/L	SNI 06.6989.20.04	10,630	10,660	11,300	10,480	10,330			
25	Free Chloride		SNI 06-4824-1998	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002			
26	H_2S	mg/L	SNI M-39-1990-03	tt	tt	tt	tt	tt	0.03	ND	0.01
27	Oil and grease	µg/L	SNI 06.2502.1991	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	5	1	1
28	MBAS(detergent)	µg/L	SNI 19.2476.91	0.346	0.627	0.506	0.294	0.316	1	0.001	1
29	Phenol	µg/L	SNI 06.6989.21.04	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0.002	ND	0.002
Biological properties											
1	Fecal Coliform	SEL/100 ml	Tabung Ganda APHA 9221 A-C.Ed.20.1996	23	3	3	3	43			
2	Total Coliform	SEL/100 ml	Tabung Ganda APHA 9221 E.Ed.20.1998	43	4	3	3	75	1000	1000	1,000

Note, ND: Not detected

Table9.1.13 Temperature/ Salinity in sea water according to depth

Survey location		Depth					
		0.5 meter		5 meter		10 meter	
		Temperature	Salinity	Temperature	Salinity	Temperature	Salinity
		(ºC)	(-)	(ºC)	(-)	(ºC)	(-)
Offshore 500m from coast	Average	29.6	33.6	-	-	-	-
	Maximum	31.8	38.7	-	-	-	-
	Minimum	28.0	25.6	-	-	-	-
Offshore 3,000m from coast	Average	29.7	34.3	29.4	35.6	29.3	36.5
	Maximum	32.0	38.3	31.5	38.5	31.5	38.6
	Minimum	27.0	25.0	27.0	30.8	27.0	32.8

(e) Sea bottom sediment

Measure of water quality is conducted at 1 sampling points, with location as shown in Figure 9.1.8. The results of sea bottom sediment sampling is shown in Table 9.1.14.

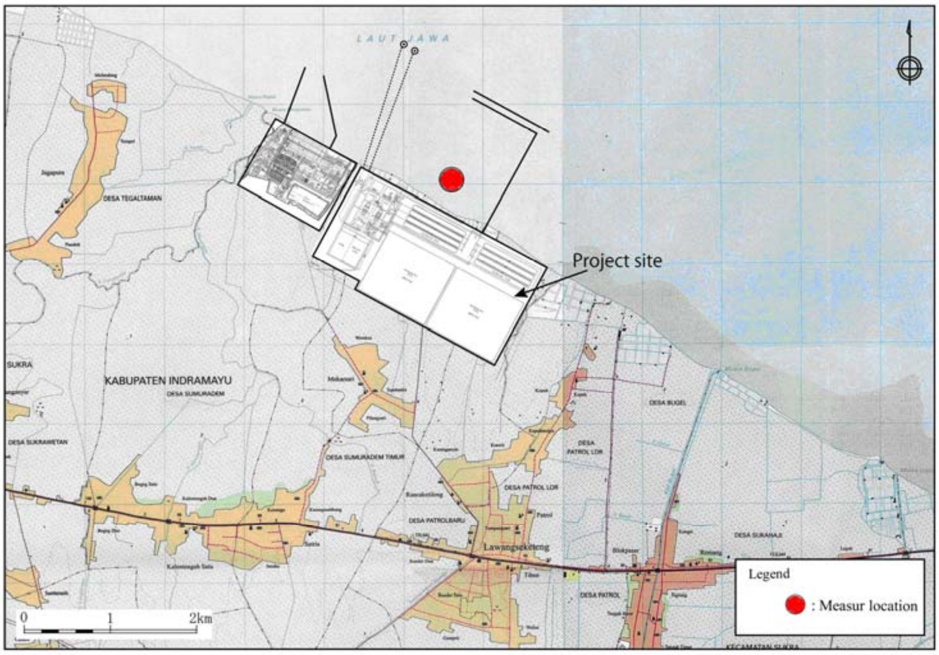


Figure 9.1.8 Sampling location for sea bottom sediment

Table 9.1.14 Results of sea bottom sediment

No.	Parameter	Unit	Result(Survey date)	
			14 May 2010	23 June 2010
1	Arsenic	mg/kg	3.1	3.3
2	Cobalt (Co)	mg/kg	17.5	15.4
3	Barium (Ba)	mg/kg	153.0	198.3
4	Boron	mg/kg	236.4	198.3
5	Selenium (Se)	mg/kg	8.8	6.4
6	Cadmium (Cd)	mg/kg	1.1	0.8
7	Chromium (Cr^{6+})	mg/kg	0.9	0.7
8	Copper (Cu)	mg/kg	7.4	5.9
9	Iron (Fe)	mg/kg	3.2	8.4
10	Lead (Pb)	mg/kg	1.6	1.4
11	Mangan (Mn)	mg/kg	5.4	5.6
12	Mercury (Hg)	mg/kg	0.0027	0.0019
13	Zinc (Zn)	mg/kg	22.2	6.4

-

(f) Physiographic

i) Physiographic-geomorphology

West Java is divided into 4 physiographic zones based on its morphology and tectonic characteristic. The project site and its surroundings belong to the region classified as Jakarta lowland zone. This zone is also known as West Java alluvial plane zone, formed by the lowland of the West Java north coast, from Serang to Cirebon. This zone is a width of nearly 40 km, is bordered by the Java Sea in the north and Bogor zone in the south.

ii) Geology

The stratigraphy of project site and its surrounding consists of lowland with geological unit. This zone is classified as flood land deposits consisting of tuffaceous clay, silt, and fine sand. This land comprises mainly of paddy field areas. Thickness of deposit reaches 5 m or more from the riverbed (Figure 9.1.9(1)).

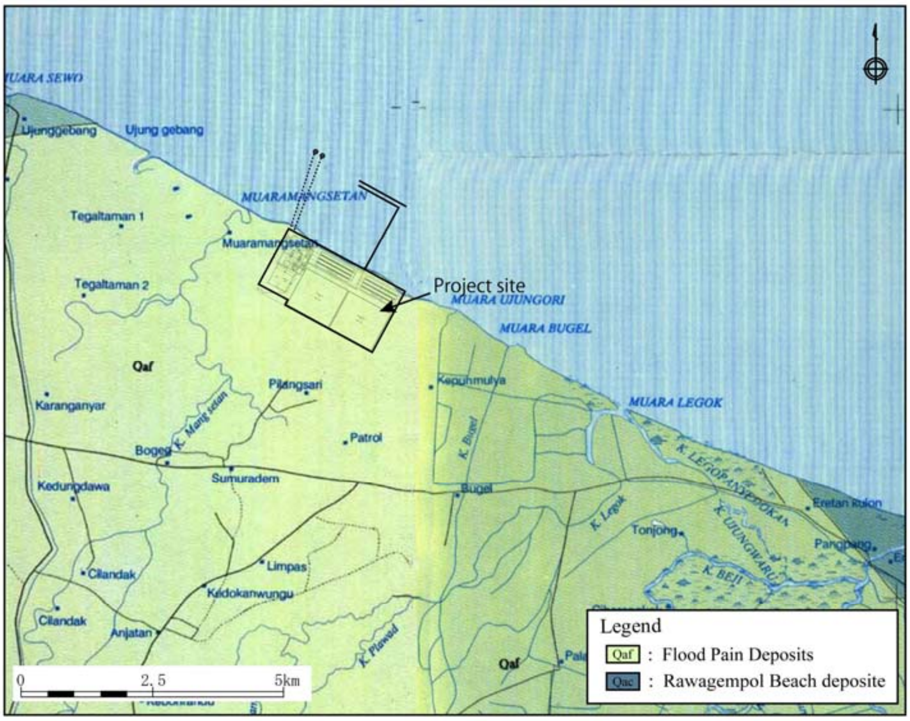


Figure 9.1.9(1) Geologic map around project site

Source: Geologic map of the Indramayu quadrangle, Java(1992)

iii) Hydrogeology

Project site and its surrounding are located on medium and low groundwater productivity. The underground structure consists of some hundreds of meters (about 400 m) of fluviatile, sea deposit and volcanic alluvium. According to groundwater and aquifer production of Indramayu-Subang area, about 80% of presence of water is occupied aquifer flowing through the pores among particles. Because of infiltration of seawater and salination on the ground level, groundwater on coastal area is brackish with a high chloride content.

iv) Geological disaster

<Landslide>

The zone around the project site is classified “very low susceptibility to landslide”. The zone has rarely or never been subjected to landslide. There are no landmarks of old or new landslides found in this zone, except for some small areas on the river sides (Figure 9.1.9(2)).

<Earthquake >

The zone around the project site is classified “moderate earthquake hazard zone”. The zone is potentially effected be earthquake shaking with an intensity scale of VI MMI (modified mercally intensity), having the potential to cause ground fracturing , liquefaction, landslide on the steeply hills and ground faulting for a small earthquake source with moderate depth (35 to 90km) (Figure 9.1.9(3)).

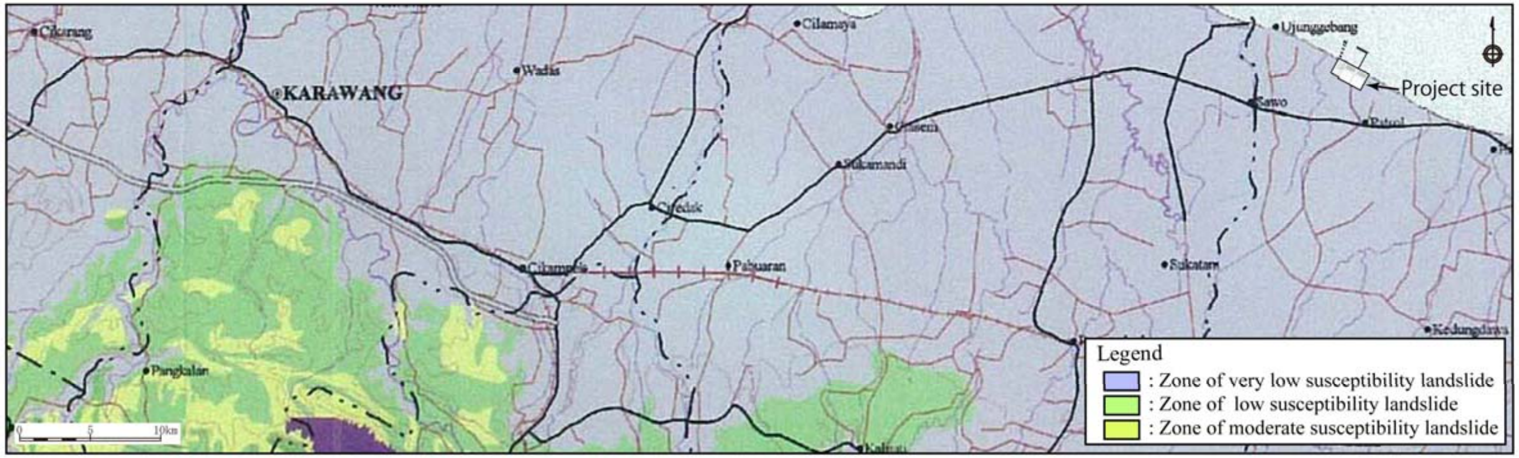


Figure 9.1.9(2) Susceptibility to landslide zone map around project site

Source: Susceptibility to landslide zone map of western part of Java(2004)

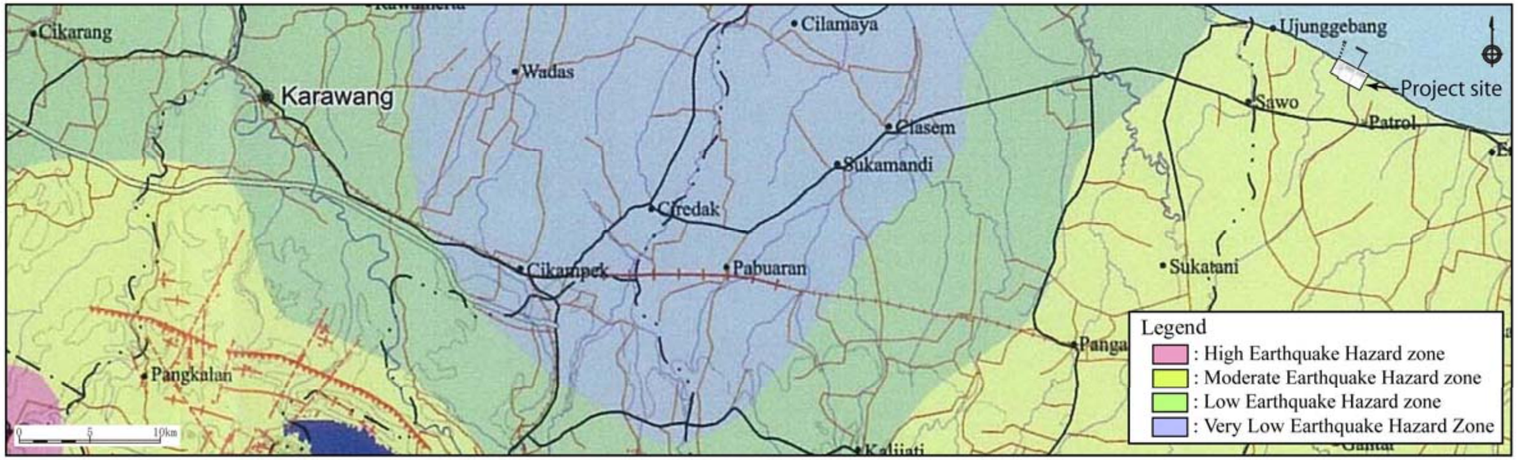


Figure 9.1.9(3) Earthquake hazard map around project site

Source: Earthquake hazard map western part of Java(2006)

(g) Hydro-oceanography

i) Characteristic of Indramayu coastal area

Indramayu west coast is categorized as shallow water. Maximum depth on the open sea occurs at 32.5 km from the coast. Sea depth of a few km from project site is less than ten meters. The Indramayu coastal morphology is classified as frontward and rearward shore. Occurrence of frontward or rearward is temporary. Shoreline changes from time to time due to natural occurrences such as wave, wind, ebb-tide, and current.

ii) Erosion

The Indramayu coast, from its eastern part to Balongan, has been subjected to significant erosion. Erosion of the Indramayu coastline has reached 2,143.10 Ha, including 522.47 Ha at Sukra. The erosion of the Indramayu coast extends 8.57 km inland.

iii) Hydrographic Condition

<Survey result in 2007 and analyses>

Two tidal stations were observed for 30 days. Near shore results shows the tidal range is 1.33 m. Relative to the zero mark of the tide pole, the highest level is 3.113 m, the lowest is 1.783 m and the average water level is 2.563 m. The tidal type in this station area is mixed tide. The results from the offshore tidal station show almost similar results to those obtained from the "near shore" station. The measured tidal range was in 1.391 m. The highest level, relative to the zero of the pole, is 3.223 m and the lowest is 1.832m. The tidal phase from two tides has insignificant difference. It means the dynamics of sea level at the "near shore" and the "offshore" stations, 10 kms apart, are similar. The harmonic constituent of the two tide stations is shown below:

Table 9.1.15(1) Harmonic constituents of nearshore tide

Constituent	M2	S2	N2	K2	K1	O1	P1	M4	MS4
Amplitude	0.16976	0.06803	0.05678	0.01434	0.20916	0.15015	0.08417	0.00492	0.00193
Phase	56.741	346.28	48.777	326.24	333.67	333.53	63.487	73.157	300.65

Source: Indramayu 1 Final Report, 2007

Table 9.1.15(2) Harmonic constituents of offshore tide.

Constituent	M2	S2	N2	K2	K1	O1	P1	M4	MS4
Amplitude	0.16702	0.044883	0.056359	0.01735	0.20412	0.15056	0.065554	0.004208	0.00142
Phase	57.022	89.542	51.266	272.75	338.32	333.55	62.434	76.834	306.37

Source: Indramayu 1 Final Report, 2007

All the bathymetry tides will be reduced into three kinds of height datum which are tide computation height, height of CP3 (existing control point) and height of Titik Tinggi Geodesy (TTG). Water level measurements have been conducted to acquire the height difference between CP3 and near shore tide pole. The result is shown below:

Table 9.1.16 Leveling measurement result

Control Point Height		Height Difference		Level of Height Datum According Zero Tide Pole	
CP3/BPN3 (existing height)	: 2.558 m	PLTU IR1-3 - Zero Tide Pole	-4.1762 m	(PLTU IR1-3)	: -1.6182 m
CP3/BPN3 (TTG)	: 1.812 m			(TTG)	: -2.3642 m
CP3/BPN3	: 2.393 m			(Tide Obs)	: -1.783 m

Source: Indramayu 1 Final Report, 2007

ADCP data for every station shows the sea current speed and direction. For the station with depth more than 3 meters, the ADCP data shows the average current direction for the west direction. For the station below 3 meters, it shows the average for the east direction. The average speed is in the range of 0.2 m/s - 0.3 m/s range. The maximum speed of more than 0.5 m/s can be found at station 1 which is below a 3 meter depth. An east – west current vector was very dominant during the observation period. The current speed data show the surface current is faster than deep water current. This is probably influenced by wind conditions. Wind conditions became unstable during the observation. Sometimes the wind was very calm and at other times it was faster than usual. Every station records the maximum current speed that occurs in every ebb rapid and flood/spring rapid. It means the tidal force is very dominant factor for the generation of the sea current in this area.

Analysis - Current measurement devices were used to provide data comprising of absolute East (i.e. u) and North (i.e. v) current components from all measured layers. Current magnitude is calculated considering resultant of u- and v-components, whereas current direction is calculated as tangential function of v- and u-components. Analysis of current data is carried out in order to capture generic pattern of current dynamics in terms of their spatial variation and temporal evolution. This is done by generating several plots and carrying out analytical calculations. Plots are useful for depicting temporal evolution as well as spatial variation (across depth and between different locations) of current magnitude and direction over recorded periods, whereas analytical calculation using simple statistical approach (i.e. Joint Probability Table) and Fast Fourier Transform (FFT) provides generalized portrayal of current dynamics at the domain being studied. All plots depict all measured layers.

Visualization - In this project, current data are presented in forms of: (1) time-series magnitude and direction, (2) time-series current vector, and (3) time-series contour plot of current magnitude and direction. In addition to that, resume plots in forms of: (1) compass plot and (2) current rose are also given. The latter (i.e. current rose) sums compass plots up by assigning and classifying all data into eight directions (N, NE, E, SE, S, SW, W and NW) and magnitude bin (i.e. Joint Probability Table). Visual interpretation according to such plots gives impression of temporal development and their spatial differences according to comparison of plots between different measured stations. FFT is applied separately to time-series u- and v-components in order to obtain dominant prevailing period of occurrence of a particular (i.e. layer and component) current. This is done by converting time-series data into frequency-series. One might relate result from FFT with semi-diurnal (half-daily) or diurnal (daily) tidal variation. This hints the importance of the contribution of tidal current component to the total (measured) current.

Direction - With minor exception, the prevailing current dynamics show strong relation to daily tidal actions. Diurnal periodicity at roughly 24 hours period is observed in all measuring stations. In general, current bi-directionalities are heading to North-West and South-East directions. Vector plots of lateral current suggest North-West to West current direction during the flood phase and North-East, East to South-East current direction during the ebb phase. An exception is observed in the location closest to the shoreline (i.e. S1). At S1, measurement shows strong evidence of Eastward current direction and the influence of tide is seen in the strengthening of current magnitude only during ebb phase when local tidal current is heading to the East and South-East. East to South-Eastward current magnitude at S1 lessens consequently due to opposing current direction during the flood phase.

Magnitude - In general, maximum current speed is within the value of 0.5m/s. This occurs merely during spring tide. Stronger magnitude is observed at location closer to the shore with slight reduction seaward. Polar current plots show reasonably well interpreted domination of flood current with respect to ebb current. Domination of flood current is pronounced during the neap tide. Within those moments, maximum ebb current is reduced up to a factor of 1.5 with respect to the flood current. Typical current speed lies between 0.2 and 0.3m/s. Eastward to South-Eastward longshore current closer to the shoreline can be up to 0.5m/s with 0.25m/s being the typical value. The longshore current magnitude seems to be very relentless in terms of direction and is not much influenced by opposing tidal current magnitude.

According to the wave measurement result, it's shown that the average wave height is in between 0.03 m ~ 1.5 m. The maximum wave height which has recorded by the wave gauge is 3.586 m. The wave data increased unexpectedly on June, 6th 2007. This was probably because the wave gauge position had change, maybe because it became trapped in fishing net. The wave data become anomalous. It can be shown in graphic below:

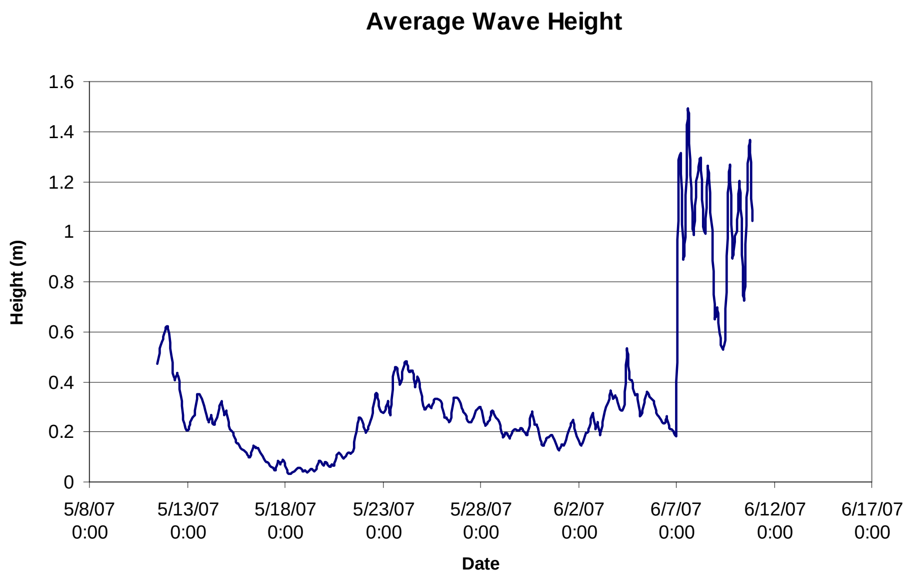
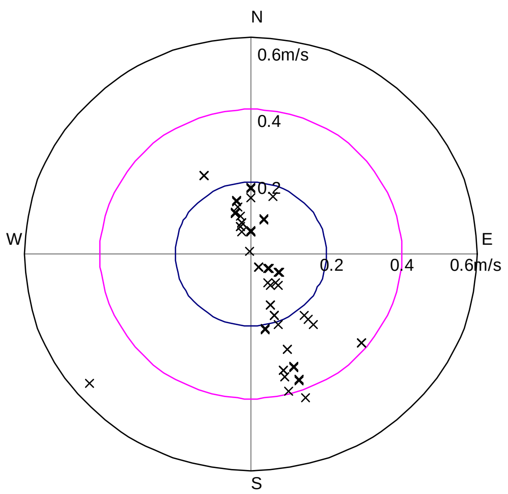


Figure 9.1.10 Average wave height diagrams

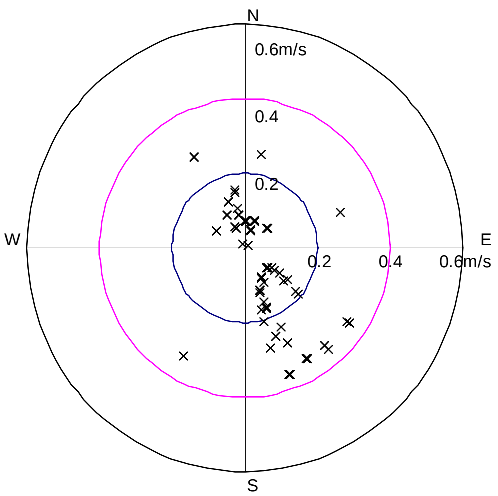
The maximum recorded significant wave height slightly exceeds 0.6m. Higher wave height likely correlates with stronger Eastward wind event as observed on 11 May, 24 May and 4 June. Accordingly, calm wind on 18 May seems to be followed by minimum recorded wave height of roughly 0.05m. Over the entire recorded period, increasing wave height occurs at roughly 12 to 13 days periodicities. 30 days of wind observation were also carried out and record the wind condition while the hydrographic survey was held. The east-west vector component was dominant during the observation period. Strong wind usually occurs in the afternoon between 13 - 19 o'clock, probably because of the monsoon wind change from west direction into east direction. According to wind distribution above, wind vectors are dominant in east direction. The wind strength becomes probably stronger from 12:00 (midday) until 19:00 hours. The maximum average wind speed was 11.6 m/s while the highest speed that occurred was 16.5 m/s. During measuring period it is found that Westerly wind prevailed. Eastward to Southward wind dominates the entire recording period with maximum magnitude of roughly 10m/s. Stronger wind magnitudes occurs generally in the afternoon, approximately between 11:00 and 21:00. Calm wind with reduction of magnitude from its maximum value of up to about 30% occurs starting from two to three hours before midnight until midday.

<Survey result in 2010 and analyses>

Tidal observation was conducted at Kp. Mekarsari, Desa Mekarsari, Kecamatan Patrol, Kabupaten Indramayu to 23 June from 7 July 2010. The observation stations are two locations, offshore 500m and 3,000m from coast. Average current velocity is 0.17m/s at offshore 500m and 3,000m (depth 2m). The dominated current direction is southeast and northwest.



Offshore 500m from coast



Offshore 3,000m from coast

Figure 9.1.11 Distribution of current speed and direction

The tidal highest level is 1.3 m, the lowest level is 0.08 m, and average level is 0.53 m. as shown in Figure 9.1.12.

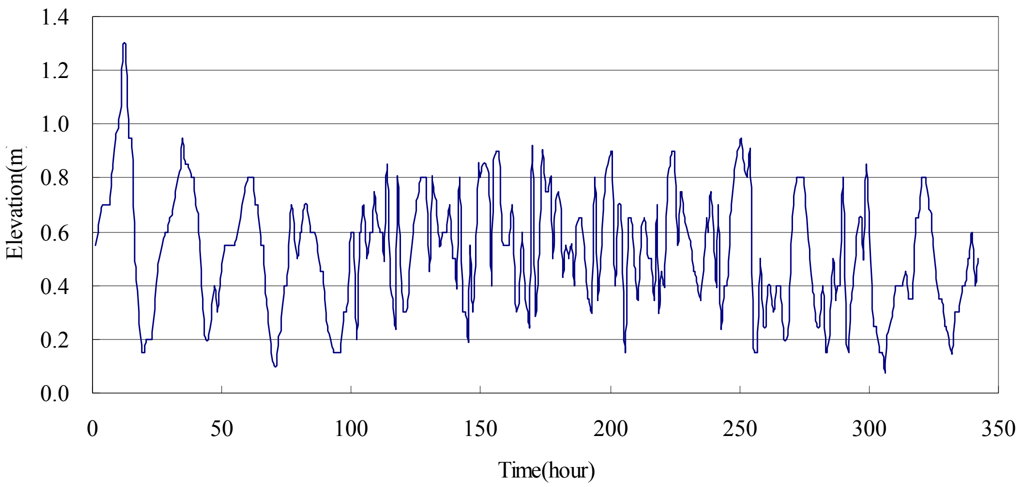


Figure 9.1.12 Tidal level

v) Land use

Location of project site is planned to be constructed in Sumurandem, Mekarsari, and Patrolbaru village, Sukra Sub-District, Indramayu District, and West Java Province. This area is located on cultivation area, consists of paddy fields and so on as shown in Table 9.1.17.

The patrol sub-district selected as the survey location has a total area of 3,976 ha, which is dominantly used as the paddy field area (81.7%), ponds, sports fields, cemetery and other public facilities. The remainder of the sub-district consists of dry and peat soil areas. In addition, the patrol sub district has a high erosion level which has affected approximately 584 ha of the area.

There are no protected or heritage areas in and around the project area (within 10km from power plant) as shown in Figure 9.1.13, Table 9.1.18. However, they do exist at locations further than 10 km from the power plant site. There are some aesthetic landscapes at about 10km from the power plant.

Table9.1.17 Land use at the survey location

Land use	Surrounding villages at the Project Site		Patrol sub district		Sukra district		Mekarsari village		Patrol Baru village		Sumuradem Timur village	
	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%
Paddy Field	731.0	60.8	3250.0	81.7	3,445	79.5	250.0	64.3	450.0	83.0	325.3	78.0
Dry land (Residential area, yard)	376.2	31.3	83.7	2.1	891	20.5	0.0	0.0	58.8	10.9	42.7	10.2
Wet Land	0.0	0.0	47.4	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Forestry Area	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Plantation Area	17.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Public Facility	56.1	4.7	11.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other	22.0	1.8	584.0	14.7	0.0	0.0	138.6	35.7	31.8	5.9	49.1	11.8
TOTAL	1,202.4	100	3.976.2	100	4,336	100	388.6	100	540.6	100	417.1	100

Source :
Monograph data of Patrol sub district 2009
Monograph data of Mekarsari village 2009
Monograph data of Sumuradem Timur village 2009
Potential data of Patrol Baru village 2009
Potential data of Sumuradem village 2008
Potential data of Karang Layung village 2008

Table 9.1.18 Aesthetic landscape

No	Aesthetic Landscape	Remark
Indramayu District		
1	Bojongsari	Resources for tourism with various facilities such as the Waterpark, outbound, science house etc
2	Pantai Balongan Indah	Sightseeing resources as a beautiful beach scene. a variety of seafood and traditional snack is sold around the location
3	Kawasan Wisata Bahari Tirtamaya	There used to be visitor facilities in 1997, but now the land is transformed into a sea because of erosion

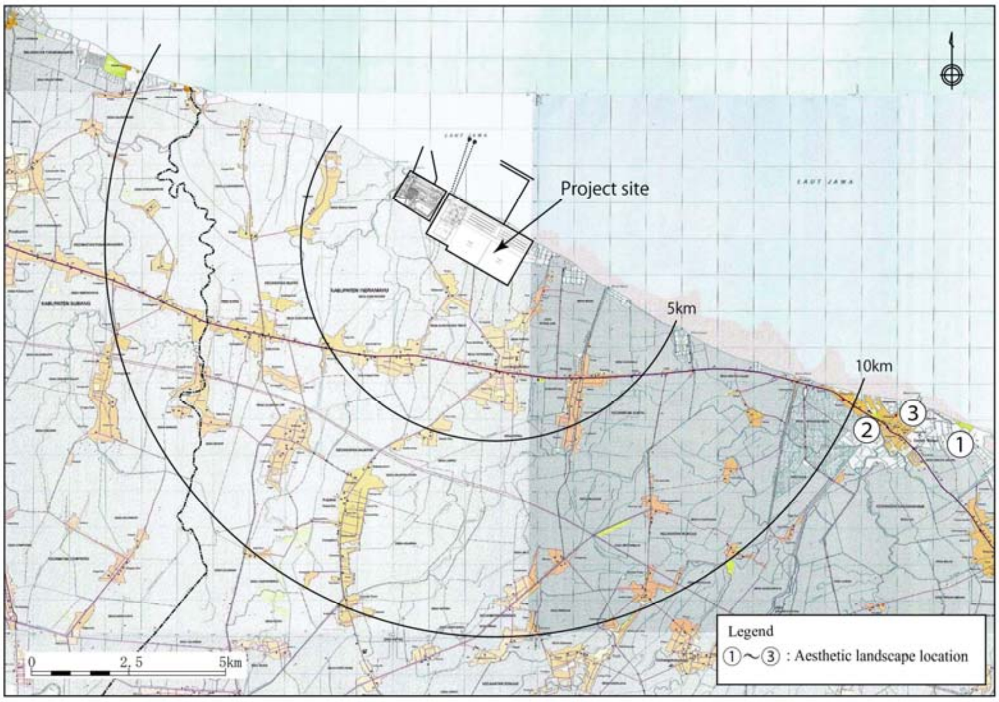


Figure 9.1.13 Aesthetic landscape location map

2) Biological component

(a) Vegetation condition

i) Terrestrial Vegetation

Potential decline of plantation or paddy field production quality is estimated from visual observation and comparison with other location distant from project plan location.

Flora data analysis is conducted with calculation of SDR (Summed Dominance Ratio) method. With this method, dominance of a species is more easily comprehended, while the value is restricted to 100% (Misra, 1968).

Formula used is as follows:

INP = (KR + FR + DR) %

Note:

INP: significant value index of a species
KR : relative density of a species
FR : relative frequency of presence of a plant species
DR : relative coverage dominance of a plant species
SDR = INP/3

Data collected through inventory method is analyzed to obtain species diversity and flora status. Status of vegetation is determined based on Government Regulation No. 7/1999 on Preservation of Vegetation and Animal Species.

Regarding transect locations shown in Figure 9.1.14, transect area is 1000 m length and 10 m width (one plot; 100 m length and 10 m width). When looking at the representative vegetation condition in the area, the vegetation condition confirmed from the survey covers only a minimum landmass for the survey.

Details on vegetation condition by field survey are described in Table 9.1.1-19, 20.

The Table 9.1.19 describes survey results during the wet season and Table 9.1.20 describes survey results during the dry season.

Location of the project site consists of paddy field with rain harvesting system and, fish pond. The dominant species are *Oryzae sativa* in the paddy field vegetation. Several species such as *Capsicum fructescens* (local name: Cabe Rawit), *Manihot esculenta* (Singkong), *Lycopersicum licopersicon* (Tomat), Gnetum gnemon (Tangkil), and *Musa parasidiaca* (Cau "Sundanese"/Pisang) exist along in side of the paddy field.

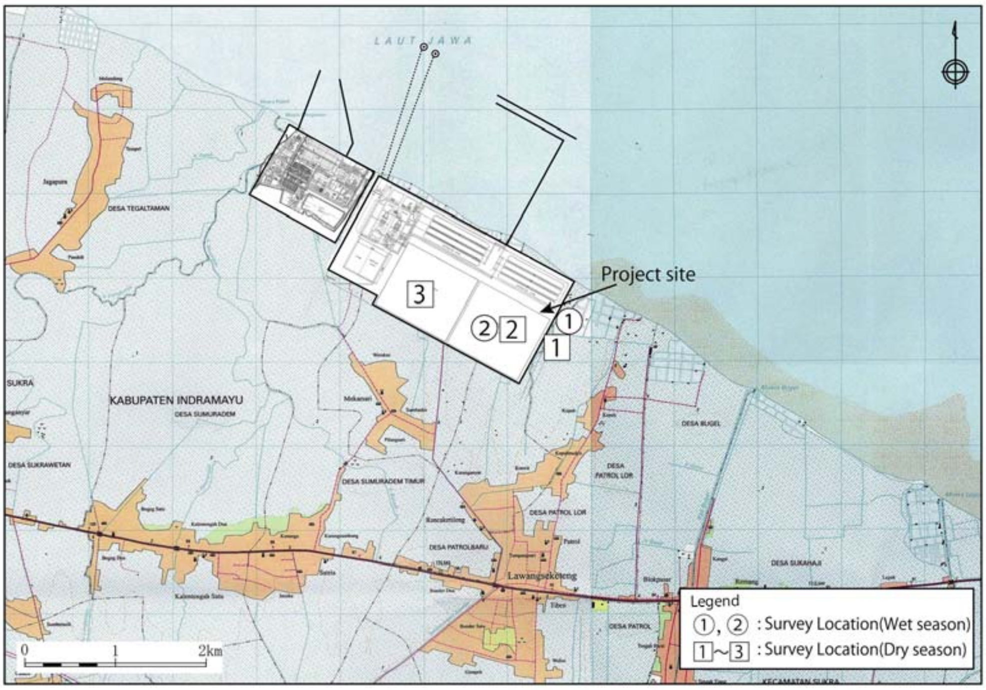


Figure 9.1.14 Survey location (flora)

Table 9.1.19(1) Survey result of terrestrial vegetation by transect method

Location : Patrol Lor (Indramayu District) ; Location 1 as shown in Figure 9.1.14

Survey date : 29 April-4 May 2010

Coordinate : 06^{o} 17' 19.5" S 107^{o} 59' 58.4" E

Topology : Riparian and Coastal Land

No	Local Name	Scientific Name	Result	FR	KR	DR	INP	SDR =INP/3	Type	Status		
										Government law	CITES	IUCN
1	Waru laut	*Thespesia populnea* (L.) Soland. ex Correa	7	12.2	8.0	17.5	37.8	12.6	AP	-	-	-
2	Api-api	*Avicinea marina* (Forsk.) Vierh.	18	7.3	20.7	17.5	45.6	15.2	WP	-	-	-
3	Kangkung laut	*Ipomea pescafre*	12	6.1	13.8	2.9	22.7	7.6	AP	-	-	-
4	Pecut kuda	*Starcythapeta jamaicensis*	11	6.1	12.6	2.9	21.6	7.2	AP	-	-	-
5	Buta-buta	*Excoecaria agallocha* L.	8	8.5	9.2	9.8	27.6	9.2	WP	-	-	-
6	Jeruju	*Acanthus ilicifolius* L.	12	12.2	13.8	9.8	35.8	11.9	AP	-	-	-
7	Katapang	*Terminalia catapa*	7	12.2	8.0	9.8	30.1	10.0	WP	-	-	-
9	Pisang	*Musa parasidiaca*	3	12.2	3.4	15.4	31.0	10.3	AP	-	-	-
12	Mangga	*Mangifera indica*	2	3.7	2.3	2.9	8.8	2.9	AP	-	-	-
13	Kimusa	*Mimmosa invisa*	2	8.5	2.3	2.9	13.7	4.6	AP	-	-	-
14	Turi	*Sesbania grandiflora Pers*	2	3.7	2.3	2.9	8.8	2.9	AP	-	-	-
15	Lamtoro	*Leucaena leucochepala*	2	2.4	2.3	2.9	7.6	2.5	AP	-	-	-
16	Nipah	*Nypa furticans Wurmb*	1	4.9	1.1	2.9	8.9	3.0	AP	-	-	-
TOTAL			87	100	100	100	300	-	-	-	-	-

Note;

WP : Wild Plants

CP : Coastal Plants

AP : Domesticated/Agricultural Plants

SP : Shade Plants

DP : Decorative Plants

Table 9.1.19(2) Survey result of terrestrial vegetation by transect method

Location : Mekarsari 1 (Indramayu District) ; Location 2 as shown in Figure 9.1.14

Survey date : 29 April-4 May 2010

Coordinate : 06° 16' 68.2" S 107° 59' 17.8" E

Topology : Fish Pond Land

No	Local Name	Scientific Name	Result	FR	KR	DR	INP	SDR =INP/3	Type	Status		
										Government law	CITES	IUCN
1	Lamtoro	*Leucaena leucocephala* (Lam.) de Wit	2	11.0	4.7	23.3	38.9	13.0	AP	-	-	-
2	Kihujan	*Samanea saman* (Jacq.) Merr.	3	6.6	7.0	3.8	17.4	5.8	DP	-	-	-
3	Pisang	*Musa parasidiaca* Linn.	4	5.5	9.3	3.8	18.6	6.2	AP	-	-	-
4	Kersen/talo	*Muntingia carabola* L.	3	5.5	7.0	3.8	16.3	5.4	DP	-	-	-
5	Sidagori	*Sida rhombifolia* L.	4	7.7	9.3	3.8	20.8	6.9	WP	-	-	-
6	Talas	*Xanthosoma sagittifolium* (L.) H.W. Schott & Endl.	2	11.0	4.7	13.1	28.7	9.6	WP	-	-	-
7	Kangkung Laut	*Ipomea maximae* (L.f.) Don ex Sweet	3	11.0	7.0	13.1	31.0	10.3	WP	-	-	-
8	Ki Musa	*Mimosa invisa* Mar.	3	7.7	7.0	3.8	18.5	6.2	WP	-	-	-
9	Putri malu	*Mimosa pudica* Duchass. & Walp	2	11.0	4.7	20.4	36.0	12.0	WP	-	-	-
10	Pecut Kuda	*Stracchytarpheta jamaicensis* (L.) Vahl	2	8.8	4.7	3.8	17.2	5.7	WP	-	-	-
11	Rumput gajah	*Pennisetum purpureum* Schumacher	4	11.0	9.3	3.8	24.1	8.0	WP	-	-	-
12	Teki	*Cyperus brevifolius* (Rottb) Endl. Ex Hassk	11	3.3	25.6	3.8	32.7	10.9	WP	-	-	-
TOTAL			43	100	100	100	300	100	-	-	-	-

Note;

+++ : Found in large numbers

WP : Wild Plants

CP : Coastal Plants

AP : Domesticated/Agricultural Plants

SP : Shade Plants

DP : Decorative Plants

Table 9.1.20(1) Survey result of terrestrial vegetation by transect method

Location : Patrol Lor (Indramayu District) ; Location 1 as shown in Figure 9.1.14

Survey date : 23-26 June 2010

Coordinate : 06° 17' 20.9" S 108° 19' 07.9" E

Topology : Riparian and Coastal Land

No	Local Name	Scientific Name	FR	KR	DR	INP	SDR =INP/3	Type	Status		
									Government law	CITES	IUCN
1	Jeruju	*Acanthus ilicifolius* L.	7.5	18.6	18.6	44.7	14.9	AP	-	-	-
2	Pisang	*Musa parasidiaca*	2.5	1.6	1.6	5.6	1.9	AP	-	-	-
3	Kimusa	*Mimmosa invisa*	10.0	5.8	5.8	21.6	7.2	WP	-	-	-
4	Kangkung laut	*Ipomea pescafre*	7.5	4.3	4.3	16.0	5.3	AP	-	-	-
5	Pecut kuda	*Starcythapeta jamaicensis*	15.0	6.6	6.6	28.2	9.4	WP	-	-	-
TOTAL									-	-	-

Note;

WP : Wild Plants

AP : Domesticated/Agricultural Plants

Table 9.1.20(2) Survey result of terrestrial vegetation by transect method

Location : Patrol (Indramayu District) ; Location 2 as shown in Figure 9.1.14

Survey date : 23-26 June 2010

Coordinate : 06^o 16' 68.2" S 107^o 59' 17.8" E

Topology : Fish Pond Land

No	Local Name	Scientific Name	FR	KR	DR	INP	SDR =INP/3	Type	Status		
									Government law	CITES	IUCN
1	Calingcing	*Oxalis corniculata* Linn.	7.3	5.5	0.6	13.4	4.5	WP	-	-	-
2	Talas	*Xanthosoma sagittifolium* (L.) H.W. Schott & Endl.	24.4	37.0	73.5	134.9	45.0	AP	-	-	-
3	Pecut kuda	*Stracchytarpheta jamaicensis* (L.) Vahl	19.5	17.8	14.5	51.9	17.3	WP	-	-	-
4	Kangkung laut	*Ipomea pescafre*	19.5	11.0	6.6	37.1	12.4	AP	-	-	-
5	Alang-alang	*Imperata cylindrica* (L.) Beauv	7.3	5.5	1.6	14.4	4.8	WP	-	-	-
6	Pisang	*Musa parasidiaca* Linn.	14.6	16.4	1.3	32.4	10.8	AP	-	-	-
7	Rumput	*Pennisetum purpureum* Schumacher	7.3	6.8	1.9	16.1	5.4	WP	-	-	-
TOTAL			100	100	100	300	100	-	-	-	-

Note;

WP : Wild Plants

AP : Domesticated/Agricultural Plants

Table 9.1.20(3) Survey result of terrestrial vegetation by transect method

Location : PLTU lama (Indramayu District) ; Location 3 as shown in Figure 9.1.14

Survey date : 23-26 June 2010

Coordinate : 06° 17' 1.5 S " 107° 57' 59.3" E

Topology : Paddy Field

No	Local Name	Scientific Name	FR	KR	DR	INP	SDR =INP/3	Type	Status		
									Government law	CITES	IUCN
1	Padi (sawah)	*Oryza sativa* L.	***	***	***	***	***	AP	-	-	-
2	Pecut kuda	*Stracchytarpheta jamaicensis* (L.) Vahl	17.6	22.2	17.7	57.6	19.2	WP	-	-	-
3	Pisang	*Musa parasidiaca* Linn.	11.8	11.1	17.7	40.6	13.5	AP	-	-	-
4	Kangkung darat	*Ipomea reptana* Roem.	11.8	11.1	17.7	40.6	13.5	AP	-	-	-
5	Talas	*Xanthosoma sagittifolium* (L.) H.W. Schott & Endl.	5.9	5.6	6.2	17.6	5.9	AP	-	-	-
TOTAL									-	-	-

Note;

+++ : Found in large numbers

WP : Wild Plants

AP : Domesticated/Agricultural Plants

ii) Mangrove

There is a stream toward the east side of the project site. Based on the survey result by transect method, several species such as *Oryza sativa* L (local name: Padi), *Avicennia marina* (Brayo / Api-Api) and *Excoecaria agallocha* (Buta-Buta) as the major mangrove component (Sukardjo, 1990) were found in the area. In addition *Achanthus ilicifolius* (Jeruju) was found as the associate mangrove component. The *Avicennia marina* appears to be the dominant specie in the area. Base on an interview, occurrence of the mangrove vegetation was not a natural phenomenon, instead was planted about 10 year ago to prevent denudation from the sea by an owner of private fish ponds.

iii) Wildlife and Domestic animals

Based on the survey result by transect method (survey location is shown in Figure 9.1.15), details on fauna condition is described in Table 9.1.21, 22. Table 9.1.21 is described survey result during wet season and Table 9.1.22 is described survey result during dry season.

In the field survey of the power plant site, 19 Least Concern listed species in IUCN (15 Aves, 2 Mammals and 2 Amphibians) were observed.

Cobra Item (*Naja sputatrix*) is listed Appendix II in CITES, but this species is reported by interview. It is not certain the existence of the species in site at the moment.

Since it is planned to divert the route of the irrigation channel in order not to interrupt water path, the impact to Amphibian and fish, which live in the fresh water body and its bank, is small.

Sukra sub-district is located in a farming area, and the area of the farmland in the sub-district is more than 4,000ha. Most part of the power plant site is now used as farmland, and the site is not a special place for biota because the characteristics of biota in the site are the same as surrounding area.

The area-size of the farmland in the planning power plant site is around 260ha. Since the size of the farmland in the power plant is about 5% of that in whole Sukra sub-district, impact to the terrestrial animals (such as birds) is limited.

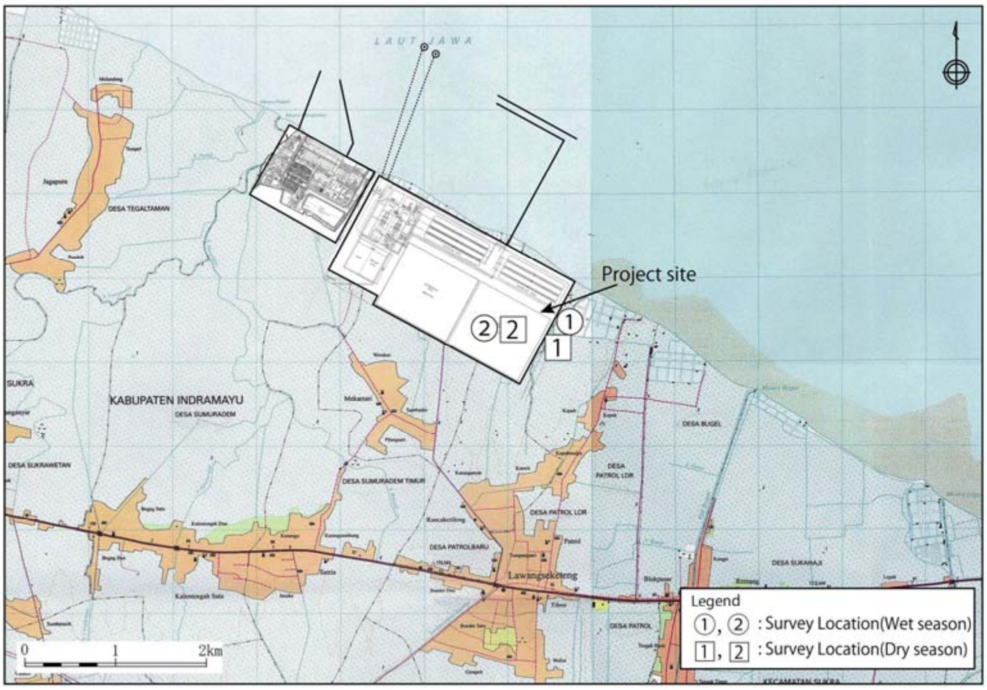


Figure 9.1.15 Survey location (fauna)

Table 9.1.21(1) Survey result of terrestrial wildlife and domestic animals by transect method

Location : Location 1 as shown in Figure 9.1.16
Survey date : 29 April-4 May 2010
Coordinate : S 06° 17'19.5" E 107° 59'58.4"
Topology : Riparian and Coastal Land
Class : Aves

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Itik	*Anas* sp.	6	14.0	12	13.2	27.1	OB			
2	Cici	*Cisticola juncidis*	6	14.0	13	14.3	28.2	OB			Least Concern
3	Wiwik Kelabu	*Cacomantis merulinus*	4	9.3	4	4.4	13.7	OB			Least Concern
4	Kapinis	*Apus affinis*	5	11.6	10	11.0	22.6	OB			Least Concern
5	Blekok	*Ardeola speciosa*	2	4.7	2	2.2	6.8	OB			Least Concern
6	Pelanduk Semak	*Malaconcinla sepiarium*	4	9.3	7	7.7	17.0	OB			-
7	Tikukur	*Streptopelia chinensis*	2	4.7	3	3.3	7.9	OB			Least Concern
8	Pipit	*Lonchura leucogastroides*	5	11.6	17	18.7	30.3	OB			Least Concern
9	Gereja	*Passer montanus*	7	16.3	20	22.0	38.3	OB			Least Concern
10	Merbah Cerukcuk	*Pycnonotus goiavier*	2	4.7	3	3.3	7.9	OB			Least Concern
11	Celepuk	*Otus lempiji*	*	*	*	*	*	IN			-
12	Citblek	*Prinia familiaris*	*	*	*	*	*	IN			Least Concern
TOTAL			43	100	91	100	200		-	-	-

Class : Mammal

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Bajing	*Callosciurus notatus*	1	1	2	2.2	3.2	OB	-	-	Least Concern
TOTAL			1	1	2	2.2	3.2				

Class : Reptile

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Kadal	*Eutropis multifasciata* Kuhl, 1820	2	2	2	2.2	4.2	OB	-	-	-
TOTAL			2	2	2	2.2	4.2				

Class : Amphibian

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Katak pohon	*Hyla* sp.	1	1	1	1.1	2.1	OB	-	-	-
2	Bancet	*Occidozyga lima* Kuhl & van Hasselt	1	1	1	1.1	2.1	OB	-	-	Least Concern
TOTAL			2	2	2	4.2	4.2				

Note;

+ : found many

++ : found in sufficient numbe

+++ : found many

OB : Direct observe

IN : : Interview

Table 9.1.21(2) Survey result of terrestrial wildlife and domestic animals by transect method

Location : Mekarsari (PLTU Baru-Patrol) (Indramayu Distric) ; Location1 as shown in Figure 9.1.16
Survey date : 29 April-4 May 2010
Coordinate : S 06^{o} 16'57.22" E 107^{o} 59'12.1"
Topology : Fish Pond Land
Class : Aves

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Walet sapi	*Colocalia esculenta*	1	8.3	1	8.3	16.7	OB	-	-	Least Concern
2	Blekok sawah	*Ardeola speciosa*	1	8.3	1	8.3	16.7	OB	-	-	Least Concern
3	Cici Padi	*Cisticola juncidis*	1	8.3	1	8.3	16.7	OB	-	-	Least Concern
4	Kapinis laut	*Apus pacificus*	2	16.7	2	16.7	33.3	OB	-	-	Least Concern
5	Kapinis rumah	*Apus affinis*	7	58.3	7	58.3	116.7	OB	-	-	Least Concern
TOTAL			12	100	12	100	200	-	-	-	-

Class : Mammal

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Domba	*Ovis aries*	1	100	21	100	200	OB	-	-	-
TOTAL			1	100	21	100	200				

Class : Reptile

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	cobra item	*Naja sputatrix*						IN		Appendix II	
2	Ular kadut	*Acrochordus granulatus*						IN			
TOTAL											

Class : Amphibian

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
	Not Found										
TOTAL											

Note;

OB : Direct observe

IN : : Interview

Table 9.1.22(1) Survey result of terrestrial wildlife and domestic animals by transect method

Location : Sukra (Indramayu Distric); Location 1 as shown in Figure 9.1.16
Survey date : 23-26 June 2010
Coordinate : S 06^{o}17'20.9" E 107^{o} 00'7.63"
Topology : Riparian and Coastal Land
Class : Aves

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Wiwik uncuing	*Cuculus sepulclaris*	1	5.6	1	3.4	9.0	OB			-
2	Burung gereja	*Passer montanus*	7	38.9	10	34.5	73.4	OB			Least Concern
3	Trinil pantai	*Tringa* sp.	1	5.6	1	3.4	9.0	OB			-
4	Cici padi	*Cisticola juncidis*	2	11.1	3	10.3	21.5	OB			Least Concern
5	Burung Cabe	*Dicaeum trocileum*	1	5.6	1	3.4	9.0	OB			-
6	Kapinis rumah	*Apus affinis*	5	27.8	12	41.4	69.2	OB			Least Concern
7	Kipasan belang	*Rhipidura javanica*	1	5.6	1	3.4	9.0	OB			Least Concern
8	Camar	*Larus ridibundus*	*	*	*	*	*	IN			Least Concern
9	Belibis batu	*Dendrocygna javanica*	*	*	*	*	*	IN			Least Concern
TOTAL			18	100	29	100	200		-	-	-

Class : Reptile

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Kadal	*Eutropis multifasciata* Kuhl, 1820	1	100	1	100	200	OB	-	-	-
TOTAL			1	100	1	100	200				

Class : Amphibian

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Bangkong	*Bufo melanostictus*	1	100	1	100	200	OB	-	-	Least Concern
TOTAL			1	100	1	100	200				

Note;

+ : found many
++ : found in sufficient numbe
+++ : found many
OB : Direct observe
IN : : Interview

Table 9.1.22 (2) Survey result of terrestrial wildlife and domestic animals by transect method

Location : Mekarsari (PLTU Baru-Patrol) (Indramayu Distric); Location 2 as shown in Figure 9.1.16
Survey date : 23-26 June 2010
Coordinate : S 06^{o} 16'57.22" E 107^{o} 59'12.1"
Topology : Fish pond land
Class : Aves

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Walet	*Collocalia linchi*	2	10	3	8.3	18.3	OB	-	-	Least Concern
2	Kapinis rumah	*Apus affinis*	6	30	15	41.7	71.7	OB	-	-	Least Concern
3	Burung gereja	*Passer montanus*	7	35	11	30.6	65.6	OB	-	-	Least Concern
4	Cici padi	*Cisticola juncidis*	4	20	6	16.7	36.7	OB	-	-	Least Concern
5	Perenjak jawa	*Prinia familiaris*	1	5	1	2.8	7.8	OB	-	-	Least Concern
TOTAL			20	100	36	100	200				

Class : Mammal

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Tikus Sawah	*Rattus argentiventer* Robinson&Kloss	1	25	1	4.2	29.2	OB			Least Concern
2	Domba	*Ovis aries* Linn	3	75	23	95.8	170.8	OB			
TOTAL			4	100	24	100	200				

Class : Reptile

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Kadal	*Eutropis multifasciata* Kuhl, 1820	1	100	1	100	200	OB	-	-	-
TOTAL			1	100	1	100	200				

Class : Amphibian

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Bangkong	*Bufo melanostictus*	1	100	1	100	200	OB	-	-	Least Concern
TOTAL			1	100	1	100	200				

Note;

+ : found many
++ : found in sufficient numbe
+++ : found many
OB : Direct observe
IN : : Interview

Table 9.1.23(1) Information of Little Swift (*Apus affinis*)

Items	Information
Range	Afghanistan; Algeria; Angola; Benin; Botswana; Burkina Faso; Burundi; Cameroon; Central African Republic; Chad; Congo; Congo, The Democratic Republic of the; Côte d'Ivoire; Djibouti; Egypt; Equatorial Guinea; Eritrea; Ethiopia; Gabon; Gambia; Ghana; Guinea; Guinea-Bissau; India; Iran, Islamic Republic of; Israel; Jordan; Kenya; Lebanon; Lesotho; Liberia; Libyan Arab Jamahiriya; Madagascar; Malawi; Mali; Mauritania; Morocco; Mozambique; Namibia; Niger; Nigeria; Pakistan; Rwanda; Sao Tomé and Principe; Saudi Arabia; Senegal; Sierra Leone; Somalia; South Africa; Spain; Sri Lanka; Sudan; Swaziland; Syrian Arab Republic; Tajikistan; Tanzania, United Republic of; Timor-Leste; Togo; Tunisia; Turkey; Turkmenistan; Uganda; United Arab Emirates; Uzbekistan; Yemen; Zambia; Zimbabwe (http://www.iucnredlist.org/apps/redlist/details/142809/0)
Habitat	Urban and open areas, sometimes over forest; up to 2,300m (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Feed	Insects.(BIRDS OF JAPAN IN PHTOGRAPHS)
Breeding	All year.Colonial. Untidy globular mass, sometimes old swallow nest, or various man-made structures or natural rock-face Eggs 2-4. (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Status	IUCN (Least Concern)

Table 9.1.23(2) Information of Fork-tailed Swift (*Apus pacificus*)

Items	Information
Range	Australia; Bangladesh; Bhutan; Cambodia; China; Christmas Island; Guam; Hong Kong; India; Indonesia; Japan; Kazakhstan; Korea, Democratic People's Republic of; Korea, Republic of; Lao People's Democratic Republic; Malaysia; Marshall Islands; Mongolia; Myanmar; Nepal; Northern Mariana Islands; Pakistan; Papua New Guinea; Philippines; Russian Federation; Singapore; Taiwan, Province of China; Thailand; Timor-Leste; Viet Nam (http://www.iucnredlist.org/apps/redlist/details/142807/0)
Habitat	Migration bird (http://www.birdlife.org/datazone/species/index.html?action=SpcHTMDetails.asp&sid=1785&m=1)
Feed	Feeds on various insects, taken in flight. (http://www.birdforum.net/opus/Apus_pacificus)
Breeding	In Indonesia, it is native bird but it may not breed. (http://www.birdlife.org/datazone/species/index.html?action=SpcHTMDetails.asp&sid=1785&m=1)
Status	IUCN (Least Concern)

Table 9.1.23(3) Information of Javan Pond-heron (*Ardeola speciosa*)

Items	Information
Range	Cambodia; Indonesia; Malaysia; Myanmar; Philippines; Thailand; Viet Nam (http://www.iucnredlist.org/apps/redlist/details/144687/0)
Habitat	Various wetlands, particularly along coast; lowlands. (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Feed	Diet includes insects, fish and crabs (http://www.birdforum.net/opus/Ardeola_speciosa)
Breeding	June-September.Colonial.Untidy platform, in tree. Eggs 3-5. (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Status	IUCN (Least Concern)

Table 9.1.23(4) Information of Zitting Cisticola (*Cisticola juncidis*)

Items	Information
Range	Albania; Algeria; Angola; Australia; Bangladesh; Belgium; Benin; Botswana; Burkina Faso; Burundi; Cambodia; Cameroon; Central African Republic; Chad; China; Congo; Congo, The Democratic Republic of the; Côte d'Ivoire; Croatia; Cyprus; Egypt; Equatorial Guinea; Eritrea; Ethiopia; France; Gabon; Gambia; Ghana; Gibraltar; Greece; Guinea; Guinea-Bissau; Hong Kong; India; Indonesia; Iran, Islamic Republic of; Iraq; Israel; Italy; Japan; Jordan; Kenya; Korea, Republic of; Lao People's Democratic Republic; Lebanon; Lesotho; Libyan Arab Jamahiriya; Macedonia, the former Yugoslav Republic of; Malawi; Mali; Malta; Mauritania; Montenegro; Morocco; Mozambique; Myanmar; Namibia; Nepal; Netherlands; Niger; Nigeria; Pakistan; Philippines; Portugal; Rwanda; Senegal; Serbia; Sierra Leone; Singapore; Slovenia; Somalia; South Africa; Spain; Sri Lanka; Sudan; Swaziland; Switzerland; Syrian Arab Republic; Taiwan, Province of China; Tanzania, United Republic of; Thailand; Timor-Leste; Togo; Tunisia; Turkey; Uganda; Viet Nam; Yemen; Zambia; Zimbabwe (http://www.iucnredlist.org/apps/redlist/details/148154/0)
Habitat	Surrounding of stream and farming ground in flatland and hillside, grassland in filled ground (http://www.mus-nh.city.osaka.jp/wada/Breed/Cisticola.html)
Feed	Insects (http://www.mus-nh.city.osaka.jp/wada/Breed/Cisticola.html)
Breeding	A cuplike style nest knitted grasses is made on grassland (http://www.mus-nh.city.osaka.jp/wada/Breed/Cisticola.html)
Status	IUCN (Least Concern)

Table 9.1.23(5) Information of Glossy Swiftlet (*Collocalia esculenta*)

Items	Information
Range	Brunei Darussalam; Christmas Island; India; Indonesia; Malaysia; Myanmar; New Caledonia; Papua New Guinea; Philippines; Singapore; Solomon Islands; Thailand; Timor-Leste; Vanuatu (http://www.iucnredlist.org/apps/redlist/details/142735/0)
Habitat	Forested and open areas; up to 1,900m. (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Feed	Takes various insects in flight.(http://www.birdforum.net/opus/Collocalia_esculenta)
Breeding	All year. Cup of vegetable matter, moss etc., bound with saliva, attached to rock-face, building wall, underside of bridge or culvert. Eggs 2. (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Status	IUCN (Least Concern)

Table 9.1.23(6) Information of Cave Swiftlet (*Collocalia linchi*)

Items	Information
Range	Indonesia; Malaysia (http://www.iucnredlist.org/apps/redlist/details/142736/0)
Habitat	On Java from sea-level to mountains over forest and open country. On Sumatra and Borneo restricted to high altitude. (http://www.birdforum.net/opus/Collocalia_linchi)
Feed	Unknown
Breeding	Small cup of lichen and fibres attached to cave wall with saliva 1 white egg. (The Slater Field Guide to AUSTRALIAN BIRDS Second Edition)
Status	IUCN (Least Concern)

Table 9.1.23(7) Information of Lesser Whistling-duck (*Dendrocygna javanica*)

Items	Information
Range	Bangladesh; Brunei Darussalam; Cambodia; China; India; Indonesia; Japan; Lao People's Democratic Republic; Malaysia; Myanmar; Nepal; Pakistan; Singapore; Sri Lanka; Taiwan, Province of China; Thailand; Viet Nam (http://www.iucnredlist.org/apps/redlist/details/141421/0)
Habitat	Lakes, marshes, sometimes mangroves, various wetlands; up to 1,450m. (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Feed	Lesser Whistling Ducks eat aquatic vegetation by dabbling on the water surface in shallow water.(http://www.naturia.per.sg/buloh/birds/Dendrocygna_javanica.htm)
Breeding	All year. Nest; simple structure in tree-cavity or old nest of other bird, up to 6m above ground, sometimes on ground amongst vegetation. Eggs 7-12. (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Status	IUCN (Least Concern)

Table 9.1.23(8) Information of Intermediate Egret (*Egretta intermedia*)

Items	Information
Range	Angola; Australia; Bangladesh; Benin; Bhutan; Botswana; Brunei Darussalam; Burkina Faso; Burundi; Cambodia; Cameroon; Cape Verde; Central African Republic; Chad; China; Congo; Congo, The Democratic Republic of the; Côte d'Ivoire; Eritrea; Ethiopia; Gabon; Gambia; Ghana; Guam; Guinea; Guinea-Bissau; India; Indonesia; Japan; Kenya; Korea, Democratic People's Republic of; Korea, Republic of; Lao People's Democratic Republic; Lesotho; Liberia; Malawi; Malaysia; Mali; Mauritania; Micronesia, Federated States of; Mozambique; Myanmar; Namibia; Nepal; Niger; Nigeria; Northern Mariana Islands; Pakistan; Palau; Papua New Guinea; Philippines; Russian Federation; Rwanda; Senegal; Sierra Leone; Singapore; Somalia; South Africa; Sri Lanka; Sudan; Swaziland; Taiwan, Province of China; Tanzania, United Republic of; Thailand; Timor-Leste; Uganda; Viet Nam; Zambia; Zimbabwe (http://www.iucnredlist.org/apps/redlist/details/144682/0)
Habitat	The species inhabits lowlands from sea-level to 1,000 m in Sumatra, and 1,450 m in Nepal1. It shows a preference for sheltered flood-plains and seasonal wetlands with water less than 80 mm deep and emergent grasses, herbs, sedges, reeds or rushes and abundant aquatic vegetation (generally avoiding areas where vegetation is too thick for feeding). Such habitats include seasonally flooded marshes, inland deltas (e.g. Okavango Basin, Botswana), ponds, swamp forest4, freshwater swamps, pools, rivers, streams, rice-fields, the margins of freshwater, brackish and saltwater lakes1, wet meadows, and flooded and dry pasture near water. It occurs less often in coastal habitats, but may roost in mangrove swamps, and frequents mudflats, tidal estuaries1, coastal lagoons, salt marshes, and tidal streams and rivers. (http://www.iucnredlist.org/apps/redlist/details/144682/0)
Feed	In aquatic habitats the diet of this species consists predominantly of fish less than 10 cm long (including eels, perch Macquaria, gudgeon and mosquitofish Gambusia), as well as frogs, crustaceans (e.g. crayfish) and aquatic insects (e.g. leeches, water bugs and dragonfly larvae). It will also take terrestrial prey in drier habitats including grasshoppers, mole crickets, bugs and beetles, snakes, spiders, lizards, and exceptionally birds (http://www.iucnredlist.org/apps/redlist/details/144682/0)
Breeding	The species breeds colonially with other species1 but does not concentrate into dense groups; individual nests being typically situated 0.5 m away from each other. The nest is a shallow platform of sticks and other marshland vegetation usually positioned in trees standing in water or over reedbeds (e.g. in inland swamps or mangroves), at heights of 3-6 m and occasionally up to 20 m. The species may also nest on ledges, in reed beds or in bushes. (http://www.iucnredlist.org/apps/redlist/details/144682/0)
Status	IUCN (Least Concern)

Table 9.1.23(9) Information of Lesser Black-headed Gull (*Larus ridibundus*)

Items	Information
Range	Afghanistan; Albania; Algeria; Anguilla; Antigua and Barbuda; Armenia; Aruba; Austria; Azerbaijan; Bahrain; Bangladesh; Barbados; Belarus; Belgium; Benin; Bermuda; Bosnia and Herzegovina; Bulgaria; Burkina Faso; Cambodia; Canada; Cape Verde; China; Côte d'Ivoire; Croatia; Cyprus; Czech Republic; Denmark; Djibouti; Dominica; Egypt; Eritrea; Estonia; Ethiopia; Faroe Islands; Finland; France; French Guiana; Gambia; Georgia; Germany; Ghana; Gibraltar; Greece; Greenland; Guadeloupe; Guam; Guinea-Bissau; Hong Kong; Hungary; Iceland; India; Indonesia; Iran, Islamic Republic of; Iraq; Ireland; Israel; Italy; Japan; Jordan; Kazakhstan; Kenya; Korea, Democratic People's Republic of; Korea, Republic of; Kuwait; Kyrgyzstan; Lao People's Democratic Republic; Latvia; Lebanon; Libyan Arab Jamahiriya; Liechtenstein; Lithuania; Luxembourg; Macedonia, the former Yugoslav Republic of; Malaysia; Mali; Malta; Martinique; Mauritania; Mexico; Micronesia, Federated States of; Moldova; Mongolia; Montenegro; Montserrat; Morocco; Myanmar; Nepal; Netherlands; Netherlands Antilles; Niger; Nigeria; Northern Mariana Islands; Norway; Oman; Pakistan; Palau; Palestinian Territory, Occupied; Philippines; Poland; Portugal; Puerto Rico; Qatar; Romania; Russian Federation; Rwanda; Saint Kitts and Nevis; Saint Lucia; Saint Pierre and Miquelon; Saint Vincent and the Grenadines; Saudi Arabia; Senegal; Serbia; Singapore; Slovakia; Slovenia; Somalia; Spain; Sri Lanka; Sudan; Suriname; Svalbard and Jan Mayen; Sweden; Switzerland; Syrian Arab Republic; Taiwan, Province of China; Tajikistan; Tanzania, United Republic of; Thailand; Trinidad and Tobago; Tunisia; Turkey; Uganda; Ukraine; United Arab Emirates; United Kingdom; United States; Uzbekistan; Viet Nam; Virgin Islands, U.S.; Western Sahara; Yemen (http://www.iucnredlist.org/apps/redlist/details/144217/0)
Habitat	During the winter the species is most common in coastal habitats1 and tidal inshore waters, showing a preference for inlets or estuaries with sandy or muddy beaches, and generally avoiding rocky or exposed coastlines. It may also occur inland during this season, frequenting ploughed fields, moist grasslands, urban parks, sewage farms, refuse tips, reservoirs, ponds and ornamental waters, and roosts on sandy and gravel sites or on inland reservoirs. (http://www.iucnredlist.org/apps/redlist/details/144217/0)
Feed	Its diet consists predominantly of aquatic and terrestrial insects, earthworms and marine invertebrates (e.g. molluscs, crustaceans and marine worms)1 although it may also take fish (usually dead or sick), rodents (e.g. voles) and agricultural grain1. During the non-breeding season the species may rely heavily on artificial food sources provided by man, especially in Western Europe1, and often scavenges from refuse tips during this period (http://www.iucnredlist.org/apps/redlist/details/144217/0)
Breeding	The nest is a rough construction of vegetation based on a shallow scrape and placed on a floating mat, in broken reeds, on a hummock, or sometimes on dry, grassy or sandy ground. The species shows a strong preference for nesting near vegetation (although vegetation overgrowth can lead to the desertion of colony sites). It usually nests in dense colonies with neighbouring nests placed an average of 1 m apart. (http://www.iucnredlist.org/apps/redlist/details/144217/0)
Status	IUCN (Least Concern)

Table 9.1.23(10) Information of Javan Munia (*Lonchura leucogastroides*)

Items	Information
Range	Indonesia; Malaysia; Singapore (http://www.iucnredlist.org/apps/redlist/details/149422/0)
Habitat	Secondary growth, scrub, gardens; lowlands. (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Feed	Diet includes grass seeds. (http://www.birdforum.net/opus/Lonchura_leucogastroides)
Breeding	March-October. Nest; ball, with side-entrance; in tree, bush, creeper or fern etc.; up to 3m above ground. Eggs 4-6. (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Status	IUCN (Least Concern)

Table 9.1.23(11) Information of Eurasian Tree Sparrow (*Passer montanus*)

Items	Information
Range	Afghanistan; Albania; Andorra; Armenia; Austria; Azerbaijan; Belarus; Belgium; Bhutan; Bosnia and Herzegovina; Brunei Darussalam; Bulgaria; Cambodia; Canada; China; Christmas Island; Croatia; Cyprus; Czech Republic; Denmark; Estonia; Faroe Islands; Finland; France; Georgia; Germany; Greece; Hong Kong; Hungary; Indonesia; Iran, Islamic Republic of; Iraq; Ireland; Italy; Japan; Kazakhstan; Korea, Democratic People's Republic of; Korea, Republic of; Kyrgyzstan; Lao People's Democratic Republic; Latvia; Liechtenstein; Lithuania; Luxembourg; Macedonia, the former Yugoslav Republic of; Malaysia; Malta; Moldova; Mongolia; Montenegro; Myanmar; Nepal; Netherlands; Norway; Poland; Portugal; Romania; Russian Federation; Serbia; Singapore; Slovakia; Slovenia; Spain; Sweden; Switzerland; Syrian Arab Republic; Taiwan, Province of China; Tajikistan; Thailand; Turkey; Turkmenistan; Ukraine; United Kingdom; Uzbekistan; Viet Nam (http://www.iucnredlist.org/apps/redlist/details/149116/0)
Habitat	Urban areas, human habitation, cultivation; up to 1,830m (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Feed	Feeds mainly on seed of herbs, grasses and cereals. Takes also animal food like spiders and insects during breeding season.(http://www.birdforum.net/opus/Passer_montanus)
Breeding	All year.Multi-brooded.Nest: pad, in hole in building or tree, sometimes in old weaver nest. (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA) Secondary cavity nester. (http://www.birdforum.net/opus/Passer_montanus)
Status	IUCN (Least Concern)

Table 9.1.23(12) Information of Bar-winged Prinia (*Prinia familiaris*)

Items	Information
Range	Indonesia (http://www.iucnredlist.org/apps/redlist/details/148176/0)
Habitat	Gardens, open areas with trees and bushes. (http://www.birdforum.net/opus/Prinia_familiaris)
Feed	unknown
Breeding	unknown
Status	IUCN (Least Concern)

Table 9.1.23(13) Information of Yellow-vented Bulbul (*Pycnonotus goiavier*)

Items	Information
Range	Brunei Darussalam; Cambodia; Indonesia; Lao People's Democratic Republic; Malaysia; Myanmar; Philippines; Singapore; Thailand; Viet Nam (http://www.iucnredlist.org/apps/redlist/details/148024/0)
Habitat	Coastal scrub, mangroves, secondary growth, plantation cultivation; lowlands but up to 1,830m in Peninsular Malaysia. (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Feed	The diet is wide and includes berries and small fruits, especially figs and cinnamon tree fruits, nectar, young shoots, and insects.(http://www.birdforum.net/opus/Pycnonotus_goiavier)
Breeding	December-October. Multi-brooded. Nest; deep cup, in bush or sapling, tussock; 0.5-3 m above ground. Eggs 2. (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Status	IUCN (Least Concern)

Table 9.1.23(14) Information of Pied Fantail (*Rhipidura javanica*)

Items	Information
Range	Brunei Darussalam; Cambodia; Indonesia; Lao People's Democratic Republic; Malaysia; Myanmar; Philippines; Singapore; Thailand; Viet Nam (http://www.iucnredlist.org/apps/redlist/details/146871/0)
Habitat	It is most frequently found in mangroves. It can also be seen in other habitat with lots of undergrowth and insects, including scrubs and cultivated areas. (http://www.naturia.per.sg/buloh/birds/Rhipidura_javanica.htm)
Feed	This species eat mainly insects. (http://www.naturia.per.sg/buloh/birds/Rhipidura_javanica.htm)
Breeding	This species breed from February to July. They build a neat well-made nest, lashed onto the fork of thin branches in the middle of a bush or leafy creeper. It is made out of stiff plant fibers held together with spiders' webs. 2 yellowish-white eggs with small brown spots are laid. (http://www.naturia.per.sg/buloh/birds/Rhipidura_javanica.htm)
Status	IUCN (Least Concern)

Table 9.1.23(15) Information of Spotted Dove (*Streptopelia chinensis*)

Items	Information
Range	Bangladesh; Bhutan; Brunei Darussalam; Cambodia; China; India; Indonesia; Lao People's Democratic Republic; Malaysia; Myanmar; Nepal; Pakistan; Philippines; Singapore; Sri Lanka; Thailand; Timor-Leste; Viet Nam (http://www.iucnredlist.org/apps/redlist/details/143497/0)
Habitat	Open areas, open woodland, scrub, cultivation, parks and gardens; up to 2,040 m. (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Feed	The diet includes grass seeds, grains and other vegetation. (http://www.birdforum.net/opus/Streptopelia_chinensis)
Breeding	All year. Multi-brooded. Nest; flimsy platform in tree, bush or bamboo. Eggs 2-3. (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Status	IUCN (Least Concern)

Table 9.1.23(16) Information of Plantain Squirrel (*Callosciurus notatus*)

Items	Information
Range	Brunei Darussalam; Indonesia (Bali, Jawa, Kalimantan, Lesser Sunda Is., Sumatera); Malaysia (Peninsular Malaysia); Singapore; Thailand (http://www.iucnredlist.org/apps/redlist/details/3600/0)
Habitat	This species is a very adaptable species, as it is found in secondary forests, plantations, and all kinds of habitats, though not so common in pristine forest. Ancestral habitats appear to be mangroves and major natural disturbances along big rivers. Now it is very common in towns, scrub, secondary forest, forest edge and urban parks. (http://www.iucnredlist.org/apps/redlist/details/3600/0)
Feed	This is a diurnal and arboreal species, though it dies descend to the ground to forage. The diet of this species consists of fruit (42%) and bark 40%, as well as insects and rubber tree latex. (http://www.iucnredlist.org/apps/redlist/details/3600/0)
Breeding	Breeding may occur year-round, but is more common in some seasons. Number of offspring is 1 to 4; avg. 2.20. Gestation period is 40 days (average). Time to independence is 6 weeks (average). (http://www.discoverlife.org/20/q?search=Callosciurus+notatus)
Status	IUCN (Least Concern)

Table 9.1.23(17) Information of Rice-field Rat (*Rattus argentiventer*)

Items	Information
Range	Brunei Darussalam; Cambodia; Indonesia; Lao People's Democratic Republic; Malaysia; Philippines; Singapore; Thailand; Timor-Leste; Viet Nam (http://www.iucnredlist.org/apps/redlist/details/19322/0)
Habitat	Its natural habitat was probably swampy grasslands, but today it occurs in rice fields, grasslands, and plantations and is broadly communal with humans. (http://www.iucnredlist.org/apps/redlist/details/19322/0)
Feed	Rice field rats feed on seeds directly. They pull up germinating seeds. They either cut or pull up transplanted plants. Tillers are usually cut and then chewed. (http://www.knowledgebank.irri.org/ricedoctor/index.php?option=com_content&view=article&id=605&Itemid=2813)
Breeding	Breeding in ricefield rats appears to be triggered by the maturation of the rice plant itself. (http://www.knowledgebank.irri.org/ricedoctor/index.php?option=com_content&view=article&id=605&Itemid=2813)
Status	IUCN (Least Concern)

Table 9.1.23(18) Information of Javan Spitting Cobra (*Naja sputatrix*)

Items	Information
Range	Southern Indonesia: Java, Bali, Lombok, Sumbawa, Komodo, Flores, Lomblen, Alor, possibly other islands in the group. The occurrence of this species on Timor and Sulawesi requires confirmation (http://www.bangor.ac.uk/~bss166/Taxa/AsNaja.htm)
Habitat	Lowlands and cultivated hill country (Venomous Snakes of the World)
Feed	Rodents, toads and snakes (Venomous Snakes of the World)
Breeding	Both sexes remain together during the breeding season. The female Black Spitting Cobra lays between 6 and 20 eggs. On two occasions, a clutch of 7 eggs was laid in June, and another clutch of 7 eggs in early July. The eggs averaged 60.5 mm in length and 26 mm in diameter. It is said that both the parents stay together to brood the eggs. The incubation period is about 88 days. The newly hatched cobras are armed with fangs and venom glands. (http://www.forestry.sarawak.gov.my/forweb/wildlife/fauna/reptile/bscobra.htm)
Status	CITES (Appendix II)

Table 9.1.23(19) Information of Black-spectacled Toad (*Bufo melanostictus*)

Items	Information
Range	Bangladesh; Cambodia; China; Hong Kong; India; Indonesia (Bali - Introduced, Irian Jaya - Introduced, Jawa, Kalimantan, Maluku - Introduced, Sulawesi - Introduced, Sumatera); Lao People's Democratic Republic; Macao; Malaysia; Myanmar; Nepal; Pakistan; Singapore; Sri Lanka; Taiwan, Province of China; Thailand; Viet Nam (http://www.iucnredlist.org/apps/redlist/details/54707/0)
Habitat	It is mainly a species of disturbed lowland habitats, from upper beaches and riverbanks to human-dominated agricultural and urban areas. It is uncommon in closed forests. (http://www.iucnredlist.org/apps/redlist/details/54707/0)
Feed	The adult diet consists of ants. (http://online-field-guide.com/Duttaphrynusmelanostictus.htm)
Breeding	It breeds in still and slow-flowing rivers and temporary and permanent ponds and pools. Adults are terrestrial and may be found under ground cover (eg. rocks, leaf-litter, logs), and are also associated with human habitations. The larvae are found in still and slow-moving waterbodies. (http://www.iucnredlist.org/apps/redlist/details/54707/0)
Status	IUCN (Least Concern)

Table 9.1.23(20) Information of Pointed-tongued Floating Frog (*Occidozyga lima*)

Items	Information
Range	Bangladesh; Cambodia; China; Hong Kong; India; Indonesia; Lao People's Democratic Republic; Malaysia; Myanmar; Thailand; Viet Nam (http://www.iucnredlist.org/apps/redlist/details/58411/0)
Habitat	It inhabits grasslands, forest edges, dry forests and lowland wetlands with dense aquatic vegetation, including pools, ponds, marshes, shallow reservoir margins, ditches, paddy fields and slow-flowing creeks. (http://www.iucnredlist.org/apps/redlist/details/58411/0)
Feed	Scientists are not sure what it eats. (http://animals.jrank.org/pages/192/True-Frogs-Ranidae-POINTED-TONGUE-FLOATING-FROG-Occidozyga-lima-SPECIES-ACCOUNTS.html)
Breeding	It breeds in the same habitats. (http://www.iucnredlist.org/apps/redlist/details/58411/0)
Status	IUCN (Least Concern)

(c) Aquatic biota

i) Coral reef and seaweed bed

Base on the direct observation as shown in Figure 9.1.16, the coral could not be found in the area. The ocean area in the vicinity of the project mainly consists of mud. Therefore the coral could not exist. Moreover the light in the sea is at a low level due to the mud particles suspended in the water. The conditions to grow seaweed and coral are extremely poor.

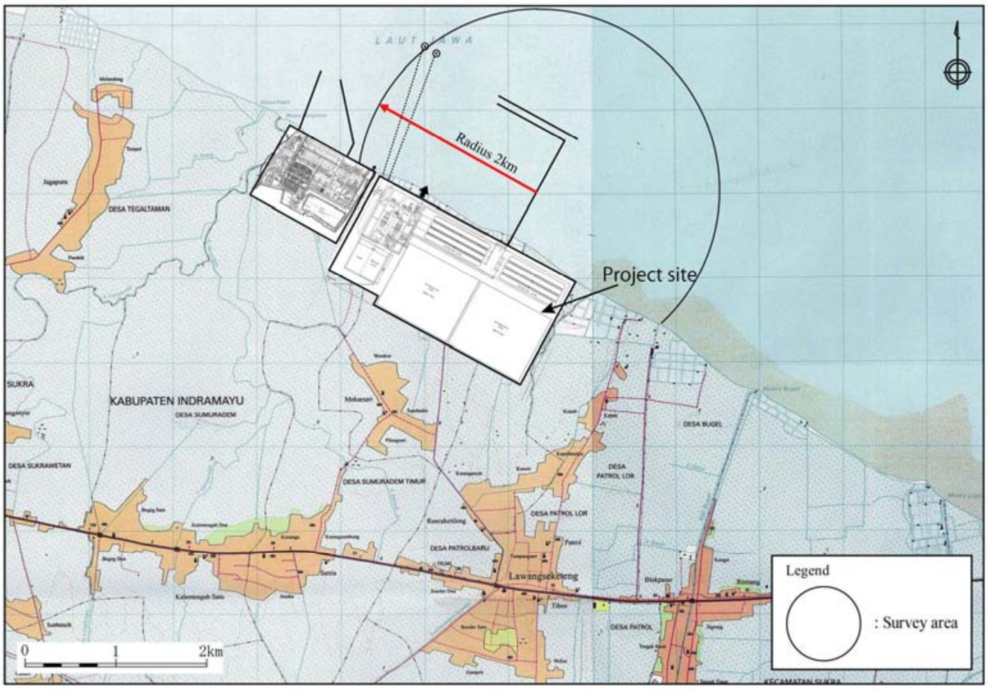


Figure 9.1.16 Survey area for coral reef and seaweed bed

ii) Plankton and Intertidal biota

Measure of plankton and benthos was conducted in 5 observation points, with location as shown in Figure 9.1.17.

In general, plankton organisms, both phytoplankton and zooplankton are found in the sea. In the case of phytoplankton, BACILLARIOPHYCEAE, DINOPHYCEAE were found in this area. The main dominate species are *Bacteriastrum* sp.,*Rhizosolenia* sp., *Coscinodiscus* sp., *Thalassiothrix* sp., and *Chaetoceros* sp. The Simpson Index at location 1, near the project, activity is 0.84 and is higher than at any other location. The Simpson Index at other locations ranges from 0.20 to 0.31 in wet season. Moreover, in dry season, Simpson Index ranges from 0.34 to 0.76. (Table9.1.24,25).

In the case of zooplankton and invertebrate, CILIATA POLYCHAETA, CRUSTCEA, BIVARVIA, GASTROPODA, UROCORDATA were found in this area. Simpson Index ranges from 0.80 to 0.88. Moreover, in dry season, Simpson Index ranges from 0.36 to 0.78. The presence of zooplankton serves as a control for phytoplankton growth and prevents phytoplankton blooming which causes water quality degradation, affecting other organisms. Simpson Index ranges between 0-1. This value close to 0 means there are no dominant species, as for this value close to 1 means dominance of a species on others. (Table 9.1.24 and Table 9.1.25)

Regarding intertidal biota at the proposed jetty site for the new power plant, *Codakia* sp., *Siliqua* sp., *Vexilium* sp.etc were found as shown in Table 9.1.26.

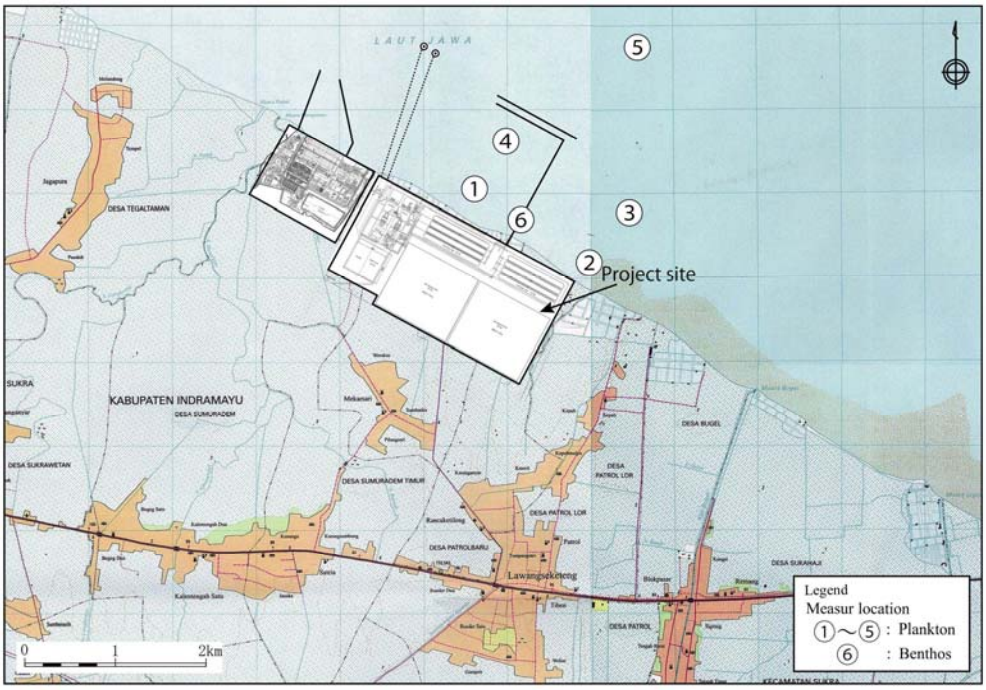


Figure 9.1.17 Sampling location for plankton and intertidal biota

Table 9.1.24(1) Plankton measure result

Survey date: 14 May 2010

No	Scientific name		Station L1 6º16'12.90"S–107º59'29.00"E	L2 6º16'07.60"S–107º59'48.00"E	L3 6º15'50.90"S–108º00'07.90"E	L4 6º16'18.41"S–108º00'15.60"E	L5 6º16'45.00"S–108º00'06.40"E
Phytoplankton							
1	BACILLARIOPHYCEAE	*Amphora sp.*	1,200				
2		*Bacteriastrum sp.*	42,400	555,000	732,600	558,600	429,000
3		*Bacteriastrum varians*	6,000	600	1,200		1,200
4		*Cerataulina sp.*	1,200	600	600		600
5		*Cetarium sp.*	1,200	6,000	3,000	4,200	
6		*Chaetoceros affinis*		1,200	600	1,200	
7		*Chaetoceros atlanticus*	2,400	1,200			600
8		*Chaetoceros laevis*	1,200	1,200	600	600	
9		*Climacodium sp.*	600	1,200			600
10		*Coscinodiscus angsili*	600				
11		*Coscinodiscus granii*					600
12		*Coscinodiscus sp.*	25,200	7,200	3,000	4,200	7,200
13		*Ditylum sp.*	600			600	600
14		*Ethmodiscus sp.*	3,600				600
15		*Hemidiscus sp.*	600				
16		*Hernidiscus sp.*	600	600		600	
17		*Melosira sp.*	1,200	2,400	1,800	3,000	4,800
18		*Nitzschia longisima*	600	1,800			
19		*Nitzschia seriata*	1,200	1,800	1,200	1,200	600
20		*Pleurosigma sp.*	3,600	4,200	2,400	3,000	1,800
21		*Rhabdonema sp.*	1,200	600			
22		*Rhizosolenia fragilisima*	12,000	9,000	2,400	1,800	3,600
23		*Rhizosolenia sp.*	63,600	46,800	53,400	18,600	42,000
24		*Thalassionema sp.*	1,200	600	14,400	6,000	4,800
25		*Thalassiosira sp.*	600		1,800	1,200	
26		*Thalassiothrix sp.*	36,000	10,200	4,800	4,200	13,200
27	DINOPHYCEAE	*Ceratium kofoidii*		1,200		1,200	
28		*Chaetoceros sp.*	18,000	12,000	5,400	6,000	4,800
29		*Noctiluca sp.*	600			1,200	
30		*Peridinium sp.*	4,200	6,600	1,800	6,000	600
31		*Tricodesmium sp.*				600	
Total individual			231,400	672,000	831,000	624,000	517,200
Simpson Index			0.84	0.31	0.22	0.20	0.30

Table 9.1.24 (2) Plankton measure result

Survey date: 14 May 2010

No	Scientific name		Station				
			L1	L2	L3	L4	L5
			6°16'12.90"S– 107°59'29.00"E	6°16'07.60"S– 107°59'48.00"E	6°15'50.90"S– 108°00'07.90"E	6°16'18.41"S– 108°00'15.60"E	6°16'45.00"S– 108°00'06.40"E
Zooplankton and Invertebrate							
1	CILIATA	*Tintinopsis sp.*	600			1,800	600
2	POLYCHAETA	*Grypaea sp.*				600	
3		*Nereis sp.*				600	
4	CRUSTCEA	*Acartia sp.*	1,200	1,800	600	1,200	600
5		*Calanus sp.*				600	600
6		*Centrofages sp.*	1,800		1,200		
7		*Oithona sp.*	600	1,200	1,200	1,200	
8		*Macrostella sp*		600			600
9		*Oncaea sp.*			600		
10		*Lucifer sp.*		1,800	600	600	
11		*Nauplius*	1,200	600	3,000	600	600
12	BIVARVIA	*Anadara sp.*	600	600	1,200		600
13	GASTROPODA	*Atlanta sp.*					600
14	UROCORDATA	*Oikopleura sp.*		600	600	600	600
Total individual			6,000	7,200	9,000	7,800	4,800
Simpson Index			0.80	0.82	0.82	0.86	0.88
Total individual			237,400	679,200	840,000	631,800	522,000
Simpson Index			0.85	0.33	0.23	0.22	0.32

Table 9.1.25 (1) Plankton measure result

Survey date: 23 June 2010

No	Scientific name		Station				
			L1	L2	L3	L4	L5
			6°16'12.90"S–107°59'29.00"E	6°16'07.60"S–107°59'48.00"E	6°15'50.90"S–108°00'07.90"E	6°16'18.41"S–108°00'15.60"E	6°16'45.00"S–108°00'06.40"E
phytoplankton							
1	BACILLARIOPHYCEAE	*Amphora sp.*		300	360		
2		*Bacteriastrum sp.*	2,400	3,480	1,620	6,480	4,800
3		*Chaetoceros affinis*		1,440	420	120	180
4		*Chaetoceros atlanticus*		300	360		120
5		*Climacodium sp.*	300	780	840	720	300
6		*Coscinodiscus sp.*	147,600	16,680	29,760	19,680	20,220
7		*Ditylum sp.*	3,840	2,700	1,500	5,640	7,320
8		*Ethmodiscus sp.*	8,080	2,100	2,820	3,420	1,500
9		*Melosira sp.*	1,620	60	1,200	600	1,200
10		*Nitzschia longisima*		300			
11		*Pleurosigma sp.*	12,360	3,420	2,280	660	1,380
12		*Rhabdonema sp.*	60				720
13		*Rhizosolenia sp.*	4,500	1,500	4,920	2,280	5,220
14		*Thalassionema sp.*	41,600	40,080	36,960	10,020	63,480
15		*Thalassiosira sp.*	300	600	960	10,560	3,960
16		*Thalassiothrix sp.*	1,066,560	70,820	119,160	317,640	431,100
17		*Bacillaria sp.*			360		
18		*Bacteriastrum minus*		1,200	1,620	4,740	5,460
19		*Biddulphia mobiliensis*	300				60
20		*Biddulphia sp.*	600	120	660	1,380	780
21	DINOPHYCEAE	*Ceratium candelabrum*		720			300
22		*Ceratium fusus*		1,080		420	660
23		*Ceratium sp.*		300	360	1,380	3,240
24		*Chaetoceros mitra*			120		60
25		*Chaetoceros sp.*	2,940	7,500	10,200	10,560	40,260
26		*Cocconeis sp.*					60
27		*Coscinodiscus centralis*	360	1,020		60	120
28		*Coscinodiscus kutzingi*	240	720	300		120
29		*Coscinodiscus radiatus*	1,200	2,040	7,620	5,040	7,500
30		*Fragilaria sp.*					60
31		*Glenodinium sp.*	300	540	360	300	
32		*Guinardia sp.*	480	300	180	300	3,360
33		*Halosphaera sp.*	120	720	1,020	300	2,640
34		*Nitzschia pungens*	180		180	300	
35		*Noctiluca sp.*	780	1,200	1,320	660	4,920

No	Scientific name		Station				
			L1	L2	L3	L4	L5
			6°16'12.90"S–107°59'29.00"E	6°16'07.60"S–107°59'48.00"E	6°15'50.90"S–108°00'07.90"E	6°16'18.41"S–108°00'15.60"E	6°16'45.00"S–108°00'06.40"E
36		*Ornithocercus sp.*				180	
37		*Peridinium sp.*	1,200	5,280	51,780	21,240	33,780
38		*Rhizosolenia delicatula*	30,900	2,940	3,120	3,840	3,480
39		*Skeletonema sp.*	60				
40		*Stephanopyxis sp.*	180				
Total individual			1,329,060	170,240	282,360	428,520	648,360
Simpson Index			0.34	0.76	0.76	0.44	0.54

Table 9.1.25 (2) Plankton measure result

Survey date: 23 June 2010

No	Scientific name		Station L1 6°16'12.90"S–107°59'29.00"E	Station L2 6°16'07.60"S–107°59'48.00"E	Station L3 6°15'50.90"S–108°00'07.90"E	Station L4 6°16'18.41"S–108°00'15.60"E	Station L5 6°16'45.00"S–108°00'06.40"E
Zooplankton and Invertebrate							
1	CILIATA	*Tintinnopsis sp.*	480	3,000	660	300	2,700
2		*Favella sp*	300	300			
3	POLYCHAETA	*Nereis sp.*				60	
4	CRUSTCEA	*Oithona sp.*	4,260	1,320	1,500	1,200	3,420
5		*Macrostella sp*					60
6		*Lucifer sp.*	420			180	
7		*Balanus sp.*	2,640	420		1,320	420
8		*Brachionus sp.*	4,200	300	660	300	1,200
9		*Candacia sp.*	300	360			60
10		*Copilia sp.*	300				
11		*Euchaeta sp.*			480	300	
12		*Undinulla sp.*	2,700	3,540	4,920	3,360	7,200
13	FORAMINIFERA	*Globorotalia sp.*		300			
14	MOLLUSCA	*Gryphaea sp.*	300	1,200	300		840
15	ROTATURIA	*Keratella sp.*					300
Total individual			15,900	10,740	8,520	7,020	16,200
Simpson Index			0.80	0.78	0.62	0.70	0.72
Total individual			237,400	679,200	840,000	631,800	522,000
Simpson Index			0.36	0.78	0.78	0.46	0.56

Table9.1.26 Measure result of intertidal biota

No.	Scientific name	Station L6 06°16'47.70"S – 107°59'18.80"E 14 May 2010	Station L6 06°16'47.70"S – 107°59'18.80"E 23 June 2010
1	*Vexilium* sp.	18	-
2	*Turricule* sp.	9	-
3	*Balanus* sp.	9	-
4	*Cantharus* sp.	9	
5	*Pholas* sp.	9	9
6	*Siliqua* sp.	18	9
7	*Codakia* sp.	36	9
8	*Nereis* sp.	-	27
Total individual		108	54
Shannon - Wiener Index		1.79	1.24

iii) Fish

Fishermen tend to go to the open sea using boats, while traditional fishermen are using net and fishing pole on the shore around the estuary. Data of fish catch is shown in Table 9.1.27.

Table 9.1.27 Diversity of fish catch

Scientific name	Local name
Arius maculatus	Jahal, Duri, Gangut
Arius sp.	Sembilang
Carax sp.	Selar
Channa micropeltes	Buhung
Chanos chanos	Bandeng
Clupea sirm Rupp	Tembang
Decapterus russelli	Layang
Doryichthys deokhatoides	Tangkur buaya
Ephinepelus sp	Kerapu lumpur
Helostoma temmincki	Tambakan
Lates sp.	Kakap
Leognatus daura	Petek
Loligo sp	Cumi
Lutjanus sp.	Kakap merah
Megalops cyprinoides	Bulan-bulan
Microphis argulus	Tangkur buaya
Mugil dussumieri	Belanak
Mystus gulio	Keteng, Lundu
Pampus chinesis	Bawal
Panaeous monodon	Udang Windu
Panaeous sp.	Udang Jerbung
Psttodes erumei	Sebelah
Rastreliger branchisoma	Kembung
Rastreliger kanagurta	Kembung Banjar
Sardinella Longiceps	Lemuru
Scatophagus argus	Ketang-ketang
Scomber janeseba	Tenggiri
Scylla seratta	Kepiting bakau
Stolepotud spp.	Teri
Strongylura leiura	Kajang
Terapon theraps	Kerong-kerong
Thunus sp.	Tongkol
Toxotes jaculatrix	Ikan Sumpit
Trichiurus sp	Layur

Source: PLTU IR1-3 EIA report

(2) Transmission line

1) Geophysics-chemistry component

(a) Physiographic-geomorphology

West Java is divided into 4 physiographic zones based on its morphology and tectonic characteristic. The project site and its surroundings belong to the region is classified Jakarta lowland zone. This zone is also known as West Java alluvial plane zone, formed by the lowland of West Java north coast, from Serang to Cirebon. This zone is a width of nearly 40 km, bordered by Java Sea in the north and Bogor zone in the south.

(b) Geology

The stratigraphy of the project site and its surrounding consists of lowland with geological unit. This zone is classified as flood land deposit consisting of tuffaceous clay, silt, and fine sand. This land is comprised of mainly paddy field area. Thickness of deposit reaches 5 m or more from the riverbed. Vicinity of Cikampek consists of silt-tuffaceous and sandy silt. The stratigraphy of proposed transmission line route in Purwakaran district consists of complex of clay, sand clay and so on (Figure 9.1.18).

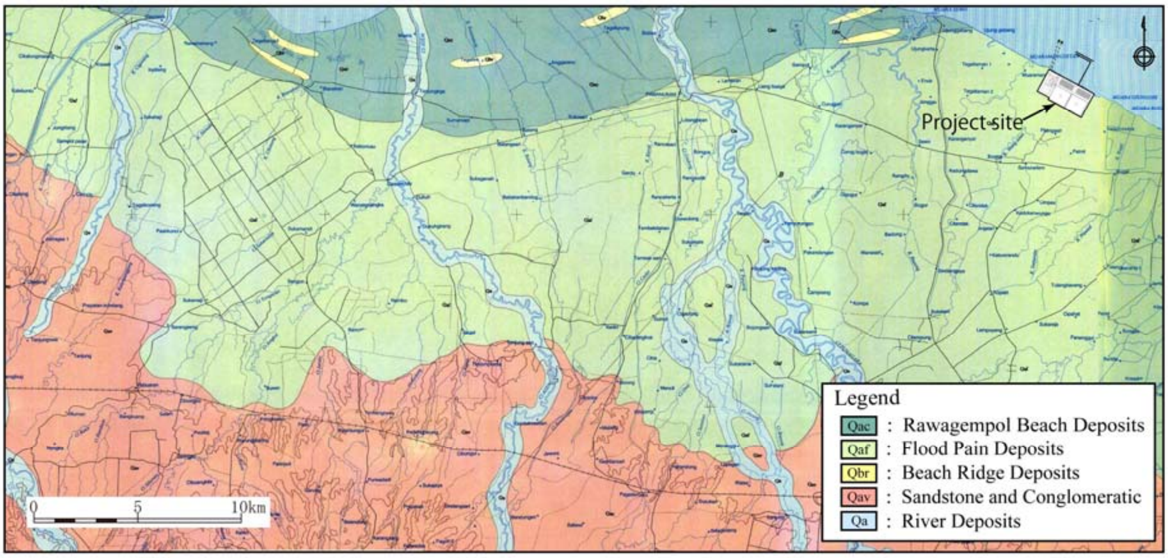


Figure 9.1.18 Geologic map around project site

(c) Geological disaster

<Landslide>

The zone from the project site to Subang district is classified "very low susceptibility to landslide". The zone has rarely or never been subjected to landslides. There are no landmarks, of old or new landslide found in this zone, except for some in small areas on the river sides.
The zone from Subang district to Bekasi district is classified "low or moderate susceptibility to landslide". The zone has low or moderate susceptibility to landslide evidence. Landslides rarely occur unless the slope is disturbed or an old landslide that has been stabilized over time slips again. Small landslides may occur especially on the sides of rivers and gullies (refer to Figure 9.1.9-3).

<Earthquake >

The zone around the project site is classified "moderate earthquake hazard zone". The zone is potentially effected by earthquake shaking with intensity scale IV MMI (modified mercally intensity), there is a potential of occurrence of ground fracturing, liquefaction, landslide on the steeply hills and ground faulting due to a small earthquake source with moderate depth (35 to 90km).

The zone from the project site to Chibatu substation is classified “very low – moderate earthquake hazard zone”. “Low earthquake hazard zone” means as below. The zone is potentially effected by earthquake shaking with intensity scale approximately V MMI (modified mercally intensity). The source of earthquake with shallow depth is rarely occurred. The zone is generally formed by Tertiary deposits. Peak Ground Acceleration (PGA) is potentially around 0.15-0.20G (Figure 9.1.9-3).

(d) Land use

Route of proposed transmission line will traverse five districts (Indramayu, Subang, Purwakarta, Karawang, Bekasi) in West Java Province. The route of the proposed transmission line is planned on mainly cultivation areas which consists of paddy fields, plantation etc (Table 9.1.28). The proposed transmission line route avoids traversing the vicinity of the protected area, residential area, heritages, aesthetic location etc (Table 9.1.29 and Table 9.1.30).

Table 9.1.28 Land use about five districts

Sub Districts	Villages	Land use (ha)						
		Paddy Field	Dry Land	Wet Land	Forestry Land	Plantation Land	Public facility	Other
Sukra	Sumuradem	406.00	276.24	0.00	0.00	17.00	22.00	0.00
	Sukra	356.55	0.00	0.00	0.00	0.00	39.00	0.00
	Sukrawetan	380.00	116.00	25.00	0.00	5.00	42.02	0.00
	Tegaltaman	536.00	280.00	0.00	0.00	0.00	37.00	0.00
	Karang Layung	325.00	100.00	0.00	0.00	0.00	18.64	0.00
	Ujung Gebang	1400.00	30.00	4.00	0.00	2.00	3.00	0.00
Pusaka Jaya	Karanganyar	577.50	208.39	0.00	0.00	14.00	24.45	0.00
	Kebondanas	573.00	95.00	0.00	0.00	0.00	16.80	0.00
	Cigugur Kaler	446.00	61.00	0.00	0.00	1.00	1.00	509.00
	Bojong Jaya	403.00	79.11	0.00	0.00	0.00	1.80	483.91
	Pusaka Jaya	514.00	108.00	0.00	0.00	0.00	12.10	0.00
Pusakanagara	Bojong Tengah	455.00	65.68	0.00	0.00	20.00	13.02	0.00
Tambakdahan	Bojonegara	425.00	100.00	0.00	0.00	300.00	8.27	0.00
	Rancaudik	572.91	45.86	0.00	0.00	0.00	9.76	0.00
	Tambakdahan	578.45	77.66	0.00	0.00	0.00	8.51	0.00
	Kertajaya	574.69	42.09	0.00	0.00	0.00	11.39	0.00
	Mariuk	524.00	74.41	0.00	0.00	12.30	36.20	0.00
	Tanjung Rasa	501.72	132.85	0.00	0.00	10.00	14.50	0.00
Compreng	Jatimulya	816.35	42.55	6.00	0.00	0.00	96.37	0.00
Binong	Wanajaya	350.00	616.00	0.00	0.00	0.00	39.12	0.00
Ciasem	Jatibaru	710.62	68.27	50.00	0.00	0.00	3.14	0.00
	Dukuh	600.00	189.00	65.00	0.00	0.00	42.60	0.00
Patok Beusi	Ranca Asih	360.65	352.69	0.00	0.00	0.00	96.50	0.00
	Rancabango	664.00	236.27	0.00	0.00	0.00	0.00	0.00
	Rancajaya	393.22	16.42	0.00	0.00	0.00	106.27	0.00
	Rancamulya	467.55	97.22	0.00	0.00	15.30	31.20	0.00

Sub Districts	Villages	Land use (ha)						
		Paddy Field	Dry Land	Wet Land	Forestry Land	Plantation Land	Public facility	Other
	Gempolsari	398.00	74.00	0.00	0.00	0.70	5.95	0.00
	Tjg Rasa Kidul	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pabuaran	Pabuaran	868.11	370.76	0.00	0.00	0.00	36.56	0.00
	Siluman	511.09	287.27	0.00	0.00	0.00	24.70	0.00
	Cihambulu	266.00	166.00	0.00	0.00	163.00	7.84	0.00
Campaka	Cijunti	160.80	104.67	0.00	0.00	82.00	32.28	6.52
Bungursari	Karangmukti	226.70	61.00	1.60	0.00	0.30	2.95	0.00
	Cikopo	25.00	174.19	0.00	454.49	65.00	22.42	0.00
	Cinangka	24.00	216.20	8.00	0.00	0.00	2.80	0.00
Cikampek	Kamojing	9.23	438.55	60.00	0.00	6.58	101.84	0.00
	Kalihurip	45.00	64.76	5.00	0.00	7.50	24.32	0.00
Klari	Karanganyar	142.00	154.30	5.00	0.00	1041.00	153.60	0.00
	Cimahi	214.00	414.00	0.00	0.00	0.00	5.90	0.00
	Curug	250.00	68.00	0.00	0.00	152.00	0.00	9.00
Ciampel	Mulyasari	144.00	121.00	35.00	0.00	21.00	3.58	0.00
	Kutanegara	5.91	819.56	0.00	1500.00	0.00	4.42	0.00
	Parungmulya	25.00	1250.00	10.00	2000.00	750.00	19.20	0.00
Teluk Jambe Barat	Margamulya	124.00	75.00	5.00	0.00	0.00	8.49	0.00
	Margakaya	158.00	134.00	0.00	0.00	0.00	41.33	0.00
	Wanakerta	233.16	149.70	0.00	0.00	0.00	0.00	0.00
	Wanajaya	50.00	400.00	0.00	0.00	150.00	1.00	0.00
Teluk Jambe Timur	Puseur Jaya	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Serang Baru	Nagasari	284.00	464.07	0.00	0.00	0.00	53.29	0.00
Cikarang Pusat	Pasir Ranji	450.00	510.00	0.00	0.00	0.00	0.00	0.00
	Sukamahi	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Cicau (GITET)	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Source : Monograph data of Patrol Sub District 2009
Monograph data of Mekarsari village 2009
Monograph data of Sumuradem Timur village 2009
Potential data of Patrol Baru village 2009
Potential data of Sumuradem village 2008
Potential data of Karang Layung village 2008

Table 9.1.29 Outline of heritage

No	Heritage	Remark
Purwakarta District		
1	Bendung Walahar, Purwakarta District	Citarum river dam had been created by the Dutch in colonial times and is using since November,30 1925

Table 9.1.30 Outline of aesthetic landscape

No	Aesthetic Landscape	Remark
Purwakarta District		
①	Wisata Agro Purwakarta	Tourism in Agro Purwakarta has natural tourist attractions such as tea and pineapple plantations. Vegetables and fruits, as well as other agricultural commodities in the area attract tourists. The geographical and geomorphologic conditions of the mountainous area show potentials for developing as an agricultural plateau which can also be an attraction for tourists. There are two tea plantations located in Tambaksari.
②	Waduk Jatiluhur	Jatiluhur Reservoir is located in District of Jatiluhur in Purwakarta Regency (± 9 km from the center of Purwakarta). Jatiluhur Dam is the largest dam in Indonesia. The dam was named by the government Basin Ir. H. Juanda, The panoramic lake covers an area of 8300 ha. The dam was built in 1957 by the French contractor, with potentials for being an affluent water source for 12.9 billion m 3 / year and is the first multipurpose dam in Indonesia.
Bekasi District		
③	Wisata Kuliner Kampung Dua Ratus	Various traditional foods are sold here. but unfortunately only 8 food vendors are doing the business at present.

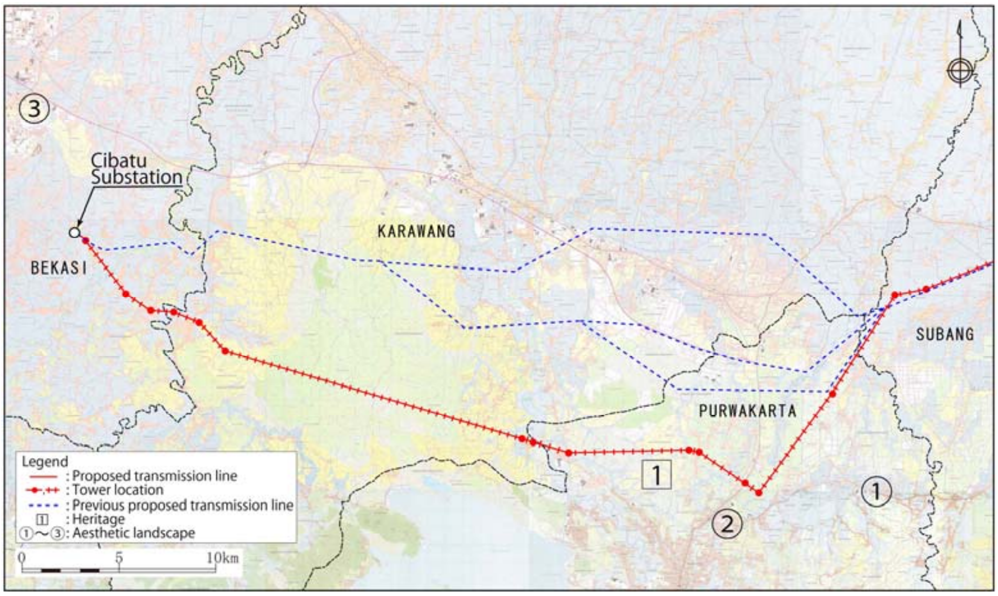


Figure 9.1.19 location map of heritage and aesthetic landscape

2) Biological component

(a) Vegetation condition

The potential decline of plantation or paddy field production quality is estimated from visual observation and comparison with other locations distant from project plant location.
A flora data analysis was conducted with calculation of SDR (Summed Dominance Ratio) method. With this method, dominance of a species is more easily comprehended, while the value is restricted to 100% (Misra, 1968).
Formula used is as follows:

INP = (KR + FR + DR) %

Note:

INP: significant value index of a species
KR : relative density of a species
FR : relative frequency of presence of a plant species
DR : relative coverage dominance of a plant species
SDR = INP/3

Data collected through inventory method is analyzed to obtain species diversity and flora status. Status of vegetation is determined based on Government Regulation No. 7/1999 on Preservation of Vegetation and Animal Species.

Regarding transect locations shown in Figure 9.1.20, the proposed transmission line route avoids forest, waterfront and residential area as much as possible and is constructed in paddy fields, cultivated areas and open fields. Detail on vegetation condition by field survey is described in Table 9.1.31, 32. Table 9.1.31describes the results of the survey carried out during the wet season and Table 9.1.32 describes results of the survey during the dry season.
The transect area for the study is 1000 m length and 10 m width (one plot; 100 m length and 10 m width). When looking at the representative vegetation condition in the area, the vegetation condition confirmed from the survey covers only a minimum landmass for the survey.

i) Within and nearby area of the new power plant site (Indramayu district)

Location of the project site consists of paddy fields with rain harvesting system, and a fish pond. The dominant species are *Oryzae sativa* in the paddy field vegetation. Several species such as *Capsicum fructescens* (local name: Cabe Rawit), *Manihot esculenta* (Singkong), *Lycopersicum licopersicon* (Tomat), Gnetum gnemon (Tangkil), and *Musa parasidiaca* (Cau “Sundanese”/Pisang) exist along in side of the paddy field.

ii) From Indramayu district to Subang district

Vicinity of the proposed transmission line route is mostly paddy field and riparian vegetation is found in the stream near the local cemetery. Based on the result of field survey conducted near the existing transmission line from the PLTU IR1-3, the dominant vegetation of *Hibiscus tiliaceus* (local name: Waru) and *Cordilyn fucticosa* (Hanjuang) were found near the cemetery.
In addition, along the road of the cemetery, *Swietenia mahagoni* (local name: Mahoni) listed as UU No 7 Tahun 1999, endangered species for IUCN, and listed Appendix-II in CITES, *Ficus benjamina* (Beringin) listed as UU No 7 Tahun 1999 were found. However these two species were intentionally planted for greening or cultivation for timber.

iii) Vicinity of Purwakarta district

The proposed transmission line route traverses the paddy field and some agro forestry land in Purwakarta district. Field survey conducted in Wanakerta – Purwakarta showed that the transmission line route is not far from the major road of Purwakarta between the Cibungur sub-district and the Campaka sub-district. And there are railways on the location site, which are used as the major train transportation from Jakarta to the major cities from West Java to East Java provinces.

Major vegetation such as the *Tectona grandis* (local name: Jati) is dominant in agro forestry. *Swietenia mahagoni* (Mhoni) is another dominant tree. The trees and shrub types covering the ground are as follows, *Pennisetum purpureum* (Rumput Gajah) covers the ground and *Lantana camara* (Saliara), *Euphatorium inulifolium* (Kirinyuh), *Clitoria ternate* (Kembang Telang) and *Mimosa pudica* (Putri Malu) ae the shrub types. These plants exist in an ecotone which is a transition zone from low land area to the mountains. There are some rare species found in the area, for example, *Amorphopallus campanulatus* (Suweg) listed as UU No 7 Tahun 1999. This species is abundant in the area, including outside the belt transect.
There are also some agricultural plants such as *Capsicum fructescens* (local name: Cabe Rawit), *Manihot esculenta* (Singkong), *Lycopersicum licopersicon* (Tomat), *Gnetum gnemon* (Tangkil), and *Musa parasidiaca* (Cau “Sundanese”/Pisang). These plants are planted for culinary purpose by the local citizens.

iv) From Karawang district to Bekasi district

Cibatu sub station serves as a main receiver of all transmission line in Bekasi district. And there is a well-known industrial city called “Delta Mas Kota industry” in the district.
One of the transect locations is not variable of vegetation, because of its existence of only open field and several ex paddy field. Only a grass called *Mimosa pudica* (local name: Putri malu) as the shrub type is found in the transect area, and outside of transect agro forestry type is found.
In other area of the transect location near Cibatu sub station, there are two types of major habitat of vegetation in the paddy field and the agro forestry. The dominant species, *Oryzae sativa* as the shrub type, *Imperata cylindrical* (local name: Alang-Alang), *Euphatorium inulifolium* (kirinyuh) and *Lantana camara* (Saliara) are found.
Natural herbs are found in the transect area such as *Cymbopogon nardus* (local name: Sereh), *Curcuma longa* (Kunyit), and *Pandanus amarylifolius* (Pandan). Fruits trees such as *Psidium guajava* (Jambu Batu), *Athocarpus heterophyla* (Nangka) used as medicine or spices are also found in the area.

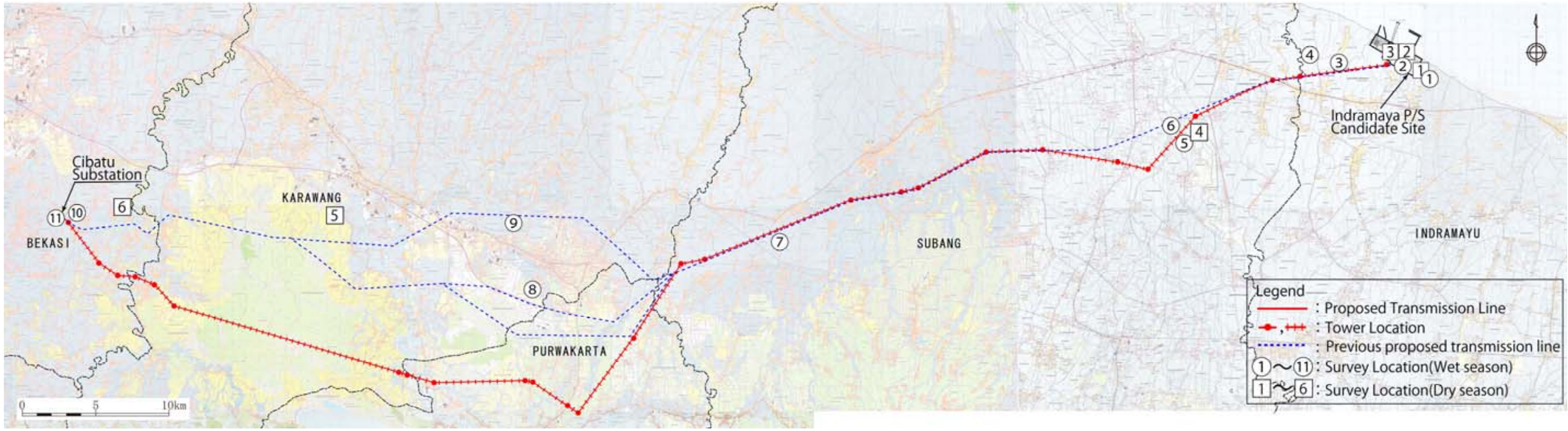


Figure 9.1.20 Survey location (flora)

Table 9.1.31(1) Survey result of terrestrial vegetation by transect method

Location : Patrol Lor (Indramayu District) ; Location 1 as shown in Figure 9.1.20

Survey date : 29 April-4 May 2010

Coordinate : 06^{o} 17' 19.5" S 107^{o} 59' 58.4" E

Topology : Riparian and Coastal Land

No	Local Name	Scientific Name	Result	FR	KR	DR	INP	SDR =INP/3	Type	Status		
										Government law	CITES	IUCN
1	Waru laut	*Thespesia populnea* (L.) Soland. ex Correa	7	12.2	8.0	17.5	37.8	12.6	AP	-	-	-
2	Api-api	*Avicinea marina* (Forsk.) Vierh.	18	7.3	20.7	17.5	45.6	15.2	WP	-	-	-
3	Kangkung laut	*Ipomea pescafre*	12	6.1	13.8	2.9	22.7	7.6	AP	-	-	-
4	Pecut kuda	*Starcythapeta jamaicensis*	11	6.1	12.6	2.9	21.6	7.2	AP	-	-	-
5	Buta-buta	*Excoecaria agallocha L.*	8	8.5	9.2	9.8	27.6	9.2	WP	-	-	-
6	Jeruju	*Acanthus ilicifolius* L.	12	12.2	13.8	9.8	35.8	11.9	AP	-	-	-
7	Katapang	*Terminalia catapa*	7	12.2	8.0	9.8	30.1	10.0	WP	-	-	-
9	Pisang	*Musa parasidiaca*	3	12.2	3.4	15.4	31.0	10.3	AP	-	-	-
12	Mangga	*Mangifera indica*	2	3.7	2.3	2.9	8.8	2.9	AP	-	-	-
13	Kimusa	*Mimmosa invisa*	2	8.5	2.3	2.9	13.7	4.6	AP	-	-	-
14	Turi	*Sesbania grandiflora* Pers	2	3.7	2.3	2.9	8.8	2.9	AP	-	-	-
15	Lamtoro	*Leucaena leucochepala*	2	2.4	2.3	2.9	7.6	2.5	AP	-	-	-
16	Nipah	*Nypa furticans* Wurmb	1	4.9	1.1	2.9	8.9	3.0	AP	-	-	-
TOTAL			87	100	100	100	300	-	-	-	-	-

Note;

WP : Wild Plants

CP : Coastal Plants

AP : Domesticated/Agricultural Plants

SP : Shade Plants

DP : Decorative Plants

Table 9.1.31(2) Survey result of terrestrial vegetation by transect method

Location : Mekarsari 1 (Indramayu District) ; Location 2 as shown in Figure9.1.20

Survey date : 29 April-4 May 2010

Coordinate : 06° 16' 68.2" S 107° 59' 17.8" E

Topology : Fish Pond Land

No	Local Name	Scientific Name	Result	FR	KR	DR	INP	SDR =INP/3	Type	Status		
										Government law	CITES	IUCN
1	Lamtoro	*Leucaena leucocephala* (Lam.) de Wit	2	11.0	4.7	23.3	38.9	13.0	AP	-	-	-
2	Kihujan	*Samanea saman* (Jacq.) Merr.	3	6.6	7.0	3.8	17.4	5.8	DP	-	-	-
3	Pisang	*Musa parasidiaca* Linn.	4	5.5	9.3	3.8	18.6	6.2	AP	-	-	-
4	kersen/talo	*Muntingia carabola* L.	3	5.5	7.0	3.8	16.3	5.4	DP	-	-	-
5	Sidagori	*Sida rhombifolia* L.	4	7.7	9.3	3.8	20.8	6.9	WP	-	-	-
6	Talas	*Xanthosoma sagittifolium* (L.) H.W. Schott & Endl.	2	11.0	4.7	13.1	28.7	9.6	WP	-	-	-
7	Kangkung Laut	*Ipomea maxima* (L.f.) Don ex Sweet	3	11.0	7.0	13.1	31.0	10.3	WP	-	-	-
8	Ki Musa	*Mimosa invisa* Mar.	3	7.7	7.0	3.8	18.5	6.2	WP	-	-	-
9	Putri malu	*Mimosa pudica* Duchass. & Walp	2	11.0	4.7	20.4	36.0	12.0	WP	-	-	-
10	Pecut Kuda	*Stracchytarpheta jamaicensis* (L.) Vahl	2	8.8	4.7	3.8	17.2	5.7	WP	-	-	-
11	Rumput gajah	*Pennisetum purpureum* Schumacher	4	11.0	9.3	3.8	24.1	8.0	WP	-	-	-
12	Teki	*Cyperus brevifolius* (Rottb) Endl. Ex Hassk	11	3.3	25.6	3.8	32.7	10.9	WP	-	-	-
TOTAL			43	100	100	100	300	100	-	-	-	-

Note;

+++ : Found in large numbers

WP : Wild Plants

CP : Coastal Plants

AP : Domesticated/Agricultural Plants

SP : Shade Plants

DP : Decorative Plants

Table 9.1.31(3) Survey result of terrestrial vegetation by transect method

Location : Sukra 1 (Indramayu District) ; Location 3 as shown in Figure 9.1.20

Survey date : 29 April-4 May 2010

Coordinate : 06^{o} 16' 58.8 S " 107^{o} 56' 16.3" E

Topology : Paddy Field

No	Local Name	Scientific Name	Result	FR	KR	DR	INP	SDR =INP/3	Type	Status		
										Government law	CITES	IUCN
1	Padi	*Oryza sativa* L.	***	***	***	***	***	***	AP	-	-	-
2	Seladah	*Lactuca sativa* L.	13	4.6	6.9	3.0	14.5	4.8	WP	-	-	-
3	Orang-aring	*Tridax procumbens* L.	6	3.8	3.2	3.0	10.0	3.3	AP	-	-	-
4	Pisang	*Musa parasidiaca* Linn.	9	3.8	4.8	3.0	11.6	3.9	AP	-	-	-
5	Labu	*Sechium edule* (Jacq.) Sw.	11	5.3	5.9	3.0	14.1	4.7	WP	-	-	-
6	Kunyit	*Curcuma longa* L.	10	7.6	5.3	10.2	23.1	7.7	AP	-	-	-
7	Rumput	*Pennisetum purpureum* Schumacher	***	***	***	***	***	***	WP	-	-	-
8	Mangga	*Mangifera indica* L.	5	5.3	2.7	3.0	11.0	3.7	WP	-	-	-
9	Kacang Panjang	*Vigna sinensis* (L.) Savi Ex Has	15	7.6	8.0	15.9	31.5	10.5	AP	-	-	-
10	Kelapa	*Cocos nucifera* L.	5	6.1	2.7	3.0	11.7	3.9	AP	-	-	-
11	Jahe	*Zingiber officinale* Rosc.	18	7.6	9.6	3.0	20.2	6.7	WP	-	-	-
12	Cabe rawit	*Capsicum fructescens* L.	13	2.3	6.9	3.0	12.2	4.1	AP	-	-	-
13	Nangka	*Artocarpus heterophyllus* Lam	6	5.3	3.2	3.0	11.5	3.8	AP	-	-	-
14	Sukun	*Arthocarpus communis* Forst	6	2.3	3.2	3.0	8.4	2.8	AP	-	-	-
15	Lamtoro	*Leucaena leucocephala* (Lam.) de Wit	4	1.5	2.1	3.0	6.6	2.2	AP	-	-	-
16	Cerama Angin	*Casuarina equisetifolia* L.	6	3.1	3.2	3.0	9.2	3.1	AP	-	-	-
17	Bayem	*Amaranthus spinosus*L.	11	2.3	5.9	11.8	20.0	6.7	WP	-	-	-
18	Bawang beureum	*Alium cepa* var. *aggregatum* L.	15	1.5	8.0	3.0	12.5	4.2	AP	-	-	-
19	Kihujan	*Samanea saman* (Jacq.) Merr.	4	3.8	2.1	3.0	8.9	3.0	AP	-	-	-
20	Sirsak	*Annona muricata* L.	3	7.6	1.6	3.0	12.2	4.1	WP	-	-	-
21	Pepaya	*Carica papaya* L.	4	6.9	2.1	3.0	12.0	4.0	AP	-	-	-

Location : Sukra 1 (Indramayu District) ; Location 3 as shown in Figure 9.1.20
Survey date : 29 April-4 May 2010
Coordinate : 06° 16' 58.8 S " 107 ° 56' 16.3" E
Topology : Paddy Field

No	Local Name	Scientific Name	Result	FR	KR	DR	INP	SDR =INP/3	Type	Status		
										Government law	CITES	IUCN
22	Sereh	*Cymbopogon citratus* (DC.) Stapf	8	6.1	4.3	3.0	13.3	4.4	AP	-	-	-
23	Jambu Batu	*Psidium guajava* L.	2	1.5	1.1	3.0	5.5	1.8	AP	-	-	-
24	Tisuk	*Hibiscus macrophylus* Roxb. ex Hornem	6	1.5	3.2	3.0	7.7	2.6	AP	-	-	-
25	Peuteuy	*Parkia speciosa* Hassk	3	0.8	1.6	3.0	5.3	1.8	WP	-	-	-
26	Singkong	*Manihot esculenta* Crantz	5	1.5	2.7	3.0	7.1	2.4	AP	-	-	-
27	Jati	*Tectona grandis* L.f.	5	1.5	2.7	10.3	14.5	4.8	AP	-	-	-
28	Waru	*Hibiscus tiliaceus L.*	1	1.5	0.5	17.7	19.8	6.6	DP	-	-	-
29	Katapang	*Terminalia catapa* L	2	1.5	1.1	25.1	27.7	9.2	DP	-	-	-
TOTAL			196	100	100	100	300	100	-	-	-	-

Note;

+++ : Found in large numbers
WP : Wild Plants
CP : Coastal Plants
AP : Domesticated/Agricultural Plants
SP : Shade Plants
DP : Decorative Plants

Table 9.1.31(4) Survey result of terrestrial vegetation by transect method

Location : Sukra 2 (Indramayu District) ; Location 4 as shown in Figure 9.1.20
Survey date : 29 April-4 May 2010
Coordinate : S 06^{o} 26'26.2" E 107^{o} 28'29.4"
Topology : Paddy Field

No	Local Name	Scientific Name	Result	FR	KR	DR	INP	SDR =INP/3	Type	Status		
										Government law	CITES	IUCN
1	Padi	*Oryza sativa* L.	***	***	***	***	***	***	AP	-	-	-
2	Seladah	*Lactuca sativa* L.	12	4.6	6.6	3.0	14.2	4.7	WP	-	-	-
3	Orang-aring	*Tridax procumbens* L.	6	3.8	3.3	3.0	10.1	3.4	AP	-	-	-
4	Pisang	*Musa parasidiaca* Linn.	7	3.8	3.9	3.0	10.6	3.5	AP	-	-	-
5	Labu	*Sechium edule* (Jacq.) Sw.	10	5.3	5.5	3.0	13.8	4.6	WP	-	-	-
6	Kunyit	*Curcuma longa* L.	7	7.6	3.9	10.2	21.7	7.2	AP	-	-	-
7	Rumput	*Pennisetum purpureum* Schumacher	***	***	***	***	***	***	WP	-	-	-
8	Mangga	*Mangifera indica* L.	5	5.3	2.8	3.0	11.1	3.7	WP	-	-	-
9	Kacang Panjang	*Vigna sinensis* (L.) Savi Ex Has	15	7.6	8.3	15.9	31.8	10.6	AP	-	-	-
10	Kelapa	*Cocos nucifera* L.	5	6.1	2.8	3.0	11.8	3.9	AP	-	-	-
11	Jahe	*Zingiber officinale* Rosc.	13	7.6	7.2	3.0	17.8	5.9	WP	-	-	-
12	Cabe rawit	*Capsicum fructescens* L.	13	2.3	7.2	3.0	12.4	4.1	AP	-	-	-
13	Nangka	*Artocarpus heterophyllus* Lam	6	5.3	3.3	3.0	11.6	3.9	AP	-	-	-
14	Sukun	*Arthocarpus communis* Forst	6	2.3	3.3	3.0	8.6	2.9	AP	-	-	-
15	Lamtoro	*Leucaena leucocephala* (Lam.) de Wit	4	1.5	2.2	3.0	6.7	2.2	AP	-	-	-
16	Cerama Angin	*Casuarina equisetifolia* L.	6	3.1	3.3	3.0	9.3	3.1	AP	-	-	-
17	Bayem	*Amaranthus spinosus*L.	11	2.3	6.1	11.8	20.2	6.7	WP	-	-	-
18	Bawang beureum	*Alium cepa var. aggregatum* L.	20	1.5	11.0	3.0	15.5	5.2	AP	-	-	-
19	Kihujan	*Samanea saman* (Jacq.) Merr.	4	3.8	2.2	3.0	9.0	3.0	AP	-	-	-
20	Sirsak	*Annona muricata* L.	3	7.6	1.7	3.0	12.2	4.1	WP	-	-	-
21	Pepaya	*Carica papaya* L.	4	6.9	2.2	3.0	12.0	4.0	AP	-	-	-

Location : Sukra 2 (Indramayu District) ; Location 4 as shown in Figure 9.1.20
Survey date : 29 April-4 May 2010
Coordinate : S 06° 26'26.2" E 107° 28'29.4"
Topology : Paddy Field

No	Local Name	Scientific Name	Result	FR	KR	DR	INP	SDR =INP/3	Type	Status		
										Government law	CITES	IUCN
22	Sereh	*Cymbopogon citratus* (DC.) Stapf	8	6.1	4.4	3.0	13.5	4.5	AP	-	-	-
23	Jambu Batu	*Psidium guajava* L.	2	1.5	1.1	3.0	5.6	1.9	AP	-	-	-
24	Tisuk	*Hibiscus macrophylus* Roxb. ex Hornem	6	1.5	3.3	3.0	7.8	2.6	AP	-	-	-
25	Peuteuy	*Parkia speciosa* Hassk	3	0.8	1.7	3.0	5.4	1.8	WP	-	-	-
26	Singkong	*Manihot esculenta* Crantz	5	1.5	2.8	3.0	7.2	2.4	AP	-	-	-
27	Jati	*Tectona grandis* L.f.	5	1.5	2.8	10.3	14.6	4.9	AP	-	-	-
28	Waru	*Hibiscus tiliaceus L.*	1	1.5	0.6	17.7	19.8	6.6	DP	-	-	-
29	Katapang	*Terminalia catapa* L	2	1.5	1.1	25.1	27.8	9.3	DP	-	-	-
TOTAL			189	100	100	100	300	-	-	-	-	-

Note;

+++ : Found in large numbers
WP : Wild Plants
CP : Coastal Plants
AP : Domesticated/Agricultural Plants
SP : Shade Plants
DP : Decorative Plants

Table 9.1.31(5) Survey result of terrestrial vegetation by transect method

Location : Bojong Tengah (Subang District) ; Location 5 as shown in Figure 9.1.20

Survey date : 29 April-4 May 2010

Coordinate : S 06^{o} 19'55.3" E 107^{o} 52'2.3"

Topology : Agro Forestry and Paddy Field

No	Local Name	Scientific Name	Result	FR	KR	DR	INP	SDR =INP/3	Type	Status		
										Government law	CITES	IUCN
1	Mangga	*Mangifera indica* L.	30	8.5	13.2	5.7	27.4	9.1	AP	-	-	-
2	Pisang	*Musa parasidiaca* Linn.	20	8.5	8.8	6.8	24.0	8.0	AP	-	-	-
3	Jagung	*Zea mays* L.	20	8.5	8.8	6.8	24.0	8.0	AP	-	-	-
4	Mahoni	*Swietenia mahagoni* (L.) Jacq.	17	8.5	7.5	11.1	27.0	9.0	AP	UU No 7 Tahun 1999	Appendix II	Endangered
5	Pete Cina	*Leucaena leucocephala* (Lam.) de Wit	11	8.5	4.8	5.2	18.5	6.2	AP	-	-	-
6	Palem	*Palmae* sp.	8	4.2	3.5	5.0	12.8	4.3	DP	-	-	-
7	Beringin	*Ficus benjamina* L.	9	5.9	3.9	9.2	19.1	6.4	DP	-	-	-
8	Genjer	*Monocharia vaginalis* (Burm.F.) Presi	15	1.7	6.6	2.3	10.6	3.5	AP	-	-	-
9	Taleus	*Colocasia* sp.	7	1.7	3.1	2.3	7.1	2.4	AP	-	-	-
10	Gempol	*Nauclea orientalis* L.	9	2.5	3.9	5.7	12.2	4.1	AP	-	-	-
11	Jongjing	*Albazia falcatoria* (L) Fosberg	9	2.5	3.9	4.8	11.2	3.7	AP	-	-	-
12	Renghas	*Gluta renghas* L.	7	1.7	3.1	5.1	9.8	3.3	DP	-	-	-
13	Sirsak	*Annona muricata* L.	11	8.5	4.8	5.1	18.4	6.1	AP	-	-	-
14	Kedondong	*Spondias dulcis* Forst.	11	8.5	4.8	5.2	18.5	6.2	AP	-	-	-
15	Salam	*Syzygium polyanthum* (Wight) Walpers	6	2.5	2.6	3.7	8.8	2.9	AP	-	-	-
16	Tisuk	*Hibiscus macrophylus* Roxb. ex Hornem	4	2.5	1.8	1.9	6.2	2.1	WP	-		-
17	Ki Hiyang	*Albizia procera* (Roxb.) Benth	2	2.5	0.9	5.7	9.2	3.1	AP	-	-	-
18	Terong	*Solanum melongena* L.	11	2.5	4.8	1.9	9.2	3.1	AP	-	-	-
19	Padi	*Oryzae sativa* L.	***	***	***	***	***	***	AP	-	-	-
20	Babadotan	*Ageratum conyzoides* L.	12	8.5	5.3	2.3	16.1	5.4	WP	-	-	-

Location : Bojong Tengah (Subang District) ; Location 5 as shown in Figure 9.1.20

Survey date : 29 April-4 May 2010

Coordinate : S 06^{o} 19'55.3" E 107^{o} 52'2.3"

Topology : Agro Forestry and Paddy Field

No	Local Name	Scientific Name	Result	FR	KR	DR	INP	SDR =INP/3	Type	Status		
										Government law	CITES	IUCN
21	Sukun	*Arthocarpus communis* Forst	9	1.7	3.9	4.2	9.8	3.3	AP	-	-	-
TOTAL			228	100	100	100	300	100	-	-	-	-

Note;

+++ : Found in large numbers

WP : Wild Plants

CP : Coastal Plants

AP : Domesticated/Agricultural Plants

SP : Shade Plants

DP : Decorative Plants

Table 9.1.31(6) Survey result of terrestrial vegetation by transect method

Location : Pusaka Jaya (Subang District) ; Location 6 as shown in Figure 9.1.20

Survey date : 29 April-4 May 2010

Coordinate : S 06^{o} 19'55.3" E 107^{o} 52'2.3"

Topology : Agro Forestry and Paddy Field

No	Local Name	Scientific Name	Result	FR	KR	DR	INP	SDR =INP/3	Type	Status		
										Government law	CITES	IUCN
1	Mangga	*Mangifera indica L.*	20	7.9	10.6	3.3	21.8	7.3	AP	-	-	-
2	Pisang	*Musa parasidiaca* Linn.	21	4.7	11.1	9.5	25.3	8.4	AP	-	-	-
3	Singkong	*Manihot esculenta* Crantz	15	4.7	7.9	9.5	22.2	7.4	AP	-	-	-
4	Wedellia	*Widellia triloba* (L.) Hitchc	8	7.9	4.2	9.5	21.6	7.2	WP	-	-	-
5	Cingcau	*Premna oblongifolia* Merr.	5	2.4	2.6	9.5	14.5	4.8	Ap	-	-	-
6	Melinjo	*Gnetum gnemon* L.	7	4.7	3.7	2.4	10.8	3.6	AP	-	-	-
7	Pecut Kuda	*Stracchytarpheta jamaicensis* (L.) Vahl	11	7.9	5.8	8.2	21.9	7.3	WP	-	-	-
8	Singkong Karet	*Ipomea reptana* Roem.	17	7.9	9.0	3.4	20.3	6.8	AP	-	-	-
9	Kangkung Darat	*Manihot glaziovii* M.A.	3	1.6	1.6	3.4	6.5	2.2	AP	-	-	-
10	Padi	*Oryzae sativa* L.	***	***	***	***	***	***	AP	-	-	-
11	Babadotan	*Ageratum conyzoides* L.	11	7.9	5.8	3.4	17.1	5.7	WP	-	-	-
12	Areuy Patuk Manuk	*Thunbergia alata* Bojer ex Sims	5	3.9	2.6	3.4	10.0	3.3	WP	-	-	-
13	Eceng	*Monocharia vaginalis* (Burm.F.) Presi	8	3.9	4.2	3.4	11.6	3.9	AP	-	-	-
14	Taleus Belitung	*Xanthosoma sagittifolium* (L.) H.W. Schott & Endl.	4	2.4	2.1	3.4	7.9	2.6	AP	-	-	-
15	Lopang	*Momordica balsamina* L.	3	0.8	1.6	3.4	5.8	1.9	AP	-	-	-
16	Baret	*Mimosa invisa* Mar.	4	3.1	2.1	3.4	8.7	2.9	WP	-	-	-
17	Jarak	*Jatropa curcas* L.	13	7.9	6.9	4.1	18.8	6.3	AP	-		-
18	Jahe	*Zingiber officinale* Rosc.	4	3.1	2.1	3.4	8.7	2.9	AP	-	-	-
19	Orang-aring	*Tridax procumbens* L.	7	3.9	3.7	3.4	11.0	3.7	AP	-	-	-
20	Rumput	*Pennisetum purpureum* Schumacher	***	***	***	***	***	***	WP	-	-	-

Location : Pusaka Jaya (Subang District) ; Location 6 as shown in Figure 9.1.20
Survey date : 29 April-4 May 2010
Coordinate : S 06° 19'55.3" E 107° 52'2.3"
Topology : Agro Forestry and Paddy Field

No	Local Name	Scientific Name	Result	FR	KR	DR	INP	SDR =INP/3	Type	Status		
										Government law	CITES	IUCN
21	Teki	*Cyperus brevifolius* (Rottb) Endl. ex Hassk	***	***	***	***	***	***	WP	-	-	-
22	Kunyit	*Curcuma domestica* L.	11	7.9	5.8	3.4	17.1	5.7	AP	-	-	-
23	Pacing	*Costus megalobrachtea* K. Schum	9	3.9	4.8	3.4	12.1	4.0	DP	-	-	-
24	Salentrong	*Vernonia cinerea* L.	3	1.6	1.6	3.4	6.5	2.2	WP	-	-	-
TOTAL			189	100	100	100	300	100	-	-	-	-

Note;

+++ : Found in large numbers
WP : Wild Plants
CP : Coastal Plants
AP : Domesticated/Agricultural Plants
SP : Shade Plants
DP : Decorative Plants

Table 9.1.31(7) Survey result of terrestrial vegetation by transect method

Location : Patokbeusi (Subang District) ; Location 7 as shown in Figure 9.1.20

Survey date : 29 April-4 May 2010

Coordinate : S 06° 23'14.6" E 107 ° 35'52.7"

Topology : Paddy Field

No	Local Name	Scientific Name	Result	FR	KR	DR	INP	SDR =INP/3	Type	Status		
										Government law	CITES	IUCN
1	Padi	*Oryza sativa* L.	***	***	***	***	***	***	AP	-	-	-
2	Kangkung	*Ipomoea aquatica* Forsk.	4	4.0	2.6	6.0	12.7	4.2	AP	-	-	-
3	Singkong Karet	*Manihot glaziovii* M.A.	6	4.0	4.0	1.1	9.1	3.0	AP	-	-	-
4	Mahoni	*Swietenia mahagoni* (L.) Jacq.	40	10.0	26.5	11.4	47.9	16.0	AP	UU No 7 Tahun 1999	Appendix II	Endangered
5	Randu	*Ceiba petandra* L. Gaertn	8	7.0	5.3	1.1	13.4	4.5	AP	-	-	-
6	Putri Malu	*Mimosa pudica* Duchass. & Walp	9	10.0	6.0	6.8	22.8	7.6	WP	-	-	-
7	Pisang	*Musa parasidiaca* Linn.	10	10.0	6.6	1.7	18.3	6.1	AP	-	-	-
8	Ki Musa	*Mimosa invisa* Mar.	5	4.0	3.3	6.8	14.1	4.7	WP	-	-	-
9	Pepaya	*Carica papaya* L.	7	6.0	4.6	6.8	17.4	5.8	AP	-	-	-
10	Jati	*Tectona grandis* L.	8	6.0	5.3	5.2	16.5	5.5	AP	-	-	-
11	Tebu	*Saccharum officinarum* L.	7	5.0	4.6	1.1	10.7	3.6	AP	-	-	-
12	Angsana	*Pterocarpus indicus* Willd.	6	4.0	4.0	1.1	9.1	3.0	DP	-	-	-
13	Alang-alang	*Imperata cylindrica* (L.) Beauv	**	**	**	**	**	**	WP	-	-	-
14	Lamtoro	*Leucaena leucocephala* (Lam.) de Wit	2	1.0	1.3	4.2	6.5	2.2	AP	-	-	-
15	Kelapa	*Cocos nucifera* L.	7	4.0	4.6	4.2	12.8	4.3	AP	-	-	-
16	Hanjuang	*Cordyline fruticosa* (L.) A.Chev.	2	1.0	1.3	6.8	9.1	3.0	AP	-	-	-
17	Waru	*Hibiscus tiliaceus L.*	5	3.0	3.3	4.2	10.5	3.5	DP	-	-	-
18	Mangga	*Mangifera indica* L.	9	8.0	6.0	4.2	18.1	6.0	AP	-	-	-
19	Bintaro	*Cerbera manghas* L.	1	1.0	0.7	0.1	1.8	0.6	AP	-	-	-
20	Orang aring	*Tridax procumbens* L.	8	7.0	5.3	6.8	19.1	6.4	AP	-	-	-

Location : Patokbeusi (Subang District) ; Location 7 as shown in Figure 9.1.20
Survey date : 29 April-4 May 2010
Coordinate : S 06^o 23'14.6" E 107^o 35'52.7"
Topology : Paddy Field

No	Local Name	Scientific Name	Result	FR	KR	DR	INP	SDR =INP/3	Type	Status		
										Government law	CITES	IUCN
21	Kangkung Darat	*Ipomea reptana* Roem.	2	1.0	1.3	6.8	9.1	3.0	WP	-	-	-
22	Kirinyuh	*Euphatorium inulifolium* Kunth.	4	3.0	2.6	6.8	12.5	4.2	WP	-	-	-
23	Bayam	*Amaranthus spinosus*L.	1	1.0	0.7	6.8	8.5	2.8	AP	-	-	-
TOTAL			151	100	100	100	300	100	-	-	-	-

Note;

++ : Found in sufficient number
+++ : Found in large numbers
WP : Wild Plants
CP : Coastal Plants
AP : Domesticated/Agricultural Plants
SP : Shade Plants
DP : Decorative Plants

Table 9.1.31(8) Survey result of terrestrial vegetation by transect method

Location : Wanakerta (Purwakarta District) ; Location 8 as shown in Figure 9.1.20

Survey date : 29 April-4 May 2010

Coordinate : S 06^{o} 26'26.2" E 107^{o} 28'49.4"

Topology : Agro Forestry land

No	Local Name	Scientific Name	Result	FR	KR	DR	INP	SDR =INP/3	Type	Status		
										Government law	CITES	IUCN
1	Jati	*Tectona grandis* L.f.	40	7.1	15.7	15.4	38.2	12.7	AP	-	-	-
2	Gulma Tusuk Konde	*Widellia triloba* (L.) Hitchc	13	4.3	5.1	2.5	11.9	4.0	WP	-	-	-
3	Sidagori	*Sida rhombifolia* L.	12	3.5	4.7	2.5	10.8	3.6	AP	-	-	-
4	Orang-aring	*Tridax procumbens* L.	5	3.5	2.0	2.5	8.0	2.7	AP	-	-	-
5	Putri malu	*Mimosa pudica* Duchass. & Walp	13	5.0	5.1	2.5	12.6	4.2	WP	-	-	-
6	Pisang	*Musa parasidiaca* Linn.	12	7.1	4.7	8.6	20.4	6.8	AP	-	-	-
7	Rumput gajah	*Pennisetum purpureum* Schumacher	***	***	***	***	***	***	WP	-	-	-
8	Saliara	*Lantana camara* L.	15	5.0	5.9	2.5	13.4	4.5	WP	-	-	-
9	Mahoni	*Swietenia mahagoni* (L.) Jacq.	27	7.1	10.6	13.5	31.2	10.4	AP	UU No 7 Tahun 1999	Appendix II	Endangered
10	Singkong	*Manihot esculenta* Crantz	11	5.7	4.3	2.5	12.5	4.2	AP	-	-	-
11	Tongkeng	*Telosma chordata* (Burm. f.) Merr.	12	7.1	4.7	2.5	14.3	4.8	WP	-	-	-
12	Akasia	*Acacia mangium* Willd.	8	2.1	3.1	2.5	7.8	2.6	AP	-	-	-
13	Kelor	*Moringa oleivera* Lam	8	5.0	3.1	2.5	10.6	3.5	AP	-	-	-
14	Tomat	*Lycopersicum licopersicon* L.	9	2.1	3.5	2.5	8.2	2.7	AP	-	-	-
15	Rosela	*Hibiscus sabdariffa* L.	7	1.4	2.8	2.5	6.7	2.2	AP	-	-	-
16	Cabe rawit	*Capsicum fructescens* L.	9	2.8	3.5	2.5	8.9	3.0	AP	-	-	-
17	Suweg	*Amorphopallus campanulatus* Bl.	3	2.1	1.2	10.0	13.3	4.4	WP	UU No 7 Tahun 1999		
18	Pepaya	*Carica papaya* L.	2	1.4	0.8	2.5	4.7	1.6	AP	-	-	-
19	Kembang Telang	*Clitoria ternata* L.	5	3.5	2.0	2.5	8.0	2.7	AP	-	-	-

Location : Wanakerta (Purwakarta District) ; Location 8 as shown in Figure 9.1.20
Survey date : 29 April-4 May 2010
Coordinate : S 06° 26'26.2" E 107° 28'49.4"
Topology : Agro Forestry land

No	Local Name	Scientific Name	Result	FR	KR	DR	INP	SDR =INP/3	Type	Status		
										Government law	CITES	IUCN
20	Kirinyuh	*Euphatorium inulifolium* Kunth.	11	7.1	4.3	2.5	13.9	4.6	WP	-	-	-
21	Melinjo	*Gnetum gnemon* L.	9	6.4	3.5	2.5	12.4	4.1	AP	-	-	-
22	Glodogan	*Polyathia longifolia* Sonn.	8	5.7	3.1	2.5	11.3	3.8	AP	-	-	-
23	Jati walanda	*Guazuma ulmifolia* Lamk.	2	1.4	0.8	2.5	4.7	1.6	AP	-	-	-
24	Mangga	*Mangifera indica* L.	4	1.4	1.6	2.5	5.5	1.8	AP	-	-	-
25	Paku hata	*Lygodium circinatum* (Burm.) Sw	2	0.7	0.8	2.5	4.0	1.3	WP	-	-	-
26	Randu	*Ceiba petandra* L. Gaertn	7	1.4	2.8	2.5	6.7	2.2	AP	-	-	-
TOTAL			254	100	100	100	300	100	-	-	-	-

Note;

+++ : Found in large numbers
WP : Wild Plants
CP : Coastal Plants
AP : Domesticated/Agricultural Plants
SP : Shade Plants
DP : Decorative Plants

Table 9.1.31(9) Survey result of terrestrial vegetation by transect method

Location : Sukamahi (Karawang District) ; Location 9 as shown in Figure 9.1. 20

Survey date : 29 April-4 May 2010

Coordinate : S 06^{o} 23'1.8" E 107^{o} 10'17.5"

Topology : Shrub and ex-paddy Field

No	Local Name	Scientific Name	Result	FR	KR	DR	INP	SDR =INP/3	Type	Status		
										Government law	CITES	IUCN
1	Waru	*Hibiscus tiliaceus L.*	3	25.0	23.1	13.9	62.0	20.7	DP	-	-	-
2	Bustru	*Luffa cylindrica* Roem.	5	33.3	38.5	43.1	114.9	38.3	WP	-	-	-
3	Rumput gajah	*Pennisetum purpureum* Schumacher	***	***	***	***	***	***	WP	-	-	-
4	Putri malu	*Mimosa pudica* Duchass & Walp	5	41.7	38.5	43.1	123.2	41.1	WP	-	-	-
TOTAL			13	100	100	100	300	100	-	-	-	-

Note;

+++ : Found in large numbers

WP : Wild Plants

CP : Coastal Plants

AP : Domesticated/Agricultural Plants

SP : Shade Plants

DP : Decorative Plants

Table 9.1.31(10) Survey result of terrestrial vegetation by transect method

Location : Cibatu / Deltamas (Bekasi District) ; Location 10 as shown in Figure 9.1.20

Survey date : 29 April-4 May 2010

Coordinate : S 06^o 22'48.7" E 107^o 9'43.4"

Topology : Agro Forestry and Paddy Field

No	Local Name	Scientific Name	Result	FR	KR	DR	INP	SDR =INP/3	Type	Status		
										Government law	CITES	IUCN
1	Belustru	*Luffa cylindrica* Roem.	8	7.4	3.7	18.6	29.7	9.9	WP	-	-	-
2	Putri Malu	*Mimosa pudica* Duchass. & Walp	10	4.4	4.7	2.2	11.3	3.8	WP	-	-	-
3	Kirinyuh	*Euphatorium inulifolium* Kunth.	12	3.7	5.6	2.2	11.5	3.8	WP	-	-	-
4	Harendong	*Melastoma* sp.	5	3.7	2.3	2.2	8.2	2.7	WP	-	-	-
5	Kangkung darat	*Ipomea reptana* Roem.	13	5.1	6.0	2.2	13.4	4.5	AP	-	-	-
6	Alang-alang	*Imperata cylindrica* (L.) Beauv	***	***	***	***	***	***	WP	-	-	-
7	Pulus Hayam	*Laportea* sp.	8	3.7	3.7	3.3	10.7	3.6	WP	-	-	-
8	Sidagori	*Sida rhombifolia L.*	15	5.1	7.0	2.2	14.3	4.8	WP	-	-	-
9	Takokak	*Solanum torvum* Swartz.	27	7.4	12.6	11.8	31.7	10.6	AP	-	-	-
10	Babandotan	*Ageratum conyzoides* L.	11	5.9	5.1	2.2	13.2	4.4	WP	-	-	-
11	Nangka	*Artocarpus heterophyllus* Lam	12	7.4	5.6	6.8	19.7	6.6	AP	-	-	-
12	Akasia	*Acacia mangium* Willd.	8	2.2	3.7	2.2	8.1	2.7	AP	-	-	-
13	Taleus	*Colocasia gigantia* (Blume.) Hook f.	8	5.1	3.7	2.2	11.1	3.7	AP	-	-	-
14	Padi	*Oryza sativa* L.	9	2.2	4.2	2.2	8.6	2.9	AP	-	-	-
15	Saliara	*Lantana camara* L.	7	1.5	3.3	4.2	8.9	3.0	WP	-	-	-
16	Pare	*Momordica vaginalis* (Burm. F.) Presi	9	2.9	4.2	2.2	9.3	3.1	AP	-	-	-
17	Pisang	*Musa parasidiaca* Linn.	3	2.2	1.4	8.8	12.4	4.1	AP	-	-	-
18	Salentrong	*Vernonia cinerea* L.	2	1.5	0.9	2.2	4.6	1.5	AP	-	-	-
19	Semanggi	*Marsilea crenata* Presi.	5	3.7	2.3	2.2	8.2	2.7	WP	-	-	-
20	Randu	*Ceiba petandra* L. Gaertn	11	7.4	5.1	7.0	19.5	6.5	AP	-	-	-
21	Pandan Wangi	*Pandanus amarylifolius* Roxb.	9	6.6	4.2	2.2	13.0	4.3	AP	-	-	-

Location : Cibatu / Deltamas (Bekasi District) ; Location 10 as shown in Figure 9.1.20
Survey date : 29 April-4 May 2010
Coordinate : S 06^{o} 22'48.7" E 107^{o} 9'43.4"
Topology : Agro Forestry and Paddy Field

No	Local Name	Scientific Name	Result	FR	KR	DR	INP	SDR =INP/3	Type	Status		
										Government law	CITES	IUCN
22	Turi	*Sesbania grandiflora* Pers.	8	5.9	3.7	2.2	11.8	3.9	AP	-	-	-
23	Tempuyung	*Sonchus arvensis* L.	2	1.5	0.9	2.2	4.6	1.5	AP	-	-	-
24	Jambu Batu	*Psidium guajava* L.	4	1.5	1.9	2.2	5.5	1.8	AP	-	-	-
25	Sereh	*Cymbopogon nardus* L. Rendle	2	0.7	0.9	2.2	3.9	1.3	WP	-	-	-
26	Lamtoro	*Leucaena leucocephala* (Lam.) de Wit										
27	Kunyit	*Curcuma longa* L.	7	1.5	3.3	2.2	6.9	2.3	AP	-	-	-
TOTAL			215	100	100	100	300	100	-	-	-	-

Note;

+++ : Found in large numbers
WP : Wild Plants
CP : Coastal Plants
AP : Domesticated/Agricultural Plants
SP : Shade Plants
DP : Decorative Plants

Table 9.1.31(11) Survey result of terrestrial vegetation by transect method

Location : Cibatu / Deltamas (Bekasi District) ; Location 11 as shown in Figure 9.1.20

Survey date : 29 April-4 May 2010

Coordinate : S 06^{o} 22'48.7" E 107^{o} 9'43.4"

Topology : Agro Forestry and Paddy Field

No	Local Name	Scientific Name	Result	FR	KR	DR	INP	SDR =INP/3	Type	Status		
										Government law	CITES	IUCN
1	Jati	*Tectona grandis* L.f.	35	6.7	14.5	7.9	29.1	9.7	AP	-	-	-
2	Lamtoro	*Leucaena leucocephala* (Lam.) de Wit	8	4.0	3.3	1.3	8.6	2.9	WP	-	-	-
3	Kasturi	*Abelmoschus moschatus* Medik.	5	3.4	2.1	1.3	6.7	2.2	WP	-	-	-
4	Sidagori	*Sida rhombifolia L.*	3	3.4	1.2	1.3	5.9	2.0	WP	-	-	-
5	Babadotan	*Ageratum conyzoides* L.	5	4.7	2.1	1.3	8.1	2.7	WP	-	-	-
6	Pete cina	*Aglaia odorata* Lour.	4	6.7	1.7	4.4	12.8	4.3	AP	-	-	-
7	Talas Hias	*Xanthosoma* sp.	6	6.7	2.5	4.4	13.6	4.5	WP	-	-	-
8	Mangga	*Mangifera indica L.*	15	4.7	6.2	7.9	18.8	6.3	WP	-	-	-
9	Anak nakal	*Duranta erecta* L.	27	6.7	11.2	27.7	45.6	15.2	WP	-	-	-
10	Singkong	*Manihot esculenta* Crantz	11	5.4	4.6	1.3	11.2	3.7	AP	-	-	-
11	Pisang	*Musa parasidiaca* Linn.	12	6.7	5.0	1.3	13.0	4.3	WP	-	-	-
12	Mahoni	*Swietenia mahagoni* (L.) Jacq.	26	2.0	10.8	7.9	20.7	6.9	AP	UU No 7 Tahun 1999	Appendix II	Endangered
13	Pulus hayam	*Laportea* sp.	8	4.7	3.3	1.3	9.3	3.1	AP	-	-	-
14	Kirinyuh	*Euphatorium inulifolium* Kunth.	9	2.0	3.7	1.3	7.0	2.3	AP	-	-	-
15	Akasia	*Acacia mangium* Willd.	7	1.3	2.9	1.3	5.5	1.8	AP	-	-	-
16	Kersen	*Muntingia carabola* L.	9	2.7	3.7	1.3	7.7	2.6	AP	-	-	-
17	Nangka	*Artocarpus heterophyllus* Lam	3	2.0	1.2	5.1	8.4	2.8	AP			-
18	Kelapa	*Cocos nucifera* L.	7	1.3	2.9	6.1	10.3	3.4	AP	-	-	-
19	Bayem kakap	*Amaranthus spinosus*L.	5	3.4	2.1	1.3	6.7	2.2	AP	-	-	-
20	Terong	*Solanum melongena* L.	11	6.7	4.6	1.3	12.6	4.2	WP	-	-	-

Location : Cibatu / Deltamas (Bekasi District) ; Location 11 as shown in Figure 9.1.20
Survey date : 29 April-4 May 2010
Coordinate : S 06° 22'48.7" E 107° 9'43.4"
Topology : Agro Forestry and Paddy Field

No	Local Name	Scientific Name	Result	FR	KR	DR	INP	SDR =INP/3	Type	Status		
										Government law	CITES	IUCN
21	Jati walanda	*Guazuma ulmifolia* Lamk.	9	6.0	3.7	7.9	17.7	5.9	AP	-	-	-
22	Mangga Kweni	*Mangifera caesia* Jack. Ex Wall	8	5.4	3.3	1.3	10.0	3.3	AP	-	-	-
23	Paku hata	*Lygodium circinatum* (Burm.) Sw	2	1.3	0.8	1.3	3.5	1.2	WP	-	-	-
24	Randu	*Ceiba petandra* L. Gaertn	4	1.3	1.7	1.3	4.3	1.4	AP	-	-	-
25	Putri Malu	*Mimosa pudica* Duchass. & Walp	2	0.7	0.8	1.3	2.8	0.9	WP	-	-	-
TOTAL			241	100	100	100	300	100	-	-	-	-

Note;

WP : Wild Plants
CP : Coastal Plants
AP : Domesticated/Agricultural Plants
SP : Shade Plants
DP : Decorative Plants

Table 9.1.32(1) Survey result of terrestrial vegetation by transect method

Location : Patrol Lor (Indramayu District) ; Location 1 as shown in Figure 9.1.20

Survey date : 23-26 June 2010

Coordinate : 06^{o} 17' 20.9" S 108^{o} 19' 07.9" E

Topology : Riparian and Coastal Land

No	Local Name	Scientific Name	FR	KR	DR	INP	SDR =INP/3	Type	Status		
									Government law	CITES	IUCN
1	Jeruju	*Acanthus ilicifolius* L.	7.5	18.6	18.6	44.7	14.9	AP	-	-	-
2	Pisang	*Musa parasidiaca*	2.5	1.6	1.6	5.6	1.9	AP	-	-	-
3	Kimusa	*Mimmosa invisa*	10.0	5.8	5.8	21.6	7.2	WP	-	-	-
4	Kangkung laut	*Ipomea pescafre*	7.5	4.3	4.3	16.0	5.3	AP	-	-	-
5	Pecut kuda	*Starcythapeta jamaicensis*	15.0	6.6	6.6	28.2	9.4	WP	-	-	-
TOTAL									-	-	-

Note;

WP : Wild Plants

AP : Domesticated/Agricultural Plants

Table 9.1.32(2) Survey result of terrestrial vegetation by transect method

Location : Patrol (Indramayu District) ; Location 2 as shown in Figure 9.1.20

Survey date : 23-26 June 2010

Coordinate : 06° 16' 68.2" S 107° 59' 17.8" E

Topology : Fish Pond Land

No	Local Name	Scientific Name	FR	KR	DR	INP	SDR =INP/3	Type	Status		
									Government law	CITES	IUCN
1	Calingcing	*Oxalis corniculata* Linn.	7.3	5.5	0.6	13.4	4.5	WP	-	-	-
2	Talas	*Xanthosoma sagittifolium* (L.) H.W. Schott & Endl.	24.4	37.0	73.5	134.9	45.0	AP	-	-	-
3	Pecut kuda	*Stracchytarpheta jamaicensis* (L.) Vahl	19.5	17.8	14.5	51.9	17.3	WP	-	-	-
4	Kangkung laut	*Ipomea pescafre*	19.5	11.0	6.6	37.1	12.4	AP	-	-	-
5	Alang-alang	*Imperata cylindrica* (L.) Beauv	7.3	5.5	1.6	14.4	4.8	WP	-	-	-
6	Pisang	*Musa parasidiaca* Linn.	14.6	16.4	1.3	32.4	10.8	AP	-	-	-
7	Rumput	*Pennisetum purpureum* Schumacher	7.3	6.8	1.9	16.1	5.4	WP	-	-	-
TOTAL			100	100	100	300	100	-	-	-	-

Note;

WP : Wild Plants

AP : Domesticated/Agricultural Plants

Table 9.1.32(3) Survey result of terrestrial vegetation by transect method

Location : PLTU lama (Indramayu District) ; Location 3 as shown in Figure 9.1.20

Survey date : 23-26 June 2010

Coordinate : 06^{o} 17' 1.5 S " 107^{o} 57' 59.3" E

Topology : Paddy Field

No	Local Name	Scientific Name	FR	KR	DR	INP	SDR =INP/3	Type	Status		
									Government law	CITES	IUCN
1	Padi (sawah)	*Oryza sativa* L.	***	***	***	***	***	AP	-	-	-
2	Pecut kuda	*Stracchytarpheta jamaicensis* (L.) Vahl	17.6	22.2	17.7	57.6	19.2	WP	-	-	-
3	Pisang	*Musa parasidiaca* Linn.	11.8	11.1	17.7	40.6	13.5	AP	-	-	-
4	Kangkung darat	*Ipomea reptana* Roem.	11.8	11.1	17.7	40.6	13.5	AP	-	-	-
5	Talas	*Xanthosoma sagittifolium* (L.) H.W. Schott & Endl.	5.9	5.6	6.2	17.6	5.9	AP	-	-	-
TOTAL									-	-	-

Note;

+++ : Found in large numbers

WP : Wild Plants

AP : Domesticated/Agricultural Plants

Table 9.1.32(4) Survey result of terrestrial vegetation by transect method

Location : Pusaka Jaya (Subang District) ; Location 4 as shown in Figure 9.1.20

Survey date : 23-26 June 2010

Coordinate : S 06^{o} 19'55.3" E 107^{o} 52'2.3"

Topology : Agro Forestry and Paddy Field

No	Local Name	Scientific Name	FR	KR	DR	INP	SDR =INP/3	Type	Status		
									Government law	CITES	IUCN
1	Wedellia	*Widellia triloba* (L.) Hitchc	2.4	6.8	7.1	16.3	5.4	WP	-	-	-
2	Pecut Kuda	*Stracchytarpheta jamaicensis* (L.) Vahl	14.3	13.7	14.7	42.7	14.2	WP	-	-	-
3	Talas	*Colocasia* sp.	4.8	6.0	4.1	14.8	4.9	AP	-	-	-
4	Baret	*Mimosa invisa* Mar.	4.8	6.8	6.1	17.7	5.9	WP	-	-	-
5	alang-alang	*Imperata cylindrical* (L.) Beauv	2.4	6.0	5.1	13.4	4.5	WP	-	-	-
6	Pisang	*Musa parasidiaca* Linn.	9.5	6.8	6.1	22.5	7.5	AP	-	-	-
7	Lopang	*Momordica balsamina* L.	9.5	6.8	6.6	23.0	7.7	AP	-	-	-
8	Orang-aring	*Tridax procumbens* L.	9.5	6.8	6.1	22.5	7.5	WP	-	-	-
9	Areuy Patuk Manuk	*Thunbergia alata* Bojer ex Sims	2.4	6.0	5.1	13.4	4.5	WP	-	-	-
10	Rumput	*Pennisetum purpureum* Schumacher	4.8	8.5	10.2	23.5	7.8	WP	-	-	-
11	Suweg	*Amorphopalus campanulatus*	2.4	0.9	1.0	4.3	1.4	WP	UU No 7 Tahun 1999	-	Endangered
12	Babadotan	*Ageratum conyzoides* L.	7.1	3.4	5.1	15.6	5.2	WP	-	-	-
13	Rumput teki	*Cyperus brevifolius*	7.1	2.6	3.6	13.3	4.4	WP	-	-	-
14	Pacing	*Costus megalobrachtea* K. Schum	7.1	6.8	7.1	21.1	7.0	DP	-	-	-
15	Jahe	*Zingiber officinale* Rosc.	4.8	2.6	3.0	10.4	3.5	AP	-	-	-
16	Kunyit	*Curcuma domestica* L.	2.4	2.6	2.0	7.0	2.3	AP	-	-	-

Location : Pusaka Jaya (Subang District) ; Location 4 as shown in Figure 9.1.20
Survey date : 23-26 June 2010
Coordinate : S 06^{o} 19'55.3" E 107^{o} 52'2.3"
Topology : Agro Forestry and Paddy Field

No	Local Name	Scientific Name	FR	KR	DR	INP	SDR =INP/3	Type	Status		
									Government law	CITES	IUCN
17	Salentrong	*Vernonia cinerea* L.	4.8	6.8	7.1	18.7	6.2	AP	-	-	-
18	Padi (sawah)	*Oryzae sativa* L.	***	***	***	***	***	AP	-	-	-
TOTAL			100	100	100	300	100	-	-	-	-

Note;

+++ : Found in large numbers
WP : Wild Plants
AP : Domesticated/Agricultural Plants
DP : Decorative Plants

Table 9.1.32(5) Survey result of terrestrial vegetation by transect method

Location : Klari (Karawang District) ; Location 5 as shown in Figure 9.1.20

Survey date : 23-26 June 2010

Coordinate : S 06^{o} 22'15.17" E 107^{o} 19'36.59"

Topology : Agro Forestry and Paddy Field

No	Local Name	Scientific Name	FR	KR	DR	INP	SDR =INP/3	Type	Status		
									Government law	CITES	IUCN
1	Kirinyuh	*Euphatorium inulifolium* Kunth.	3.3	6.7	5.00	15.0	5.0	WP	-	-	-
2	Tongkeng	*Telosma chordata* (Burm. f.) Merr.	13.3	40.0	30.0	83.3	27.8		-	-	-
3	Alang-alang	*Imperata cylindrica* (L.) Beauv	6.7	5.0	3.8	15.4	5.1	WP	-	-	-
4	Orang aring	*Tridax procumbens* L.	16.7	23.3	17.5	57.5	19.2	AP	-	-	-
5	Jambu Batu	*Psidium guajava* L.	6.7	0.3	2.5	9.5	3.2	AP	-	-	-
6	Pisang	*Musa parasidiaca* Linn.	13.3	1.2	8.8	23.3	7.8	DP	-	-	-
7	Salentrong	*Vernonia cinerea* L.	6.7	4.2	3.1	14.0	4.7	AP	-	-	-
8	Tempuyung	*Sonchus arvensis* L.	6.7	11.7	8.8	27.1	9.0	WP	-	-	-
9	Lamtoro	*Leucaena leucocephala* (Lam.) de Wit	6.7	0.7	5.0	12.3	4.1	DP	-	-	-
10	Takokak	*Solanum torvum* Swartz.	3.3	0.3	2.5	6.2	2.1	WP	-	-	-
11	Talas	*Colocasia* sp.	3.3	0.3	2.5	6.2	2.1	AP	-	-	-
12	Suweg	*Amorphopalus campanulatus*	3.3	0.2	1.3	4.8	1.6	WP	UU No 7 Tahun 1999	-	Endangered
13	Mangga	*Mangifera indica* L.	3.3	0.2	1.3	4.8	1.6	AP	-	-	-
14	Pecut Kuda	*Stracchytarpheta jamaicensis* (L.) Vahl	3.3	0.2	1.3	4.8	1.6	WP	-	-	-
15	Pandan Wangi	*Pandanus amarylifolius* Roxb.	3.3	8.3	6.3	17.9	6.0	AP	-	-	-

Location : Klari (Karawang District) ; Location 5 as shown in Figure 9.1.20
Survey date : 23-26 June 2010
Coordinate : S 06^o 22'15.17" E 107^o 19'36.59"
Topology : Agro Forestry and Paddy Field

No	Local Name	Scientific Name	FR	KR	DR	INP	SDR =INP/3	Type	Status		
									Government law	CITES	IUCN
16	Padi (sawah)	*Oryzae sativa* L.	***	***	***	***	***	AP	-	-	-
TOTAL			100	100	100	300	100	-	-	-	-

Note;

+++ : Found in large numbers
WP : Wild Plants
AP : Domesticated/Agricultural Plants
DP : Decorative Plants

Table 9.1.32(6) Survey result of terrestrial vegetation by transect method

Location : Delta Mas- Sukamahi (Bekasi District) ; Location 6 as shown in Figure 9.1.20

Survey date : 23-26 June 2010

Coordinate : S 06° 22'35.95" E 107 ° 11'27.46"

Topology : Agro Forestry and Paddy Field

No	Local Name	Scientific Name	FR	KR	DR	INP	SDR =INP/3	Type	Status		
									Government law	CITES	IUCN
1	Jarak	*Jatropa curcas* L.	3.5	1.5	1.3	6.3	2.1	WP	-	-	-
2	Orang aring	*Tridax procumbens* L.	5.3	3.1	2.5	10.9	3.6	WP	-	-	-
3	Pulus Hayam	*Laportea* sp.	1.8	0.1	1.1	2.9	1.0	AP	-	-	-
4	Sidagori	*Sida rhombifolia* L.	1.8	2.1	1.7	5.5	1.8	WP	-	-	-
5	Rumput gajah	*Pennisetum purpureum* Schumacher	8.8	5.7	4.6	19.1	6.4	WP	-	-	-
6	Gulma Tusuk Konde	*Widellia triloba* (L.) Hitchc	8.8	23.7	19.3	51.8	17.3	WP	-	-	-
7	Talas Hias	*Xanthosoma* sp.	1.8	0.1	1.1	2.9	1.0	AP	-	-	-
8	Kacang panjang	*Vigna sinensis* (L.) Savi Ex Has	12.3	6.2	5.0	23.5	7.8	AP	-	-	-
9	Bayem kakap	*Amaranthus spinosus*L.	10.5	20.1	16.4	47.0	15.7	WP	-	-	-
10	Babadotan	*Ageratum conyzoides* L.	8.8	5.1	4.2	18.1	6.0	WP	-	-	-
11	Taleus	*Colocasia* sp.	1.8	0.5	0.4	2.7	0.9	AP	-	-	-
12	Kirinyuh	*Euphatorium inulifolium* Kunth.	10.5	10.8	8.8	30.2	10.1	WP	-	-	-
13	Saliara	*Lantana camara* L.	5.3	7.2	5.9	18.3	6.1	WP	-	-	-
14	Terong	*Solanum melongena* L.	1.8	4.1	3.4	9.2	3.1	AP	-	-	-
15	Putri malu	*Mimosa pudica* Duchass. & Walp	8.8	7.2	5.9	21.9	7.3	WP	-	-	-
16	Takokak	*Solanum torvum* Swartz.	1.8	2.1	1.7	5.5	1.8	AP	-	-	-

Location : Delta Mas- Sukamahi (Bekasi District) ; Location 6 as shown in Figure 9.1.20
Survey date : 23-26 June 2010
Coordinate : S 06° 22'35.95" E 107° 11'27.46"
Topology : Agro Forestry and Paddy Field

No	Local Name	Scientific Name	FR	KR	DR	INP	SDR =INP/3	Type	Status		
									Government law	CITES	IUCN
17	Harendong	*Melastoma* sp.	7.0	0.5	16.8	24.3	8.1	AP	-	-	-
18	Padi	*Oryzae sativa* L.	***	***	***	***	***	AP	-	-	-
TOTAL			100	100	100	300	100	-	-	-	-

Note;

+++ : Found in large numbers

WP : Wild Plants

AP : Domesticated/Agricultural Plants

(b) Wildlife and Domestic animals

The transect locations are shown in Figure 9.1.21. Details on fauna condition are described in Table 9.1.33 and Table 9.1.34. Table 9.1.33 describs the results for the survey carried out during the wet season and Table 9.1.34 describes the results of the survey done during dry season.

The majority of species of birds in West Java Province is found in Agroforestry typology. Species of birds in Agroforestry is Olive-backed Tailorbird (*Orthotomus sepium*), Javan Munia (*Lonchura leucogastroides*), and Scarlet-headed Flowerpecker (*Dicaeum trochileum*). Other species in the surroundings of the mangrove typology are birds such as Yellow-billed Egret (*Egretta intermedia*), and in around the paddy field typology are birds such as Javan Munia (*Lonchura leucogastroides*) and Scaly-breasted Munia (*Lonchura punctulata*), and in around the reparian typology are birds such as house swift (*Apus nipalensis*),and in around the shrub typology are birds such as Bar-winged Prinia (*Prinia familiaris*), and in around the yard typology are birds such as Eurasian Tree Sparrow (*Passer montanus*) are found. In addition, some protected species are found in West Java, such as Crimson Sunbird (*Aethopyga siparaja*), Great Egret (*Ardea alba*), and Javan Kingfisher (*Halcyon cyanoventris*).

The survey results regarding wildlife and domestic animals in the five districts traversed by the proposed transmission line route are as follows.

i) Within and in the nearby area of the new power plant site (Indramayu district)

Majority of birds in Indramayu district are paddy field birds such as Scaly-breasted Munia (*Lonchura punctulata*), White-headed Munia (*Lonchura maja*) and Javan Munia *(Lonchura leucogastroides*).

Terrestrial mammals species found in the project site are Tikus sawah (*Rattus argentiventer*) and Tikus got (*Rattus rattus*). Domestic animals found in the project site are buffalo, goat, cow, chicken, duck, goose, etc.

Regarding reptile and amphibian species, namely lizard, Spiny-tailed House Gecko (*Hemidactylus frenatus),* Many-lined sun skink (*Mabuya multifasciata),* Long-tailed Lizard (*Takydromus sexlineatus),* biawak (*Varanus salvator),* and Common gliding Lizard (*Draco volans)* are found on the project site.

Based on survey results by transect method, a group of *Cisticola juncidis* (local name: cici padi) and *Apus pacificus* (local name: kapinis laut) are found. A group of *Ovis aries* (local name: domba) are also found, although these are not classified into wild groups but to a group of farm herd.

ii) From Indramayu district to Subang district
In Subang District, Javan Munia (*Lonchura leucogastroides*), Scaly-breasted Munia (*Lonchura punctulata*), and White-headed Munia (*Lonchura maja*) are found. These species of birds usually are found in a paddy field.

Base on an interview with the local citizens, there used to be several eagles found in the area. A group of Kapinis (*Apus affinis*) and Manuk Piit "Sundanese"(*Lonchura leucogastroides*) are found in these area. During field survey, any kinds of birds flying in the area were not identified. However, a kind of frog species, which is called bangkong (*Fejervarja limnocharis*) by the local people, was found in the paddy field.

iii) Vicinity of Purwakarta district

Agro forestry birds are the dominating species of birds in Purwakarta District. Birds such as Olive-backed Tailorbird (*Orthotomus sepium*), Javan Munia (*Lonchura leucogastroides*) and Scarlet-headed Flowerpecker (*Dicaeum trochileum*) are found.

Based on direct observion on the transect area, Burung Gereja (*Passer montanus*) and Manuk Piit "Sundanese" (*Lonchura leucogastroides*) are found as the dominant species. These two species are commonly found in all places in Indonesia, and they have the capability of adapting to a new environment.

Some species such as citizen-bred, Itik (*Anas* sp.) some riparian birds such as Manuk Blekok (*Ardeola speciosa*) are found in the transect area. These riparian birds migrate and settle in the area near the paddy field and the local fish pond.
Species in other classes are also found in the location, such as *Hyla* sp., *Bufo limnocharis*, and *Mabuya faciculata*.

iv) From Karawang district to Bekasi district

According to the document based on the investigation, Cattle Egret (*Bubulcus ibis*), Little Egret (*Egretta garzetta*) and Yellow-billed Egret (*Egretta intermedia*) are found in the surroundings of the mangrove in Karawang District (Cilamaya Sub-district, Pakis Jaya Sub-district). However, the transmission line does not cross these areas.

In Bekasi district, Eurasian Tree Sparrow (*Passer montanus*) in yard typology, Javan Munia (*Lonchura leucogastroides*), Scaly-breasted Munia (*Lonchura punctulata*), and White-headed Munia (*Lonchura maja*) are found. These species of birds usually are found in paddy fields.

An interview with the local citizen during the field survey has revealed the existence of Kapinis (*Apus affinis*) and Manuk Piit "Sundanese" (*Lonchura leucogastroides*). Local people often see Cobra (*Naja sputatrix*) near the paddy field.

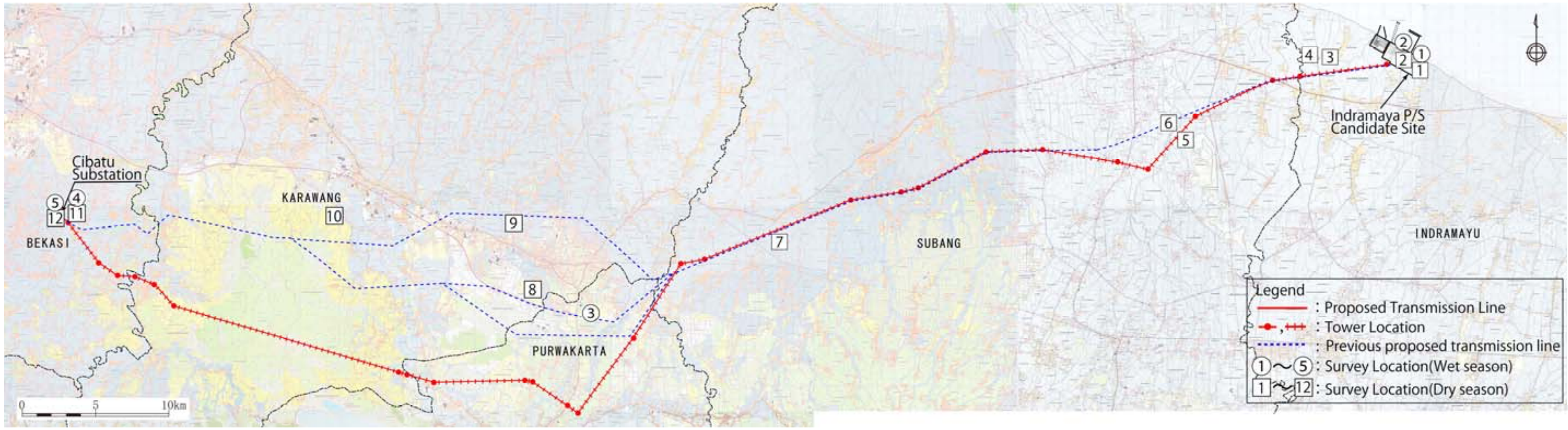


Figure 9.1.21 Survey location (fauna)

Table 9.1.33(1) Survey result of terrestrial wildlife and domestic animals by transect method

Location : Location 1 as shown in Figure 9.1.21
Survey date : 29 April-4 May 2010
Coordinate : S 06^{o} 17'19.5" E 107^{o} 59'58.4"
Topology : Riparian and Coastal Land
Class : Aves

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Itik	*Anas* sp.	6	14.0	12	13.2	27.1	OB	-	-	-
2	Cici	*Cisticola juncidis*	6	14.0	13	14.3	28.2	OB	-	-	Least Concern
3	Wiwik Kelabu	*Cacomantis merulinus*	4	9.3	4	4.4	13.7	OB	-	-	Least Concern
4	Kapinis	*Apus affinis*	5	11.6	10	11.0	22.6	OB	-	-	Least Concern
5	Blekok	*Ardeola speciosa*	2	4.7	2	2.2	6.8	OB	-	-	Least Concern
6	Pelanduk Semak	*Malaconcinla sepiarium*	4	9.3	7	7.7	17.0	OB	-	-	-
7	Tikukur	*Streptopelia chinensis*	2	4.7	3	3.3	7.9	OB	-	-	Least Concern
8	Pipit	*Lonchura leucogastroides*	5	11.6	17	18.7	30.3	OB	-	-	Least Concern
9	Gereja	*Passer montanus*	7	16.3	20	22.0	38.3	OB	-	-	Least Concern
10	Merbah Cerukcuk	*Pycnonotus goiavier*	2	4.7	3	3.3	7.9	OB	-	-	Least Concern
11	Celepuk	*Otus lempiji*	*	*	*	*	*	IN	-	-	Least Concern
12	Citblek	*Prinia familiaris*	*	*	*	*	*	IN	-	-	Least Concern
TOTAL			43	100	91	100	200		-	-	-

Class : Mammal

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Bajing	*Callosciurus notatus*	1	1	2	2.2	3.2	OB	-	-	Least Concern
TOTAL			1	1	2	2.2	3.2				

Class : Reptile

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Kadal	*Eutropis multifasciata* Kuhl, 1820	2	2	2	2.2	4.2	OB	-	-	-
TOTAL			2	2	2	2.2	4.2				

Class : Amphibian

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Katak pohon	*Hyla* sp.	1	1	1	1.1	2.1	OB	-	-	-
2	Bancet	*Occidozyga lima* Kuhl & van Hasselt	1	1	1	1.1	2.1	OB	-	-	Least Concern
TOTAL			2	2	2	4.2	4.2				

Note;

+ : found many

++ : found in sufficient numbe

+++ : found many

OB : Direct observe

IN : : Interview

Table 9.1.33(2) Survey result of terrestrial wildlife and domestic animals by transect method

Location : Mekarsari (PLTU Baru-Patrol) (Indramayu Distric) ; Location1 as shown in Figure9.1.21
Survey date : 29 April-4 May 2010
Coordinate : S 06° 16'57.22" E 107 ° 59'12.1"
Topology : Fish Pond Land
Class : Aves

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Walet sapi	*Colocalia esculenta*	1	8.3	1	8.3	16.7	OB	-	-	Least Concern
2	Blekok sawah	*Ardeola speciosa*	1	8.3	1	8.3	16.7	OB	-	-	Least Concern
3	Cici Padi	*Cisticola juncidis*	1	8.3	1	8.3	16.7	OB	-	-	Least Concern
4	Kapinis laut	*Apus pacificus*	2	16.7	2	16.7	33.3	OB	-	-	Least Concern
5	Kapinis rumah	*Apus affinis*	7	58.3	7	58.3	116.7	OB	-	-	Least Concern
TOTAL			12	100	12	100	200	-	-	-	-

Class : Mammal

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Domba	*Ovis aries*	1	100	21	100	200	OB	-	-	-
TOTAL			1	100	21	100	200				

Class : Reptile

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	cobra item	*Naja sputatrix*						IN		Appendix II	
2	Ular kadut	*Acrochordus granulatus*						IN			
TOTAL											

Class : Amphibian

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
	Not Found										
TOTAL											

Note;

OB : Direct observe

IN : : Interview

Table 9.1.33(3) Survey result of terrestrial wildlife and domestic animals by transect method

Location : Pasirwangi (Purwakerta Distric) ; Location3 as shown in Figure 9.1.21
Survey date : 29 April-4 May 2010
Coordinate :
Topology : Agro Forestry and Paddy Field
Class : Aves

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Wiwik Kelabu	*Cacomantis merulinus*	1	9.1	1	4.3	13.4	OB	-	-	Least Concern
2	Madu Sriganti	*Nectarinia jugularis*	2	18.2	5	21.7	39.9	OB	-	-	-
3	Tekukur	*Streptopelia chinensis*	1	9.1	1	4.3	13.4	OB	-	-	Least Concern
4	Kapinis	*Apus affinis*	1	9.1	2	8.7	17.8	OB	-	-	Least Concern
5	Walet Sapi	*Colocalia esculenta*	2	18.2	7	30.4	48.6	OB	-	-	Least Concern
6	Burung Cabe	*Dicaeum trocileum*	1	9.1	2	8.7	17.8	OB	-	-	-
7	Cekakak	*Halycon smyrnensis*	1	9.1	2	8.7	17.8	OB	-	-	Least Concern
8	Blekok	*Ardeola speciosa*	1	9.1	2	8.7	17.8	OB	-	-	Least Concern
9	Kutilang	*Pycnonotus aurigaster*	1	9.1	1	4.3	13.4	OB	-	-	Least Concern
10	Wiwik Kelabu	*Cacomantis merulinus*	1	9.1	1	4.3	13.4	OB	-	-	Least Concern
TOTAL			11	100	23	100	200				

Class : Mammal

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Kambing	*Capra aegagrus hircus* Linn	1	1	2	8.7	9.7	OB	-	-	-
TOTAL			1	1	2	8.7	9.7				

Class : Reptile

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Kadal	*Eutropis multifasciata* Kuhl, 1820	1	100	1	4.4	104.4	OB	-	-	-
2	Orong-orong	*Takydromus sexlineatus*	1	100	2	8.7	108.7	OB	-	-	-
TOTAL			1	200	1	13.0	213.0				

Class : Amphibian

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Bancet	*Occidozyga lima* Kuhl & van Hasselt	1	1	1	4.4	5.4	OB	-	-	Least Concern
TOTAL			1	1	1	4.4	5.4				

Note;

+ : found many

++ : found in sufficient numbe

+++ : found many

OB : Direct observe

IN : : Interview

Table9.1.33 (4) Survey result of terrestrial wildlife and domestic animals by transect method

Location : Sukamahi/Deltamas (Bekasi Distric) ; Location 4 as shown in Figure 9.1.21
Survey date : 29 April-4 May 2010
Coordinate : S 06^{o} 22'48.7" E 107^{o} 9'43.4"
Topology : Agro Forestry and Paddy Field
Class : Aves

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Blekok	*Ardeola speciosa*	3	50.0	5	41.7	91.7	OB	-	-	Least Concern
2	Toed	*Lanius scach*	1	16.7	3	25.0	41.7	OB	-	-	Least Concern
3	Pipit	*Lonchura leucogastroides*	1	16.7	2	16.7	33.3	OB	-	-	Least Concern
4	Ayam	*Gallus* sp.	1	16.7	2	16.7	33.3	OB	-	-	-
5	Wiwik Kelabu	*Cacomantis merulinus*	*	*	*	*	*	IN			Least Concern
6	Beluk Watu Jawa	*Claucidium castanopterum*	*	*	*	*	*	IN			-
TOTAL			6	100	12	100	200				

Class : Mammal

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Domba	*Ovis aries* Linn	1	20	21	25.0	45.0	OB	-	-	-
2	Kambing	*Capra aegagrus hircus* Linn	1	20	1	1.2	21.2	IN			
3	Sapi	*Bos taurus* Linn	3	60	62	73.8	133.8	IN			
TOTAL			5	100	84	100	200				

Class : Reptile

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN

Class : Reptile

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Kadal	*Eutropis multifasciata* Kuhl, 1820	2	100	2	16.7	116.7	OB	-	-	-
2	Cicak Pohon	*Hemidactylus frenatus*	1	50	1	8.3	58.3	OB	-	-	-
TOTAL			2	150	3	25.0	175.0				

Class : Amphibian

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Bangkong	*Bufo melanostictus*	1	1	1	8.3	9.3	OB	-	-	-
TOTAL			1	1	1	8.3	9.3				

Note;

+ : found many

++ : found in sufficient numbe

+++ : found many

OB : Direct observe

IN : : Interview

Table 9.1.33(5) Survey result of terrestrial wildlife and domestic animals by transect method

Location : Cibatu/Deltamas (Bekasi Distric) ; Location5 as shown in Figure 9.1.21
Survey date : 29 April-4 May 2010
Coordinate : S 06° 22'48.7" E 107° 9'43.4"
Topology : Agro Forestry and Paddy Field
Class : Aves

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Pipit	*Cacomantis merulinus*	7	21.9	20	30.8	52.6	OB	-	-	Least Concern
2	Peking	*Nectarinia jugularis*	3	9.4	5	7.7	17.1	OB	-	-	Least Concern
3	Tikukur	*Streptopelia chinensis*	3	9.4	3	4.6	14.0	OB	-	-	Least Concern
4	Cici Padi	*Apus affinis*	3	9.4	13	20.0	29.4	OB	-	-	Least Concern
5	Kutilang	*Colocalia esculenta*	4	12.5	4	6.2	18.7	OB	-	-	Least Concern
6	Toed	*Dicaeum trocileum*	5	15.6	5	7.7	23.3	OB	-	-	-
7	Kapinis	*Halycon smyrnensis*	7	21.9	15	23.1	45.0	OB	-	-	Least Concern
8	Elang	*Ardeola speciosa*	*	*	*	*	*	IN			Least Concern
TOTAL			32	100	65	100	200				

Class : Mammal

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Domba	*Ovis aries*	6	1	58	89.2	90.2	OB	-	-	-
2	Tikus sawah	*Rattus argentiventer* Robinson&Kloss	**	**	**	**	**	IN			Least Concern
3	Musang	*Paradoxurus hermaphroditus* Pallas	**	**	**	**	**	IN			Least Concern
TOTAL			6	1	58	89.2	90.2				

Class : Reptile

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Kadal	*Eutropis multifasciata* Kuhl, 1820	2	100	2	3.1	103.1	OB	-	-	-
2	Orong-orong	*Takydromus sexlineatus*	2	100	2	3.1	103.1	OB	-	-	-
3	Cobra	*Naja sputatrix*	***	***	***	***	***	IN		Appendix II	
4	Ular kisik	*Xenochrophis vittatus*	***	***	***	***	***	IN			
5	ular kadut	*Acrochordus granulatus*	***	***	***	***	***	IN			
TOTAL			2	200	2	6.2	206.2				

Class : Amphibian

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Katak Sawah	*Fejervarya cancrivora*	1	1	1	1.5	2.5	OB	-	-	Least Concern
TOTAL			1	1	1	1.5	2.5				

Note;

+ : found many

++ : found in sufficient numbe

+++ : found many

OB : Direct observe

IN : : Interview

Table 9.1.34(1) Survey result of terrestrial wildlife and domestic animals by transect method

Location : Sukra (Indramayu Distric); Location 1 as shown in Figure 9.1.21
Survey date : 23-26 June 2010
Coordinate : S 06°17'20.9" E 107° 00'7.63"
Topology : Riparian and Coastal Land
Class : Aves

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Wiwik uncuing	*Cuculus sepulclaris*	1	5.6	1	3.4	9.0	OB			-
2	Burung gereja	*Passer montanus*	7	38.9	10	34.5	73.4	OB			Least Concern
3	Trinil pantai	*Tringa* sp.	1	5.6	1	3.4	9.0	OB			-
4	Cici padi	*Cisticola juncidis*	2	11.1	3	10.3	21.5	OB			Least Concern
5	Burung Cabe	*Dicaeum trocileum*	1	5.6	1	3.4	9.0	OB			-
6	Kapinis rumah	*Apus affinis*	5	27.8	12	41.4	69.2	OB			Least Concern
7	Kipasan belang	*Rhipidura javanica*	1	5.6	1	3.4	9.0	OB			Least Concern
8	Camar	*Larus ridibundus*	*	*	*	*	*	IN			Least Concern
9	Belibis batu	*Dendrocygna javanica*	*	*	*	*	*	IN			Least Concern
TOTAL			18	100	29	100	200		-	-	-

Class : Reptile

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Kadal	*Eutropis multifasciata* Kuhl, 1820	1	100	1	100	200	OB	-	-	-
TOTAL			1	100	1	100	200				

Class : Amphibian

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Bangkong	*Bufo melanostictus*	1	100	1	100	200	OB	-	-	-
TOTAL			1	100	1	100	200				

Note;

+ : found many

++ : found in sufficient numbe

+++ : found many

OB : Direct observe

IN : : Interview

Table 9.1.34(2) Survey result of terrestrial wildlife and domestic animals by transect method

Location : Mekarsari (PLTU Baru-Patrol) (Indramayu Distric); Location 2 as shown in Figure 9.1.21
Survey date : 23-26 June 2010
Coordinate : S 06° 16'57.22" E 107 ° 59'12.1"
Topology : Fish pond land
Class : Aves

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Walet	*Collocalia linchi*	2	10	3	8.3	18.3	OB	-	-	Least Concern
2	Kapinis rumah	*Apus affinis*	6	30	15	41.7	71.7	OB	-	-	Least Concern
3	Burung gereja	*Passer montanus*	7	35	11	30.6	65.6	OB	-	-	Least Concern
4	Cici padi	*Cisticola juncidis*	4	20	6	16.7	36.7	OB	-	-	Least Concern
5	Perenjak jawa	*Prinia familiaris*	1	5	1	2.8	7.8	OB	-	-	Least Concern
TOTAL			20	100	36	100	200				

Class : Mammal

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Tikus Sawah	*Rattus argentiventer* Robinson&Kloss	1	25	1	4.2	29.2	OB			Least Concern
2	Domba	*Ovis aries* Linn	3	75	23	95.8	170.8	OB			
TOTAL			4	100	24	100	200				

Class : Reptile

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Kadal	*Eutropis multifasciata* Kuhl, 1820	1	100	1	100	200	OB	-	-	-
TOTAL			1	100	1	100	200				

Class : Amphibian

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Bangkong	*Bufo melanostictus*	1	100	1	100	200	OB	-	-	-
TOTAL			1	100	1	100	200				

Note;

+ : found many

++ : found in sufficient numbe

+++ : found many

OB : Direct observe

IN : : Interview

Table 9.1.34(3) Survey result of terrestrial wildlife and domestic animals by transect method

Location : PLTU Lamai (PLTU Baru-Patrol) (Indramayu Distric) ;Location 3 as shown in Figure 9.1.21

Survey date : 23-26 June 2010

Coordinate : S 06^o 17'1.5" E 107^o 59'30"

Topology : Paddy field

Class : Aves

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Kuntul sedang	*Egretta Intermedia*	3	30	46	82.1	112.1	OB	-	-	Least Concern
2	Burung Gereja	*Passer montanus*	4	40	5	8.9	48.9	OB	-	-	Least Concern
3	Bebek/meri	*Anas* sp.	1	10	2	3.6	13.6	OB	-	-	-
4	Cici Padi	*Cisticola juncidis*	1	10	2	3.6	13.6	OB	-	-	Least Concern
5	Walet	*Collocalia linchi*	1	10	1	1.8	11.8	OB	-	-	Least Concern
TOTAL			10	100	56	100	200		-	-	-

Class : Mammal

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Domba	*Ovis aries*	1	100	3	100	200	OB	-	-	-
TOTAL			1	100	3	100	200				

Class : Reptile

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Kadal	*Eutropis multifasciata* Kuhl, 1820	1	100	1	100	200	OB	-	-	-
TOTAL			1	100	1	100	200				

Class : Amphibian

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Bangkong	*Bufo melanostictus*	1	100	3	100	200	OB	-	-	-
TOTAL			1	100	3	100	200				

Note;

+ : found many

++ : found in sufficient numbe

+++ : found many

OB : Direct observe

IN : : Interview

Table 9.1.34(4) Survey result of terrestrial wildlife and domestic animals by transect method

Location : Sukra (Indramayu Distric) ;Location 4 as shown in Figure9.1.21
Survey date : 23-26 June 2010
Coordinate : S 06°17'39.9" E 107 ° 56'7.63"
Topology : Paddy field
Class : Aves

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Burung gereja	*Passer montanus*	1	4.8	2	3.7	8.5	OB			Least Concern
2	Cici Padi	*Cisticola juncidis*	3	14.3	3	5.6	19.8	OB			Least Concern
3	Kapinis rumah	*Apus affinis*	6	28.6	7	13.0	41.5	OB			Least Concern
4	Blekok sawah	*Ardeola speciosa*	3	14.3	3	5.6	19.8	OB			Least Concern
5	Burung pipit	*Lonchura leucogastroides*	6	28.6	12	22.2	50.8	OB			Least Concern
6	Kuntul sedang	*Egreta Intermedia*	2	9.5	27	50.0	59.5	OB			Least Concern
TOTAL			21	100	54	100	200		-	-	-

Class : Mammal

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Tikus Sawah	*Rattus argentiventer* Robinson&Kloss	**	**	**	**	**	IN			Least Concern
TOTAL											

Class : Amphibian

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Bangkong	*Bufo melanostictus*	1	100	1	100	200	OB	-	-	-
TOTAL			1	100	1	100	200				

Note;

+ : found many

++ : found in sufficient numbe

+++ : found many

OB : Direct observe

IN : : Interview

Table 9.1.34(5) Survey result of terrestrial wildlife and domestic animals by transect method

Location : Pusaka Jaya; Location 5 as shown in Figure 9.1.21

Survey date : 23-26 June 2010

Coordinate : S 06^{o} 19'55.3" E 107^{o} 52'2.3"

Topology : Paddy Field, Riparian and Agroforestry

Class : Aves

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Perenjak Jawa	*Prinia familiaris*	3	7.7	3	6.7	14.4	OB	-	-	Least Concern
2	Cinenen Pisang	*Orthotomus sutorius*	1	2.6	1	2.2	4.8	OB	-	-	Least Concern
3	Walet	*Collocalia linchi*	7	17.9	10	22.2	40.2	OB	-	-	Least Concern
4	Burung Gereja	*Passer montanus*	5	12.8	2	4.4	17.3	OB	-	-	Least Concern
5	Burung Pipit	*Lonchura leucogastroides*	7	17.9	11	24.4	42.4	OB	-	-	Least Concern
6	Kuntul sedang	*Egreta intermedia*	1	2.6	1	2.2	4.8	OB	-	-	Least Concern
7	Cici Padi	*Cisticola juncidis*	4	10.3	5	11.1	21.4	OB	-	-	Least Concern
8	Bondol Peking	*Lonchura punctulata*	3	7.7	4	8.9	16.6	OB	-	-	Least Concern
9	Tekukur	*Streptopelia chinensis*	3	7.7	3	6.7	14.4	OB	-	-	Least Concern
10	Wiwik Kelabu	*Cacomantis merulinus*	2	5.1	2	4.4	9.6	OB	-	-	Least Concern
11	Burung Madu Sriganti	*Nectarinia jugularis*	2	5.1	2	4.4	9.6	OB	-	-	Least Concern
12	Toed	*Lanius schach*	1	2.6	1	2.2	4.8	OB	-	-	Least Concern
13	Celepuk	*Otus bakkamoena*	*	*	*	*	*	IN			Least Concern
14	Blekok sawah	*Ardeola speciosa*	*	*	*	*	*	IN			Least Concern
TOTAL			26	100	44	100	200				

Class : Mammal

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Tikus Sawah	*Rattus argentiventer* Robinson&Kloss	**	**	**	**	**	IN			Least Concern
TOTAL											

Class : Reptile

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Kadal	*Eutropis multifasciata* Kuhl, 1820	1	50	1	50	100	OB	-	-	-
2	Londok	*Draco volans*	1	50	1	50	100	OB	-	-	-
3	Ular Sawah		*	*	*	*	*	IN			
4	Ular Kobra		*	*	*	*	*	IN			
5	Cecak Pohon		2	100	2	100	200	OB	-	-	-
TOTAL											

Class : Amphibian

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Katak	*Fejervarya cancrivora*	1	100	1	100	200	OB			Least Concern
TOTAL			1	100	1	100	200				

Note;

+ : found many

++ : found in sufficient numbe

+++ : found many

OB : Direct observe

IN : : Interview

Table 9.1.34(6) Survey result of terrestrial wildlife and domestic animals by transect method

Location : Bojong Tengah (Subang Distric) ; Location 6 as shown in Figure 9.1.21
Survey date : 23-26 June 2010
Coordinate : S 06° 19'50.5" E 107° 51'54.7"
Topology : Agro Forestry and Paddy Field Land
Class : Aves

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Burung gereja	*Passer montanus*	5	19.2	11	25.0	44.2	OB	-	-	Least Concern
2	Peking	*Lonchura punctulata*	2	7.7	2	4.5	12.2	OB	-	-	Least Concern
3	Wiwik kelabu	*Cacomantis merulinus*	1	3.8	1	2.3	6.1	OB	-	-	Least Concern
4	Cinenen	*Orthotomus sutorius*	1	3.8	1	2.3	6.1	OB	-	-	Least Concern
5	Tekukur	*Streptopelia chinensis*	1	3.8	1	2.3	6.1	OB	-	-	Least Concern
6	Walet	*Collocalia linchi*	3	11.5	5	11.4	22.9	OB	-	-	Least Concern
7	Kapinis rumah	*Apus affinis*	3	11.5	7	15.9	27.4	OB	-	-	Least Concern
8	Cici Padi	*Cisticola juncidis*	4	15.4	6	13.6	29.0	OB	-	-	Least Concern
9	Kutilang	*Pycnonotus aurigaster*	1	3.8	1	2.3	6.1	OB	-	-	Least Concern
10	Pipit	*Lonchura leucogastroides*	5	19.2	9	20.5	39.7	OB	-	-	Least Concern
11	Burung Cabe	*Dicaeum trocileum*	*	*	*	*	*	IN			-
12	Madu Sriganti	*Nectarinia jugularis*	*	*	*	*	*	IN			Least Concern
13	Merbah cerukcuk	*Pycnonotus goiavier*	*	*	*	*	*	IN			Least Concern
14	Caladi	*Dendrocopos macei*	*	*	*	*	*	IN			Least Concern
TOTAL			26	100	44	100	200				

Class : Mammal

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Anjing	*Canis lupus familiaris*	2	100	3	100	200	OB	-	-	-
2	Tikus sawah	*Rattus argentiventer* Robinson&Kloss	**	**	**	**	**	IN			Least Concern
TOTAL			2	100	3	100	200	2			

Class : Reptile

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Kadal	*Eutropis multifasciata* Kuhl, 1820	2	100	2	100	200	OB	-	-	-
2	Ular kobra	*Naja sputatrix*	*	*	*	*	*	IN		Appendix II	
3	Ular koros	*Ptyas korros* Schlegel, 1837	*	*	*	*	*	IN			
4	Ular tanah/ular gibuk	*Agkistrodon rhodostoma Boie, 1827*	*	*	*	*	*	IN			
5	Ular sapi	*Zaocys carinatus*	*	*	*	*	*	IN			
TOTAL			2	100	2	100	200				

Class : Amphibian

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Bangkong	*Bufo melanostictus*	2	100	2	100	200	OB	-	-	-
TOTAL			2	100	2	100	200				

Note;

+ : found many
++ : found in sufficient numbe
+++ : found many
OB : Direct observe
IN : : Interview

Table 9.1.34(7) Survey result of terrestrial wildlife and domestic animals by transect method

Location : Patok beusi; Location 7 as shown in Figure 9.1.21
Survey date : 23-26 June 2010
Coordinate : S 06° 23'14.6" E 107 ° 35'52.7"
Topology : Agro Forestry and Paddy Field Land
Class : Aves

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Cinenen Pisang	*Orthotomus sutorius*	1	5.6	1.0	2.5	8.1	OB	-	-	Least Concern
2	Burung Gereja	*Passer montanus*	2	11.1	6.0	15.0	26.1	OB	-	-	Least Concern
3	Kutilang	*Pycnonotus aurigaster*	2	11.1	2.0	5.0	16.1	OB	-	-	Least Concern
4	Walet	*Collocalia linchi*	4	22.2	18.0	45.0	67.2	OB	-	-	Least Concern
5	Tekukur	*Streptopelia chinensis*	2	11.1	2.0	5.0	16.1	OB	-	-	Least Concern
6	Blekok sawah	*Ardeola speciosa*	3	16.7	3.0	7.5	24.2	OB	-	-	Least Concern
7	Kekep Babi	*Artamus leuchorhyncus*	1	5.6	3.0	7.5	13.1	OB	-	-	Least Concern
8	Toed	*Lanius schach*	1	5.6	1.0	2.5	8.1	OB	-	-	Least Concern
9	Cinenen kelabu	*Orthotomus ruficeps*	1	5.6	1.0	2.5	8.1	OB	-	-	Least Concern
10	Perenjak Jawa	*Prinia familiaris*	1	5.6	3.0	7.5	13.1	OB	-	-	Least Concern
TOTAL			18	100	40	100	200		-	-	-

Class : Mammal

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Tikus Sawah	*Rattus argentiventer* Robinson&Kloss	**	**	**	**	**	IN			Least Concern
TOTAL											

Class : Reptile

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Kadal	*Eutropis multifasciata* Kuhl, 1820	1	50	1	50	100	OB	-	-	-
2	Tokek	*Gecko gecko*	1	50	1	50	100	OB	-	-	-
3	Ular Sawah		*	*	*	*	*	IN			
TOTAL			2	100	2	100	200				

Class : Amphibian

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Kodok	*Bufo melanogaster*	1	100	1	100	200	OB	-	-	-
TOTAL			1	100	1	100	200				

Note;

+ : found many

++ : found in sufficient numbe

+++ : found many

OB : Direct observe

IN : : Interview

Table 9.1.34(8) Survey result of terrestrial wildlife and domestic animals by transect method

Location : Kamojang; Location 8 as shown in Figure 9.1.21
Survey date : 23-26 June 2010
Coordinate : S 06^o 25'45.83" E 107^o 27'42.54"
Topology : Agroforestry, Paddy Field, and Grassland
Class : Aves

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Burung Pipit	*Lonchura leucogastroides*	8	24.2	19	25.0	49.2	OB	-	-	Least Concern
2	Burung Gereja	*Passer montanus*	3	9.1	7	9.2	18.3	OB	-	-	Least Concern
3	Cinenen Pisang	*Orthotomus sutorius*	3	9.1	3	3.9	13.0	OB	-	-	Least Concern
4	Walet	*Collocalia linchi*	5	15.2	25	32.9	48.0	OB	-	-	Least Concern
5	Tekukur	*Streptopelia chinensis*	5	15.2	6	7.9	23.0	OB	-	-	Least Concern
6	Wiwik Uncuing	*Cuculus sepulcralis*	1	3.0	1	1.3	4.3	OB	-	-	-
7	Perenjak Jawa	*Prinia familiaris*	2	6.1	3	3.9	10.0	OB	-	-	Least Concern
8	Kapinis rumah	*Apus affinis*	2	6.1	4	5.3	11.3	OB	-	-	Least Concern
9	Cici Padi	*Cisticola juncidis*	4	12.1	8	10.5	22.6	OB	-	-	Least Concern
10	Celepuk	*Otus bakkamoena*	*	*	*	*	*	*			Least Concern
TOTAL			33	100	76	100	200				

Class : Mammal

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Tikus Sawah	*Rattus argentiventer* Robinson&Kloss	**	**	**	**	**	IN			Least Concern
TOTAL											

Class : Reptile

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Kadal	*Eutropis multifasciata* Kuhl, 1820	3	75	3	75	150	OB	-	-	-
2	Londok	*Draco volans*	1	25	1	25	50	OB	-	-	-
3	Ular Sawah		*	*	*	*	*	IN			-
4	Ular Kobra		*	*	*	*	*	IN			-
TOTAL			4		4		200				

Class : Amphibian

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Katak	*Fejervarya cancrivora*	2	100	2	100	200	OB	-	-	Least Concern
TOTAL			2	100	2	100	200				

Note;

+ : found many

++ : found in sufficient numbe

+++ : found many

OB : Direct observe

IN : : Interview

Table 9.1.34(9) Survey result of terrestrial wildlife and domestic animals by transect method

Location : Klari Transek ; Location 9 as shown in Figure 9.1.21
Survey date : 23-26 June 2010
Coordinate : S 06° 22'16.54" E 107 ° 19'44.38"
Topology : Agroforestry
Class : Aves

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Burung Pipit	*Lonchura leucogastroides*	4	26.7	13	43.3	70.0	OB			Least Concern
2	Cinenen pisang	*Orthotomus sutorius*	1	6.7	1	3.3	10.0	OB			Least Concern
3	Tekukur	*Streptopelia chinensis*	5	33.3	9	30.0	63.3	OB			Least Concern
4	Kutilang	*Pycnonotus aurigaster*	1	6.7	1	3.3	10.0	OB			Least Concern
5	Burung Gereja	*Passer montanus*	1	6.7	1	3.3	10.0	OB			Least Concern
6	Walet	*Collocalia linchi*	2	13.3	4	13.3	26.7	OB			Least Concern
7	Toed	*Lanius schach*	1	6.7	1	3.3	10.0	OB			Least Concern
TOTAL			15	100	30	100	200		-	-	-

Class : Mammal

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	sapi	*Bos taurus*	1	100	1	100	200	OB			-
TOTAL			1	100	1	100	200				

Class : Reptile

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	kadal	*Eutropis multifasciata* Kuhl, 1820	1	100	1	100	200	OB			-
TOTAL			1	100	1	100	200				

Class : Amphibian

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Kodok	*Bufo melanogaster*	1	100	1	100	200	OB			-
TOTAL			1	100	1	100	200				

Note;

+ : found many

++ : found in sufficient numbe

+++ : found many

OB : Direct observe

IN : : Interview

Table 9.1.34(10) Survey result of terrestrial wildlife and domestic animals by transect method

Location : Klari Transek ; Location 10 as shown in Figure 9.1.21
Survey date : 23-26 June 2010
Coordinate : S 06° 22'15.17" E 107 ° 19'36.59"
Topology : Paddy field and Agroforestry
Class : Aves

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Burung Pipit	*Lonchura leucogastroides*	4	22.2	26	46.4	68.7	OB	-	-	Least Concern
2	Walet	*Collocalia linchi*	2	11.1	2	3.6	14.7	OB	-	-	Least Concern
3	Burung Gereja	*Passer montanus*	1	5.6	2	3.6	9.1	OB	-	-	Least Concern
4	Cici Padi	*Cisticola juncidis*	4	22.2	15	26.8	49.0	OB	-	-	Least Concern
5	Bondol Peking	*Lonchura punctulata*	1	5.6	3	5.4	10.9	OB	-	-	Least Concern
6	Kutilang	*Pycnonotus aurigaster*	1	5.6	2	3.6	9.1	OB	-	-	Least Concern
7	Perenjak Jawa	*Prinia familiaris*	2	11.1	2	3.6	14.7	OB	-	-	Least Concern
8	Cinenen pisang	*Orthotomus sutorius*	1	5.6	1	1.8	7.3	OB	-	-	Least Concern
9	Entog	*Cairina moschata*	1	5.6	2	3.6	9.1	OB	-	-	Least Concern
10	Ayam	*Galus galus*	1	5.6	1	1.8	7.3	OB	-	-	-
TOTAL			18	100	56	100	200				

Class : Mammal

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Tikus sawah	*Rattus argentiventer* Robinson&Kloss	**	**	**	**	**	IN			Least Concern
2	Kucing Rumah	*Felis domestica*	1	100	1	100	200	OB	-	-	-
TOTAL			1	100	1	100	200				

Class : Reptile

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	ular sawah		1	50	1	50	100	OB			-
2	kadal	*Eutropis multifasciata* Kuhl, 1820	1	50	1	50	100	OB			-
TOTAL			2	200	2	200	200				

Class : Amphibian

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Kodok	*Bufo melanogaster*	2	100	2	100	200	OB			-
TOTAL			2	100	2	100	200				

Note;

+ : found many

++ : found in sufficient numbe

+++ : found many

OB : Direct observe

IN : : Interview

Table 9.1.34(11) Survey result of terrestrial wildlife and domestic animals by transect method

Location : Cibatu/Deltamas (Bekasi Distric) ; Location 11 as shown in Figure 9.1.21
Survey date : 23-26 June 2010
Coordinate : S 06^{o} 22'48.7" E 107^{o} 9'43.4"
Topology : Agro Forestry and Paddy Field Land
Class : Aves

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Tekukur	*Streptopelia chinensis*	1	14.3	1	14.3	28.6	OB	-	-	Least Concern
2	Ayam	*Galus galus*	2	28.6	2	28.6	57.1	OB	-	-	-
3	Toed	*Lanius scach*	1	14.3	1	14.3	28.6	OB	-	-	Least Concern
4	Cici Padi	*Cisticola juncidis*	1	14.3	1	14.3	28.6	OB	-	-	Least Concern
5	Pipit	*Lonchura leucogastroides*	2	28.6	2	28.6	57.1	OB	-	-	Least Concern
6	Bubut besar	*Centropus sinensis*	*	*	*	*	*	IN			Least Concern
7	Layang-layang	*Hirundo* sp.	*	*	*	*	*	IN			-
8	Puyuh	*Turnix suscitator*	*	*	*	*	*	IN			Least Concern
9	Celepuk	*Otus bakkamoena*	*	*	*	*	*	IN			Least Concern
10	Kutilang	*Pycnonotus aurigaster*	*	*	*	*	*	IN			Least Concern
11	Peking	*Lonchura punctulata*	*	*	*	*	*	IN			Least Concern
12	Elang ular bido	*Spilornis cheela*	*	*	*	*	*	IN			Least Concern
TOTAL			7	100	7	100	200		-	-	-

Class : Mammal

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Domba	*Ovis aries* Linn	2	50	18	50.0	100.0	OB	-	-	-
2	Sapi	*Bos taurus* Linn	1	25	16	44.4	69.4	OB	-	-	-
3	Anjing	*Canis lupus familiaris*	1	25	2	5.6	30.6	OB	-	-	-
TOTAL			4	100	36	100	200				

Class : Reptile

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Kadal	*Eutropis multifasciata* Kuhl, 1820	1	50	1	50	100	OB	-	-	-
2	Londok	*Bronchocela jubata*	1	50	1	50	100	OB	-	-	-
3	Oray welang	*Bungarus fasciatus*	*	*	*	*	*	IN			-
4	Ular kobra	*Naja sputatrix*	*	*	*	*	*	IN		Appendix II	-
5	Ular koros	*Ptyas korros* Schlegel, 1837	*	*	*	*	*	IN			-
TOTAL			2	100	2	100	200				

Class : Amphibian

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Katak Sawah	*Fejervarya cancrivora*	1	100	1	100	200	OB	-	-	Least Concern
TOTAL			1	100	1	100	200				

Note;

+ : found many

++ : found in sufficient numbe

+++ : found many

OB : Direct observe

IN : : Interview

Table 9.1.34(12) Survey result of terrestrial wildlife and domestic animals by transect method

Location : Sukamahi/Deltamas (Bekasi Distric) ; Location 12 as shown in Figure 9.1.21
Survey date : 23-26 June 2010
Coordinate : S 06° 22'48.7" E 107° 9'43.4"
Topology : Agro Forestry and Paddy Field Land
Class : Aves

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Wiwik uncuing	*Cuculus sepulclaris*	1	9.1	1	5.9	15.0	OB	-	-	-
2	Wiwik kelabu	*Cacomantis merulinus*	1	9.1	1	5.9	15.0	OB	-	-	Least Concern
3	Ayam	*Galus galus*	2	18.2	5	29.4	47.6	OB	-	-	-
4	Toed	*Lanius schach*	2	18.2	2	11.8	29.9	OB	-	-	Least Concern
5	Tekukur	*Streptopelia chinensis*	2	18.2	2	11.8	29.9	OB	-	-	Least Concern
6	Perenjak jawa	*Prinia familiaris*	1	9.1	2	11.8	20.9	OB	-	-	Least Concern
7	Kutilang	*Pycnonotus aurigaster*	2	18.2	4	23.5	41.7	OB	-	-	Least Concern
TOTAL			11	100	17	100	200		-	-	-

Class : Mammal

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Domba	*Ovis aries* Linn	2	100	19	100	200	OB			-
TOTAL			2	100	19	100	200				

Class : Reptile

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Kadal	*Eutropis multifasciata* Kuhl, 1820	1	33.3	1	33.3	66.7	OB	-	-	-
2	Londok	*Bronchocela jubata*	1	33.3	1	33.3	66.7	OB	-	-	-
3	Ular kobra	*Naja sputatrix*	1	33.3	1	33.3	66.7	OB	-	Appendix II	-
TOTAL			2	100	3	100	200				

Class : Amphibian

No	Local Name	Scientific Name	FM	FR	DM	DR	INP	SOURCE	Status		
									Government law	CITES	IUCN
1	Katak Sawah	*Fejervarya cancrivora*	1	100	1	100	200	OB			Least Concern
TOTAL			1	100	1	100	200				

Note;

+ : found many

++ : found in sufficient numbe

+++ : found many

OB : Direct observe

IN : : Interview

<Reference>

The majority of species of birds in West Java Province is found in Agro forestry typology. The species of birds in Agro forestry are the Olive-backed Tailorbird (*Orthotomus sepium*), Javan Munia (*Lonchura leucogastroides*) and Scarlet-headed Flowerpecker (*Dicaeum trochileum*).

In respect of other species, they are generally found around paddy field typology such as Javan Munia (*Lonchura leucogastroides*) and Scaly-breasted Munia (*Lonchura punctulata*), around riparian typology such as House swift (*Apus nipalensis*), around shrub typology such as Bar-winged Prinia (*Prinia familiaris*), and around yard typology such as Eurasian Tree Sparrow (*Passer montanus*) are found.

Moreover, some protected species are found in West Java, such as Crimson Sunbird (*Aethopyga siparaja*), Great Egret (*Ardea alba*), and Javan Kingfisher (*Halcyon cyanoventris*) (Table 9.1.35).

ii) Reptile, Amphibian and Domestic animals

The terrestrial mammal species found at the project site are Rice-field Rat (*Rattus argentiventer*) and Black Rat (*Rattus rattus*). Rice-field Rat is specified for LC (Least Concern) with IUCN (Table 9.1.34). Domestic animal species found at the project site are buffalo, goat, cow, chicken, duck, goose, etc.

Reptile and Amphibian species in the project site were found, namely lizard, Spiny-tailed House Gecko (*Hemidactylus frenatus*), Many-lined sun skink (*Mabuya multifasciata*), Long-tailed Lizard (*Takydromus sexlineatus*), Biawak (*Varanus salvator*), and Common gliding Lizard. (*Draco volans*). The Cobra Item (*Naja sputatrix*) is listed in Appendix II in CITES, but this species is reported by interview and its existence as aspecies at the project was not confirmed at this time.

Table 9.1.35 shows the information of spicies listed LC (Least Concern) with IUCN. However, some species are already mentioned in chapter 9.1 of this report, such as Little Swift (*Apus affinis*), Javan Pond-heron (*Ardeola speciosa*), Zitting Cisticola (*Cisticola juncidis*), Glossy Swiftlet (*Collocalia esculenta*), Cave Swiftlet (*Collocalia linchi*), Whistling-duck (*Dendrocygna javanica*), Intermediate Egret (*Egretta intermedia*), White-throated Kingfisher (*Halcyon smyrnensis*), Black-headed Gull (*Larus ridibundus*), Javan Munia (*Lonchura leucogastroides*), Information of Eurasian Tree Sparrow (*Passer montanus*), Bar-winged Prinia (*Prinia familiaris*), Yellow-vented Bulbul (*Pycnonotus goiavier*), Pied Fantail (*Rhipidura javanica*), Spotted Dove (*Streptopelia chinensis*), Ricefield Rat (*Rattus argentiventer*), Plantain Squirrel (*Callosciurus notatus*), Black-spectacled Toad (*Bufo melanostictus*), and Pointed-tongued Floating Frog (*Occidozyga lima*).

However, the impact of the project will be limited to the tower base areas, and considering each base area size is only (25m×25m max), and there are large intervals between the towers, the impact on the above mentioned species will be very limited.

Table 9.1.35(1) Information of White-breasted Woodswallow (*Artamus leucorynchus*)

Items	Information
Range	Australia; Brunei Darussalam; India; Indonesia; Korea, Republic of; Malaysia; Myanmar; New Caledonia; Palau; Papua New Guinea; Philippines; Timor-Leste; Vanuatu (http://www.iucnredlist.org/apps/redlist/details/146738/0)
Habitat	Open areas with scattered trees, cultivation. (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Feed	The diet includes insects caught on the wing. (http://www.birdforum.net/opus/Artamus_leucorynchus)
Breeding	March-May. Nest; loose, shallow cup, in hollow-topped pylon pole or on tree-branch; at least 3.5m above ground. (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Status	IUCN (Least Concern)

Table 9.1.35(2) Information of Plaintive Cuckoo (*Cacomantis merulinus*)

Items	Information
Range	Bangladesh; Bhutan; Brunei Darussalam; Cambodia; China; India; Indonesia; Lao People's Democratic Republic; Malaysia; Myanmar; Philippines; Singapore; Thailand; Viet Nam (http://www.iucnredlist.org/apps/redlist/details/142261/0)
Habitat	Secondary growth, open woodlands, scrub,grassland,cultivated areas, parks and gardens; up to 1,830m(A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Feed	It catches insects on the ground.(http://www.birdforum.net/opus/Cacomantis_merulinus)
Breeding	Brood-parasitic. (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Status	IUCN (Least Concern)

Table 9.1.35(3) Information of Muscovy Duck (*Cairina moschata*)

Items	Information
Range	Argentina; Belize; Bolivia; Brazil; Chile; Colombia; Costa Rica; Ecuador; El Salvador; French Guiana; Guatemala; Guyana; Honduras; Mexico; Nicaragua; Panama; Paraguay; Peru; Suriname; Trinidad and Tobago; United States; Uruguay; Venezuela (http://www.iucnredlist.org/apps/redlist/details/141478/0)
Habitat	Forested swamps, lakes and streams. (http://www.birdforum.net/opus/Cairina_moschata)
Feed	Includes plant material obtained by grazing or dabbling in shallow water, and some small vertebrates and insects. (http://www.birdforum.net/opus/Cairina_moschata)
Breeding	8-16 white eggs are laid, usually in a tree hole or hollow, and are incubated for 35 days. (http://www.birdforum.net/opus/Cairina_moschata)
Status	IUCN (Least Concern)

Table 9.1.35(4) Information of Greater Coucal (*Centropus sinensis*)

Items	Information
Range	Bangladesh; Bhutan; Brunei Darussalam; Cambodia; China; India; Indonesia; Lao People's Democratic Republic; Malaysia; Myanmar; Nepal; Pakistan; Philippines; Singapore; Sri Lanka; Thailand; Viet Nam (http://www.iucnredlist.org/apps/redlist/details/142326/0)
Habitat	Open forest,forest edge, secondary growth, scrub, grassland, mangroves; up to 1,525m. (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Feed	They eat large insects, frogs, lizards, snakes, caterpillers, snails, birds eggs fruit and seed. (http://www.birdforum.net/opus/Centropus_sinensis)
Breeding	January-August. Nest; large dome with side-entrance, sometimes bowl, in bush, grass, bamboo or tree; up to 2.5m above ground. Eggs 2-5. (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Status	IUCN (Least Concern)

Table 9.1.35(5) Information of Fulvous-breasted Woodpecker (*Dendrocopos macei*)

Items	Information
Range	Bangladesh; Bhutan; Cambodia; India; Indonesia; Lao People's Democratic Republic; Myanmar; Nepal; Pakistan; Thailand; Viet Nam (http://www.iucnredlist.org/apps/redlist/details/141696/0)
Habitat	Deciduous woodland, scattered trees in open country, bomboo, secondary growth; up 1,220m. (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Feed	Unknown
Breeding	December-June. Excavated hole in tree or bamboo; 1-3m above ground. Eggs 3-5. (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Status	IUCN (Least Concern）

Table 9.1.35(6) Information of White-throated Kingfisher (*Halcyon smyrnensis*)

Items	Information
Range	Afghanistan; Azerbaijan; Bangladesh; Bhutan; Cambodia; China; Egypt; Hong Kong; India; Indonesia; Iran, Islamic Republic of; Iraq; Israel; Jordan; Kuwait; Lao People's Democratic Republic; Lebanon; Malaysia; Myanmar; Nepal; Pakistan; Philippines; Singapore; Sri Lanka; Syrian Arab Republic; Thailand; Turkey; Viet Nam (http://www.iucnredlist.org/apps/redlist/details/142148/0)
Habitat	Open habitats, secondary growth, cultivation; up to 1,525m. (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Feed	The diet includes large insects, rodents, snakes, fish and frogs. (http://www.birdforum.net/opus/Halcyon_smyrnensis)
Breeding	October-June. Nest excavated tunnel in bank. Eggs 3-7. (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Status	IUCN (Least Concern）

Table 9.1.35(7) Information of Long-tailed Shrike (*Lanius schach*)

Items	Information
Range	Afghanistan; Bangladesh; Bhutan; Cambodia; China; India; Indonesia; Iran, Islamic Republic of; Kazakhstan; Kyrgyzstan; Lao People's Democratic Republic; Malaysia; Myanmar; Nepal; Pakistan; Papua New Guinea; Philippines; Singapore; Taiwan, Province of China; Tajikistan; Thailand; Timor-Leste; Turkmenistan; Viet Nam (http://www.iucnredlist.org/apps/redlist/details/146421/0)
Habitat	Open country, cultivation, gardens, roadsides, secondary growth sometimes forest edge; up to 2,135m. (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Feed	Diet includes lizards, large insects, small birds and rodents. (http://www.birdforum.net/opus/Lanius_schach)
Breeding	April-February. Nest; large compact cup, in tree, bush or sapling: 0.9-6m above ground. (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Status	IUCN (Least Concern）

Table 9.1.35(8) Information of Scaly-breasted Munia (*Lonchura punctulata*)

Items	Information
Range	Afghanistan; Bangladesh; Bhutan; Brunei Darussalam; Cambodia; China; India; Indonesia; Lao People's Democratic Republic; Malaysia; Myanmar; Nepal; Philippines; Singapore; Sri Lanka; Taiwan, Province of China; Thailand; Timor-Leste; Viet Nam (http://www.iucnredlist.org/apps/redlist/details/149426/0)
Habitat	Cultivation, scrub, secondary growth; up to 1,915m. (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Feed	Scaly-breasted Munias specialise in eating grass seeds and sedges, and have large conical beaks adapted for this purpose. They feed both on seeding heads on grass stems, as well as on ripe seeds that have fallen to the ground. They may also snack on small berries, such as those of the Lantana bush. Some have been seen picking at road kills. (http://www.naturia.per.sg/buloh/birds/Lonchura_punctulata.htm)
Breeding	All year. Nest; ball with slightly sported side-entrance, in bush, tree or creepers etc.;0.8-13m above ground. Eggs 3-6. (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Status	IUCN (Least Concern）

Table 9.1.35(9) Information of Olive-backed Sunbird (*Nectarinia jugularis*)

Items	Information
Range	Australia; Brunei Darussalam; Cambodia; China; India; Indonesia; Lao People's Democratic Republic; Malaysia; Myanmar; Papua New Guinea; Philippines; Singapore; Solomon Islands; Thailand; Viet Nam (http://www.iucnredlist.org/apps/redlist/details/149013/0)
Habitat	This species are very bold and often builds nests close to human habitation (balconies, porches, corridors) and they are found almost everywhere except the deepest forest. (http://www.naturia.per.sg/buloh/birds/Nectarina_jugularis.htm)
Feed	This species survive mainly on nectar, although they may snack on the occasional insect. (http://www.naturia.per.sg/buloh/birds/Nectarina_jugularis.htm)
Breeding	This species breed from April to August. They build a hanging flask-shaped nest with an overhanging porch at the entrance, and a trail of hanging material at the bottom end. Materials used include plant fibers, mosses, and spiders' webs. 2 greenish-blue eggs with dark brown spots and lines are laid. Males usually don't help in incubation, but may help out in raising the young. (http://www.naturia.per.sg/buloh/birds/Nectarina_jugularis.htm)
Status	IUCN (Least Concern）

Table 9.1.35(10) Information of Ashy Tailorbird (*Orthotomus ruficeps*)

Items	Information
Range	Brunei Darussalam; Indonesia; Malaysia; Myanmar; Philippines; Singapore; Thailand (http://www.iucnredlist.org/apps/redlist/details/148436/0)
Habitat	Mangroves, coastal scrub and peatswamp forest, rarely inland forest; also all available habitats on certain offshore islands. Lowlands. (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Feed	They are often seen feeding on small insects in pairs or small family group. (http://www.birdforum.net/opus/Orthotomus_ruficeps)
Breeding	January-October. Nest; like common Tailorbird; up to 0.25-1.5m above ground. Eggs 2-3. (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Status	IUCN (Least Concern）

Table 9.1.35(11) Information of Common Tailorbird (*Orthotomus sutorius*)

Items	Information
Range	Bangladesh; Bhutan; Cambodia; China; India; Indonesia; Lao People's Democratic Republic; Malaysia; Myanmar; Nepal; Pakistan; Singapore; Sri Lanka; Thailand; Viet Nam (http://www.iucnredlist.org/apps/redlist/details/148430/0)
Habitat	Gardens, scrub, bamboo, clump, cultivation borders, open deciduous woodland, mangroves; up to 1,525m.(A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Feed	The diet includes insects, larvae, berries, fruits, nectar and seeds. (http://www.birdforum.net/opus/Orthotomus_sutorius)
Breeding	December-October. Multi-brooded. Nest; deep cup, in cylinder formed by 1-3, sewn-together leaves, in bush or tree; 0.5-2 m (rarely to 5 m) above ground. Eggs 3-6(3-4 in south). (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Status	IUCN (Least Concern）

Table 9.1.35(12) Information of Collared Scops-owl (*Otus bakkamoena*)

Items	Information
Range	Bangladesh; Bhutan; Brunei Darussalam; Cambodia; China; Hong Kong; India; Indonesia; Japan; Korea, Democratic People's Republic of; Korea, Republic of; Lao People's Democratic Republic; Malaysia; Myanmar; Nepal; Pakistan; Russian Federation; Singapore; Sri Lanka; Taiwan, Province of China; Thailand; Viet Nam (http://www.iucnredlist.org/apps/redlist/details/143194/0)
Habitat	Forests and well-wooded areas. (http://www.birdforum.net/opus/Otus_bakkamoena)
Feed	Diet is mainly insects. (http://www.birdforum.net/opus/Otus_bakkamoena)
Breeding	It nests in a hole in a tree, laying 3-5 eggs. (http://www.birdforum.net/opus/Otus_bakkamoena)
Status	IUCN (Least Concern）

Table 9.1.35(13) Information of Sooty-headed Bulbul (*Pycnonotus aurigaster*)

Items	Information
Range	Cambodia; China; Hong Kong; Indonesia; Lao People's Democratic Republic; Myanmar; Thailand; Viet Nam (http://www.iucnredlist.org/apps/redlist/details/148014/0)
Habitat	Secondary growth scrub, grass, forest clearings, cultivation; up to 1,830m (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Feed	Unknown
Breeding	March-June. Multi-brooded. Flimsy cup, in tree; 3-3.4 m above ground. (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Status	IUCN (Least Concern）

Table 9.1.35(14) Information of Crested Serpent-eagle (*Spilornis cheela*)

Items	Information
Range	Bangladesh; Bhutan; Brunei Darussalam; Cambodia; China; Hong Kong; India; Indonesia; Japan; Lao People's Democratic Republic; Macao; Malaysia; Myanmar; Nepal; Pakistan; Philippines; Sri Lanka; Taiwan, Province of China; Thailand; Viet Nam (http://www.iucnredlist.org/apps/redlist/details/144363/0)
Habitat	Broadleaved evergreen, deciduous and peatswamp forest, secondary forest; up to 2,470 m.
Feed	The Crested Serpent Eagle, as its English and scientific names suggest, is a specialist reptile eater which hunts over woodland for snakes and lizards. (http://www.birdforum.net/opus/Spilornis_cheela)
Breeding	January-October. Large, looselybuilt cup, in tree; 6-30 m above ground.
Status	IUCN (Least Concern）

Table 9.1.35(15) Information of Barred Buttonquail (*Turnix suscitator*)

Items	Information
Range	Bangladesh; Bhutan; Cambodia; China; India; Indonesia; Japan; Lao People's Democratic Republic; Malaysia; Myanmar; Nepal; Pakistan; Philippines; Singapore; Sri Lanka; Taiwan, Province of China; Thailand; Viet Nam (http://www.iucnredlist.org/apps/redlist/details/141577/0)
Habitat	Dry grassy areas, scrub and cultivation, secondary growth; up to 1,650 m. (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Feed	The diet includes insects and seeds.(http://www.birdforum.net/opus/Turnix_suscitator)
Breeding	December-September. Nest; Scrape(often with light roof) on ground amongst grass. Eggs 3-5. (A FIELD GUIDE TO THE BIRDS OF SOUTH-EAST ASIA)
Status	IUCN (Least Concern)

Table 9.1.35(16) Information of Common Palm Civet (*Paradoxurus hermaphroditus*)

Items	Information
Range	Bangladesh; Bhutan; Brunei Darussalam; Cambodia; China; India; Indonesia (Irian Jaya - Introduced, Jawa, Kalimantan, Lesser Sunda Is. - Introduced, Maluku - Introduced, Sulawesi - Introduced, Sumatera); Lao People's Democratic Republic; Malaysia (Peninsular Malaysia, Sabah, Sarawak); Myanmar; Nepal; Philippines; Singapore; Sri Lanka; Thailand; Viet Nam (http://www.iucnredlist.org/apps/redlist/details/41693/0)
Habitat	This species has been found in a wide range of habitats including evergreen and deciduous forest (primary and secondary), plantations and near humans, in habitats up to 2,400 m (http://www.iucnredlist.org/apps/redlist/details/41693/0)
Feed	This species mainly feed on fruits, but they will also eat rodents, birds and insects. (http://www.theanimalfiles.com/mammals/carnivores/civet_asian_palm.html)
Breeding	This species give birth to litters of 2 - 5 youngsters (http://www.theanimalfiles.com/mammals/carnivores/civet_asian_palm.html)
Status	IUCN (Least Concern)

Table 9.1.35(17) Information of Asian Brackish Frog (*Fejervarya cancrivora*)

Items	Information
Range	Brunei Darussalam; Cambodia; China; India; Indonesia (Irian Jaya - Introduced); Lao People's Democratic Republic; Malaysia; Philippines; Singapore; Thailand; Viet Nam (http://www.iucnredlist.org/apps/redlist/details/58269/0)
Habitat	It occurs in mangrove forest, estuarine habitats, swamps and open, wet coastal areas, such as roadside ditches and puddles. It also thrives in man-made environments such as rice paddy fields. Tadpoles develop in rain pools above the high water line on the mainland, and in any body of standing water in the Philippines. It is tolerant of moderate salinity. (http://www.iucnredlist.org/apps/redlist/details/58269/0)
Feed	Food items in the gut of frogs from both habitats have been examined. The diet of frogs collected near brackish water was predominantly crustacean and included crabs (Sesarma spp.), while the diet of those collected near fresh water comprised mainly insects. Gut contents of frogs included all the small animal species found in the respective environments, the choice of prey appearing to be limited only by size. (http://onlinelibrary.wiley.com/doi/10.1111/j.1469-7998.1974.tb03152.x/abstract)
Breeding	Unknown
Status	IUCN (Least Concern)

9.1.3 Socio-economic-cultural component

(1) Power plant and coal unloading jetty

Indramayu District is one of the districts located along Java north coast on West Java Province. Total area of the district is 204,011 km^2, with geographical position of 107°36'-107°52' eastern longitude and 6°14'-6°40' southern latitude.

1) Demography

The highest population aspect at the project site is located in the Sumuradem Timur village with a total population of 7,338 inhabitants. While the lowest population is located in Mekarsari village where there are 4,079 inhabitants.

Table 9.1.36 Population composition based on gender in survey location

Location	Male	Female	Total Population	Total Area (ha)	Population density (inhabitants/ha)	Number of Family	Number of Household	Number of Poor Household
Patrol sub district	27,714	27,498	55,212	3,919	14	16,450	13,631	6,263
Sukra sub district	-	-	45,552	4,336	-	-	11,441	4,968
Mekarsari village	2,005	2,074	4,079	389	10	1,174	-	-
Patrol Baru village	2,943	2,813	5,756	327	18	1,596	-	-
Sumuradem Timur village	3,658	3,679	7,338	377	19	2,005	-	-

Source:
Monograph data of Patrol sub district 2009
Monograph data of Mekarsari village 2009
Monograph data of Sumuradem Timur village 2009
Potential data of Patrol Baru village 2009
Potential data of Sumuradem village 2008

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Table 9.1.37 Population composition based on age group in survey location

Age Group	Patrol sub district		Sukra sub district		Age Group	Mekarsari Village		Age Group	Patrol Baru village		Sumuradem Timur Village	
	Total	%	Total	%		Total	%		Total	%	Total	%
0 - 4	3,416	6.19	-	-	0 - 3	231	5.66	0 - 4	381	6.62	-	-
5 - 9	4,690	8.49	-	-	4 - 6	173	4.24	5 - 9	389	6.76	-	-
10 - 14	4,525	8.20	-	-	7 - 12	399	9.78	10 - 14	399	6.93	-	-
15 - 19	4,932	8.93	-	-	13 - 15	233	5.71	15 - 19	433	7.52	-	-
20 - 24	5,438	9.85	-	-	16 - 18	335	8.21	20 - 24	425	7.38	-	-
25 - 29	5,039	9.13	-	-	20 - 26	604	14.81	25 - 29	401	6.97	-	-
30 - 34	4,411	7.99	-	-	27 - 40	1,035	25.37	30 - 34	413	7.18	-	-
35 - 39	4,394	7.96	-	-	41 - 56	763	18.71	35 - 39	395	6.86	-	-
40 - 44	3,837	6.95	-	-	57 +	306	7.5	40 - 44	396	6.88	-	-
45 - 49	3,314	6.00	-	-	-	-	-	45 - 49	356	6.18	-	-
50 - 54	3,076	5.57	-	-	-	-	-	50 - 54	375	6.51	-	-
55 - 59	2,397	4.34	-	-	-	-	-	55 - 59	360	6.25	-	-
60 - 64	1,973	3.57	-	-	-	-	-	60 - 64	344	5.98	-	-
65 +	3,770	6.83	-	-	-	-	-	65 +	689	11.97	-	-
TOTAL	55,212	100	45,552	100	TOTAL	4,079	100	TOTAL	5,756	100	7,338	100

Source:
Monograph data of Patrol sub district 2009
Monograph data of Mekarsari village 2009
Monograph data of Sumuradem Timur village 2009
Potential data of Patrol Baru village 2009
Potential data of Sumuradem village 2008

2) Education level and religion

To determine the quality of human resource in the survey location, one of the parameters used is to look at the educational level of the population, which includes the availability of education facilities and supporting structures. Based on data from the district, the availability of school buildings and teaching staff is relatively adequate although in limited amounts.

Table 9.1.38 Number of school building in survey location

School Building	Patrol sub district	Sukra sub district	Mekarsari Village	Patrol Baru village	Sumuradem Timur Village
Kindergarten	4	4	1	0	1
Elementary School	23	23	2	1	2
Junior High School	6	6	0	1	0
High School	1	1	0	0	0
University	0	0	0	0	0
Other	0	0	1	4	3

Table 9.1.39 Population composition based on education level in survey location

Education Level	Patrol sub district	Sukra sub district	Mekarsari Village	Patrol Baru village	Sumuradem Timur Village
Non-Education	-	-	-	400	0
Ungraduated from Elementary School	-	-	-	480	0
Kindergarten	-	-	-	108	40
Elementary School	6,393	-	908	262	104
Junior High School	2,679	-	60	413	84
High School	1,956	-	30	45	74
Academy (D1-D3)	203	-	-	25	28
Bachelor (S1-S3)	171	-	-	10	21
Other	-	-	125	-	740

Source:
Monograph data of Patrol sub district 2009
Monograph data of Mekarsari village 2009
Monograph data of Sumuradem Timur village 2009
Potential data of Patrol Baru village 2009
Potential data of Sumuradem village 2008

From the result of the interview there is a phenomenon that children of school age in the location of the majority of surveys, drop out in the first medium level. In addition, school-age children receive less formal education compared with those who tend to choose the test equation package. In Sumuradem Timur village, for example, there are 104 children of school age seeking education at Elementary School and 600 other students who have chosen to follow the chase pack A. After completing school at the primary level, most of the children work as farm laborers or do othe menial laboring works. From these symptoms it can be assumed that family members at the survey site are highly reliant on social capital in meeting the economic needs of the household because the role of education has not become a major requirement or priority.

Table 9.1.40 shows the number of population according to religion adherent vicinity of village planned in the project site. The major religion is Islam.

Table 9.1.40 Population composition based on religion adherent in survey location

Religion	Patrol sub district		Sukra sub district		Mekarsari Village		Patrol Baru village		Sumuradem Timur Village	
	Total	%	Total	%	Total	%	Total	%	Total	%
Islam	55,137	99.86	56,246	99.31	4,079	100	5,756	100	5,813	100
Catholic	75	0.14	170	0.30	0	0	0	0	0	0
Protestant	0	0	191	0.34	0	0	0	0	0	0
Hindu	0	0	0	0	0	0	0	0	0	0
Budha	0	0	32	0.06	0	0	0	0	0	0
TOTAL	55,212	100	56,639	100	4,079	100	5,756	100	5,813	100

Source:
Monograph data of Patrol sub district 2009
Monograph data of Mekarsari village 2009
Monograph data of Sumuradem Timur village 2009
Potential data of Patrol Baru village 2009
Potential data of Sumuradem village 2008

3) Workforce

The majority of residents on project site work as farm laborers. From interviews and field observations, the economic factors and limited income from subsistence agriculture are assumed to be one of the drivers for population mobility in the community and the activities undertaken to improve the welfare of their families by finding urban-oriented jobs.

The kinds of work done by people in the location of the survey lead to diversity of livelihoods, among others, they become construction workers and some even travel overseas to do domestic labor works. The other types of economic activities still performed in the villages are trade and the running of business kiosks/stalls (petty trade). When viewed from the structure of the population, based on age groups, generally the 15-59 year age group is relatively large in number, so it can be said that the economic activities in villages are dominated by people of a productive age.

Table 9.1.41 Population composition based on livelihood on survey location

Occupation	Patrol sub district		Sukra sub district		Mekarsari Village		Patrol Baru village		Sumuradem Timur Village	
	Total	%	Total	%	Total	%	Total	%	Total	%
Housewife	0	0.0	-	-	0	0	0	0	0	0
Farm	7,571	58.7	-	-	275	24.1	538	9.6	790	16.1
Farm Labor	0	0	-	-	791	69.3	45	0.8	1,578	32.2
Trader	3,148	24.4	-	-	22	1.9	20	0.4	128	2.6
Craftsman	96	0.7	-	-	0	0	0	0	0	0
Fisherman	702	5.4	-	-	0	0	0	0	0	0
PNS/TNI/ Police	312	2.4	-	-	17	1.5	14	0.3	38	0.8
Driver	0	0	-	-	0	0	0	0	0	0
Private Employee	0	0	-	-	10	0.9	50	0.9	1,985	40.4
Building Labor	0	0	-	-	0	0	0	0	0	0
Retired	76	0.6	-	-	2	0.2	3	0.1	0	0
Not Working	0	0	-	-	0	0	0	0	0	0
Other	997	7.7	-	-	24	2.1	4,938	88.1	389	7.9
TOTAL	12,902	100	-	-	1,141	100	5,608	100	4,908	100

Source:
Monograph data of Patrol sub district 2009
Monograph data of Mekarsari village 2009
Monograph data of Sumuradem Timur village 2009
Potential data of Patrol Baru village 2009
Potential data of Sumuradem village 2008

4) Socio-economics

(a) Livelihood

Based on observations on the survey site, in general, it seems permanent resident houses are of the brick wall construction type. From interviews, it was established that the average-sized home is between 120-140 m², consists of 3-4 bedroom units, and is occupied on average by 3-4 family members. The number of residents being relatively small compared to the occupied area of the house is caused by the mobility of economic activities of other family members, most of whom work in urban areas as well as overseas. Almost all the houses have inside bathroom facilities, kitchen and toilet. To provide for the secondary needs, the ownership of complementary goods such as TVs, radios, bicycles and motor vehicles are owned by almost every household.

Table9.1.42 Facilities ownership in Patrol sub district *

Type of Goods	Total Owner (Household)
Radio	3,085
Telephone	382
VCD/DVD player	0
Sewing Machine	0
Oven	0
Refrigerator	0
Television	10,163
Bicycle	3,636
Motorcycle	3,612
Car	113

Source:
Monograph Patrol sub district 2009
Remark: * Other areas not available

In terms of energy use, every household in the survey sites is already using the service connection from PLN to the source of electricity, whereas for cooking needs, the majority of residents have been using LPG (Liquid Petroleum Gas) gas energy, while the others still use kerosene fuel and firewood.

(b) Income

The level of income and expenditure in an average population of the survey location varied significantly, but generally show the same tendency. The pre-prosperous population groups, which work as farm laborers, pedicab drivers and construction workers, and whose income level is smaller than the total anticipated spending, borrow money from funding institutions such as cooperation, land owners and dealers (middlemen). Meanwhile, to meet the capital requirements of groups such as farmers, fishermen, office employees and public servants, in addition to borrowing from the cooperative, they also borrow money from funding agencies such as commercial banks or by using bank credit.

Table 9.1.43 Level of average income by occupation at the site project and surrounding areas

Occupation	Average Income/Month
Farm Labor, Pedicab Driver	Rp.250,000 - Rp.500,000
Farmer, Fisherman	Rp.700,000- Rp. 900,000
Public Official/Army/Police Private Employee	Rp.1,000,000-Rp.2,500,000
Building Labor	Rp.700,000- Rp. 900,000

Source : Field Data, 2010

The income of "Santosa" Cooperative per month by fishing boat entry at Sukahaji fish auction place (TPI) during February and July is shown in Table9.1-44.

Table 9.1.44 Income of Santosa cooperative

Month	Total Income	
February	Rp.	24,068,450
March	Rp.	20,376,300
April	Rp.	26,092,600
May	Rp.	31,226,250
June	Rp.	–*
July	Rp.	26,124,250

* Because of bad weather at sea In June , there was no catching marine products which entered the TPI.

Note:

Per day; about 15 boats entered the TPI

Per boat; about 15 kg of sea products

Fishermen come from Indramayu, Pemalang, Gebong,ts), Kluwut (Brebes), Bugel (Approximately 154 boats)

According to an interview with TPI Officer and Fishermen, data of fish catch in Sukahaji Village mentioned Koperasi Tani Mina "SENTOSA" is shown in Table 9.1.45.

Table 9.1.45 Type of Marine Products

Type of Marine Products	
Local Name	*Name of marine Products*
Ikan Layur	Parch fish
Ikan Kembung	Mackerel fish
Rajungan	Small crab/Swimmer crab
Ikan Teri	Tiny sea fish
Ikan Tengiri	Tengiri fish
Ikan Super Tengiri	Super Tengiri fish
Ikan Lajar/ Kuru	Kuru fish
Udang	Shrimp
Ikan Pari	Ray fish
Ikan Ilat–ilat	Ilat-ilat fish
Ikan Utik/ Manyung	Utik fish/manyung fish
Ikan Tetet	Tetet fish
Ikan Koros/Balak	Koros fish
Ikan Baji–baji	Baji-baji fish
Ikan Kerong	Kerong fish
Ikan Drebis	Drebis fish
Ikan Belo	Belo fish
Kepiting	Crab
Ikan Capu	Capu fish

5) Socio-culture

(a) Social institution

Social institutions of both formal and non-formal types are found in the villages. Formal ones are village government institutions and non-formal ones are traditional such as social gathering groups, religious groups (such as mosque and praying groups) and so on. Thus institutions play an important role on the village life.

(b) Community health component

The most dominant prevalent diseases in the Sukra Sub-district are listed in Table 9.1.46.

Table 9.1.46 Dominant prevalent diseases in

No	Disease	Number
1	Skin disease	842
2	Diarrhoea	667
3	Eye disease	590
4	Caries	534
5	Pneumonia	524
6	Ear infection	453
7	Scabies	277
8	Gastroenteritis	87
9	Lung TBC	28
10	Measles	17

Source: EIA of IR_A1-3

(c) Healthcare resources

Healthcare resources in Sukra Sub-Districts consist of a health center, clinic, pharmacy and others. The healthcare facilities in the Sukra Sub-district are listed in Table 9.1.47.

Table 9.1.47 Healthcare facilities in Sukra Sub-District

Health facility	Number
Secondary health center	3
Health center with ward	1
Midwives	5
Clinic	1
Pharmacy	1
Drugstore	1
General practitioner	2
Private midwives	10

Source: EIA of IR_A1-3

(d) Community nutrition level

Based on observations of community nutrition level in year 2005, low nutrition and lack of nutrition are common issues in this area. This low nutrition level delays childhood growth, and increases disease vulnerability.

(e) Environmental condition which might worsen disease spread

Based on data from health centers, the number of contagious diseases such as lung TBC, diarrhea, upper respiratory tract infection, and pneumonia are still prevalent up to year 2005.

During rainy season, most of the areas are flooded. Thus the wet conditions worsen the spread of diseases, particularly skin disease and digestive tract infections. The number of public toilet facility using the river flow (without septic tank) also contributes to the spread of diseases.

(2) Transmission line

1) Demography

The population age group composition, of the firty two villages traversed by the transmission line, is shown in Table 9.1.48.

Table 9.1.48 Population composition

Sub Districts	Villages	Age Group														
		0 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	65 -+	TOTAL
Sukra	Sumuradem	730	926	950	671	631	649	706	651	543	691	402	406	306	540	8,802
	Sukra	2,257	683	919	783	853	436	414	434	445	531	513	512	549	486	9,815
	Sukrawetan	342	646	709	676	599	602	722	823	728	520	530	430	547	-	7,874
	Tegaltaman	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Karang Layung	355	301	288	280	354	538	550	337	300	263	240	186	162	9	4,163
	Ujung Gebang	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pusaka Jaya	Karanganyar	751	530	449	602	578	633	751	752	713	653	377	379	543	1,056	8,767
	Kebondanas	459	640	424	626	605	584	583	553	543	462	444	387	131	202	6,643
	Cigugur Kaler	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bojong Jaya	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Pusaka Jaya	786	920	749	904	806	789	842	807	787	793	817	835	314	364	10,513
Pusakanagara	Bojong Tengah	227	217	200	229	228	214	216	193	220	202	204	196	186	471	3,203
Tambakdahan	Bojonegara	243	368	352	385	354	344	487	468	405	328	339	235	228	256	4,792
	Rancaudik	266	288	272	313	362	394	334	362	297	347	266	267	163	326	4,257
	Tambakdahan	542	525	567	654	544	643	582	682	607	598	416	393	222	387	7,362
	Kertajaya	189	279	319	279	316	371	351	320	264	242	238	188	126	228	3,710
	Mariuk	327	390	405	407	344	321	331	307	281	266	277	238	188	309	4,391
	Tanjung Rasa	306	452	518	484	384	516	527	447	443	396	283	235	173	386	5,550
Compreng	Jatimulya	300	256	291	283	292	286	287	258	246	258	246	261	250	604	4,118
Binong	Wanajaya	418	507	448	479	381	506	535	590	450	391	357	334	230	425	6,051
Ciasem	Jatibaru	421	544	700	798	690	601	632	593	484	753	454	421	262	663	8,016
	Dukuh	666	742	784	579	542	550	618	724	730	553	532	295	175	173	7,663
Patok Beusi	Ranca Asih	402	466	453	448	422	501	423	401	333	306	257	268	165	160	5,005
	Rancabango	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Rancajaya	328	405	432	473	443	423	405	394	302	320	332	280	294	689	5,520
	Rancamulya	589	857	737	1,212	683	571	468	532	514	481	483	481	272	747	8,627
	Gempolsari	722	752	846	833	718	808	662	661	488	455	473	532	321	-	8,271
	Tjg Rasa Kidul	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Sub Districts	Villages	Age Group														
		0 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	65 -+	TOTAL
Pabuaran	Pabuaran	852	1,239	1,076	771	928	784	932	958	952	929	903	671	347	325	11,667
	Siluman	504	507	597	630	556	555	525	501	405	419	345	304	308	485	6,641
	Cihambulu	251	298	310	304	345	350	290	293	240	227	192	182	119	209	3,610
Campaka	Cijunti	506	788	801	527	291	815	798	251	222	260	181	144	146	124	5,854
Bungursari	Karangmukti	0	532	0	360	0	285	0	292	0	225	0	270	0	336	2,300
	Cikopo	513	554	433	470	644	591	491	326	231	229	209	156	88	182	5,117
	Cinangka	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cikampek	Kamojing	225	264	280	215	287	375	343	297	218	212	138	124	89	172	3,239
	Kalihurip	288	277	333	321	244	369	54	72	311	332	334	343	344	307	3,929
Klari	Karanganyar	844	721	604	585	560	540	503	626	642	541	486	439	724	1,032	8,847
	Cimahi	802	673	508	371	430	405	554	569	558	411	406	305	259	340	6,591
	Curug	509	1,171	1,171	909	676	511	416	546	649	793	521	435	491	456	9,254
Ciampel	Mulyasari	254	317	344	344	358	338	384	374	410	412	316	334	244	434	4,863
	Kutanegara	308	306	303	279	320	271	314	317	309	276	311	198	200		3,712
	Parungmulya	432	443	492	418	440	454	460	391	463	436	86	139	99	194	4,947
Teluk Jambe Barat	Margamulya	208	335	245	289	314	359	293	336	389	545	284	287	248	479	4,611
	Margakaya	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Wanakerta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Wanajaya	481	491	467	468	446	341	330	354	262	187	177	206	120	108	4,438
Teluk Jambe Timur	Puseur Jaya	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Serang Baru	Nagasari	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cikarang Pusat	Pasir Ranji	50	37	40	300	270	320	1,415	700	0	0	0	0	0	0	3,132
	Sukamahi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Cicau (GITET)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Source: Potential Data and Monograph Data of 52 Villages

2) Education level and religion

Education levels and religions of the first two villages traversed by transmission line are shown in Table 9.1.49 and Table9.1.50 respectively.

Table 9.1.49 Education level

Sub Districts	Villages	Early Chilhood Education			Elementary School			Junior High School			High School			Academy			Non Education
		School	Teacher	Graduate	School	Teacher	Graduate	School	Teacher	Graduate	School	Teacher	Graduate	School	Teacher	Graduate	
Sukra	Sumuradem	0	0	48	1	0	2400	3	21	1150	1	18	600	1	24	294	0
	Sukra	6	33	237	3	52	4558	1	18	873	0	0	859	1	0	105	71
	Sukrawetan	0	0	858	5	35	270	0	0	127	0	0	110	0	0	14	4207
	Tegaltaman	4	5	25	3	0	0	0	0	0	0	0	0	0	0	0	265
	Karang Layung	0	0	251	1	0	358	0	0	292	0	0	200	0	0	21	1
	Ujung Gebang	2	3	89	4	20	513	1	5	125	0	0	15	0	0	7	227
Pusaka Jaya	Karanganyar	1	0	91	5	0	858	0	0	169	0	0	209	0	0	77	51
	Kebondanas	5	16	87	5	0	1886	2	0	772	0	0	552	0	0	153	64
	Cigugur Kaler	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bojong Jaya	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Pusaka Jaya	4	0	1847	3	0	3086	2	0	1992	2	0	440	0	0	291	75
Pusakanagara	Bojong Tengah	1	2	17	3	12	523	0	0	273	0	0	122	0	0	37	0
Tambakdahan	Bojonegara	0	0	10	0	0	766	0	0	0	0	0	0	0	0	0	0
	Rancaudik	4	0	157	5	0	1246	1	0	1137	0	0	233	0	0	77	164
	Tambakdahan	0	0	22	0	0	2513	0	0	916	0	0	335	0	0	119	144
	Kertajaya	0	0	29	0	0	843	0	0	461	0	0	150	0	0	87	368
	Mariuk	0	0	85	0	0	1068	0	0	702	0	0	314	0	0	56	44
	Tanjung Rasa	1	0	390	2	0	476	0	0	98	0	0	68	0	0	20	303
Compreng	Jatimulya	3	0	287	6	0	2043	0	0	594	0	0	41	0	0	32	355
Binong	Wanajaya	0	0	34	0	0	804	0	0	453	0	0	378	0	0	19	24
Ciasem	Jatibaru	0	0	0	0	0	5105	0	0	204	0	0	55	0	0	18	0
	Dukuh	3	10	404	5	29	1332	1	23	1807	0	0	167	0	0	118	380
Patok Beusi	Ranca Asih	0	0	175	0	0	2722	0	0	485	0	0	185	0	0	59	5
	Rancabango	0	0	0	5	0	0	3	0	0	2	0	0	0	0	0	0
	Rancajaya	2	5	50	3	15	1560	0	0	1032	0	0	756	0	0	22	48
	Rancamulya	4	0	100	4	0	986	0	0	616	0	0	320	0	0	200	279
	Gempolsari	3	11	0	4	22	0	0	0	0	0	0	0	0	0	0	0
	Tjg Rasa Kidul	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Sub Districts	Villages	Early Chilhood Education			Elementary School			Junior High School			High School			Academy			Non Education
		School	Teacher	Graduate	School	Teacher	Graduate	School	Teacher	Graduate	School	Teacher	Graduate	School	Teacher	Graduate	
Pabuaran	Pabuaran	5	11	537	8	46	437	2	35	2093	2	10	1494	0	0	729	44
	Siluman	4	14	234	6	53	2404	1	24	1678	0	0	1120	0	0	58	157
	Cihambulu	3	6	64	3	18	2639	1	6	68	1	6	30	0	0	68	0
Campaka	Cijunti	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bungursari	Karangmukti	0	0	33	0	0	2048	0	0	391	0	0	132	0	0	24	0
	Cikopo	3	10	113	4	32	2906	1	20	898	0	0	240	0	0	86	0
	Cinangka	1	3	0	1	12	180	0	0	110	0	0	39	0	0	11	0
Cikampek	Kamojing	1	3	58	1	0	641	0	0	360	0	0	463	0	0	39	104
	Kalihurip	3	20	102	3	0	598	1	0	363	0	0	479	0	0	324	1774
Klari	Karanganyar	2	0	87	5	22	1186	0	0	431	0	0	305	0	0	29	0
	Cimahi	2	8	408	3	18	321	0	0	285	0	0	307	0	0	23	1316
	Curug	2	6	80	6	48	1970	1	22	1274	0	0	1418	0	0	87	0
Ciampel	Mulyasari	0	0	83	0	0	565	0	0	760	0	0	227	0	0	39	219
	Kutanegara	1	3	19	3	18	525	0	0	185	0	0	20	0	0	1	15
	Parungmulya	1	2	111	2	14	1150	0	0	220	0	0	128	0	0	37	160
Teluk Jambe Barat	Margamulya	1	4	115	4	36	1429	2	61	379	1	15	471	0	0	42	147
	Margakaya	0	0	283	0	0	583	0	0	375	0	0	197	0	0	12	0
	Wanakerta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Wanajaya	0	0	53	0	0	415	0	0	490	0	0	420	0	0	9	335
Teluk Jambe Timur	Puseur Jaya	1	0	118	1	0	397	0	0	0	0	0	0	0	0	0	0
Serang Baru	Nagasari	3	3	47	3	21	722	1	8	445	1	5	369	0	0	60	281
Cikarang Pusat	Pasir Ranji	3	5	50	5	30	0	1	20		1	30	182	2	0	0	0
	Sukamahi	1	2	14	3	17	379	1	9	431	1	6	95	0	0	5	0
	Cicau (GITET)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Source: Potential Data and Monograph Data of 52 Villages

Table 9.1.50 Population Composition Based on Religion

Sub Districts	Villages	Islam		Catholic		Protestant		Hindu		Budha		Other	
		Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Sukra	Sumuradem	5,105	99.86	7	0.14	0	0	0	0	0	0	0	0
	Sukra	8,095	99.94	5	0.06	0	0	0	0	0	0	0	0
	Sukrawetan	7,578	99.91	7	0.09	0	0	0	0	0	0	0	0
	Tegaltaman	6,264	100.00	0	0	0	0	0	0	0	0	0	0
	Karang Layung	4,163	100.00	0	0	0	0	0	0	0	0	0	0
	Ujung Gebang	4,144	100.00	0	0	0	0	0	0	0	0	0	0
Pusaka Jaya	Karanganyar	8,761	99.93	0	0	6	0.07	0	0	0	0	0	0
	Kebondanas	6,669	99.78	0	0	15	0.22	0	0	0	0	0	0
	Cigugur Kaler	4,529	100.00	0	0	0	0	0	0	0	0	0	0
	Bojong Jaya	4,573	99.98	0	0	1	0.02	0	0	0	0	0	0
	Pusaka Jaya	10,394	98.87	50	0.48	69	0.66	0	0	0	0	0	0
Pusakanagara	Bojong Tengah	3,203	100.00	0	0	0	0	0	0	0	0	0	0
Tambakdahan	Bojonegara	4,792	100.00	0	0	0	0	0	0	0	0	0	0
	Rancaudik	4,257	100.00	0	0	0	0	0	0	0	0	0	0
	Tambakdahan	7,348	99.81	0	0	14	0.19	0	0	0	0	0	0
	Kertajaya	3,699	99.70	11	0.30	0	0	0	0	0	0	0	0
	Mariuk	4,391	100.00	0	0	0	0	0	0	0	0	0	0
	Tanjung Rasa	5,545	99.91	0	0	5	0.09	0	0	0	0	0	0
Compreng	Jatimulya	4,123	100.00	0	0	0	0	0	0	0	0	0	0
Binong	Wanajaya	6,185	100.00	0	0	0	0	0	0	0	0	0	0
Ciasem	Jatibaru	8,016	100.00	0	0	0	0	0	0	0	0	0	0
	Dukuh	2,809	99.96	0	0	1	0.04	0	0	0	0	0	0
Patok Beusi	Ranca Asih	5,005	100.00	0	0	0	0	0	0	0	0	0	0
	Rancabango	-	-	-	-	-	-	-	-	-	-	-	-
	Rancajaya	5,657	100.00	0	0	0	0	0	0	0	0	0	0
	Rancamulya	7,223	99.86	0	0	10	0.14	0	0	0	0	0	0
	Gempolsari	-	-	-	-	-	-	-	-	-	-	-	-
	Tjg Rasa Kidul	-	-	-	-	-	-	-	-	-	-	-	-

Sub Districts	Villages	Islam		Catholic		Protestant		Hindu		Budha		Other	
		Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Pabuaran	Pabuaran	11,650	99.85	0	0	13	0.11	4	0.03	0	0	0	0
	Siluman	6,655	100.00	0	0	0	0	0	0	0	0	0	0
	Cihambulu	3,565	100.00	0	0	0	0	0	0	0	0	0	0
Campaka	Cijunti	4,362	99.89	0	0	5	0.11	0	0	0	0	0	0
Bungursari	Karangmukti	2,300	100.00	0	0	0	0	0	0	0	0	0	0
	Cikopo	5,101	99.69	2	0.04	8	0	0	0	6	0.12	0	0
	Cinangka	3,343	97.35	22	0.64	63	1.83	6	0.17	0	0	0	0
Cikampek	Kamojing	3,239	100.00	0	0	0	0	0	0	0	0	0	0
	Kalihurip	4,031	99.78	0	0	9	0	0	0	0	0	0	0
Klari	Karanganyar	7,790	99.27	7	0.09	50	0.64	0	0	0	0	0	0
	Cimahi	-	-	-	-	-	-	-	-	-	-	-	-
	Curug	9,211	99.54	17	0.18	21	0.23	5	0.05	0	0	0	0
Ciampel	Mulyasari	-	-	-	-	-	-	-	-	-	0	-	-
	Kutanegara	3,712	100.00	0	0	0	0	0	0	0	0	0	0
	Parungmulya	4,411	99.30	18	0.41	13	0.29	0	0	0	0	0	0
Teluk Jambe Barat	Margamulya	4,598	99.76	7	0.15	3	0.07	1	0.02	0	0	0	0
	Margakaya	4,843	98.32	53	1.08	30	0.61	0	0	0	0	0	0
	Wanakerta	5,623	100.00	0	0	0	0	0	0	0	0	0	0
	Wanajaya	4,566	99.80	0	0	9	0	0	0	0	0	0	0
Teluk Jambe Timur	Puseur Jaya	7,760	98.50	19	0.24	77	0.98	14	0.18	8	0.10	0	0
Serang Baru	Nagasari	4,442	100.00	0	0	0	0	0	0	0	0	0	0
Cikarang Pusat	Pasir Ranji	3,132	100.00	0	0	0	0	0	0	0	0	0	0
	Sukamahi	5,760	99.48	7	0.12	18	0.31	0	0.00	5	0.09	0	0
	Cicau (GITET)	-	-	-	-	-	-	-	-	-	-	-	-

Source: Potential Data and Monograph Data of 52 Villages

3) Workforce

The workforce classifications and numbers, in fifty two villages traversed by the transmission line are shown in Table 9.1.51.

Table 9.1.51 Population composition based on Workforce Classification

Sub Districts	Villages	Occupation																											
		Farm		Farm Labor		PNS/TNI /Police		Craftsman		Trader		Breeder		Fisherman		Mechanic		Doctor		Midwifes		Housemaid		Bussinesman		Employee		Other	
		Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Sukra	Sumuradem	1,304	35.04	1,900	51.06	80	2.15	3	0.08	35	0.94	0	0.00	0	0.00	5	0.13	0	0.00	1	0.03	10	0.27	35	0.94	30	0.81	318	8.55
	Sukra	724	33.29	1,254	57.66	45	2.07	0	0.00	20	0.92	4	0.18	0	0.00	4	0.18	0	0.00	0	0.00	8	0.37	0	0.00	0	0.00	116	5.33
	Sukrawetan	2,169	53.37	1,810	44.54	65	1.60	0	0.00	0	0.00	0	0.00	0	0.00	7	0.17	2	0.05	0	0.00	0	0.00	0	0.00	0	0.00	11	0.27
	Tegaltaman	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Karang Layung	1,832	85.89	97	4.55	20	0.94	5	0.23	98	4.59	15	0.70	0	0.00	4	0.19	0	0.00	0	0.00	60	2.81	0	0.00	0	0.00	2	0.09
	Ujung Gebang	313	20.30	616	39.95	5	0.32	0	0.00	5	0.32	0	0.00	483	31.32	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	120	7.78
Pusaka Jaya	Karanganyar	256	6.53	3,000	76.51	31	0.79	0	0.00	110	2.81	71	1.81	0	0.00	8	0.20	1	0.03	0	0.00	0	0.00	100	2.55	297	7.57	47	1.20
	Kebondanas	584	27.37	1,125	52.72	38	1.78	7	0.33	22	1.03	0	0.00	0	0.00	6	0.28	0	0.00	3	0.14	342	16.03	0	0.00	0	0.00	7	0.33
	Cigugur Kaler	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bojong Jaya	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Pusaka Jaya	525	5.69	6,708	72.69	98	1.06	50	0.54	152	1.65	36	0.39	0	0.00	25	0.27	2	0.02	3	0.03	186	2.02	140	1.52	650	7.04	653	7.08
Pusakanagara	Bojong Tengah	460	26.76	1,102	64.11	25	1.45	0	0.00	22	1.28	48	2.79	3	0.17	3	0.17	0	0.00	0	0.00	38	2.21	0	0.00	16	0.93	2	0.12
Tambakdahan	Bojonegara	1,105	60.85	600	33.04	12	0.66	0	0.00	9	0.50	0	0.00	0	0.00	4	0.22	0	0.00	2	0.11	3	0.17	34	1.87	45	2.48	2	0.11
	Rancaudik	12	1.66	234	32.28	141	19.45	87	12.00	0	0.00	3	0.41	1	0.14	2	0.28	8	1.10	0	0.00	24	3.31	213	29.38	0	0.00	0	0.00
	Tambakdahan	47	9.27	0	0.00	6	1.18	18	3.55	0	0.00	0	0.00	2	0.39	3	0.59	3	0.59	0	0.00	18	3.55	410	80.87	0	0.00	0	0.00
	Kertajaya	161	13.08	530	43.05	22	1.79	2	0.16	14	1.14	12	0.97	0	0.00	9	0.73	0	0.00	1	0.08	7	0.57	0	0.00	36	2.92	437	35.50
	Mariuk	641	23.43	1,124	41.08	28	1.02	5	0.18	96	3.51	55	2.01	0	0.00	6	0.22	0	0.00	1	0.04	14	0.51	57	2.08	274	10.01	435	15.90
	Tanjung Rasa	1,247	67.41	502	27.14	37	2.00	0	0.00	8	0.43	0	0.00	0	0.00	15	0.81	1	0.05	2	0.11	0	0.00	0	0.00	35	1.89	3	0.16
Compreng	Jatimulya	1,306	40.14	1,225	37.65	98	3.01	0	0.00	83	2.55	12	0.37	0	0.00	5	0.15	1	0.03	0	0.00	0	0.00	189	5.81	72	2.21	263	8.08
Binong	Wanajaya	250	9.01	2,329	83.93	31	1.12	7	0.25	28	1.01	6	0.22	0	0.00	51	1.84	0	0.00	0	0.00	0	0.00	11	0.40	0	0.00	62	2.23
Ciasem	Jatibaru	0	0.00	0	0.00	40	4.51	209	23.59	614	69.30	20	2.26	0	0.00	3	0.34	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	Dukuh	2,362	60.44	487	12.46	10	0.26	0	0.00	787	20.14	12	0.31	0	0.00	15	0.38	4	0.10	6	0.15	0	0.00	102	2.61	0	0.00	123	3.15
Patok Beusi	Ranca Asih	750	48.02	673	43.09	18	1.15	6	0.38	42	2.69	0	0.00	5	0.32	0	0.00	1	0.06	1	0.06	1	0.06	9	0.58	46	2.94	10	0.64
	Rancabango	1,818	63.66	515	18.03	248	8.68	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	125	4.38	0	0.00	150	5.25
	Rancajaya	1,075	63.09	553	32.45	26	1.53	0	0.00	32	1.88	0	0.00	0	0.00	7	0.41	0	0.00	0	0.00	0	0.00	6	0.35	2	0.12	3	0.18
	Rancamulya	1,000	15.46	2,430	37.57	37	0.57	0	0.00	680	10.51	10	0.15	0	0.00	50	0.77	1	0.02	5	0.08	60	0.93	826	12.77	530	8.19	839	12.97
	Gempolsari	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Sub Districts	Villages	Occupation																											
		Farm		Farm Labor		PNS/TNI /Police		Craftsman		Trader		Breeder		Fisherman		Mechanic		Doctor		Midwifes		Housemaid		Bussinesman		Employee		Other	
		Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
	Tjg Rasa Kidul	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pabuaran	Pabuaran	2,456	58.90	642	15.40	278	6.67	27	0.65	88	2.11	6	0.14	0	0.00	15	0.36	1	0.02	8	0.19	56	1.34	71	1.70	456	10.94	66	1.58
	Siluman	764	32.35	757	32.05	32	1.35	9	0.38	20	0.85	3	0.13	0	0.00	4	0.17	0	0.00	0	0.00	120	5.08	12	0.51	634	26.84	7	0.30
	Cihambulu	934	51.72	357	19.77	75	4.15	64	3.54	7	0.39	29	1.61	0	0.00	4	0.22	0	0.00	1	0.06	8	0.44	12	0.66	90	4.98	225	12.46
Campaka	Cijunti	510	57.82	128	14.51	29	3.29	99	11.22	2	0.23	0	0.00	0	0.00	2	0.23	0	0.00	28	3.17	0	0.00	15	1.70	57	6.46	12	1.36
Bungursari	Karangmukti	645	27.89	1,504	65.02	15	0.65	120	5.19	18	0.78	3	0.13	0	0.00	6	0.26	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	2	0.09
	Cikopo	60	4.70	1,000	78.31	33	2.58	0	0.00	0	0.00	4	0.31	0	0.00	0	0.00	11	0.86	1	0.08	0	0.00	6	0.47	150	11.75	12	0.94
	Cinangka	0	0.00	0	0.00	4	23.53	1	5.88	0	0.00	1	5.88	0	0.00	5	29.41	0	0.00	0	0.00	0	0.00	1	5.88	5	29.41	0	0.00
Cikampek	Kamojing	6	1.62	177	47.71	13	3.50	4	1.08	0	0.00	0	0.00	0	0.00	2	0.54	0	0.00	0	0.00	0	0.00	0	0.00	165	44.47	4	1.08
	Kalihurip	175	8.03	370	16.99	20	0.92	2	0.09	51	2.34	0	0.00	0	0.00	4	0.18	6	0.28	5	0.23	25	1.15	0	0.00	1,189	54.59	331	15.20
Klari	Karanganyar	541	41.55	286	21.97	87	6.68	1	0.08	14	1.08	0	0.00	0	0.00	3	0.23	1	0.08	1	0.08	0	0.00	0	0.00	366	28.11	2	0.15
	Cimahi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Curug	430	25.32	129	7.60	543	31.98	0	0.00	55	3.24	0	0.00	0	0.00	11	0.65	0	0.00	0	0.00	0	0.00	0	0.00	527	31.04	3	0.18
Ciampel	Mulyasari	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Kutanegara	30	2.42	967	78.05	12	0.97	0	0.00	29	2.34	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	201	16.22
	Parungmulya	405	40.66	213	21.39	19	1.91	2	0.20	37	3.71	0	0.00		0.00	15	1.51	1	0.10	1	0.10	6	0.60	40	4.02	243	24.40	14	1.41
Teluk Jambe Barat	Margamulya	315	24.19	839	64.44	24	1.84	34	2.61	20	1.54	0	0.00	6	0.46	0	0.00	0	0.00	0	0.00	0	0.00	5	0.38	0	0.00	59	4.53
	Margakaya	0	0.00	380	26.30	61	4.22	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3	0.21	1,000	69.20	1	0.07
	Wanakerta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Wanajaya	1,872	45.53	1,987	48.32	26	0.63		0.00	0	0.00	0	0.00		0.00		0.00		0.00		0.00		0.00		0.00	225	5.47	2	0.05
Teluk Jambe Timur	Puseur Jaya	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Serang Baru	Nagasari	1,681	52.40	387	12.06	21	0.65	40	1.25	55	1.71	541	16.86	0	0.00	15	0.47	0	0.00	4	0.12	0	0.00	35	1.09	348	10.85	81	2.52
Cikarang Pusat	Pasir Ranji	400	21.94	500	27.43	23	1.26	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	500	27.43	300	16.46	100	5.49
	Sukamahi	1,020	60.82	225	13.42	7	0.42	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	340	20.27	0	0.00	85	5.07
	Cicau (GITET)	1,750	44.29	721	18.25	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1,027	25.99	0	0.00	453	11.47

Source: Potential Data and Monograph Data of 52 Villages

4) Livelihood

The Industrial groups providing livelihood in the five districts traversed by the transmission line is shown in Table 9.1.52.

Table 9.1.52 Number of Industry and Labor in District Level

Industrial Group	Indramayu District		Subang District		Karawang District		Purwakarta District		Bekasi District	
	Total Manufacture	Total Labor	Total Manufacture	Total Labor	Total Manufacture	Total Labor	Total Manufacture	Total Labor	Total Manufacture	Total Labor
Textile	0	0	6	4,288	72	35,841	0	0	63	29,296
Commerce, Bank and Insurance	29	420	0	0	0	0	0	0	0	0
Food and Drink	66	481	26	4,336	0	0	0	0	54	6,812
Chemistry and Pharmacy	2	324	2	333	101	14,676	0	0	165	33,394
Building and Public Work	38	295	0	0	0	0	0	0	0	0
Timber	0	0	7	641	14	487	0	0	26	4,676
Ceramic and Metal	1	508	0	0	133	13,032	600*	3,125*	374	114,097
Gas and Oil	7	2,557	0	0	0	0	0	0	23	11,121
Assembling Cars and Workshops	0	0	0	0	0	0	0	0	0	0
Printing Office and Publishing	2	20	0	0	21	9,103	0	0	35	7,214
Transportation	0	0	1	408	11	1,496	0	0	0	0
Leather and Rubber	0	0	3	2,088	0	0	0	0	0	0
Agriculture and Plantation	11	169	0	0	0	0	2,118	8,423	0	0
Tobacco and Cigarette	0	0	0	0	0	0	0	0	0	0
Electronic	0	0	0	0	42	4,965	600*	3,125*	0	0
Tourism	6	464	0	0	0	0	0	0	0	0
Indonesian Labor	n/a	7,090	0	0	0	0	0	0	0	0
Other	224	3,103	2	249	8,876	39,544	610	9,020	12	7,228

* Data for Metal, Mnufacture, Assembling, Electronic and Others (Ilmea)

5) Socio-culture

(a) Social institution

The five districts (Indramayu, Subang, Purwakarta, Karawang and Bekasi) traversed by the transmission line, have the same governance structure. Social Institutions of both formal and informal types are found in the districts. Formal ones from Regent to Village Heads are administrated by district governments. Informal ones are traditional, such as social gathering, religios groups (such mosque and praying groups) and so on. These institutions play an important role in village life.

(b) Community health component

i) Indramayu

According to healthcare facility data, the 10 most prevalent diseases occurring in the Sukra sub-district of the Indramayu district are shown in Table 9.1.53.

Table 9.1.53 Dominant prevalent diseases in Sukra sub-district

No	Disease	Number
1	Skin disease	842
2	Diarrhea	667
3	Eye disease	590
4	Caries	534
5	Pneumonia	524
6	Ear infection	453
7	Scabies	277
8	GO	87
9	Lung TBC	28
10	Measles	17

Source: EIA of IR_A1-3

ii) Subang

According to healthcare facility data, the 10 most prevalent diseases occurring in the Subang District are shown in Table 9.1.54.

Table 9.1.54 Dominant prevalent diseases in Subang District

No	Disease	Number
1	Upper Respiratory Tract Infection	69,921
2	Ulcer	27,006
3	Hypertension	24,025
4	Diarrhea and Gastroenteritis	19,861
5	Myalgia	19,225
6	Cough	18,104
7	Influenza	15,130
8	Dermatitis	13,376
9	Common Cold	13,196
10	Pulp Disease	12,561

Source: Subang District Health Office

iii) Purwakarta

The infant mortality rate is one of the main indicators used to assess the health status of a region. Based on data from the Purwakarta District Health Office in the year 2007, there were 71 cases of neonatal mortality and 15 cases of infant mortality. Additionaly, there were 25 deaths of mothers mostly caused by childbirth.

iv) Karawang

According to healthcare facility data, the 10 most prevalent diseases in the Karawang District are listed in Table 9.1.55.

Table 9.1.55 Dominant prevalent diseases in Karawang District

No	Disease	Number	
		2007	2008
1	Chicken pox	5,384	-
2	Whooping Cough	241	-
3	Measles	1,020	-
4	Cholera and diarrhea	-	28,255
5	Tuberculosis	5,944	1,618
6	Enteric Fever	23,452	-
7	Dengue Hemorrhagic Fever	738	-
8	Diphtheria	1	-
9	Dysentery Bassilier	4,764	-
10	Inflammation of Heart	105	-

Source: Karawang District Health Office

v) Bekasi

According to healthcare facility data, the 10 most prevalent diseases in Bekasi District are listed in Table 9.1.56.

Table 9.1.56 Dominant prevalent diseases in Bekasi District

No	Disease	Number
1	Upper Respiratory Tract Infection	2,921
2	Cough	1,302
3	Diarrhea and Gastroenteritis	1,062
4	Fever	981
5	Common Cold	966
6	Influenza	574
7	Skin Disease	307
8	Dermatitis	263
9	Lower Respiratory Tract Infection	236
10	Other Disease	857

Source: Bekasi District- Health and Social Affairs Service

(c) Healthcare resources

i) Indramayu

Healthcare resources in the Indramayu District consist of public health centers, public health sub centers, clinics, midwifes and so on. The healthcare facilities in the Indramayu distric are listed in Table 9.1.57.

Table 9.1.57 Number of healthcare facilities in Indramayu district (2008)

Number of Healthcare Facilities	Total
Public Health center	49
Public Health sub center	67
Doctor	58
Midwife	421
Dentist	24
Nurse	569

Source: Indramayu District health office

ii) Subang

Healthcare resources in the Subang District consist of hospitals, district health centers, secondary health centers, clinics, dentists and so on. The healthcare facilities in the Subang District are shown in Table 9.1.58.

Table 9.1.58 Number of healthcare facilities in Subang District (2008)

Number of Healthcare Facilities	Total
Hospital	3
District Health center	40
Secondary Health Center	74
Clinic	32
Dentist	18

Source: Subang District health office

iii) Purwakarta

Healthcare resources in the Purwakarta District consist of general hospitals, maternity hospitals, public health centers, and pharnaccies. The healthcare facilities in the Purwakarta District are shown in Table 9.1.59.

Table 9.1.59 Number of healthcare facilities in Purwakarta District (2008)

Number of Healthcare Facilities	Total
General Hospital	4
Maternity Hospital	18
Public Health Center	19
Secondary Public Health Center	49
Pharmacy	40

Source: Purwakarta District health office

iv) Karawang

The healthcare resources in the Karawang District consist of general hospitals, public health centers, dispensaries, medical centers, midwives and so on. The healthcare facilities in the Karawang District are shown in Table 9.1.60.

Table 9.1.60 Number of healthcare facilities in Karawang District (2008)

Number of Healthcare Facilities	Total
General Hospital	13
Public Health center	44
Public Health Sub Center	71
Dispensaries	57
Medical center	172
Doctor	197
Nurse	83
Nurse assistance	206
Dentist assistance	21
Midwife	347
Sanitation	20

Source: Karawang District health office

v) Bekasi

The healthcare resources in Bekasi District consist of public health centers, family planning clinics, doctor's clinics, and midwife's clinics. The healthcare facilities in the Bekasi District are shown in Table 9.1.61.

Table 9.1.61 Number of healthcare facilities in Bekasi District (2008)

Number of Healthcare Facilities	Total
Public Health center	38
Family Planning Clinic	42
Doctor Clinic	102
Midwife Clinic	232

Source: Bekasi District health office

(d) Environmental condition which might worsen disease spread

i) Indramayu

Based on data from healthcare centers, a number of contagious diseases such as lung tuberculosis, diarrhea, upper respiratory tract infection, and pneumonia are still prevalent. During rainy seasons, most of the areas are flooded. Thus conditions worsen the spread of diseases, particularly skin diseases and digestive tract infection. The number of public toilet facility using the river flow (without a septic tank) also contributes to the spread of diseases.

ii) Subang

Based on data from health centers, a number of contagious diseases such as upper respiratory tract infection, diarrhea, and dermatitis are still prevalent. During rainy season, most of the areas are flooded. Thus conditions worsens the spread of diseases, particularly coughs, influenza, and the common cold.

iii) Purwakarta

Health status is affected by environmental factors, which include clean water facilities, family latrines, wastewater disposal facilities and the quality of housing. In the Purwakarta District in 2007, 117,329 families have the use of clean water facilities (SAB), and 73,474 families have latrines. As for water disposal facilities (SPAL), there were 122,761 families are living in homes having healthy waste disposal facilities.

iv) Karawang

Based on data from health centers, the number of contagious diseases such as TBC, diarrhea, and choleras are still prevalent. During rainy season, most of the areas are flooded. Flow in the river overflows and the contiuously wet conditions are a cause of the spread of skin and other diseases etc.

v) Bekasi

Based on data from health centers, the number of contagious diseases such as upper respiratory tract infection, cough, diarrhea and dermatitis are still prevalent. Bad weather that often hits the Bekasi District causes the spread of diseases, particularly fever, common cold and influenza.

9.2 Environmental Impact Assessment (EIA) related laws and regulations

9.2.1 EIA regulations and procedures

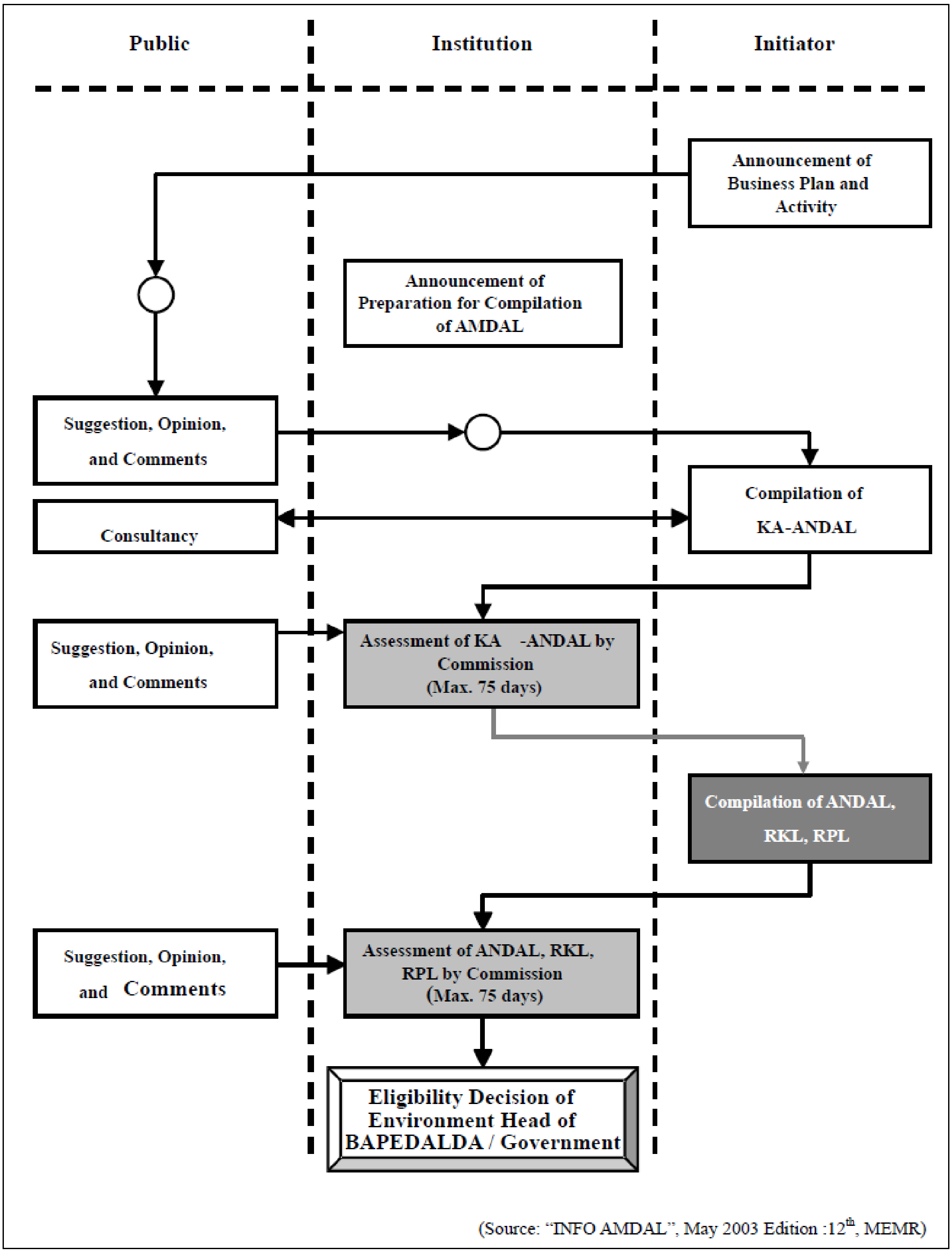
Indonesia has the following major laws and regulations concerning EIA:

- Law concerning Environmental Management (Law No.23/ 1997, Republic of Indonesia)
- Government Regulation concerning Environmental Impact Assessment (Indonesian Government Regulation No.27/ 1999)
- Decision on EIA Guidelines (Decision of the State Minister for the Environment No.02/ 2000)
- Decision of the State Minister concerning Community Involvement and Information Disclosure in the Process of Environmental Impact Assessment (Decision of the Head of the Environmental Impact Management Agency No.08/ 2000)
- Guidelines for Preparing Environmental Impact Assessment Papers (Decision of the State Minister for the Environment No.08/ 2006)
- Decree of the State Minister on Types of Projects and Necessity for Implementing Environmental Impact Assessment (Decree of the State Minister for the Environment No.11/ 2006)
- Decree of the State Minister for Procedures of EIA Commission (Decree of the State Minister for the Environment No.05/ 2008)

In the procedures for a project subject to environmental impact assessment, the project owner is required to announce the project in newspapers and elsewhere. Following this, the project owner is required to explain the project and EIA study plan at an explanatory meeting hosted by the head of the local government. The project owner shall prepare a TOR-EIA (KA-ANDAL) that reflects the comments at the explanatory meeting. Such a KA-ANDAL shall describe the scope of the survey, survey method, analysis method, and additional information.

Afterwards, the project owner shall submit the KA-ANDAL to the competent ministry or executive for approval (either the Ministry for the Environment, Governor of the Province, or mayor concerned) and obtain approval from the Commission Committee. When necessary, the Committee may request the project owner to revise the KA-ANDAL.

The project owner who successfully obtains approval for the KA-ANDAL is required to submit an RKL, which describes activities, the competent ministry or executive in charge, budget, and additional items to reduce the impact on the environment, and RPL, which describes the methods and efforts to monitor changes in the environment, as well as an ANDAL, to the competent ministry or executive for approval (either the Ministry for Environment or Governor of the Province or mayor concerned) via the Assessment Committee Office to obtain approval from the local environment bureau (Figure 9.2.1).



Source: JICA (2006): The study on the improvement measures for electric power generation facilities in Jave-Bali region in the Republic of Indonesia

Figure 9.2.1 Procedure for EIA and information discloser

9.2.2 EIA related organizations

At the beginning, the Commission Committee of the Environmental Impact Management Agency (BAPEDAL: Badan Pengendalian Dampak Lingkungan) of the Indonesian Government conducted EIA review. Along with decentralizing power from the central government to local governments, responsibilities for EIA review and supervision have been transferred to regional branches (BAPEDALDA: Badan Pengendalian Dampak Lingkungan Daerah). In 2006, BAPEDAL was merged into the State Ministry of the Environment. Following this, BAPEDALDA, which was a branch of the central government, has been reorganized into the environmental bureaus of provincial, regency, and district governments. In connection with this, the environmental bureau of the West Java Province was renamed BPLDH (Badan Pengelolaan Lingkungan Hidup Daerah) in 2006.

The national, provincial, regency, and district governments are empowered to implement EIA review, under which the Commission Committee, the Technical Team for Evaluation Reports, and the Secretariat for the Assessment Committee are organized.

－ **Commission Committee**

The Commission Committee evaluates KA-ANDAL, ANDAL, RKL, and RPL, and submits its evaluations for the approval of the following ministry or executives:

- National government: Head of the Environmental Impact Management Agency
- Province: Provincial governor
- Regency or district: Regency governor or mayor

－ **Technical Team for Evaluation Reports**

The Technical Team for Evaluation Reports evaluates the technical aspects of KA-ANDAL, ANDAL, RKL, and RPL and submits its results and evaluations to the Commission Committee.

－ **Secretariat for the Assessment Committee**

The Secretariat for the Assessment Committee assists the Commission Committee and the Technical Team for Evaluation Reports.

The Commission Committee and the Technical Team for Evaluation Reports of the West Java Province roughly consist of the following: (Figure 9.2.2)

Technical team for evaluation report

Member of Commission Committee

- Environmental Agency "BPLHD" **(Coordinate)** (6 persons)
- University **(Technical)** (2 persons)
- Regional Development Agency "like BAPPEDA" **(Technical)**(2 persons)
- Government in study area (Project Site) (1 person/District)
- Forest Agency (2 persons)
- Transport Agency (Coast and Land around 2 persons)
- NGO (2 persons)
- Community leader (10 persons /District)
- Inhabitant (25 persons at the Site)

Figure 9.2.2 Members of Commission Committee and Technical Team for Evaluation Reports of West Java Province

9.2.3 Relation with the project

Table 9.2.1 lists the descriptions and scales of projects subject to EIA in the power sector stipulated in Decree No.11/ 2006 of the State Minister for the Environment.

Table 9.2.1 Projects subject to EIA in electricity sector

No.	Project description	Scale of object
1	Transmission line	≥150 kV
2	Thermal power station (diesel, gas turbine, steam turbine, combined cycle)	≥100 MW (per a site)
3	Geothermal power generation	≥55 MW
4	Hydropower station	Dam height ≥15 m, or reservoir area ≥200 ha, or ≥50 MW
5	Other (Thermal energy conversion, photovoltaic generation, wind generation, peat-fired power station, and others)	≥10 MW

Since this project aims to construct a 1,000 MW coal-fired power plant and a 500 kV transmission line, the project is subject to EIA.

This project will build a 2.5 km- or 1.5 km-long jetty to unload coal into the coal-fired power plant. A pier longer than 200 m is subject to EIA in Indonesia. Since the above-mentioned jetty is an incidental facility of the coal-fired power station, the EIA of the jetty will be covered by that of the coal-fired power plant.

In accordance with Decree No.05/ 2008 of the State Minister for the Environment stipulates, the environmental agency of Indramayu Regency is empowered to approve the EIA of coal-fired power plant. Since the transmission lines of this project will be located in five districts, the environmental agency of the West Java Province (BPLHD) is empowered to approve the EIA of transmission line.

In addition to EIA, the permits concerning the operation of the project including ”Principal permit” regarding the project content, and "Location permit" regarding the land use. ”Location permit” establishes the square measure and period of land acquisition. Location permit has its legal basis on the following regulation:

- Decree of the State Minister concerning Location permit (Decree of the State Minister of Agrarian Affairs Decree No.02/1999)

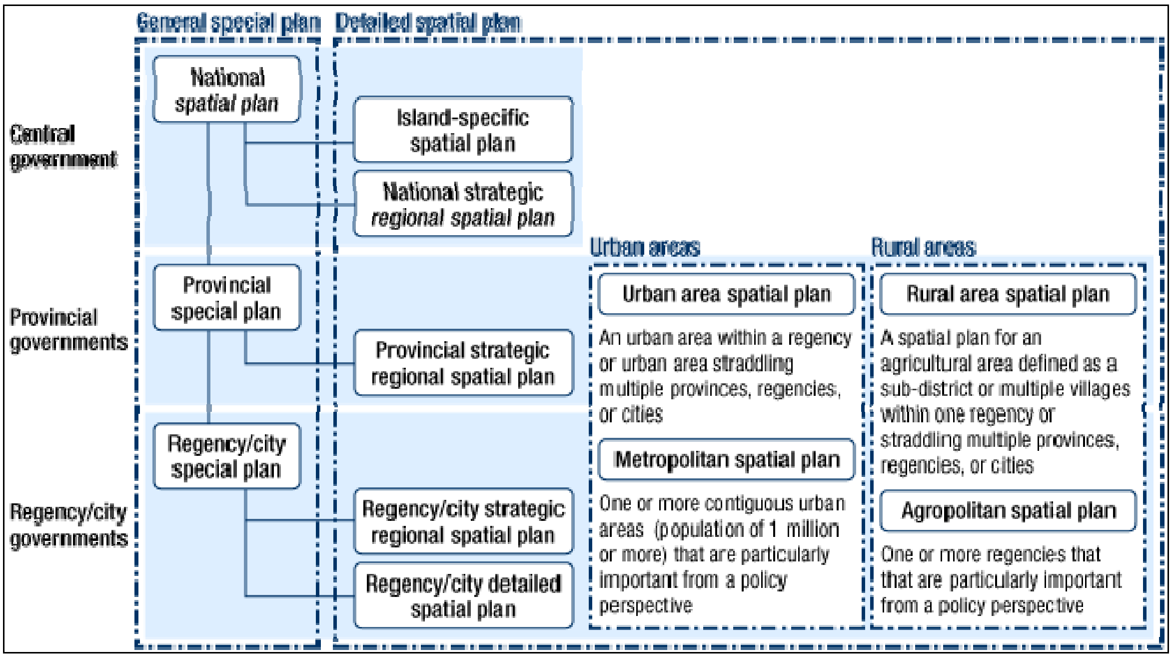
In this decree, “Location permit” is granted for an acquisition of necessary land by business enterprise within the context of investment, or for a land use that satisfies the investment needs. Additionally, location permit is to be granted to the land that complies with the local Spatial plan.

“Location permit” regulates the area that can be administered by the relevant business company or the business group, but the area regulation is not applied to public corporation including public profit organization such as PLN, and profit organization whose stock is owned by general public.

“Location permit” regulates the acquisition period based on the acquired land area. In the case of this project, the site measures over 50ha and the acquisition period is set to 3 years. In principle, land acquisition should be completed within the established period, but the term may be extended up to one year if 50% of the land described in Location permit has already been acquired.

As previously described, Location permit is given to the land that complies with the local Spatial plan. In Indonesia, Spatial Planning Law (Law No.24 /1992) was enacted in 1992, and revised in 2007 reflecting decentralization and other conditions (Law No.26/ 2007)

The government of Indonesia is three-tiered, consisting of provinces (including provinces/regions with special status), Cities (urban local authorities), and regencies (rural local authorities). The respective governments have the authority to draft socioeconomic development plans and spatial plans. Development in the country centers on these plans. The system of the spatial plan is shown on the following figure.
(http://www.mlit.go.jp/kokudokeikaku/international/spw/general/indonesia/index_e.html)



(Souce: http://www.mlit.go.jp/kokudokeikaku/international/spw/general/indonesia/index_e.html)

9.2.4 Information disclosure

According to Decision of the Head of the Environmental Impact Management Agency No.08/ 2000, the project owner is required to hold local meetings to explain environmental impact assessment at its different levels to local residents. Direct explanatory meetings to local residents who are likely to be impacted are only at the stage of preparing a KA-ANDAL.

After the KA-ANDAL is prepared, the Commission Committee holds explanatory meetings. Representatives commissioned by local areas that are likely to be directly or indirectly impacted are entitled to participate, as members, in the Commission Committee. Such local representatives are recognized as messengers by local residents. Commissioning may be in the form of a formal document (concluding an agreement as the representative for the local body) or in other forms of approval (formal leaders such as village mayors, or informal leaders such as religious leaders and traditional local leaders). Representatives are expected to collect opinions and requests from their local residents and periodically communicate and consult with them.

Explanation of EIA at such each stage (four stages) to local residents is as follow; Table 9.2-2 lists a comparison between Indonesian regulation and JICA guideline regarding information disclosure

1. Preliminary phase of EIA

- The project owner is required to provide public notice on the project, in principle, in newspapers or on bulletin boards in the villages concerned, according to the schedule approved by the competent ministry or executives.
- Such public notice shall cover the name and address of the project owner; the location, description, and map of the project; type of the project and products; types of waste and amount to be discharged; waste control system; expected impact on the environment; and deadline for comments, proposals, and opinions from local residents.

2. Preparation phase of KA-ANDAL (Public hearing)

- The project owner must conduct an explanatory meeting for Project Affected People (PAPs), and the results reflect the KA-ANDAL.
- The project owner is required to provide public notice on the places to hold explanatory meetings and the methods such as gatherings, workshops and seminars.
- The project owner is required to provide information with an outline of the project (type, scale, location), important environmental elements that are likely to be impacted, and problems of environmental impact that are likely to occur.

3. Preparation phase of KA-ANDAL (Consulting meeting)

- The technical team in the Commission Committee conducts a technical check for KA-ANDAL.

4. Evaluation phase of KA-ANDAL (Commission meeting)

- The project owner provides explanations in the Commission Committee. Local Authorities, representatives of the region, and local people have the right to participate in the Commission Committee to evaluate KA-ANDAL.

- Local residents concerned may submit proposals and opinions to the Commission Committee up until at least three days prior to the Commission Committee meeting.

5. Examination phase of ANDAL, RKL, and RPL (Commission meeting)

- The project owner provides explanations in the Commission Committee. Local Authorities, representatives of the region, and local people have the right to participate in the Commission Committee to evaluate ANDAL, RKL, and RPL.
- Local residents concerned may submit proposals and opinions to the Commission Committee within 45 (forty-five) days after an official announcement of the Commission Committee meeting.

Table 9.2.2 Comparison between Indonesian regulation and JICA guideline regarding information disclosure

Items	Indonesian regulation Decision of BAPEDAL No.08/ 2000	JICA guideline
Disclosure of information, explanatory meeting	Preliminary phase of EIA A public announcement for the project is in principle using newspapers. At local villages, the bulletin board in the village office is used.	–
	Preparation phase of KA-ANDAL (Public hearing) The project owner conducts an explanatory meeting for Project Affected People (PAPs), and the results reflect the KA-ANDAL.	JICA consults with local stakeholders in collaboration with the recipient governments after disclosure of drafts of scoping, and incorporates results of consultation into TOR.
	Preparation phase of KA-ANDAL (Consulting meeting) The technical team in the Commission Committee conducts a technical check for KA-ANDAL.	–
	Evaluation phase of KA-ANDAL (Commission meeting) The project owner provides explanations in the Commission Committee. Local Authorities, representatives of the region, and local people have the right to participate in the Commission Committee to evaluate KA-ANDAL.	–
	Examination phase of ANDAL, RKL, and RPL (Commission meeting) The project owner provides explanations in the Commission Committee. Local Authorities, representatives of the region, and local people have the right to	When preparing a rough outline of environmental and social considerations, JICA holds a series of stakeholder consultations in collaboration with the recipient governments after information disclosure and incorporates the result of consultation into draft final report.

Items	Indonesian regulation Decision of BAPEDAL No.08/ 2000	JICA guideline
	participate in the Commission Committee to evaluate ANDAL, RKL, and RPL.	JICA discloses the draft final report and consults with local stakeholders in collaboration with the recipient governments, and incorporates the results of that consultation into the final reports.
Category of target people	**Preparation phase of EIA:** resident in and around project site **Public hearing**：Project Affected People (PAPs) **Consulting meeting**：The technical team in the Commission Committee **Evaluation phase of KA-ANDAL**：Local Authorities, representatives of the region, and local people **Examination phase of ANDAL, RKL, and RPL:** Local Authorities, representatives of the region, and local people	"Local stakeholders" means affected individuals or groups including squatters and local Non-governmental Organizations (NGOs).

The disclosure of information meets requirements of JICA guidelines until the assessment phase of KA-ANDAL, however, it is uncertain how far the information about the results of EIA, including land compensation, is described to people seeking compensation at the assessment phase of ANDAL.

As described below, it is the legal system in Indonesia that the project owner provides more concrete explanation for land expropriation and compensation to people seeking compensation, and hears their opinions at preliminary phase of the actual construction after EIA procedure.

9.2.5 Environmental standards

From Table 9.2.3 to Table 9.2.7 shows the emission standards which should be observed by this project and the environmental standards which is referred in the surrounding environment. The IFC guideline value is added for reference.

Table 9.2.3 Emission gas standards

(Unit: mg/Nm^3)

Parameter	Gas emission standards No.21/ 2008	IFC Guideline (Thermal power plant: 2008)
SO_2	750	200 - 850*
NO_2	750	510
Particulate Matter	100	50
Opacity	20%	-

Notes:

* : Targeting the lower guidelines values and recognizing variability in approaches to the management of SO_2 emissions (fuel quality vs. use of secondary controls) and the potential for higher energy conversion efficiencies (FGD may consume between 0.5% and 1.6% of electricity generated by the plant). Larger plants are expected to have additional emission control measures. Selection of the emission level in the range is to be determined by the environmental assessment considering the project’s sustainability, development impact, and cost-benefit of the pollution control performance.

Table 9.2.4 Waste water standards

Parameter	Waste water standards No.08/ 2009	IFC Guideline (Thermal power plant: 2008)
1. Generated waste water from operation process		
pH	6 - 9	6 – 9
TSS	100 mg/L	50 mg/L
Oil and Grease	10 mg/L	10 mg/L
Residual chlorine*1	0.5 mg/L	0.2 mg/L
Total Cr	0.5 mg/L	0.5 mg/L
Cu	1 mg/L	0.5 mg/L
Fe	3 mg/L	1.0 mg/L
Zn	1 mg/L	1.0 mg/L
Pb	-	0.5 mg/L
Cd	-	0.1 mg/L
Hg	-	0.005 mg/L
As	-	0.5 mg/L
PO^{4-}	10 mg/L	-
2. Blow down Boiler		
pH	6 - 9	-
Cu	1 mg/L	-
Fe	3 mg/L	-
3. Demineralization/WTP		
pH	6 - 9	-
TSS	100 mg/L	-
4. Thermal effluent		
Temperature	40° C*2	*3
Residual chlorine*1	0.5 mg/L	0.2 mg/L
5. Desalinization*4		
pH	6 – 9	-
Salinity	The salinity concentration of waste water at 30m in radius from the drain outlet should be the same as the salinity concentration of the sea water.	-
6. FGD system (Sea water wet scrubber)*5		
pH	6 – 9	-
SO_4^{2-}	The maximum increasing sulfate ion concentration between waste water and intake water should be less than 4%.	-
7. Coal Stockpile*6		
pH	6 - 9	-
TSS	200 mg/L	-
Fe	5 mg/L	-
Mn	2 mg/L	-

Notes: IPAL means "waste water treatment facility"

*1 : In case chlorine inject into the intake water

*2 : Monthly average value at the outlet of the condenser

*3 : Elevated temperature areas due to discharge of once-through cooling water (e.g., 1 Celsius above, 2 Celsius above, 3 Celsius above ambient water temperature) should be minimized by adjusting intake and outfall design through the project specific environmental assessment depending on the sensitive aquatic ecosystems around the discharge point.

*4 : In case there is no capability for IPAL to treat waste water from desalination system

*5 : In case there is no capability for IPAL to treat waste water from FGD system

*6 : In case there is no capability for IPAL to treat runoff water from coal stockpile

Table 9.2.5 Ambient air quality standards

Parameter	Air quality standards (No.41/1999)		IFC guideline (General: 2007) (unit : µg/m^3)
	Average time	Limitation values	
SO_2	1 hr 24 hr 1 year	900 µg/m^3 365 µg/m^3 60 µg/m^3	500 (10minute: guideline) 125 (24hr: interim target-1*) 50 (24hr: interim target-2*) 20 (24hr: guideline)
CO	1 hr 24 hr	30,000 µg/m^3 10,000 µg/m^3	-
NO_2	1 hr 24 hr 1 year	400 µg/m^3 150 µg/m^3 100 µg/m^3	200 (1hr: guideline) - 40 (1year: guideline)-
O_3	1 hr 1 year	235 µg/m^3 50 µg/m^3	8-hour daily maximum 160 (interim target-1*) 100 (guideline)
HC	3 hr	160 µg/m^3	-
PM_{10} (Particle Size<10µm)	24 hr	150 µg/m^3	150 (24hr: interim target-1*) 100 (24hr: interim target-2*) 75 (24hr: interim target-3*) 50 (24hr: guideline) 70 (1year: interim target-1*) 50 (1year: interim target-2*) 30 (1year: interim target-3*) 20 (1year: guideline)
$PM_{2.5}$ (Particle Size<2.5µm)	24 hr 1 year	65 µg/m^3 15 µg/m^3	75 (24hr: interim target-1*) 50 (24hr: interim target-2*) 37.5 (24hr: interim target-3*) 25 (24hr: guideline) 35 (1year: interim target-1*) 25 (1year: interim target-2*) 15 (1year: interim target-3*) 10 (1year: guideline)
Total amount of suspended particulates(TSP)	24 hr 1 year	230 µg/m^3 90 µg/m^3	-
Pb	24 hr 1 year	2 µg/m^3 1 µg/m^3	-
Dust Fall	30 days	10 ton/km^2 (Residential Area) 20 ton/km^2 (Industrial Area)	-
Fluoride	24 hr 90 days	0.5 µg/m^3 3 µg/m^3	-
Fluor Index	24 hr	40 µg/100cm^3 (Filter Dimensions)	-
Chlorine & Clorine Dioxide	24 hr	150 µg/m^3	-
Sulphat Index	30 days	1 mg SO_3/100cm^3	-

Notes:

* : Interim targets are provided in recognition of the need for a staged approach to achieving the recommended guidelines

Table 9.2.6 Ambient sea water quality standards (No.51/ 2004)

Parameter	Unit	Category			
		Port	Recreation	Biota	
				Value	Remarks
1. Physical properties					
Coler	Pt.Co		30		
Transparency	m	>3	>6	>5(coral) - (mangrove) >3 (seaweed bed)	<10% (euphotic depth)
Odor	-	null	null	null	
Turbidity	NTU		5	<5	
SS	mg/L	80	20	20 (coral) 80 (mangrove) 20 (seaweed bed)	
Rubbish		null	null	null	
Temperature	℃	natural (< +2℃)	natural (< +2℃)	natural (< +2℃)	28-30 (coral) 28-32 (mangrove) 28-30 (seaweed bed)
Oil content		null	null	null	
2. Chemical properties					
pH		6.5 - 8.5	7-8.5	7-8.5	< 0.2
Salinity		Natural (< +5)	natural (< +5)	natural (< +5)	33-34 (coral) 34 (mangrove) 33-34 (seaweed bed)
DO	mg/L	-	>5	>5, >6	(>80-90%: oxygen saturation)
BOD_5	mg/L	-	10	20	
NH_3-N	mg/L	0.3	null	0.3	
PO_4-P	mg/L	-	0.015	0.015	
NO_3－N	mg/L	-	0.008	0.008, 0.002	
CN	mg/L	-	-	0.5, 0.05	
H_2S	mg/L	0.03	null	0.002	0.01 (Pesticide)
Hydrocarbon	mg/L	1	-	-	
Phenol	mg/L	0.002	null	0.002	
PAH	mg/L	-	0.003	0.003	
PCB	mg/L	0.01	null	0.01	
Surfer	mg/L MBAS	1	0.001	1	
Oil and grease	mg/L	5	1	1	
Pesticide	mg/L	-	null	0.01	
TBT	mg/L	0.01	-	0.01	
3. Heavy metal					
Hg	mg/L	0.003	0.002	0.001, 0.001	
Cr^{6+}	mg/L	-	0.002	0.005, 0.05	
As	mg/L	-	0.025	0.012, 0.5	
Cd	mg/L	0.01	0.002	0.001, 0.002	
Cu	mg/L	0.05	0.05	0.008, 0.005	

Parameter	Unit	Category			
		Port	Recreation	Biota	
				Value	Remarks
Pb	mg/L	0.05	0.005	0.008, 0.015	
Zn	mg/L	0.1	0.095	0.05	
Ni	mg/L	-	0.075	0.05	
4. Microorganisms					
Fecal Coliform	/100ml	-	200	-	
Total Coliform	/100ml	1,000	1,000	1,000	
Bacteria	/100ml	-	-	null	
Plankton	/100ml	-	-	no bloom	
5. Radioactive Materials					
Intensity of Radioactive Ray	Bq/L	-	4	4	

Table 9.2.7 Noise standards

(unit : dBA)

Parameter	Noise standards No.48/ 1996	IFC Guideline (General: 2007)
1. Area		
- Residential area	55	55 (07:00-22:00) 45 (22:00-07:00)
- Commercial area and Service	70	70 (07:00-22:00) 70 (22:00-07:00)
- Office	65	
- Green space	50	
- Industry area	70	70 (07:00-22:00) 70 (22:00-07:00)
- Administrative institution and Community facility	60	
- Recreation area	70	
- Other area		
Train station	60	
Port	70	
2. Circumstance		
Medical facility	55	55 (07:00-22:00) 45 (22:00-07:00)
Educational facility	55	55 (07:00-22:00) 45 (22:00-07:00)
Worship facility	55	

9.3 Review on alternative plans (project validity)

9.3.1 In the absence of the project

According to the RUKN (National Electricity General Plan 2008-2027) of Indonesia, the electrical generating capacity existing in all over Indonesia of 24,509 MW falls short of the peak power demand of the entire Indonesia that was 25,407 MW in 2008. In addition, the output of IR A1-3 is restricted for deterioration and other reasons.

If this project will not be implemented, the loads on IR A1-3 will further increase, resulting in more power shortage concerns.

9.3.2 Selection of construction site

There were two candidates (Site A and Site B) for the site of this project. Figure 9.3.1 shows the locations of the candidate sites and Table 9.3.1 compares the statuses of the two candidates in the original plan.

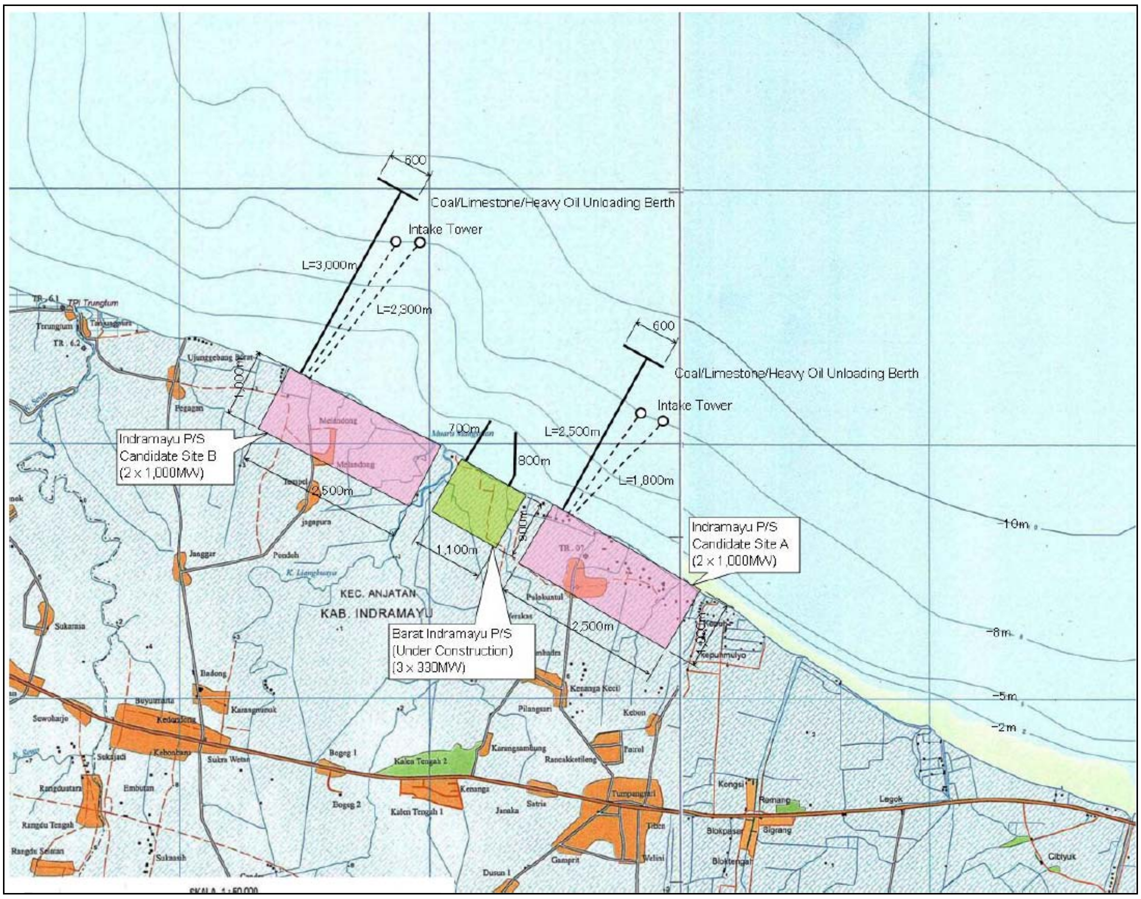


Figure 9.3.1 Map of candidate site

Table 9.3.1 Comparison of Site A and Site B

Item		Site A	Site B
Area of Indramayu power plant 1 & 2 (Power House, Coal Storage, Swithyard, Ash Disposal)		Apprpx. 320ha	Apprpx. 320ha
Present land satiation		Farmland, Shrimp farm	Melandong village (House, School, Hospital, and Rice field)
Marine facilities	Lengeth of berth facilities	1,500m (Breakwater & Piled jetty type) 2,500m (Piled jetty type)	3,000m
	Lengeth of intake facilities	1,800m	2,300m
	Construction, Operation, and Maintenace Cost	Low	High

Site A will be selected for reasons of ease of land acquisition and costs of construction, operation, and maintenance of incidental facilities (from Chapter 4.2)..

9.3.3 Candidate Types for Coal-fired Power Plant

Conventional thermal power plants include subcritical pressure power plant, and supercritical pressure power plant, and Ultra Supercritical power plant, power generation efficiency being Subcritical < Supercritical < USC（Table 9.3.2）. Fuel consumption becomes less in high generation efficiency, with less CO2 emission. Power plant of high generation efficiency has also advantage in economic efficiency, and consequently Ultra Supercritical power plant is adopted in this project (from Chapter 6.2).

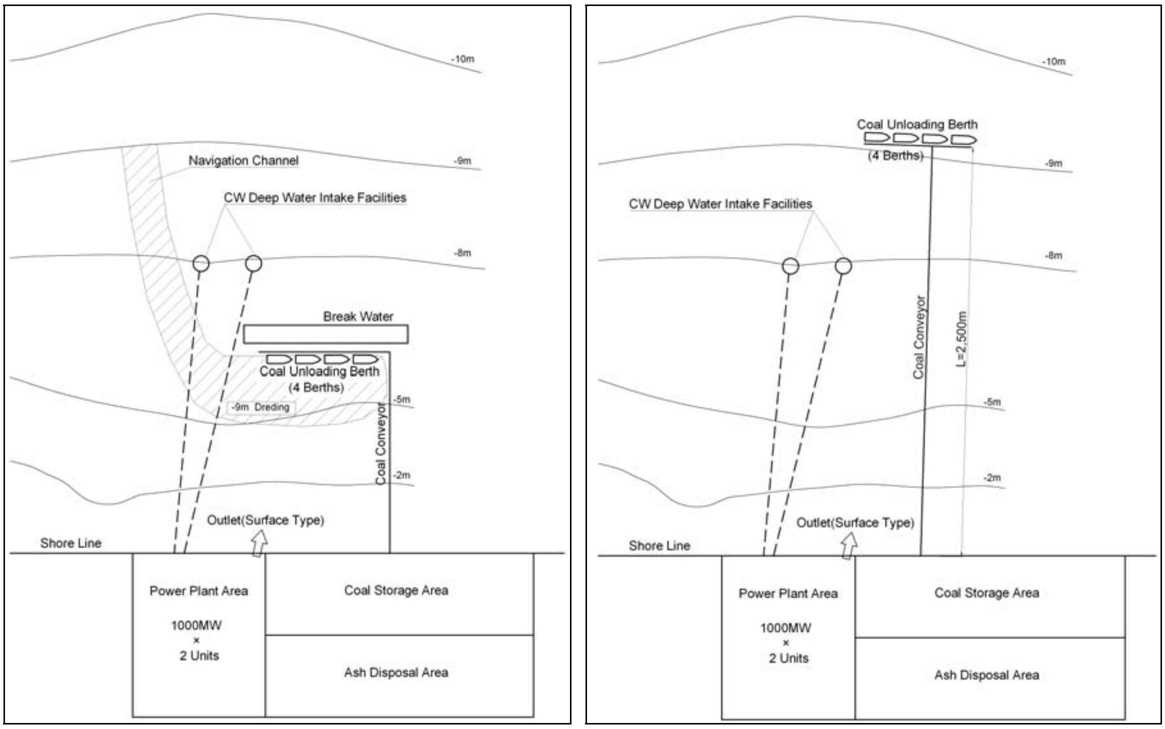
Table 9.3.2 Comparison of types for coal power plant

	Subcritical 16.6MPag, 538/538°C	Supercritical 24.1MPag, 538/566°C	USC 24.5MPag, 600/600°C
Turbine efficiency	45.00%	46.35 %	47.46 %
Boiler efficiency, HHV	84.62 %	84.62 %	84.62 %
Plant efficiency, gross	38.08 % (base)	39.22 % (3.00% better)	40.16 % (5.47% better)
Fuel consumption	base	129,000 t/year less	231,000 t/year less
CO2 emission (t/year)	base	193,500 t/year less	346,500 t/year less

9.3.4 Proposed structures for the coal unloading jetty

The coal shipped by a vessel will be transported to the coal storage yard via the coal unloading jetty constructed next to the coal storage yard. The coal unloading jetty will be constructed to allow landing of 12,500 DWT vessels (from Chapter7.2).

Two alternative structures are proposed for the coal unloading jetty in consideration of the limit of the significant wave height at 50 cm restricted for a 12,500 DWT. Figure 9.3.2 shows layouts and Table 9.3.3 shows summaries of the two jetty structures. Alternative-2 is vulnerable to the effect of wave, resulting in restricted coal unloading and requires wider coal yard compared to Alternative-1. In consequence, Alternative-1 is selected, while dredging is necessary to establish anchoring site.



Alternative-1 (Breakwater & Piled jetty type) Alternative-2 (Piled jetty type)

Figure 9.3.2 Layout of the coal unloading jetty

Table 9.3.3 Outline of the coal unloading jetty

Items	Alternative-1 (Breakwater & Piled jetty type)	Alternative-2 (Piled jetty type)
Specification	- Coal Unloading: 4 Berths (Unit1=2Berths, Unit2=2Berths)	- Coal Unloading: 4 Berths (Unit1=2Berths, Unit2=2Berths)
Operation of Coal handling	Relatively ease operation (not vulnerable to the effect of wave)	Relatively difficult operation ((vulnerable to the effect of wave)
Dredging	Necessity for navigation channel and mooring basin	Not necessity

9.3.5 Flue Gas Desulfurization (FGD)

Low-sulfur coal is used in the power plant in this project, and the exhaust standard of both the host country and IFC Guideline value will be met without FGD (from Chapter 6.4.6). If FGD system is installed, there are two choices for FGD process. One is sea water wet scrubber, the other is limestone-gypsum FGD process (Table 9.3.4).

It will be considered later as to which of the two FDG processes should be selected.

Table 9.3.4 Comparison of FDG processes

	Sea water wet scrubber	Limestone-gypsum FGD
Process	reduce the SO_2 content by seawater	reduce the SO_2 content by limestone
SO_2 Removal efficiency	90 – 98%	90 – 98%
Absorbent	HCO_3^- in seawater (one path)	HCO_3^- form $CaCO_3$ (recirculation)
By-product	Nothing	gypsum
Ancillary system	Aeration basin	Limestone and gypsum handling system

9.3.6 The position of the outlet

There are two suggestions of the outlet position of the power plant: the west point adjacent to the plant site, and the point facing the center of the plant site near the base of the jetty. In consideration of impact for thermal diffusion to IR_A1-3 in west side, discharge point shall be more than approx. 1,200m coastally from west boundary as shown in Figure9.3.6 (from Chapter 7.3).

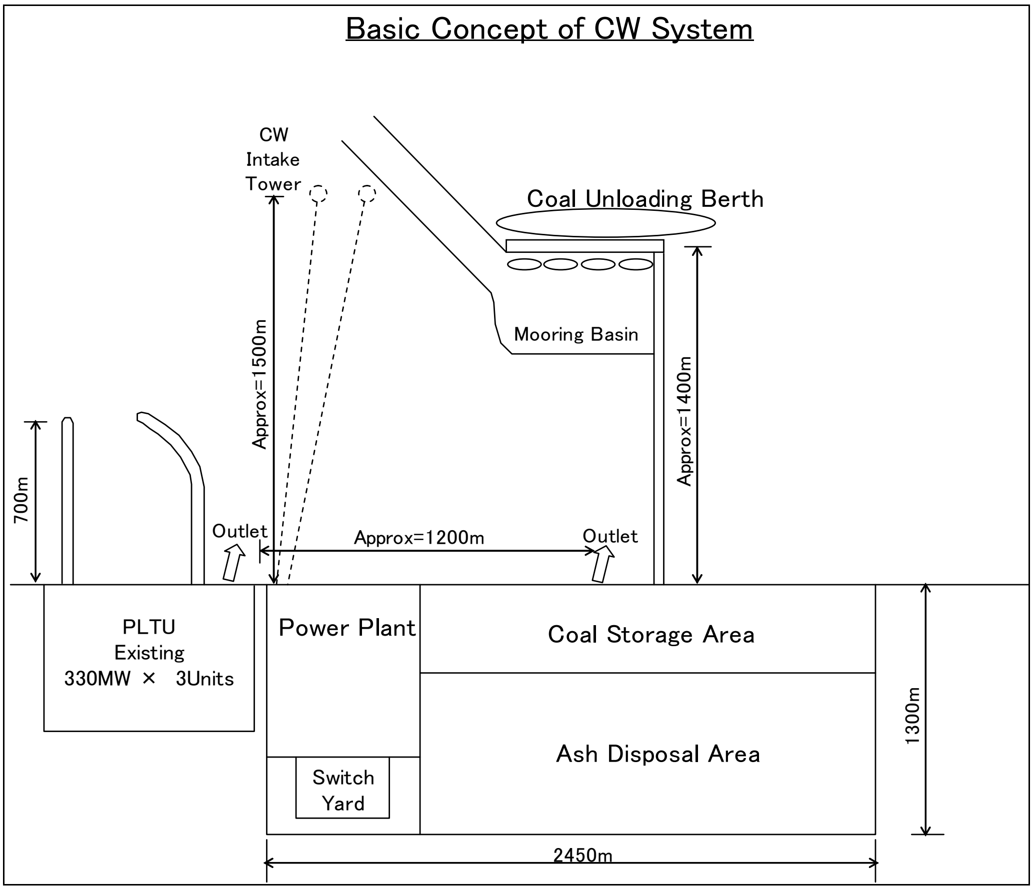


Figure 9.3.6 Location of out let

9.4 Scope of environmental impact assessment

9.4.1 Impact identification

This Chapter picks up the items having potential impacts from the projected Indramayu Coal Fired Thermal Power Plant and its facilities, and describes the method of prediction and evaluation of environmental impact. The mitigation measures for the significant impacts describe at chapter 9.5.1.

(1) Power plant

Table 9.4.1 shows the matrix of the items having potential impacts of the thermal power plant during preconstruction, construction, and operation. Table 9.4.2 and Table 9.4.3 explain the reason of environmental impacts.

Table 9.4.1(1) EIA matrix of the power plant

No		Item	Pre-Construction	Stage Activity							
				Construction			Operation				
				1	2	3	4	5	6	7	8
Environmental contamination	1	Air pollution		X	X	X		X	X		X
	2	Water pollution			X	X	X			X	X
	3	Noise/Vibration		X	X	X	X	X			X
	4	Waste				X	X				X
	5	Odor									
Natural environment	6	Hydrology								X	
	7	Underground water									
	8	Ground subsidence									
	9	Topography, geology and soil									
	10	Protected Area									
	11	Terrestrial ecosystem			X						
	12	Marine ecosystem				X				X	
	13	Global warming							X		
Social environment	14	Involuntary resident resettlement	X								
	15	Employment /Livelihood	X	X				X			
	16	Local economy	X	X				X			
	17	Social infrastructure/service facilities		X				X			
	18	Transportation		X				X			
	19	Sanitation/ Risks for infectious diseases such as (HIV/AIDS)		X				X			
	20	Local custom		X				X			

Table 9.4.1(2) EIA matrix of the power plant

No		Item	Pre-Construction	Stage Activity							
				Construction			Operation				
				1	2	3	4	5	6	7	8
Social environment	21	Burden on vulnerable groups(women, children, aged, impoverished, minorities, indigenous people and such)	X								
	22	Uneven distribution of benefit and loss(damage)	X								
	23	Utilization/Right of water, including underground water									
	24	Cultural heritage									
	25	Landscape					X				
Others	26	Electromagnetic interference									
	27	Safety / Accident		X	X	X	X	X			X

Specification

Pre construction: land clearance		
Construction	1	Mobilization of personal and equipment
	2	Land preparation
	3	Construction of base camp, plant, ash disposal site, and intake channels
Operation	4	Operation of power plant (existence of plant)
	5	Mobilization of personal, equipment
	6	Operation of power plant (exhaust gas)
	7	Operation of power plant (thermal effluent)
	8	Operation of power plant (ash disposal site and coal storage)

Table 9.4.2(1) Explanation regarding the EIA matrix of the power plant (Significant items)

Item		Activity	Explanation regarding considering impact
Environmental contamination	Air pollution	Mobilization of personal and equipment (construction/operation phase)	Mobilization of equipment during the construction/ operation phase will create emissions containing PM, SOx, and NOx. As a result, air pollution will occur.
		Land preparation	Operation of equipment during the construction phase will create emission containing PM, SOx, and NOx. As a result, air pollution will occur.
		Construction of base camp, plant, ash disposal site, and intake channels	
		Operation of power plant (exhaust gas)	Operation of the power plant will create emissions containing fly ash, SOx, and NOx. As a result, air pollution will occur.
		Operation of power plant (coal storage yard and ash disposal areas)	The coal storage yard and ash disposal area during the operation phase of the project will produce dust. As a result, air pollution will occur.
	Water pollution	Land preparation	The run off water from construction area will contain elevated levels of suspended solids, causing water pollution.
		Construction of base camp, plant, ash disposal site, and intake channels	Operation of equipment during the construction phase and dredging work for intake channel will cause water pollution.
		Operation of power plant (existence of plant)	Operation of power plant will produce thermal effluent, waste water. As a result, seawater pollution will occur.
		Operation of power plant (thermal effluent)	
		Operation of power plant (ash disposal site and coal storage)	The run off water from ash disposal and coal storage sites will contain elevated levels of suspended solids, causing water pollution.
	Noise/Vibration	Mobilization of personal and equipment (construction/operation phase)	Mobilization of equipment during the construction/ operation phase will increase noise/vibration intensity within the vicinity of the project area.
		Land preparation	Land clearing and development, construction of facility will increase noise/vibration intensity within the vicinity of the project area.
		Construction of base camp, plant, ash disposal site, and intake channels	
		Operation of power plant (existence of plant)	Operation of power plant will increase noise/vibration intensity within the vicinity of the project area.
		Operation of power plant (ash disposal site and coal storage)	
	Waste	Construction of base camp, plant, ash disposal site, and intake channels	Workers during the construction phase will produce increased amounts of sewage and garbage. Construction phase will produce construction waste, and so on.
		Operation of power plant (existence of plant)	Workers on operation phase will produce increased amounts of sewage and garbage. Operation phase will produce sludge from waste water treatment, waste oil, and so on.
		Operation of power plant (ash disposal site)	Operation of power plant will produce fly ash and bottom ash.

Table 9.4.2(2) Explanation regarding the EIA matrix of the power plant (Significant items)

Item		Activity	Explanation regarding considering impact
Natural environment	Hydrology	Operation of power plant (thermal effluent)	Tidal currents may be influence by thermal effluent.
	Terrestrial ecosystem	Land preparation	The disturbance on terrestrial ecosystem (including aquatic biota) may occur as a direct result of land clearance.
	Marine ecosystem	Construction of base camp, plant, ash disposal site, and intake channels	The disturbance on marine ecosystem (plankton, fish etc.) may occur as a direct result of dredging activities for intake channel. There is mangrove and corral in Indramayu regency, but they are far from the power plant. Therefore, it does not seem to affect them from power plant activities.
		Operation of power plant (thermal effluent)	
	Global warming	Operation of power plant (exhaust gas)	Operation of power plant will create emission containing CO_2 (greenhouse gas).
Social environment	Involuntary resident resettlement	Pre construction	Residents will have to be involuntary resettled because the project site will be compulsory acquired.
	Employment /Livelihood	Pre construction	The project will lead to a loss of cultivated land due to the compulsory land acquisition.
		Mobilization of personal and equipment (construction/operation phase)	The project will increase both business and employment opportunities.
	Local economy	Pre construction	The project will lead to a loss of cultivated land due to the compulsory land acquisition.
		Mobilization of personal and equipment (construction/operation phase)	The project will increase both business and employment opportunities. Interaction between workers and local community will create higher demand for goods and services.
	Social infrastructure/service facilities	Mobilization of personal and equipment (construction/operation phase)	During construction/ operation phase of the project the number of workers will increase. Social infrastructure and services for the project workers, their family will be required.
	Transportation	Mobilization of personal and equipment (construction/operation phase)	Mobilization of equipment on construction/ operation phase will increase traffic intensity. As a result, local road infrastructure will be placed under higher stress, with the possibility of gridlock during peak times.
	Sanitation/ Risks for infectious diseases such as (HIV/AIDS)	Mobilization of personal and equipment (construction/operation phase)	Mobilization of new workers, due to job opportunities, may cause an increase of disease. Poor environmental sanitation will cause significant impact to the prevalence of contagious diseases.
Social environment	Local custom	Mobilization of personal and equipment (construction/operation phase)	Due to an influx of migrant workers, the community maybe be affected by the change in customs and behaviors. The presence and customs of the migrant workers might conflict with local way of life and customs.
	Burden on vulnerable groups (women, children, aged, impoverished, minorities, indigenous people and such as)	Pre construction	Resident resettlement and land acquisition will occur as a direct result of the project. Vulnerable groups relocated from the site would need to be given special consideration at their new location, regarding employment /Livelihood and distribution of benefit/ loss.

Table 9.4.2(3) Explanation regarding the EIA matrix of the power plant
(Significant items)

<table>
<tr><th colspan="2">Item</th><th>Activity</th><th>Explanation regarding considering impact</th></tr>
<tr><td rowspan="2">Social environment</td><td>Uneven distribution of benefit and loss(damage)</td><td>Pre construction</td><td>Resident resettlement and land acquisition will occur as a direct result of the project. As a result, uneven distribution of benefit and loss will be created.</td></tr>
<tr><td>Landscape</td><td>Operation of power plant (existence of plant)</td><td>Aesthetic landscape in the vicinity of project site may be diminished by existence of the plant.</td></tr>
<tr><td rowspan="5">Others</td><td rowspan="5">Safety / Accident</td><td>Mobilization of personal and equipment (construction/operation phase)</td><td rowspan="5">(Accident)
- Mobilization of equipment and materials will result in increased usage of land traffic infrastructure. Traffic gridlock, traffic accidents may occur disturbing local activities.
- Workers may be involved in accidents due to the nature of the construction/operation activities.
(Health problems)
Ambient air or water quality degradation etc can adversely affect the health of project workers. Workers may suffer from hearing damage due to the nature of the construction and operating activities (loud equipment).

(Security problems)
- Security problems may arise in project activity, as an indirect impact from job and business opportunities, changes to livelihood patterns, and changes to community behavior due to the influx of migrant workers.</td></tr>
<tr><td>Land preparation</td></tr>
<tr><td>Construction of base camp, plant, ash disposal site, and intake channels</td></tr>
<tr><td>Operation of power plant (existence of plant)</td></tr>
<tr><td>Operation of power plant (ash disposal site and coal storage)</td></tr>
</table>

Table 9.4.3 Explanation regarding the EIA matrix of the power plant
(Insignificant items)

Item		Explanation regarding no impact
Environmental contamination	Odor	There is not use of odor substance in project activity.
Natural environment	Underground water	There is not use of underground water in project activity.
	Ground subsidence	There is not use of underground water in project activity. Therefore, ground subsidence will not occur.
	Topography, geology and soil	Project site comprises of paddy fields and shrimp ponds, and is almost flat. Therefore, it is almost not possible to affect topography, geology and soil.
	Protected Area	There are no protected areas within the project area.
Social environment	Utilization/Rights of water, including underground water	Sea water for production of desalinated water will be use in project activity. Therefore, Utilization/Rights of water will not be existent..
	Cultural heritage	There are no issues with cultural heritage within the project area.
Others	Electromagnetic interference	The area surrounding the project site is comprised of mainly paddy fields. Therefore, it is unlikely that anyone is affected by electromagnetic interference.

(2) Coal unloading jetty

Table 9.4.4 shows the matrix of the items having potential impacts of the coal during construction, and operation. Table 9.4.5 and Table 9.4.6 explain the reason of environmental impacts.

Table 9.4.4 EIA matrix of the coal unloading jetty

No		Item	Stage Activity					
			Construction				Operation	
			1	2	3	4	5	6
Environmental contamination	1	Air pollution	X	X		X		X
	2	Water pollution		X	X	X	X	X
	3	Noise/Vibration	X	X	X	X	X	X
	4	Waste						X
	5	Odor						
Natural environment	6	Hydrology						
	7	Protected Area						
	8	Terrestrial ecosystem						
	9	Marine ecosystem		X	X	X	X	X
	10	Global warming						
Social environment	11	Involuntary resident resettlement						
	12	Employment /Livelihood	X	X	X	X	X	X
	13	Local economy	X	X	X	X	X	X
	14	Social infrastructure/service facilities	X					
	15	Transportation	X	X			X	
	16	Sanitation/ Risks for infectious diseases such as (HIV/AIDS)	X					
	17	Local custom	X					
	18	Burden on vulnerable groups(women, children, aged, impoverished, minorities, indigenous people and such)						
	19	Uneven distribution of benefit and loss(damage)						
	20	Utilization/Right of water						
	21	Cultural heritage						
	22	Landscape			X	X		
Other	23	Safety / Accident	X	X	X	X	X	X

Specification

Construction	1	Mobilization of personal and equipment
	2	Dredging for water way and dumping of the dredged materials
	3	Construction the bases of offshore breakwater
	4	Construction of the jetty structure
Operation	5	Incoming and outgoing ships
	6	Coal transportation (operation of the jetty)

Table 9.4.5(1) Explanation regarding the EIA matrix of the coal unloading jetty (Significant items)

Item		Activity	Explanation regarding considering impact
Environmental contamination	Air pollution	Mobilization of personal, and equipment	Mobilization of equipment during the construction phase will increase traffic intensity. As a result, air pollution will occur.
		Dredging for water way and dumping of the dredged materials	Operation of construction equipment will create emissions containing PM, SOx, and NOx. As a result, air pollution will occur.
		Construction of the jetty structure	
		Coal transportation (operation of the jetty)	Operation of the jetty will create coal dust. As a result, air pollution will occur.
	Water pollution	Dredging for water way and dumping of the dredged materials	Dredging work and dumping of the dredged materials will cause water pollution.
		Construction the bases of offshore breakwater	Waste water from construction equipments will cause water pollution.
		Construction of the jetty structure	
		Incoming and outgoing ships	Ballast water and waste water from ships will cause water pollution.
		Coal transportation (operation of the jetty)	Operation of the jetty creates the opportunity for a coal spill. As a result, water pollution will occur.
	Noise/Vibration	Mobilization of personal and equipment	Mobilization of equipment during the construction phase will increase noise intensity.
Environmental contamination	Noise/Vibration	Dredging for water way and dumping of the dredged materials	Operation of construction equipment will increase noise intensity.
		Construction the bases of offshore breakwater	
		Construction of the jetty structure	
		Incoming and outgoing ships	The ships engine and horns will generate increased noise intensity.
		Coal transportation (operation of the jetty)	Operation of cranes will increase noise intensity.
	Waste	Coal transportation (operation of the jetty)	Operation of the jetty will create oil waste.
Natural environment	Marine ecosystem	Dredging for water way and dumping of the dredged materials	Dredging work and dumping of the dredged materials will contribute to the loss the individual benthos and increase the turbidity in the sea water. Increasing the turbidity will affect the phytoplankton and sea weed.
		Construction the bases of offshore breakwater	Putting the offshore breakwater will contribute to the loss the individual of the benthos, while the offshore breakwaters will become the foundation for sea weed and sessile animals.

Table 9.4.5(2) Explanation regarding the EIA matrix of the coal unloading jetty
(Significant items)

Item		Activity	Explanation regarding considering impact
Natural environment	Marine ecosystem	Construction of the jetty structure	Installing the jetty bases will result in the loss the individual benthos, while they will become the foundation of sea weed and sessile animal.
		Incoming and outgoing ships	Ballast water and waste water from ships will cause water pollution.
		Coal transportation (operation of the jetty)	Operation of the jetty creates the opportunity for a coal spill. Water pollution will affect marine organisms.
Social environment	Employment /Livelihood	Mobilization of personal and equipment	Business and employment opportunities around project site will increase because of project activity.
		Dredging for water way and dumping of the dredged materials	Dredging work and dumping of the dredged materials will increase the number of ships that can utilize the area. The ships may disturb fishing activities.
		Construction the bases of offshore breakwater	Installing the offshore breakwater may cause the loss of a fishing field.
		Construction of the jetty structure	Installing the jetty bases may cause the loss of a fishing field.
		Incoming and outgoing ships	Coal transport though coast will increase the number of coal loading ships. The ships may disturb fishing activities.
		Coal transportation (operation of the jetty)	Operation of the jetty creates the opportunity for a coal spill.. Water pollution will affect the fishing field.
	Local economy	Mobilization of personal and equipment	Business and employment opportunities around project site will increase because of project activity. Mobilization of personnel and equipment will increase the number of construction ships. These ships may disturb maritime transportation.
		Dredging for water way and dumping of the dredged materials	Dredging activities will lead to an increase the number of ships that utilize the area. The ships may disturb fishing activities.
		Construction the bases of offshore breakwater	Installing an offshore breakwater may result in the loss of a fishing field.
		Construction of the jetty structure	Installing the jetty bases may result in the loss of a fishing field.
		Incoming and outgoing ships	Coal transport will increase the number of coal loading ships. The ships may disturb fishing activities.
		Coal transportation (operation of the jetty)	Operation of the jetty creates the opportunity for a coal spill. Water pollution will affect to fishing field
	Social infrastructure/service facilities	Mobilization of personal and equipment	The size of the local work force will increase greatly during the construction and operational phases of the project. Social infrastructure/services for the project workers, their family will have to be provided.

Table 9.4.5(3) Explanation regarding the EIA matrix of the coal unloading jetty (Significant items)

Item		Activity	Explanation regarding considering impact
Social environment	Transportation	Mobilization of personal and equipment	Mobilization of personnel and equipment will increase the number of construction ships. The ships may disturb maritime transportations.
		Dredging for water way and dumping of the dredged materials	Dredging work will increase the number of ships that utilize the area. The extra ships may disturb maritime transportations.
		Incoming and outgoing ships	Coal transport will increase the number of coal loading ships. The ships may disturb maritime transportations.
	Sanitation/ Risks for infectious diseases such as (HIV/AIDS)	Mobilization of personal and equipment	Mobilization of new workers, due to job opportunities, may cause an increase of disease. Poor environmental sanitation will cause significant impact to the prevalence of contagious diseases.
	Local custom	Mobilization of personal and equipment	Due to an influx of migrant workers, the community maybe be affected by the change in customs and behaviors. The presence and customs of the migrant workers might conflict with local way of life and customs.
	Landscape	Construction the bases of offshore breakwater	The proposed offshore breakwater and the jetty will change the view of the coast.
		Construction of the jetty structure	
Others	Safety / Accident	Mobilization of personal and equipment	Construction activities and coal transport will increase the number of ships. The possibility of collisions will be increased.
		Dredging for water way and dumping of the dredged materials	
		Construction the bases of offshore breakwater	
		Construction of the jetty structure	
		Incoming and outgoing ships	
		Coal transportation (operation of the jetty)	

Table 9.4.6 Explanation regarding the EIA matrix of the coal unloading jety (Insignificant items)

Item		Explanation regarding no impact
Environmental contamination	Odor	There is not use of odor substance.
Natural environment	Hydrology	The jetty and the offshore breakwater most likely will not disturb the current because of the size and the direction.
	Protected Area	There is not protected area in the project area.
	Terrestrial ecosystem	Since the jetty and the offshore breakwater will be built on the coast, there is no impact to the land.
	Global warming	Since ships using the jetty will be limited, the amount of CO_2 will have a negligible effect on global warming.
Social environment	Involuntary resident resettlement	Since the jetty and the offshore breakwater will be built on the coast, there is no impact to the land.
	Burden on vulnerable groups(women, children, aged, impoverished, minorities, indigenous people and such)	
	Uneven distribution of benefit and loss(damage)	
	Utilization/Right of water	Sea water for production of desalinated water will use in project activity. Therefore, Utilization/Right of water does not exist.
	Cultural heritage	There are no protected cultural heritage areas within the project boundaries.

(3) Transmission line

Table 9.4.7 shows the matrix of the items having potential impacts of the transmission line during preconstruction, construction, and operation. Table 9.4.8 explains the reason of environmental impacts.

Table 9.4.7 EIA matrix of the transmission line

No		Item	Pre-construction	Stage Activity			
				Construction			Operation
				1	2	3	4
Environmental contamination	1	Air pollution					
	2	Water pollution					
	3	Noise/Vibration					
	4	Waste					
	5	Odor					
Natural environment	6	Hydrology					
	7	Underground water					
	8	Ground subsidence					
	9	Topography, geology and Soil					
	10	Protected Area					
	11	Terrestrial ecosystem			x		x
	12	Marine ecosystem					
	13	Global warming					
Social environment	14	Involuntary resident resettlement	x				
	15	Employment /Livelihood					
	16	Local economy					
	17	Social infrastructure/service facilities					
	18	Transportation		x			
	19	Sanitation/ Risks for infectious diseases such as (HIV/AIDS)					
	20	Local custom					
	21	Burden on vulnerable groups(women, children, aged, impoverished, minorities, indigenous people and such)	x				
	22	Uneven distribution of benefit and loss(damage)	x				
	23	Utilization/Right of water, including underground water					
	24	Cultural heritage			x		
	25	Landscape					x
Others	26	Electromagnetic field					x
	27	Safety / Accident		x	x	x	x

Specification

Pre construction: land clearance		
Construction	1	Mobilization of personnel, equipment
	2	Land preparation
	3	Construction of transmission tower
Operation	4	Electrical transmission(existence of tower)

Table 9.4.8(1) Explanation regarding the EIA matrix of the transmission line (Significant items)

Item		Activity	Explanation regarding considering impact
Natural environment	Terrestrial ecosystem	Land preparation	The disturbance to terrestrial ecosystems may occur due to land clearance.
		Electrical transmission(existence of tower)	The disturbance on avian migration may occur due to the existence of towers.
Social environment	Involuntary resident resettlement	Pre construction	Residents will have to be involuntary resettled because the project site will be compulsory acquired.
	Transportation	Mobilization of personnel and equipment	Mobilization of equipment during the construction phase will increase in traffic. As a result, local road infrastructure will be placed under higher stress, with the possibility of gridlock during peak times.
	Burden on vulnerable groups (women, children, aged, impoverished, minorities, indigenous people and such as)	Pre construction	Resident resettlement and land acquisition will occur as a direct result of the project. Vulnerable groups relocated from the site would need to be given special consideration at their new location, regarding employment /Livelihood and distribution of benefit/ loss.
	Uneven distribution of benefit and loss(damage)	Pre construction	Resident resettlement and land acquisition will occur as a direct result of the project. As a result, uneven distribution of benefit and loss will be created.
	Cultural heritage	Land preparation	It is possible that the land preparation results in a loss of local heritage.
	Landscape	Electrical transmission(existence of tower)	Aesthetic landscape vicinity of transmission line may be influence by the existence of a tower.
Others	Electromagnetic field	Electrical transmission(existence of tower)	According to Electromagnetic field, the scientific community has not reached a consensus on specific biological responses. Therefore, Impact will be approached based on national regulation and International Commission on Non-Ionizing Radiation Protection guideline.
	Safety / Accident	Mobilization of personnel and equipment Land preparation Construction of transmission tower Electrical transmission(existence of tower)	(Accident) - Mobilization of equipment and materials will result in increased usage of land traffic infrastructure. Traffic gridlock, traffic accidents may occur disturbing local activities. - Accident of workers by the handling of equipments in construction/operation phase may occur. (Health problems) Ambient air or water quality degradation etc can adversely affect the health of project workers. Workers may suffer from hearing damage due to the nature of the construction and operating activities (loud equipment). (Security problems) - Security problems may arise in project activity, as an indirect impact from job and business opportunities, changes to livelihood patterns, and changes to community behavior due to the influx of migrant workers.

Table 9.4.8(2) Explanation regarding the EIA matrix of the transmission line (Insignificant items)

Item		Explanation regarding no impact
Environmental contamination	Air pollution	Construction period per a tower is short term such as land preparation is within three months, construction of tower is one month and string work is one month. Construction work is around area including the center of tower site (25m x 25m). Therefore the dispersion of air pollutant due to construction is assumed limited area.
	Water pollution	Water use and water discharge due to construction are almost not occurred. Therefore, it is not possible to affect water quality directly.
	Noise/Vibration	As well as air pollutant, construction period is short term. Moreover construction area/scale is small. Therefore, degradation of living environment by noise/vibration is almost not occurred.
	Waste	As well as air pollutant, construction period is short term. Moreover construction area/scale(including the number of personnel) is small. Therefore, generation of waste is very few.
	Odor	There is not use of odor substance in project activity.
Natural environment	Hydrology	Transmission line route is on land, not near any water bodies. Therefore, it is not possible to affect hydrology directly.
	Underground water	There is no use of underground water during the project.
	Ground subsidence	There is not use of underground water in project activity. Therefore, ground subsidence should not be an issue.
	Topography, geology and soil	Project site comprises of paddy fields, cultivated field, and is almost flat. Therefore, it is almost not possible to affect topography, geology and soil.
	Protected Area	There are no protected areas within the project site.
	Marine ecosystem	Transmission line route is on land. Therefore, it is not possible to affect marine ecosystem directly.
	Global warming	Since equipment during construction phase will be limited, the amount of CO_2 released will be negligible.
Social environment	Employment /Livelihood	Construction period is short term. Moreover construction area/scale (including the number of personnel) is small. Therefore, impact to people around construction area is assumed few.
	Local economy	
	Social infrastructure/service facilities	
	Sanitation/ Risks for infectious diseases such as (HIV/AIDS)	
	Local custom	
	Utilization/Rights of water, including underground water	There is not use of water in project activity. Therefore, Utilization/Rights of water is not an issue.

9.4.2 Method of prediction and evaluation of impact

This Chapter describes the method of prediction and evaluation of environmental impacts for the main impact items.

(1) Air quality

Impact derived from air pollution can be predicted using mathematical models. One such model is the Gaussian model, this formula shown below, is used to calculate the dispersion rate of pollutants emitted from a stack.

$$C(x,y,z)=\frac{Q}{2\pi\ \sigma_y\sigma_z u}\exp\left(\frac{y^2}{2\pi\ \sigma_y^2}\right)\left(\exp\left\{-\frac{(z-He)^2}{2\sigma_z{}^2}\right\}+\exp\left\{-\frac{(z+He)^2}{2\sigma_z{}^2}\right\}\right)$$

In which,

C(x,y,z): pollutant concentration at x,y,z locations (mg/m3)
x, y and z : distance along axis x, y and z (m)
H : effective height of stack (m)
Q : pollution emission gas (g/second)
u : average wind velocity (m/second)
σ y : dispersion coefficient in horizontal direction (m)
σ z : dispersion coefficient in vertical direction (m)

With regards to the air pollution that will be emitted during the construction phase from, heavy machinery use, vehicles, and vessels operating, an estimation will be calculated taking into account the construction method, the period, the distance to the receptors and the environmental preservation measures etc.

(2) Water Quality

The project will generate water pollution in the following ways; soil runoff from bare land from earthmoving activities, increased seawater turbidity from equipment operating, waste water, and the run off water from the ash disposal site and coal storage site. An estimation of water quality impact will be conducted using mathematical models and an informal method based on the construction method, the period etc.

Impact arising from the thermal effluent discharges, CW (cooling water), will be estimated by applying the following temperature diffusion formula:

$$\frac{\partial T}{\partial t}+u\frac{\partial T}{\partial x}+v\frac{\partial T}{\partial y}+w\frac{\partial T}{\partial x}=\frac{\partial}{\partial x}\left(Kx\frac{\partial T}{\partial x}\right)+\frac{\partial}{\partial y}\left(Ky\frac{\partial T}{\partial x}\right)+\frac{\partial}{\partial z}\left(Kz\frac{\partial T}{\partial x}\right)$$

In which,

T :temperature
Kx,Ky,Kz : diffusion coefficient in x, y, z

The vertical distribution of the water temperature is assumed to the same transition.

(3) Noise

Noise predictions will be carried out using the International Standard ISO 9613, Acoustics-Attenuation of Sound during Propagation Outdoor.

The ISO Propagation model calculates the predicted sound pressure level by taking the source power level for equipment in separate octave bands and subtracting a number of attenuation factors according to the following equation:

$$Lp = Lw + D - Ageo - Aatm - Agr - Abar - Amisc$$

In which,

Lp : predicted sound pressure level
Lw: sound pressure level
D : directive factor
Ageo: geometrical divergence ($20xLog_{10}r2+8$)
r : distance
Aatm : atmospheric absorption
Agr : ground effect
Abar : barrier attenuation
Amisc: miscellaneous other effect

Noise will be generated from the following sources, heavy machinery use, site vehicles, and from vessels operating. An estimation of extent of the noise impacts will be conducted using both mathematical models and an informal method based on the construction method, the period, the distance to the receptors, etc.

(4) Waste

The project will generate two (2) main types of waste; general waste, produced by the work force and facility waste, that would include coal ash (fly ash, bottom ash),oil and sludge by the power plant etc. The amount of waste and the associated impacts will be estimated using an informal method, based on the magnitude of the power plant and the amount of workers based at the site.

(5) Hydrology (oceanography)

Potential changes to the local sea currents due to the construction of the jetty and the thermal discharges from the power station will be assessed using the following formula:

(Momentum equation)

$$\frac{\partial u}{\partial t}+\frac{\partial u^2}{\partial x}+\frac{\partial uv}{\partial y}+\frac{\partial uw}{\partial z}=-\frac{1}{\rho}\frac{\partial p}{\partial x}+\mu\nabla^2 u+\gamma\frac{\partial^2 u}{\partial z^2}$$

$$\frac{\partial v}{\partial t}+\frac{\partial uv}{\partial x}+\frac{\partial v^2}{\partial y}+\frac{\partial vw}{\partial z}=-\frac{1}{\rho}\frac{\partial p}{\partial y}+\mu\nabla^2 v+\gamma\frac{\partial^2 v}{\partial z^2}$$

$$\frac{\partial w}{\partial t}+\frac{\partial uw}{\partial x}+\frac{\partial vw}{\partial y}+\frac{\partial w^2}{\partial z}=g-\frac{1}{\rho}\frac{\partial p}{\partial z}+\mu\nabla^2 w+\gamma\frac{\partial^2 w}{\partial z^2}$$

(Continuity equation)

$$\frac{\partial u}{\partial x}+\frac{\partial v}{\partial y}+\frac{\partial w}{\partial z}=0$$

In which:

u,v,w : current velocity in x, y, z
t : time
P : pressure
ρ_w : water density
μ and ν : coefficient of the horizontal and vertical eddy viscosity

(6) Terrestrial ecosystem

1) Flora

The extent to which the vegetation will be impacted upon will be assessed by making a comparison between the current vegetation and the proposed final site conditions. Estimations of how much vegetation will be removed due to the power plant development will also be made.

2) Fauna

The extent to which the local fauna will be impacted upon will be assessed by making a comparison between the current fauna and the associated habitats and the proposed final site conditions. The impact estimation will also include the adaption capabilities the fauna with regards to a change of habitat.

(7) Marine ecosystem

The impact that the project will have on aquatic biota will be estimated by researching and comparing the current site to studies that were performed on sites of a similar nature (similar aquatic biota, similar activities conducted, etc.).

(8) Global warming (greenhouse gas)

Exhaust gases containing CO2 (greenhouse gas) will be created during operation of power plant. However, this project will adopt clean coal technology (supercritical technology) for the coal-fired thermal power plant. Therefore, a great deal of reduction amount of greenhouse gas will be expected by the introduction of supercritical technology for use of highly efficient energy. The estimation of impact on greenhouse gas is conducted with a formal method based on the comparison of the magnitude of greenhouse gases generated from new type and old type coal-fired thermal power plants.

In general, thermal efficiency (based on the lower heating value (LHV)) of the new technology adopted in this project will be elevated a few percentages compared to conventional type.

The reduction amount of CO2 in a year estimated is the following formula.

$$\text{The reduction amount of } CO_2 = \text{ElectricPowerOutput} \times (1/T_{f\,cov} - 1/T_{fnew}) \times Ef$$

In which:

$T_{f\,cov}$: Thermal efficiency of conventional type

$T_{f\,new}$: Thermal efficiency of this project

Ef : Emission factors for greenhouse gas

(9) Social economy and culture

In the pre-construction stage, the loss of land and income will be estimated personally by social survey data. Estimation of impact on these issues is conducted by an informal method. That is, comparison of income condition and lost amounts, and other conditions.

The guideline for environmental and social consideration of JICA includes a number of social economy and culture impacts as follows:

- Burden on vulnerable groups as women, children, aged, impoverished, minorities, (indigenous people and such)
- Uneven distribution of benefit and loss (damage)

In the construction stage and operation stage, business opportunity and the number of employed workers around the project site will be increased. The estimation of active impact is conducted using an informal method. That is, the comparison of present income conditions and payments for workers, etc. compared to those before the project construction commenced.

The interaction between workers and local community will create higher demand for goods and services. An estimation of the negative impact will be conducted using an informal method. That is, based on relevant concept and theory, using analogy for similar projects.

Mobilization of new workers by job opportunity may cause an increase or disease prevalence. An estimation of negative impact will be conducted using an informal method. That is, based on relevant concept and theory, using analogy of similar projects.

Business opportunity, and the change of livelihood patterns of the people around the project site will occur depending on project activity at the time.

(10) Transportation

Transportation impact estimation will be conducted using an informal method. That is, comparison of the current traffic volume with the increased traffic volume that will occur due to power plant development (construction phase, operation phase).

(11) Heritage

Heritage impact estimation will be conducted using an informal method. That is the difference between the condition with and without the project based on tower height, proximity to heritage sites etc.

(12) Sanitation/ Risks for infectious diseases

The influx of migrant workers in the community may lead to an increase of disease prevalence. Poor environmental sanitation will have a significant impact on the prevalence of contagious diseases. The impact will be assessed using an informal method, using relevant theories and by researching and comparing the current site to studies that were performed on sites of a similar nature. The impact estimation will only be a hypothesis, based on the theories of some experts.

Significant impact estimation methods are formed in a matrix, qualitative relationships between the project activity and the environment, and the monitoring of the types and frequencies of certain illnesses caused by the project activity can be assessed. Thus the magnitude of the impact and the occurrence of illness or health problems in the community can be estimated.

(13) Landscape

Landscape impact estimation will be conducted using an informal method. That is, comparison of stack height, jetty length and proximity to tourist areas, etc.

(14) Safety

1) Accident

Traffic gridlock and traffic accidents may disturb local activities; an informal impact assessment will be conducted. A comparison will be made between current and projected (construction phase, operation phase) traffic volumes.

Workers may have accidents when handling tools and equipment during the construction and operation phases of the project.

2) Health problems

Dust in ambient air or water quality degradation etc will impact the health level of the project workers. Workers may suffer hearing damage due to prolonged exposure to noise emitted by the machinery.

9.4.3 Result of prediction and evaluation of impact

This chapter summarizes the results of prediction and evaluation of impacts of the main environmental impact item for proposed power plant with jetty and transmission line.

Detailed results of prediction and evaluation of environmental impact of all items for power plant with jetty and transmission line are showed in Annex-1 draft ANDAL.

(1) Air pollution

1) Power plant

(a). Construction phase

i) Mobilization of personnel and equipment

Dispersion concentration of air pollutant at wind velocity of 2 m/sec due to mobilization of personnel and equipment is shown in Figure 9.4.1and Table 9.4.9.

Background concentration of NOx ranges between 1.0-31.9µg/m3, and NOx concentration from vehicle emission is 2.3µg/m3, thus NOx concentration in ambient air is not exceeding the standards.

Background concentration of PM_{10} ranges between 62.5-77.7 µg/m^3 (Daily average),, and PM_{10} concentration from vehicle emission is 0.3 µg/m^3, thus particulate concentration in ambient air is not exceeding the standards.

The impact on air pollutant due to mobilization of personnel and equipment is considered negative insignificant, because impact intensity, duration and coverage area will be low, short term and limited.

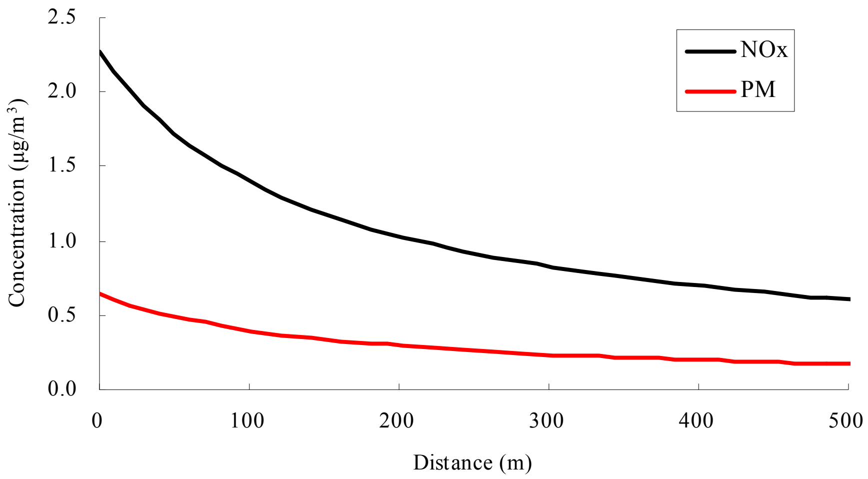


Figure9.4.1 Dispersion concentration of air pollutant

Table.9.4.9 Dispersion concentration of air pollutant

Item	Background concentration ($\mu g/m^3$) (1)	The highest concentration ($\mu g/m^3$) (2)	Prediction concentration in ambient air quality ($\mu g/m^3$) (1)+(2)	Air quality standards (No.41/1999) ($\mu g/m^3$)	IFC guideline value (General 2007) ($\mu g/m^3$)
NOx	1.0-31.9	2.3(1hr)	3.3-34.2	400(1hr)	200(1hr)
PM_{10}	62.5-77.7 (Daily average)	0.6(1hr) 0.3(24hr)	62.8-78.0(24hr)	150(24hr)	50-150(24hr)

ii) Land preparation/ Construction of base camp, plant, ash disposal site, and intake channels

Dispersion concentration of air pollutant at wind velocity of 2 m/sec due to large-sized vehicle, heavy equipment is shown in Figure 9.4.2, Table 9.4.10.

Background concentration of SOx ranges < 6.7μg/m3, and SOx concentration from heavy equipment emission is 0.05μg/m3, thus SOx concentration in ambient air is not exceeding the standards.

Background concentration of NOx ranges between 1.0-31.9μg/m3, and NOx concentration from heavy equipment emission is 1.3μg/m3, thus NOx concentration in ambient air is not exceeding the standards.

Background concentration of particular ranges between 62.5-77.7 $\mu g/m^3$ (Daily average), and PM_{10} concentration from heavy equipment emission is 0.1 μg/m3, thus particulate concentration in ambient air is not exceeding the standards.

The impact on air pollutant due to Land preparation/construction is considered negative insignificant, because impact intensity, duration and coverage area will be low, short term and limited etc.

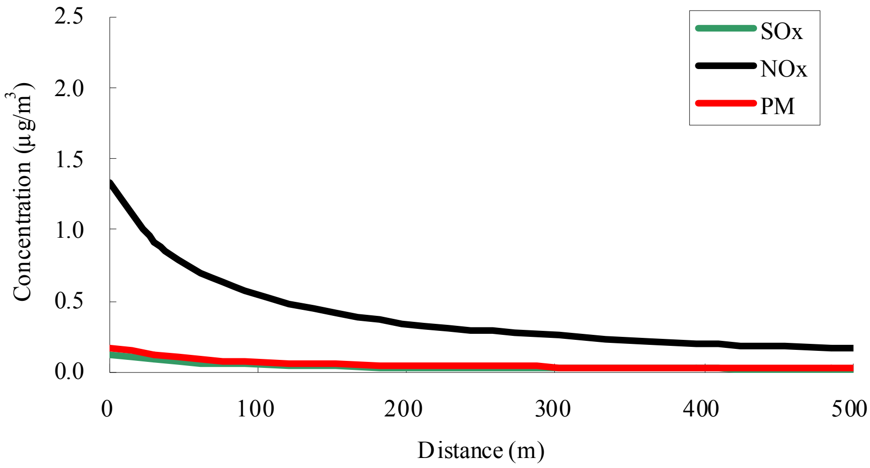


Table 9.4.10 Dispersion concentration of air pollutant

Item	Background concentration ($\mu g/m^3$) (1)	The highest concentration ($\mu g/m^3$) (2)	Prediction concentration in ambient air quality ($\mu g/m^3$) (1)+(2)	Air quality standards (No.41/1999) ($\mu g/m^3$)	IFC guideline value (General 2007) ($\mu g/m^3$)
SOx	-6.7	0.1(1hr) 0.05(24hr)	＜6.8(1hr) ＜6.75 (24hr)	900(1hr) 365(24hr)	500(10min) 20-125(24hr)
NOx	1.0-31.9	1.3(1hr)	2.3-33.2	400(1hr)	200(1hr)
PM_{10}	62.5-77.7 (Daily average)	0.2(1hr) 0.1(24hr)	62.6-77.8(24hr)	150(24hr)	50-150(24hr)

(b) Operation phase

i) Operation of power plant (exhaust gas)

Prediction conditions are as below,

_ Wind direction: north and northwest

Wind direction toward residential area includes north, northwest northeast and east. Most frequent of the above wind directions is the north wind. According to calmative impact by this project and IR_A1-3, the case of northwest wind will become a more serious impact. Since this project and IR_A1-3 are by northwestern extension.

_ Wind velocity: 1.5m/s

Wind velocity between 1.0-1.9(m/s) is the most frequent range.

_ Dispersion coefficient: Category B (in case of wind velocity 1.5m/s)

Dispersion concentration of air pollutants is estimated as shown in Table 9.4.11, Figure9.4.3-4.

<IR_B1 only >

The result in case of unit one operation is as below;

According to SO_2, maximum ground level concentration (24hr) is 34.5$\mu g/m^3$ at 4.9km form the plant. The predicted concentration plus background concentration is estimated <36.7 $\mu g/m^3$.

According to NO_2, maximum ground level concentration (24hr) is 22.3$\mu g/m^3$. The predicted concentration plus background concentration is estimated 33.3-40.2 $\mu g/m^3$.

According to PM_{10}, the maximum ground level concentration (24hr) is 2.2$\mu g/m^3$. The the predict concentration plus background concentration is estimated 64.7-79.9 $\mu g/m^3$.

<IR_B1 and IR_A1-3 >

According to cumulative air pollutant of this project and neighboring IR_A1-3, the result of estimations is differed by wind parameters (cumulative pattern).

According to SO_2, maximum ground level concentration (24hr) is 66.9-74.6$\mu g/m^3$ at 5.2-5.9km from the plant. The predicted concentration plus background concentration is estimated 69.1-76.8 $\mu g/m^3$, not exceeding standard values.

According to NO_2, maximum ground level concentration is 52.3-57.7$\mu g/m^3$ at 5.2-5.9km from the plant. The predicted concentration plus background concentration is estimated 63.3-75.6 $\mu g/m^3$, not exceeding threshold value.

According to PM_{10}, maximum ground level concentration (24hr) is about 6.1-6.7μg/m^3 at 5.3-6.1 km from the plant. The predicted concentration plus background concentration is estimated 68.6-84.4 μg/m^3. It is not exceeding standards value.

< IR-B1＆2 and IR_A1-3>

According to cumulative air pollutant of this project and neighboring IR_A1-3, the result of estimation is different by wind parameter (cumulative pattern).

According to SO_2, maximum ground level concentration (24hr) is 96.9-108.4μg/m^3 at 5.0-5.7km from the plant. The predicted concentration plus background concentration is estimated 99.1-110.6 μg/m^3, not exceeding standard value.

According to NO_2, maximum ground level concentration (24hr) is 70.8-79.5μg/m^3 at 5.0-5.7km from the plant. The predicted concentration plus background concentration is estimated 81.8-97.4 μg/m^3, not exceeding threshold value.

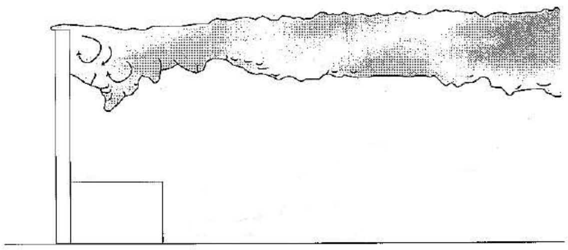
According to PM_{10}, maximum ground level concentration (24hr) is 7.8-8.7μg/m^3 at 5.2-5.9km from the plant. The predicted concentration plus background concentration is estimated 70.3-86.4μg/m^3, not exceeding standards value.

< Consideration according to the occurrence of downwash and down draft>

Based on the Briggs model, when the gas emissions speed is lower than 1.5 times of the wind velocity on stack height, downwash may occur. In this project, the gas emissions speed is 20.3m/s.

Wind velocity occurred downwash is assumed more than 14m/s at stack height (more than about 8m/s at ground level).

Based on Table 9.1.6, the occurrence ratio of wind velocities being more than 8m/s, on an annual basis is few (1.4 %(0.4% in case of wind direction to residential area). Therefore downwash will occur rarely.



Based on the Huber model, when stack height is lower than 2.5 times of building height, downdraft may occur. In this project, stack height is 220m.

The building height in the vicinity of the stack for downdraft to occur would be more than 90m. The proposed all buildings height will be less than 90m, therefore downdraft will not occur.

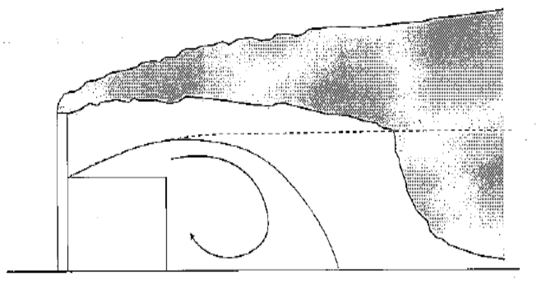


Table 9.4.11 Dispersion concentration of air pollutant (Worst Case)

<IR_B1 only>

Item	Wind direction	Background concentration ($\mu g/m^3$) (1)	The highest concentration ($\mu g/m^3$) (2)	The appearance distance from stack (km)	Prediction concentration in ambient air quality ($\mu g/m^3$) (1)+(2)	Air quality standards (No.41/1999) ($\mu g/m^3$)	IFC guideline value (General 2007) ($\mu g/m^3$)
SOx	North	<6.7(1hr) <2.2(24hr)	65.0(1hr) 34.5(24hr)	4.9	<71.7(1hr) <36.7(24hr)	900(1hr) 365(24hr)	500(10min) 20-125(24hr)
	North west						
NOx	North	1.0-31.9(1hr) 11.0-17.9(24hr)	42.0(1hr) 22.3(24hr)		43.0-73.9(1hr) 33.3-40.2(24hr)	400(1hr) 150(24hr)	200(1hr)
	North west						
PM_{10}	North	48.6-91.0(1hr) 62.5-77.7(24hr)	4.1(1hr) 2.2(24hr)		64.7-79.9(24hr)	150(24hr)	50-150(24hr)
	North west						

<IR_B1 and IR_A1-3>

Item	Wind direction	Background concentration ($\mu g/m^3$) (1)	The highest concentration ($\mu g/m^3$) (2)	The appearance distance from stack (km)	Prediction concentration in ambient air quality ($\mu g/m^3$) (1)+(2)	Air quality standards (No.41/1999) ($\mu g/m^3$)	IFC guideline value (General 2007) ($\mu g/m^3$)
SOx	North	<6.7(1hr) <2.2(24hr)	126.3(1hr) 66.9(24hr)	5.9	<133.0(1hr) <69.1(24hr)	900(1hr) 365(24hr)	500(10min) 20-125(24hr)
	North west		140.7(1hr) 74.6(24hr)	5.2	<147.4(1hr) <76.8(24hr)		
NOx	North	1.0-31.9(1hr) 11.0-17.9(24hr)	98.6(1hr) 52.3(24hr)	5.9	99.6-130.5(1hr) 63.3-70.2(24hr)	400(1hr) 150(24hr)	200(1hr)
	North west		108.9(1hr) 57.7(24hr)	5.2	109.9-140.8(1hr) 68.7-75.6(24hr)		
PM	North	48.6-91.0(1hr) 62.5-77.7(24hr)	11.6(1hr) 6.1(24hr)	6.1	68.6-83.8(24hr)	150(24hr)	50-150(24hr)
	North west		12.6(1hr) 6.7(24hr)	5.3	69.2-84.4(24hr)		

Note, Background concentration is quoted from survey result in 12-13 May 2010

< IR-B1＆2 and IR_A1-3>

Item	Wind direction	Background concentration (μg/m^3) (1)	The highest concentration (μg/m^3) (2)	The appearance distance from stack (km)	Prediction concentration in ambient air quality (μg/m^3) (1)+(2)	Air quality standards (No.41/1999) (μg/m^3)	IFC guideline value (General 2007) (μg/m^3)
SOx	North	<6.7(1hr) <2.2(24hr)	182.8(1hr) 96.9(24hr)	5.7	<189.5(1hr) <99.1(24hr)	900(1hr) 365(24hr)	500(10min) 20-125(24hr)
	North west		204.5(1hr) 108.4(24hr)	5.0	<211.2(1hr) <110.6(24hr)		
NOx	North	1.0-31.9(1hr) 11.0-17.9(24hr)	133.6(1hr) 70.8(24hr)	5.7	134.6-165.5(1hr) 81.8-88.7(24hr)	400(1hr) 150(24hr)	200(1hr)
	North west		150.0(1hr) 79.5(24hr)	5.0	151.0-181.9(1hr) 90.5-97.4(24hr)		
PM	North	48.6-91.0(1hr) 62.5-77.7(24hr)	14.8(1hr) 7.8(24hr)	5.9	70.3-85.5(24hr)	150(24hr)	50-150(24hr)
	North west		16.5(1hr) 8.7(24hr)	5.2	71.2-86.4(24hr)		

Note, Background concentration is quoted from survey result in 12-13 May 2010

The emission rates of IR-B1&2 were designed on the basis of the relevant environmental regulations, environmental regulations are shown in Table 9.4.12.. In order to reduce the emission levels of sulfur oxides, particulates and nitrogen oxides in the flue gas to below exhaust gas regulation levels, mitigation measures such as procurement of low sulfur coal (0.35%) and the use of, electrostatic precipitators(99.6%) and low combust technology will be implemented. Moreover to monitor the composition of the stack emissions, a system that will constantly monitor the emissions (CEMS) will be installed. If it is difficult to procure low sulfur coal, an FGD system will be installed to reduce sulfur oxide.

Based on the abovementioned, the project should only have a minimal impact on air quality (from Chapter 6.4).

Table 9.4.12 Emission rate and Gas emission standards

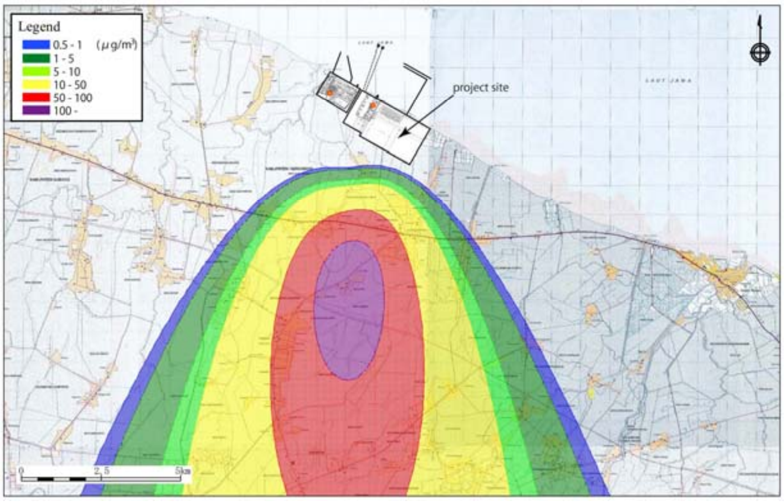
Parameter	Unit	Emission rate*	Gas emission standards No.21/ 2008*	IFC EHS guideline** (Dec,2008)
SO_2	$mg/m^3{}_N$	665	750	200-850
NO_2	$mg/m^3{}_N$	430	750	510
Particular Matter	$mg/m^3{}_N$	42	100	50

* at $25^0C, O_2$ 7% ** at $0^0C, O_2$ 6%

< Prediction conditions: Wind direction; North, Wind velocity; 1.5m/s, Dispersion coefficient; Category B >

< IR-B1>

< IR-B1 and IR_A1-3>



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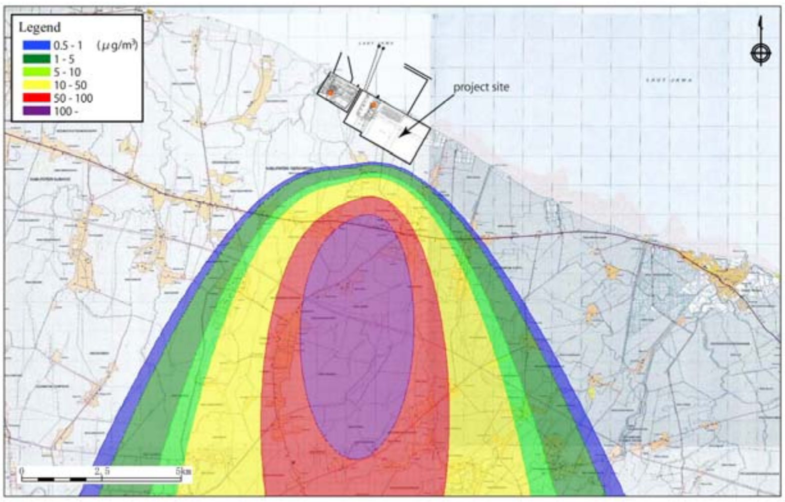
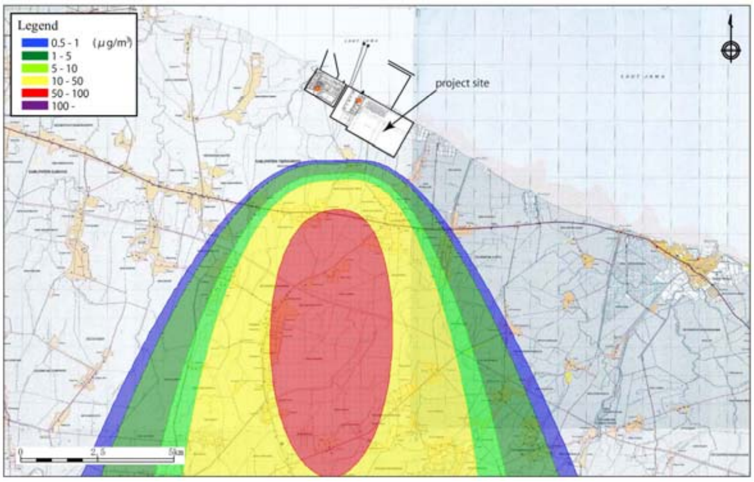


Figure9.4.3 (1) Dispersion concentration of air pollutant (SO_2)

< Prediction conditions: Wind direction; North, Wind velocity; 1.5m/s, Dispersion coefficient; Category B >

< IR-B1>

< IR-B1 and IR_A1-3>



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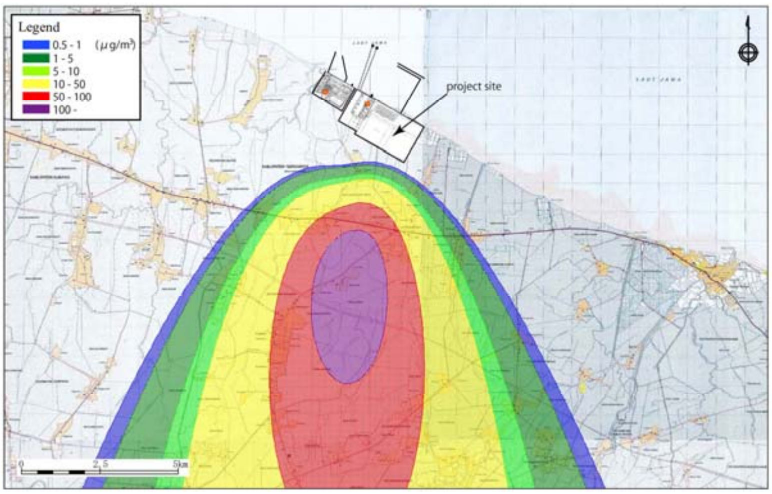
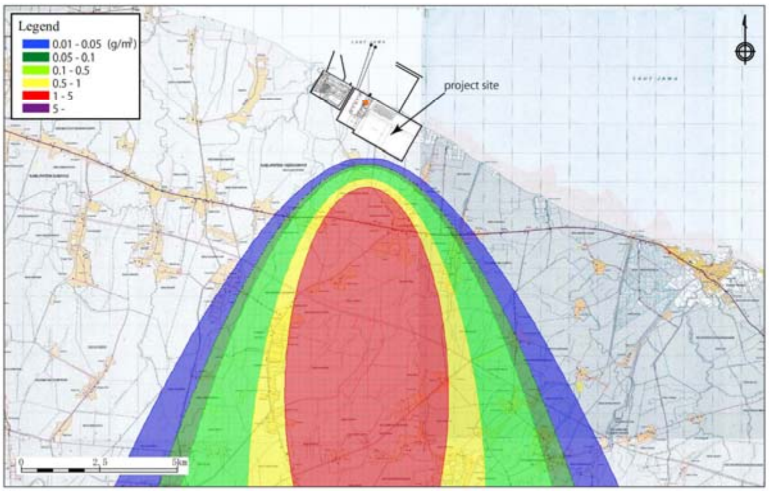


Figure9.4.3 (2) Dispersion concentration of air pollutant (NO_2)

< Prediction conditions: Wind direction; North, Wind velocity; 1.5m/s, Dispersion coefficient; Category B >

< IR-B1>



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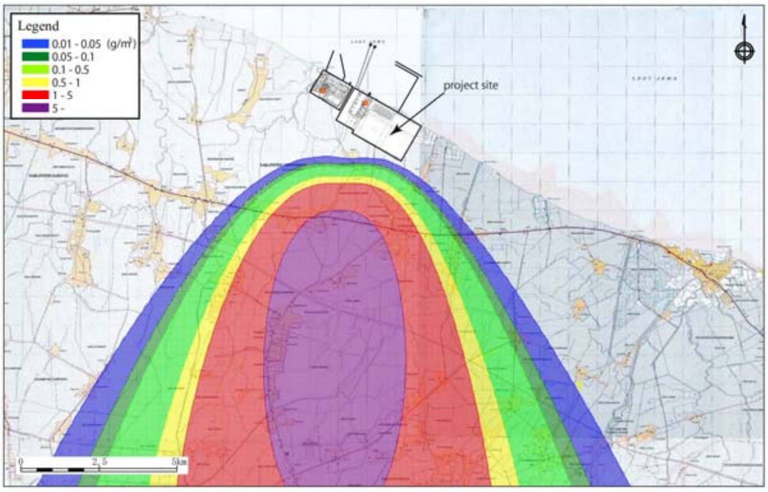

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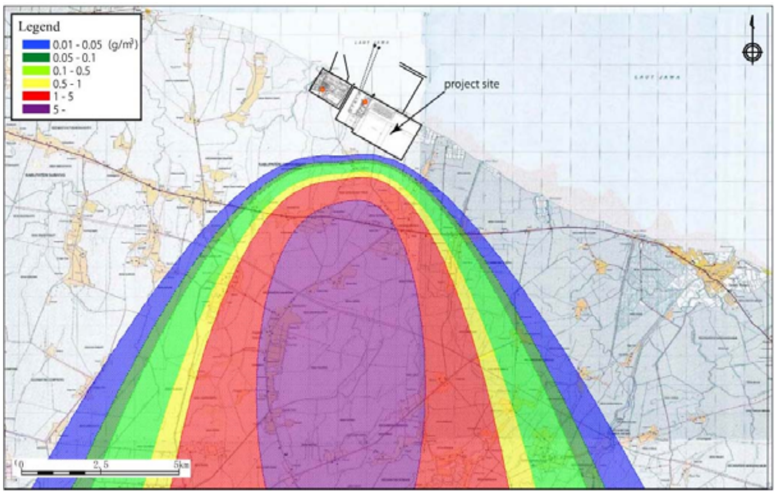
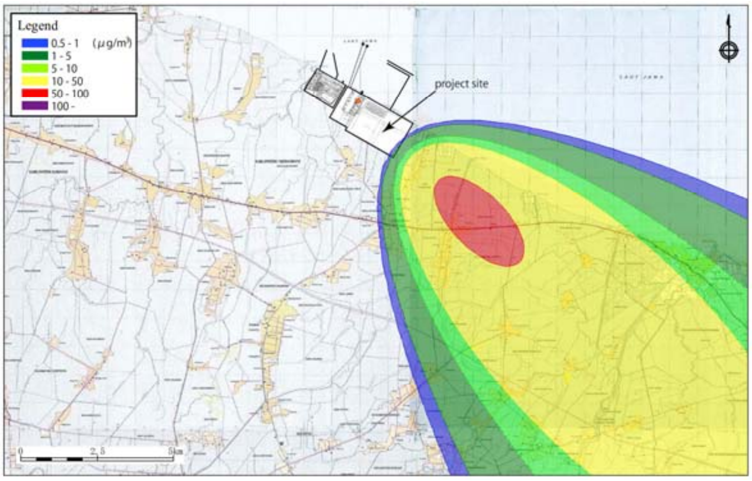


Figure9.4.3 (3) Dispersion concentration of air pollutant (PM_{10})

< Prediction conditions: Wind direction; Northwest, Wind velocity; 1.5m/s, Dispersion coefficient; Category B >

< IR-B1>



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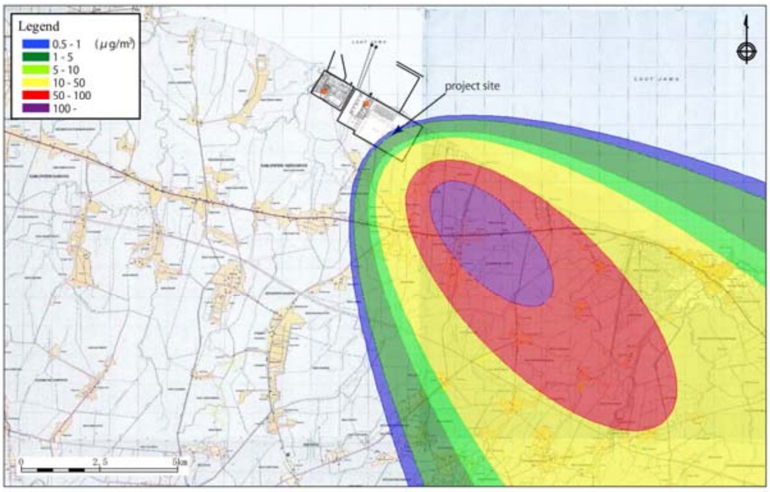

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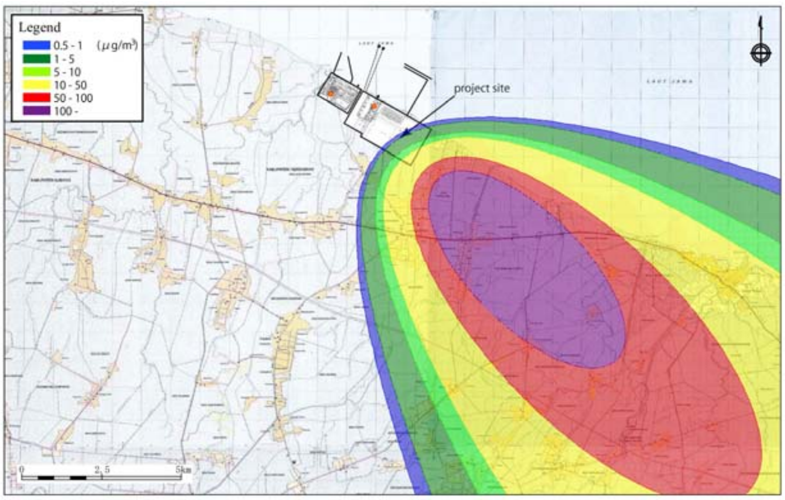
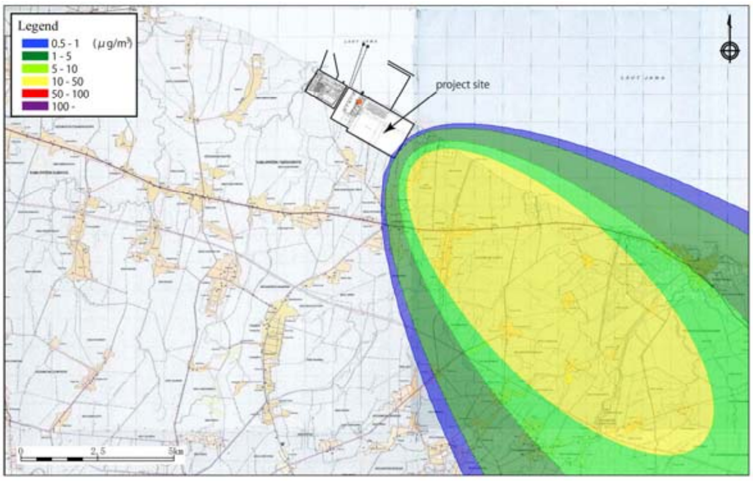


Figure9.4.4 (1) Dispersion concentration of air pollutant (SO_2)

< Prediction conditions: Wind direction; Northwest, Wind velocity; 1.5m/s, Dispersion coefficient; Category B >

< IR-B1>



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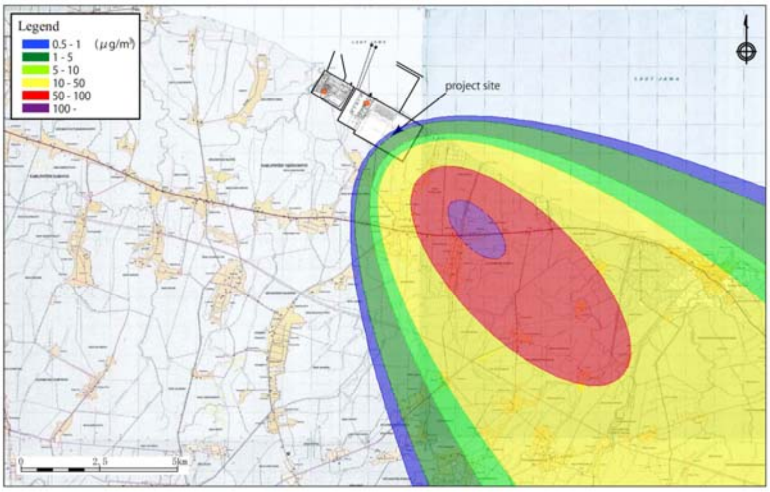

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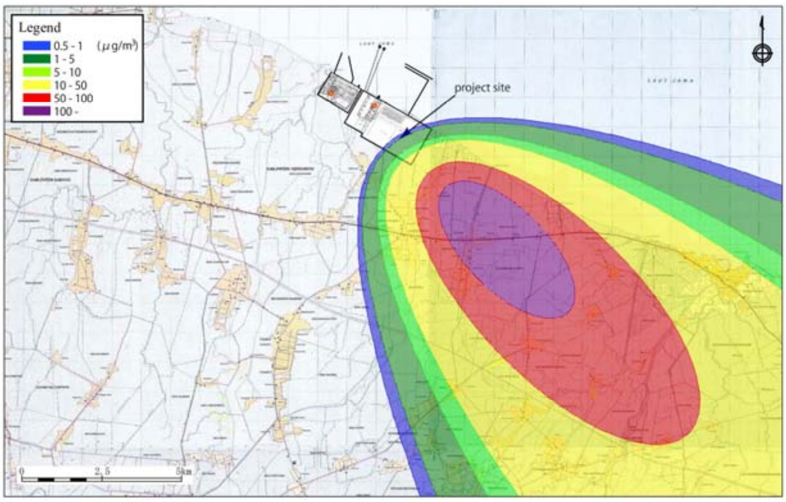
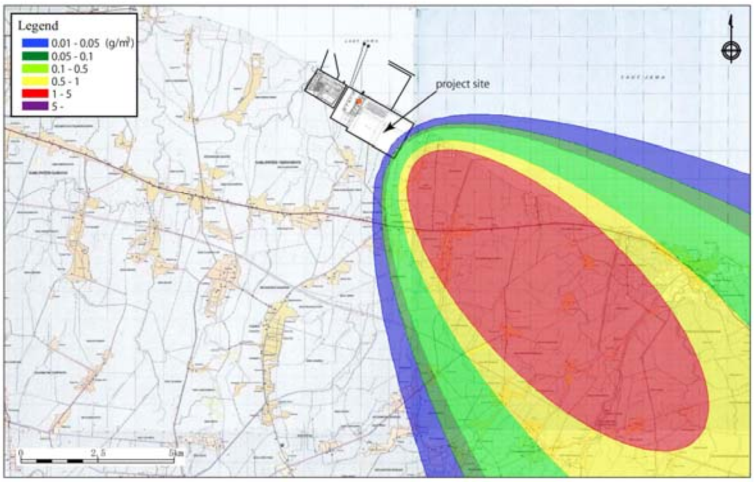


Figure9.4.4 (2) Dispersion concentration of air pollutant (NO_2)

< Prediction conditions: Wind direction; Northwest, Wind velocity; 1.5m/s, Dispersion coefficient; Category B >

< IR-B1>



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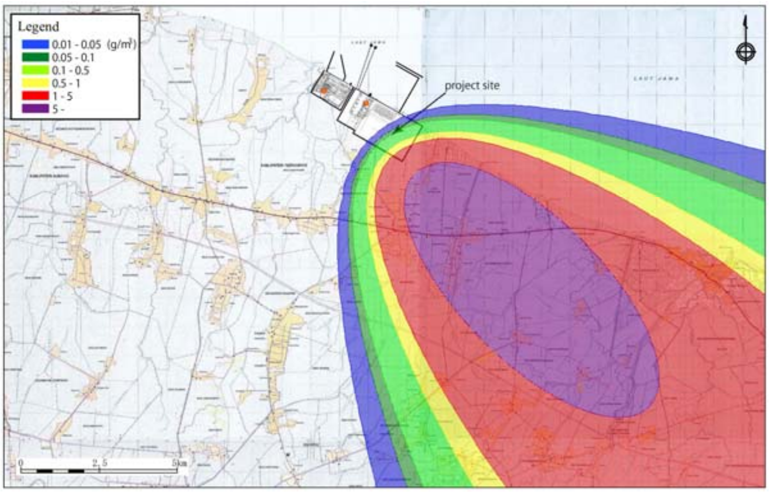

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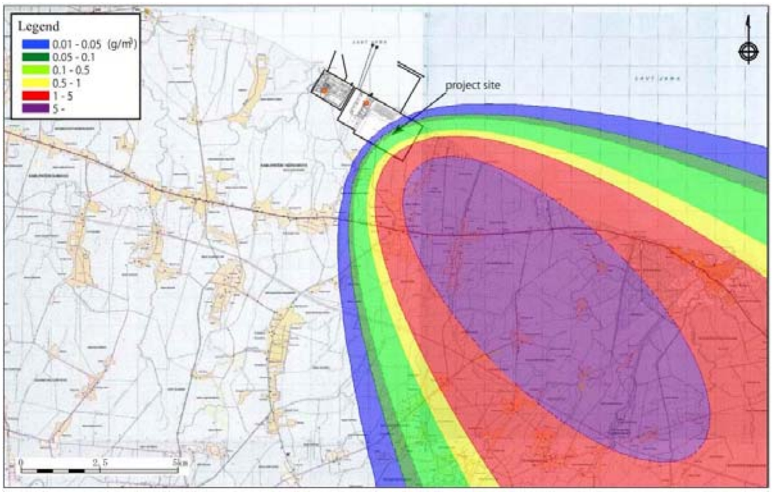


Figure9.4.4 (3) Dispersion concentration of air pollutant (PM10)

ii) Mobilization of personnel and equipment

The traffic quantity during power plant operation is less than that estimated during the construction phase.

Therefore, the emission factors of nitrogen oxides (NOx), particulate matter (PM) are less than that estimated during the construction phase too.

The negative impact on air pollution due to mobilization of personnel and equipment is considered to be insignificant, because impact intensity, duration and coverage area will be low, short term and limited respectively.

iii) Operation of power plant (coal storage yard and ash disposal areas)

The coal storage activities will result in the dispersion of fly ash and bottom ash particulates due to wind blows. According to the Beaufort scale, when wind the speed exceeds about 6m/s, dust on the ground may lift.

The occurrence ratio of wind speed exceeding about 6m/s, around the project site, is about 20 percentages (annual average).

Therefore, preventive measures regarding dust lifting in this project will be carried out as shown in Table 9.4.13.

Table 9.4.13 Outline of preventive measure

Item	Preventive measures
Coal storage yard (including the jetty)	Main preventive measures is as below: _ Regular aspersion _ Set of barrier , green belt around coal storage yard, ash disposal areas _ Enclosure of conveyer, equipment and so on _ Conduct of monitoring
Ash disposal areas	

The negative impacts, such as an increase of air pollutants due to coal storage yard and ash disposal areas is considered to be potentially significant; however the intensity, duration and coverage area will be limited due to the preventive measures as shown in Table 9.4.13.

2) Coal unloading Jetty

(a). Construction phase

i) Mobilization of personnel and equipment

Maximum traffic quantity is less than that estimated during the construction phase for power plant.

Therefore, the emission factors of nitrogen oxides (NOx) and particulate matter (PM) are less than that estimated during the construction phase.

The impact on air pollution due to mobilization of personnel and equipment is considered negative insignificant, because impact intensity, duration and coverage area will be low, short term and limited area respectively.

ii) Dredging for water way and dumping of the dredged materials/ Construction of the jetty structure

The total amount of nitrogen oxides (NOx) caused construction for power plant and that for jetty is almost same.

The construction area for jetty is far from residential area compared with that for power plant.

The impact on air pollution due to mobilization of personnel and equipment is considered negative insignificant, because impact intensity, duration and coverage area will be low, short term and limited etc.

(b). Operation phase

The negative impacts such as an increase of air pollutants due to coal storage yard and ash disposal area are considered to be potentially significant. However, the berth is located approximately 1.5 -1.8 km from the coast line, far from residential areas, therefore it is assumed that negative impacts will be limited. In addition, preventative measures are planned, such as, the enclosure of the conveyer to stop dust lifting.

(2) Water pollution

1) Power plant

(a). Construction Phase

Land preparation/ Construction of the base camp, plant, ash disposal site, and intake channels

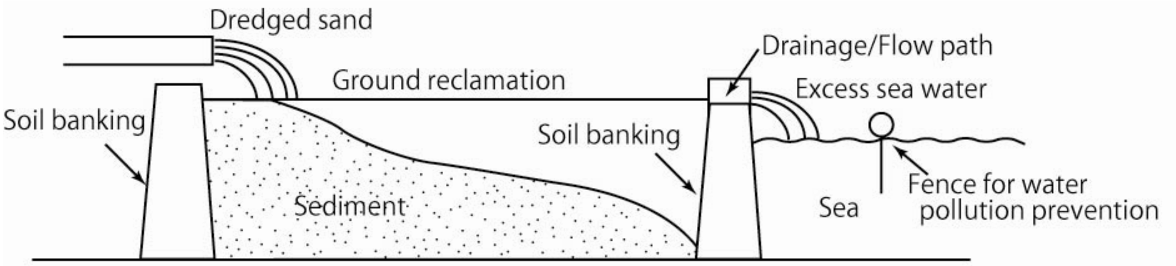
In order to raise the ground surface of the site to approximately 2m AMSL (above mean sea level) to avoid possible impact to the site during storms and an especially high tide, land reclamation will need to be conducted by transferring sea bottom sediment in front of the project site.

It is assumed that the quantity of dredged sand required for the site reclamation is about 6,500,000m^3 (2,450m x 1,300m x 2m). The dredging equipment types wil be the hydraulic dredge and the glove dredge. The works and prevention measures, for sand outflow, will be conducted as per the Figure 9.4.5.

The area where land will be reclaimed will be surrounded by a sheet pile wall. Dredged sea floor sediments will be transferred to the area via two (2) separate types of dredging machines; a hydraulic dredge and a glove dredge. After the sand settles in the enclosed area, sea water will be discharged to the sea. If required, a flocculating agent will be used to reduce the concentration of suspended solids. All seawater discharged from the works will also pass through an additional pollutant prevention fence; this will be installed beyond the sheet pile wall.

Based on the abovementioned, the standard for suspended soils within wastewater, 100 mg/L, will be complied with; moreover the dispersion extent of sand (turbidity) will be limited within the construction area (the port area in this project).

The material the project will utilize is to be sourced from nearby the site. The sea bottom sediment analysis reported in chapter 3 did not identify any elevated concentrations of chemicals that are of concern in respect of the environmental baseline. Therefore the land reclamation is not viewed as a significant change in scope and is very low risk.



Note; The elimination ratio of suspended soil by fence for water pollution prevention is estimated from 40 to 80% (Source: Guidance of the turbidity impact prediction in port construction (April 2004), Ministry of land, Infrastructure, Transport and Tourism)

Figure9.4.5 Prevention measure for sand outflow

However, the run-off water from the bare area during land preparation and dredging works for the intake channel will contain elevated levels of suspended solids, causing water pollution. Therefore, preventive measures of the run- off water, turbidity is shown in Table9.4.14.

Table9.4.14 Outline of water quality control

Item	Developmental pathway	Preventive measures
The run off water by rainfall	The run off water by rainfall from bare area will be dispersed nearby project site during land preparation, construction phase	Rain water, effluent during construction phase will be treated by the drain processing with the settling basin appropriately. Therefore, concentration of turbidity in wastewater will be controlled less than 100mg/L after processing to be complied regulation.
Turbidity of water	Dredging work for intake channel will cause turbidity of water.	Based on the abovementioned, method of preventing water pollution will be adopted around dredging area as the need arises.

Negative impacts such as an increase to water turbidity, due to land preparation are considered to be significant, however the intensity, duration and coverage area will be limited by preventive measures as shown in Table 9.4.14.

(b). Operation phase

- Operation of power plant (existence of plant)

Operation of power plant will produce wastewater form facilities. Wastewater from each facility is gathered in central wastewater treatment system (IPAL). Central water treatment system consists on neutralization, coagulating sedimentation, filtration etc. Wastewater will be managed and be treated appropriately to comply with water quality regulation (from Chapter 6.4.10). Treated wastewater will be mixed and diluted with large volume of thermal effluent.

The impact on water quality due to power plant operating is considered negative insignificant, because impact intensity, duration and coverage area will be low, long term and limited respectively.

- Operation of power plant (thermal effluent)

The temperature of thermal effluent will be discharged within ΔT 8°C relative to the intake water and be less than 40°C. Therefore the temperature of the thermal effluent is within water quality regulation (40°C※; Waste water standarsds No.08/ 2009) (from Chapter 7.3).

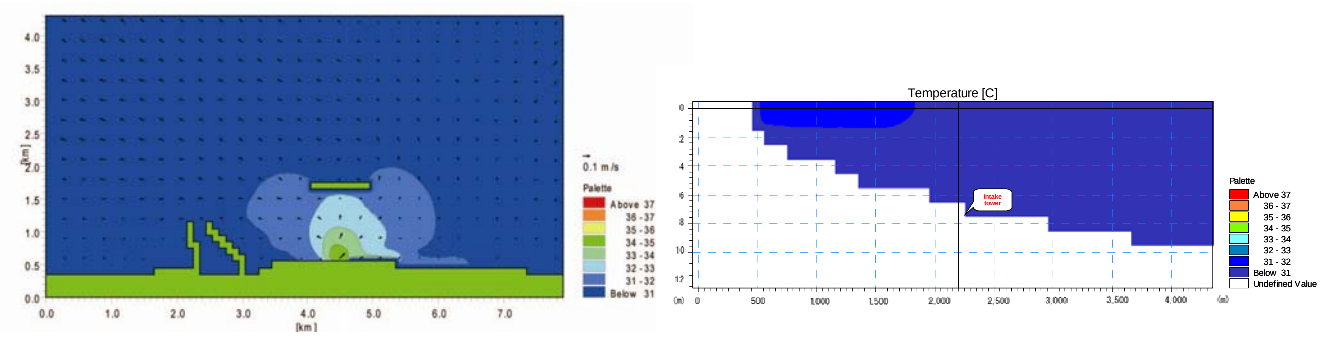
Dispersion of thermal effluent is shown in Table 9.4.15 and Figure 9.4.6

Table 9.4.15 Dispersion extent of thermal effluent

Item (calculation condition)	Velocity of discharge water 2.5m/s, Current speed 0m/s	Velocity of discharge water 2.5m/s, Current speed 0.25m/s, Direction Southeast	Velocity of discharge water 2.5m/s, Current speed 0.25m/s, Direction Northwest
IR-B1	0.44km^2	0.45km^2	1.05km^2
IR-B1 and IR_A1-3	3.19km^2	1.66km^2	3.31km^2
IR-B1&2 and IR_A1-3	4.76km^2	2.68km^2	4.21km^2

※ Note: Monthly average value at the outlet of the condenser

< IR-B1>



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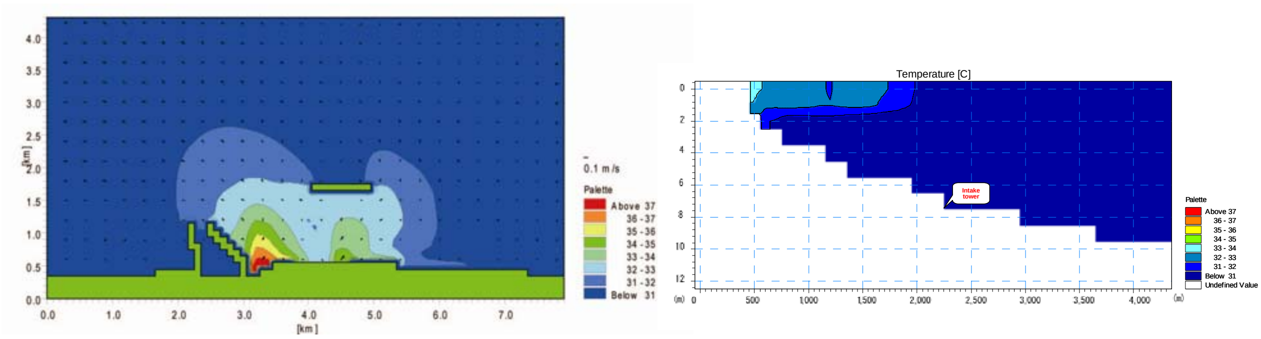

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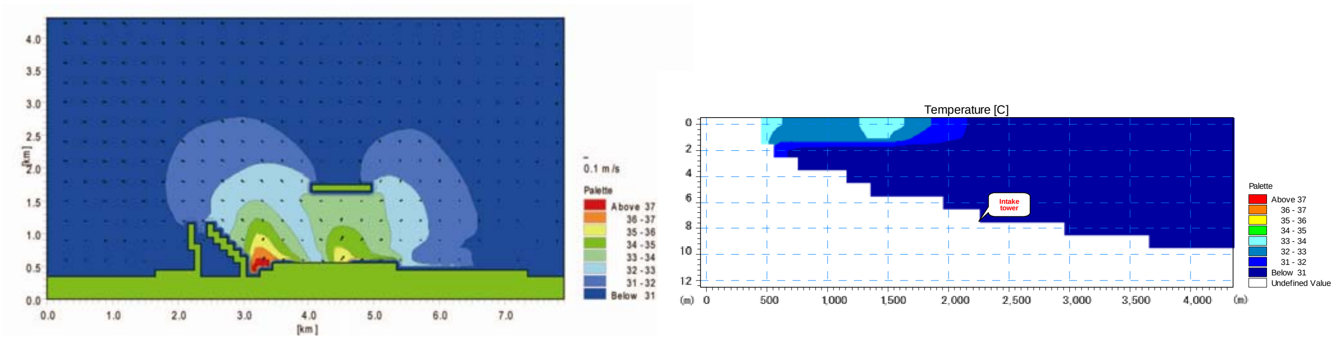
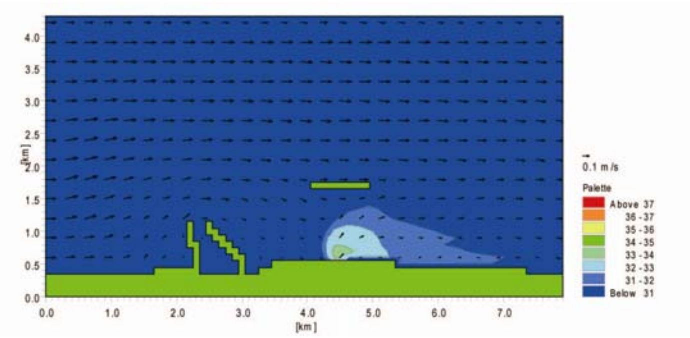


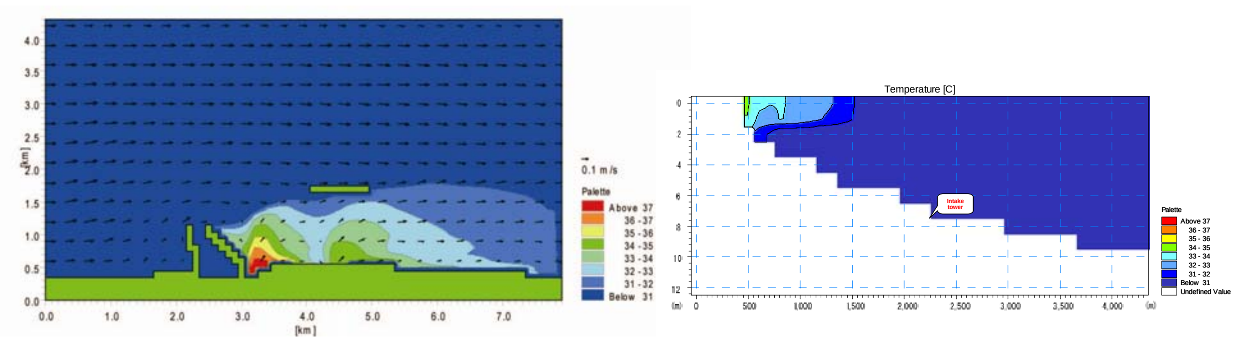
Figure 9.4.6(1) Dispersion of thermal effluent (Current speed 0m/s)

< IR-B1>



Note, There is not vertical thermal dispersion diagram, since thermal effluent is not distributed on an extension of coast and intake of IR-B1＆2.

< IR-B1 and IR_A1-3>



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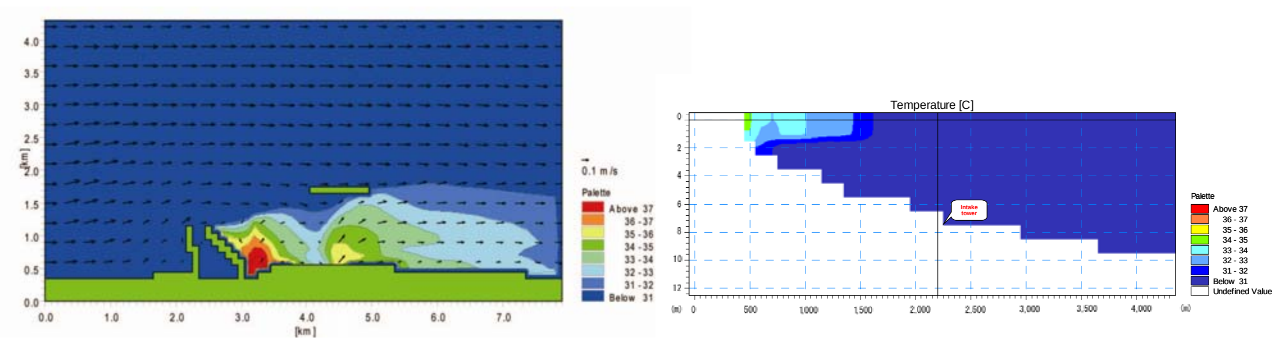
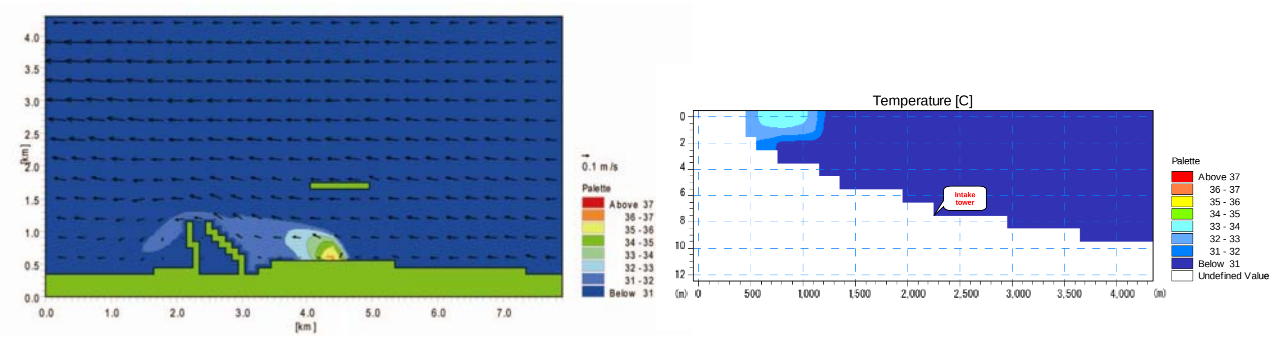


Figure 9.4.6(2) Dispersion of thermal effluent (Current speed 0.25m/s, Direction Southeast)

< IR-B1>



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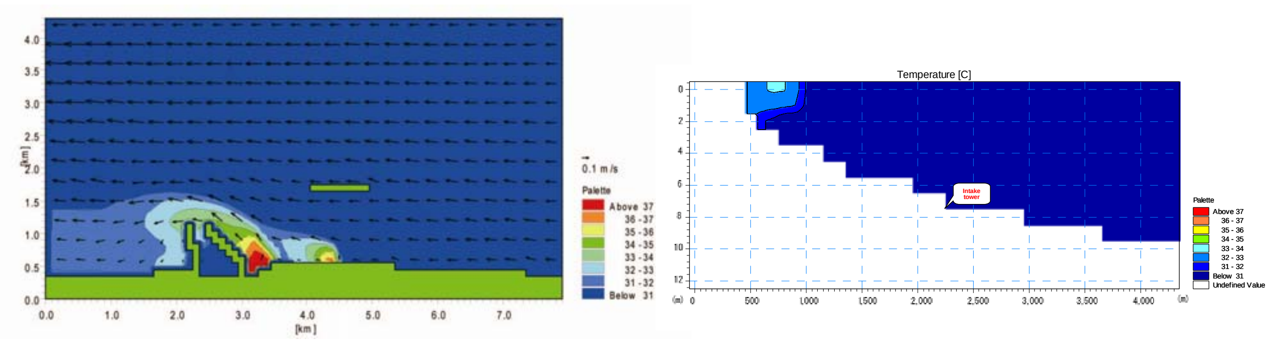

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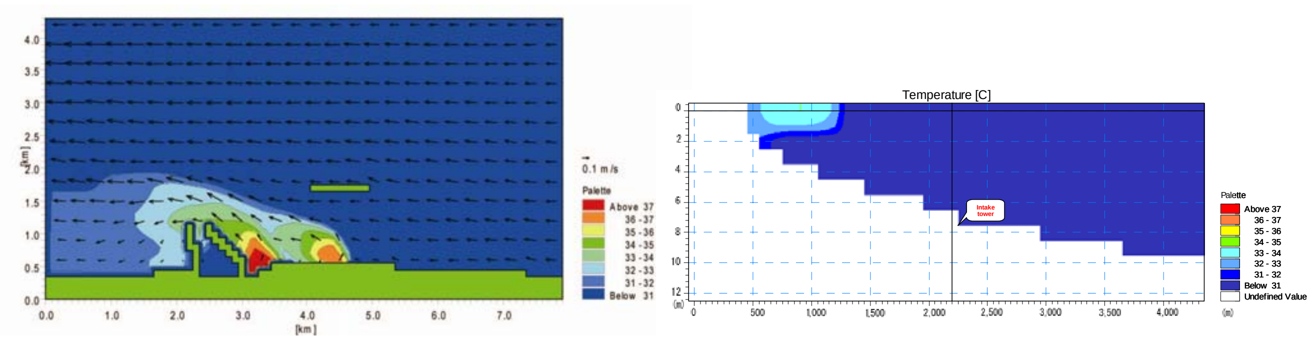


Figure 9.4.6(3) Dispersion of thermal effluent Current speed 0.25m/s, Direction Northwest)

Based on hydrological conditions, the dispersion extension (dimension) of raised 2^{o}C compared with sea water temperature is different. In case of an cumulative effect of this project and IR_A1-3, thermal effluent will reach 1-2 km from the outtake towards offshore, and 3-4 km along the coast line towards the southeast and towards the northwest directions.

According to vertical thermal dispersion diagram, thermal water body will be several meters from the surface. Therefore circulation of thermal effluent will not occur.

Based on the abovementioned, the negative impact on water quality due to thermal effluent could be considered significant, however the intensity, duration and coverage area of these impacts will be limited.

- Operation of power plant (ash disposal site and coal storage)

Rain water, waste water from ash pond and coal storage will not be leaked directly to the outside area. Leakage from the bottom of the ash pond will be prevented using an impermeable layer such as high density polyethylene (HDPE) sheet (from Chapter 7.5).

Wastewater is gathered in central wastewater treatment system (IPAL). Wastewater will be managed and be treated appropriately to comply with water quality regulations (from Chapter 6.4.10).

The negative impacts on water quality due to rain water, waste water from ash pond and coal storage are considered significant; however the intensity, duration and coverage area will be limited.

2) Coal unloading jetty

(a) Construction phase

- Dredging for the water way and dumping of the dredged materials/ Construction of the bases of offshore breakwater / Construction of the jetty structure

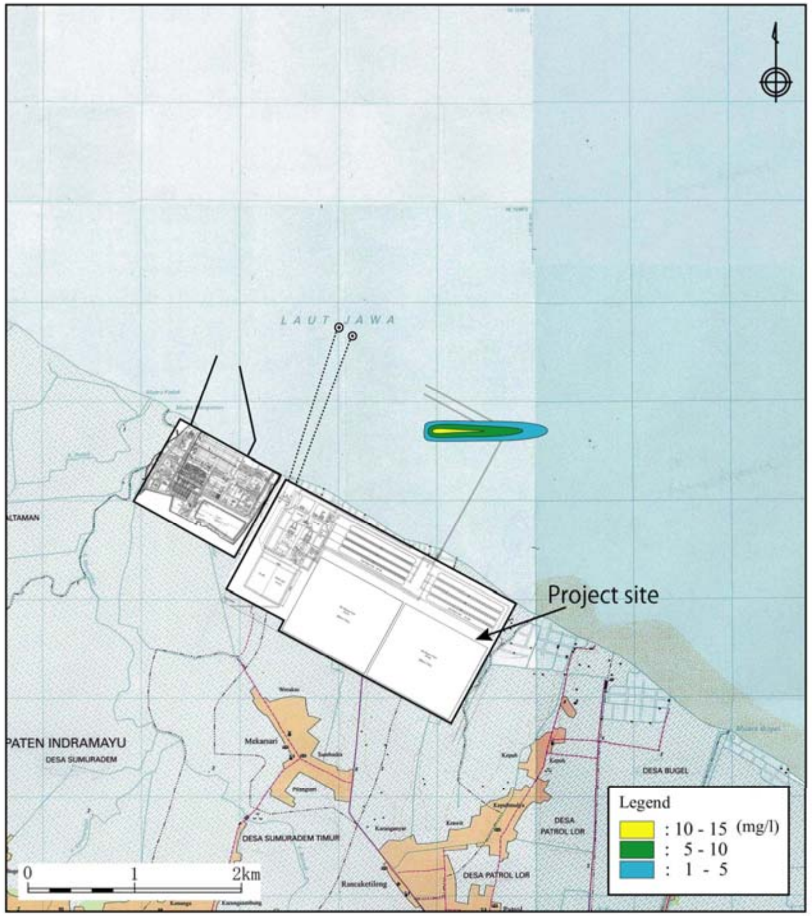
The ambient water quality standard for suspended soils is 20 mg/L. The simulation result is shown in Figure9.4.7. The dispersion extent of more than 20 mg/L of suspended soils will almost not occur due to the dredging works. If the dispersion extent of more than 20 mg/L occurs, it is likely that it will disappear quickly.

In the case of dumping materials the dispersion area, of more than 20 mg/L, is about 0.5 km^2 after 1 hour and after 2hours it will shrink to about 0.3km^2 (refer to Figure9.4.8).

According to another project in Indonesia, the dumping area should be at least 5 miles from the coastline and in 12m of water. A detailed location plan will be created based on the results discussed with relative authority in the future.

To estimate the impact of the dumping site a location has been tentatively chosen for the diffusion calculation.

<After1hour from dredging work>



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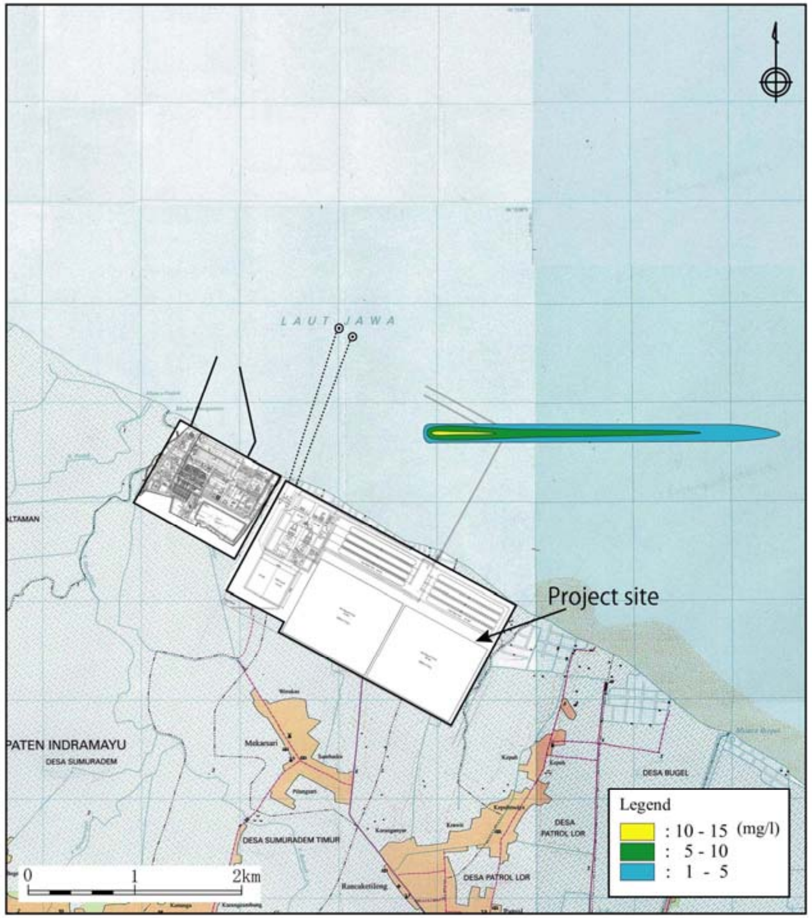

Figure 9.4.7 Degradation of seawater quality by dredging work
(Diffusion extent of suspended soils)

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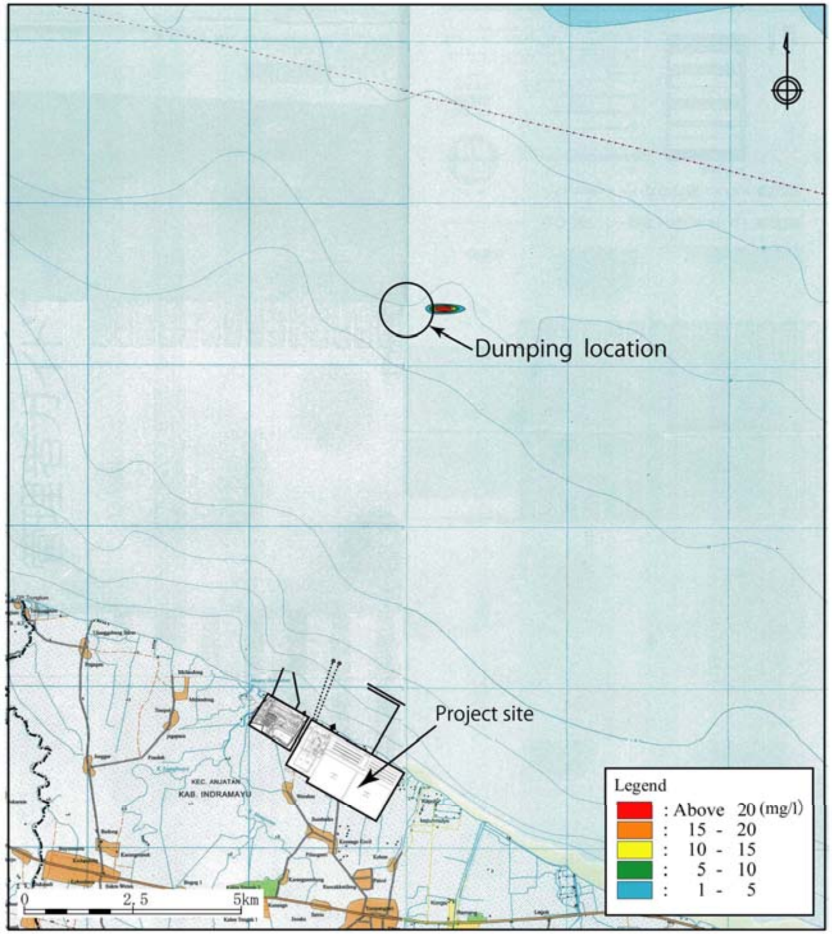


<After 2hours from dumping>

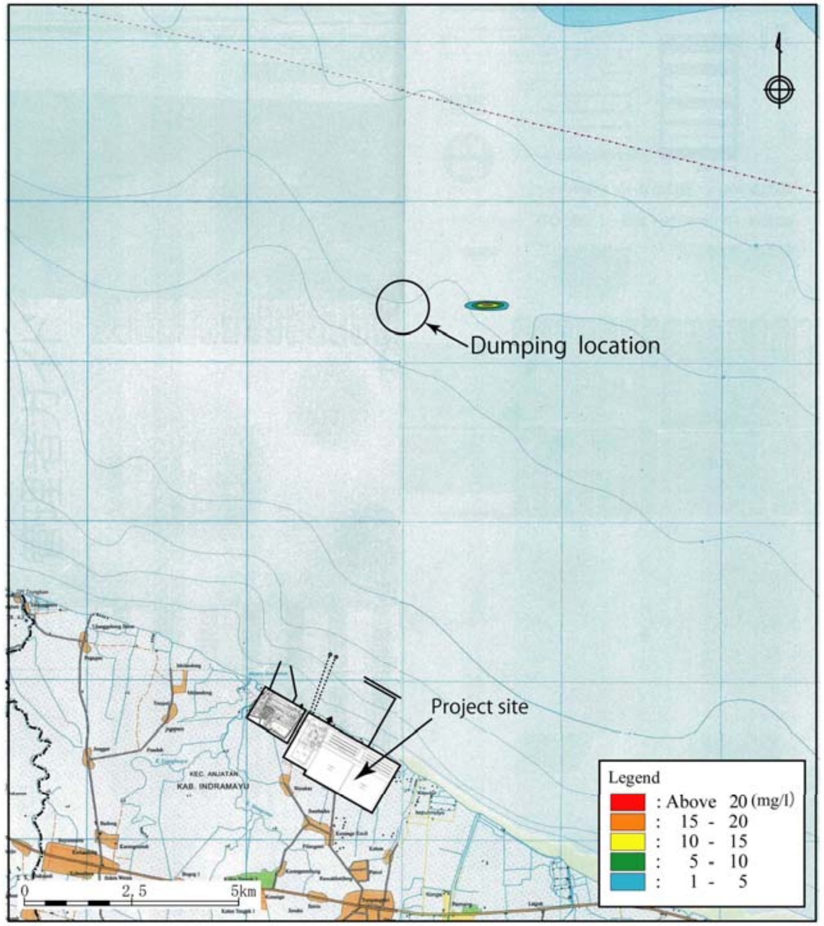


Figure 9.4.8 Degradation of seawater quality by dumping of the dredged materials
(Diffusion extent of suspended soils)

Note; Dumping location is the tentative plan for diffusion calculation.

(b) Operation phase

- Incoming and outgoing ships

The negative impacts on water quality due to the dumping of ballast water and wastewater from ships is considered to be potentially significant. Ballast water and wastewater from ships will cause water pollution. Indonesia has ratified International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978. Therefore, prevention of pollutant of the marine environment by ships will correspond with the treaty. For example, vessels compliant to MARPOL73/78 treaty are hired.

- Coal transportation (operation of the jetty)

Regarding coal transportation, preventive measure for coal spill such as enclosure of conveyers will be carried out accordingly. Therefore degradation of water quality due to coal spill will hardly occur.

The impact on water quality due to coal transportation is considered negative insignificant, because impact intensity, duration and coverage area will be low, long term and limited respectively.

(3) Noise

1) Power plant

(a) Construction phase

- Mobilization of personnel and equipment

The road from Sumuradem to Patrollor is passing residential areas. Prediction results of noise level by mathematical model are shown in Table 9.4.16. Increase of noise level by the project activities is estimated from 0.2 to 0.5 dBA and is less than 1 dBA.

Table 9.4.16 Estimation of impact regarding noise level along road during construction phase

(Unit: dBA)

Duration / Item	Result of field survey	Estimation by mathematical model			
		Background noise	Noise intensity produced by relevant equipment	Noise level at receiving point	Increase of noise level
6:00 ～ 7:00	-	74.9	65.8	75.4	0.5
7:00 ～ 8:00	73.0	74.6	65.5	75.1	0.5
8:00 ～ 9:00	79.0	75.3	65.1	75.7	0.4
9:00 ～10:00	75.5	75.4	65.2	75.8	0.4
10:00 ～11:00	75.3	76.4	66.2	76.8	0.4
11:00 ～12:00	-	77.0	-	77.0	-
12:00 ～13:00	-	76.2	-	76.2	-
13:00 ～14:00	-	76.5	-	76.5	-
14:00 ～15:00	-	76.4	63.1	76.6	0.2
15:00 ～16:00	76.1,76.8	76.9	63.6	77.1	0.2
16:00 ～17:00	-	76.4	63.1	76.6	0.2
17:00 ～18:00	73.5	75.8	62.5	76.0	0.2
18:00 ～19:00	-	73.4	63.2	73.8	0.4

Note, Survey result of 2points along road is described.
Prediction result is estimated 1m from road.

The impact on increase of noise intensity due to mobilization of personnel and equipment is considered negative insignificant, because impact intensity, duration and coverage area will be low, short term and limited respectively.

- Land preparation/ Construction of base camp, plant, ash disposal site, and intake channels

The negative impact of increased noise intensity due to the operation of heavy machine, equipment is considered to be potentially significant.

As a result, noise dispersion vicinity of the power plant is shown in Figure 9.4.9. At the boundary of project site, noise level estimation is assumed to be less than 60dBA. In addition the noise level in residential areas is estimated to be approximately 55dBA. A noise value of 55dBA is an appropriate noise threshold for a residential area. As preventive measure, heavy equipment will not be used at nighttime during the construction. Therefore, based on aforementioned, negative impacts will be assumed to be minimal..

Figure 9.4.9 Noise dispersion

(b) Operation phase

- Mobilization of personnel and equipment

Traffic quantity during power plant operating is less than that estimated during the construction phase. Therefore, noise intensity and impact is less than that estimated during construction phase too.

The impact on increase of noise intensity due to mobilization of personnel and equipment is considered negative insignificant, because impact intensity, duration and coverage area will be low, short term and limited respectively.

- Operation of power plant (existence of plant/ ash disposal site and coal storage)

Estimated noise dispersion in the vicinity of the power plant is shown in Figure 9.4.10. At a distance of about 500 m from the boundary of the project site, the noise level is estimated to be less than 40dBA. Therefore, the predicted noise level is not exceeding the noise threshold for residential areas, (55dBA).

The negative impacts due to the increase of noise intensity caused by the power plant operating are considered to be insignificant, because the impact intensity, duration and coverage area will be low, long term and limited.

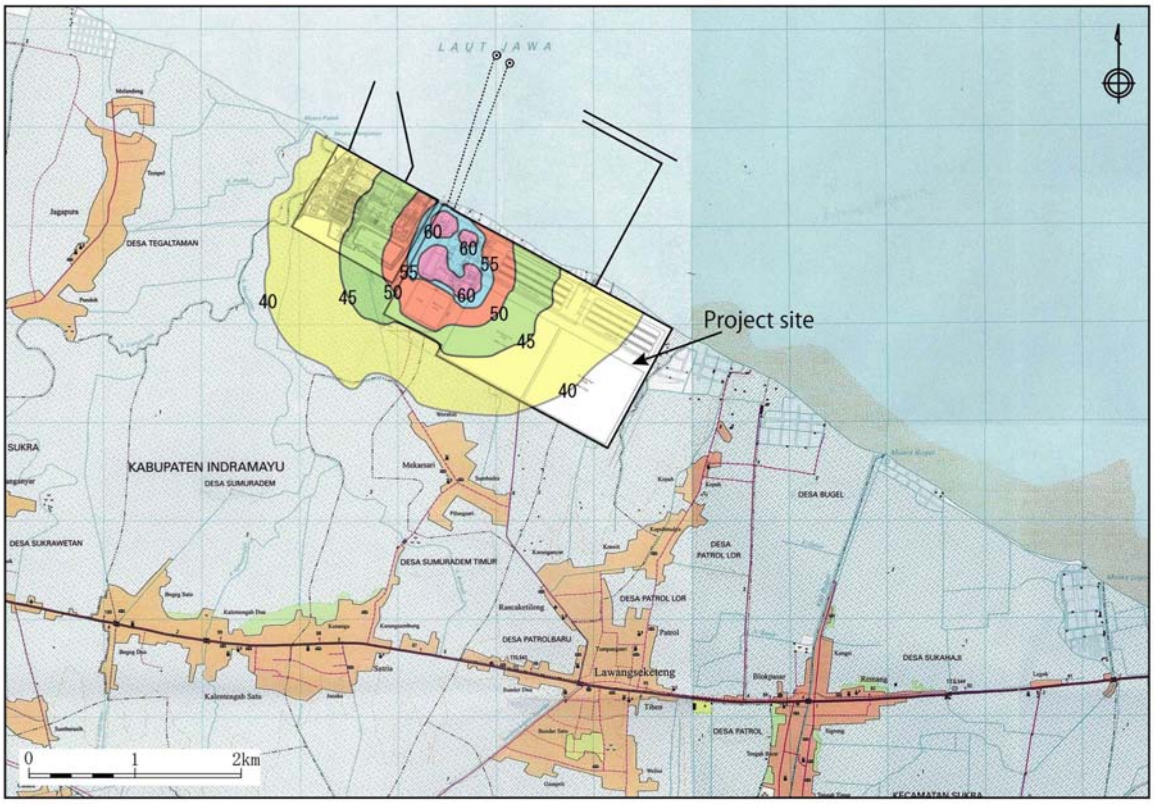


Figure 9.4.10 Noise dispersion

2) Coal unloading jetty

(a) Construction phase

- Mobilization of personnel and equipment

Maximum traffic quantity is less than that estimated during the construction phase for power plant.

Therefore, the noise intensity and impact is less than that estimated during construction phase for power plant too.

The impact of increase of noise intensity due to power plant operating is considered negative insignificant, because impact intensity, duration and coverage area will be low, short term and limited respectively.

- Dredging for water way and dumping of the dredged materials / Construction the bases of offshore breakwater / Construction of the jetty structure

In general, the noise level will decline to about 70dBA at about 1000 m from the noise source, this estimation is calculated based on LA＝LWA-8-20log10r. Noise dispersion from the noise source at the nearest point from land, such as the unloader on shore, is shown in Figure 9.4.11. Therefore, it is estimated there will be no noise influence on the residential areas.

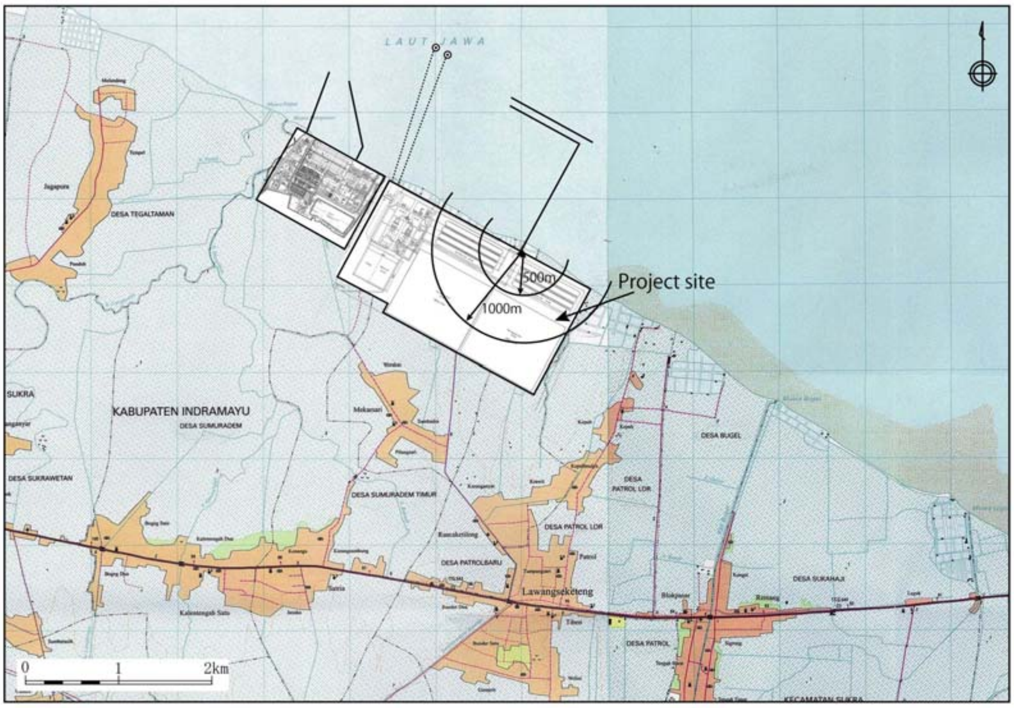


Figure 9.4.11 Noise dispersion

The impact on increase of noise intensity due to construction for jetty is considered negative insignificant, because impact intensity, duration and coverage area will be low, long term and limited respectively.

(b) Operation phase

- Incoming and outgoing ships /Operation of jetty

The noise level will decline about 70dBA at about 1,000 m from point of the unloader onshore. Therefore, it is estimated that these activities will not have a noise influence at residential areas.

The impact on increase of noise intensity due to operation of jetty is considered negative insignificant, because impact intensity, duration and coverage area will be low, long term and limited respectively.

(4) Waste

1) Power plant

(a) Construction phase

- Construction of base camp, plant, ash disposal site, and intake channels

Construction workers will produce sewage and garbage. Construction work will produce construction waste, such as scrap steel, concrete waste, packaging materials and waste oil etc.

These materials will be managed and be treated appropriately. The methods for the handling and treating of these materials are shown in Table 9.4.17.

Table 9.4.17 Outline of waste treatment

Item	Developmental pathway	Preventive measures
Sewage and garbage	Workers during construction phase will produce sewage and garbage.	The amount of sewage will be reduced as much as possible by dehydration and transport to specified places. Reusable waste will be used for suitable purpose. Others that cannot reuse will gather and transport to specified places, avoiding mess in the surrounding area.
Construction waste	Construction work will be produced wastes of iron, wood, plastic etc.	Reusable waste will be used for suitable purpose. Others that cannot reuse will gather and transport to specified places, avoiding mess in the surrounding area.

The impact due to waste generation by construction activities is considered negative insignificant, because impact intensity, duration and coverage area will be low, short term and limited respectively.

(b) Operation phase

- Operation of power plant (existence of plant)

Workers in power plant will produce sewage and garbage. Waste oil is generated from the operation and the maintenance of facilities. These materials will be managed and be treated appropriately. The methods for the handling and treating these materials are shown in Table 9.4.18.

The negative impacts due to waste generation by operating power plant are considered to be insignificant, because impact intensity, duration and coverage area will be very low, short term and limited.

Table 9.4.18 Outline of waste treatment

Item	Developmental pathway	Preventive measures
Sewage and garbage	Workers during operation phase will produce increased amounts of sewage and garbage.	The amount of sewage will be reduced as much as possible by dehydration and transport to specified places. Reusable waste will be used for suitable purpose. Others that cannot reuse will gather and transport to specified places, avoiding mess in the surrounding area.
Waste oil	It is generated on operating and the maintenance of facilities.	Disposal of waste oil will be entrusted to industrial waste disposal contractor

- Operation of power plant (ash disposal site)

Fly ash and bottom ash are generated in processes of coal combustion. Fly ash and bottom ash are categorized as a hazardous material by Indonesian Government Therefore, the handling and storage of those materials are managed in accordance with Indonesian regulations. Preventive measures for those materials are shown in Table 9.4-19.

An ash disposal site will be sets up on the project site. The area is 68.2ha (880m x 775m). The capacity is estimated to be 4,284,500 ton (from Chapter 7.5). The nominal capacity of the ash disposal pond is calculated based on the total volume of the ash to be accumulated for the duration of 20 years operation with 85 % load factor. 20 years of ash disposal capacity is secured according to the present design and the capacity is thought to be sufficient because part of the ash is reused as concrete and cement (from Chapter 6.4.8.2).

The negative impacts due to ash generation by operating power plant are considered to be insignificant, because impact intensity, duration and coverage area will be low, short term and limited.

Table 9.4.19 Outline of ash treatment

Item	Developmental pathway	Preventive measures
Fly ash and dust	Anelectrostatic precipitator catches fly ash and dust from the coal combustion gas.	Fly ash and bottom ash will be disposed of into the ash disposal site. The ash disposal site can handle fly ash and bottom ash more than 20 years.
Bottom ash	The hot ash not flied produces in coal combustion gas.	Bottom ash is collected in discharge bin, and then the ash is transported to ash disposal site.

2) Coal unloading Jetty

(a) Operation phase

- Coal transportation (operation of the jetty)

Waste oil is generated from operating and the maintenance of facilities. Waste oil will be managed and be treated appropriately for its disposal in an environmentally sensitive way.

The impact due to waste generation from the operating jetty is considered negative insignificant, because impact intensity, duration and coverage area will be low, short term and limited respectively.

(5) Hydrology

1) Power plant

(a) Operation phase

- Operation of power plant (thermal effluent)

The volume of seawater used for water-cooling needed is around 162,000m^3/h (45m^3/s) (from Chapter 7.3). The prediction on change of sea currents caused by discharged thermal effluent was conducted as part of this study.

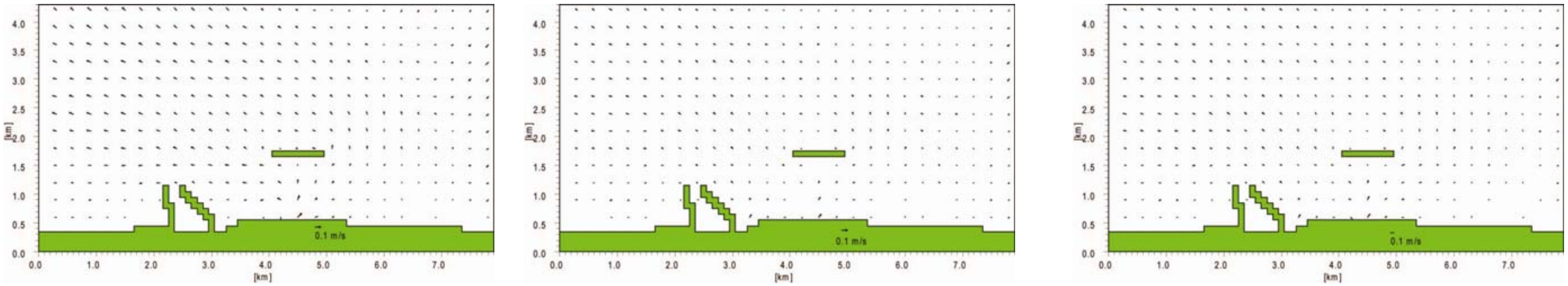
The Indramayu site is located on the coast facing the open sea. According to Chapter 3.1.6 C. Hydro condition, the dominant current direction is east-west, and current speed 0.2-0.3 m/s.

The impacts of the discharge of the cooling water on the existing cuurents are shown in Figure 9.4.12.

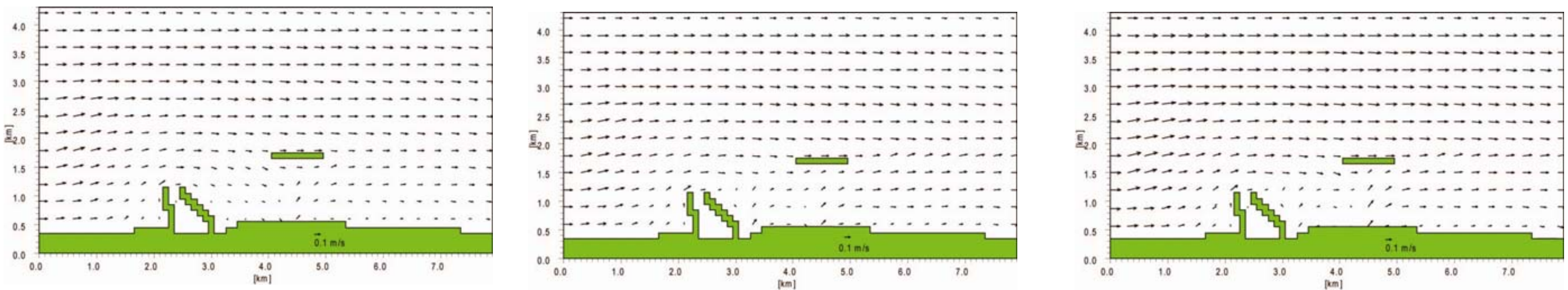
The results show that the current changes caused by the discharged water are within an estimated radius of about 2 km from the cooling water outlet.

Based on the abovementioned, the impact on sea current due to thermal effluent is considered negative insignificant, because impact intensity, duration and coverage area will be low, long term and limited respectively.

< Velocity of discharge water 2.5m/s Current speed 0m/s>



< Velocity of discharge water 2.5m/s Current speed 0.25m/s, Direction Southeast >



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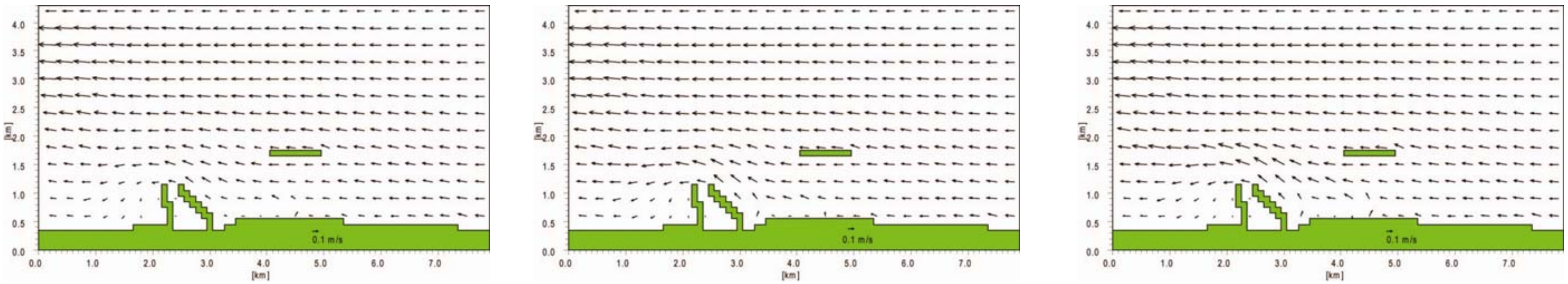


< IR-B1> < IR-B1 and IR_A1-3> < IR-B1＆2 and IR_A1-3>

Figure 9.4.12 Prediction on change of sea current

(6) Terrestrial ecosystem

1) Power plant

(a). Construction phase

- Land preparation

In the field survey of the power plant site, 19 animal species (15 Aves, 2 Mammals and 2 Amphibians), listed as species of Least Concern in IUCN, were observed.

The project site is comprised of paddy fields and a shrimp pond. Moreover the nearest natural mangrove forest is a dozen km away from project site.

The existing condition of the land (paddy field, shrimp pond and so on) will disappear due to the land clearing and development. However, the Sukra sub-district is located in a farming area, and the area size of the farmland in the sub-district is more than 4,000ha. Most part of the power plant site is now used as farmland, also the site is not a recognized special area for biota, as the characteristics of biota in the site are the same as those found in the surrounding area. The area-size of the farmland that will be claimed by the power plant site is around 270ha. The size of the farmland in the power plant is about 5% of that in the Sukra sub-district, therefore impact to the terrestrial animals (such as birds) will be assumed to a limited extent.

2) Transmission line

a. Construction phase (Land preparation)

In the field survey of the transmission line route, 35 animal species (29 Aves, 3 Mammals, 3 Amphibians), listed in IUCN as species of Least Concern,, were observed. The impact of the project will be limited to the tower base area, and considering each base area size (25m×25m max) and the large intervals of the towers, the impact on the ecosystem will be very limited. Additionally, the transmission line route will be selected to avoid bird migratory paths and habitats to the possible extent. If a protected species was discovered, PLN would consult with specialists about transplanting the individual.

Regarding flora, two rare plants were found based on field survey result. Swietenia mahagoni (local name: mahoni) listed as UU No 7 Tahun 1999, endangered species for IUCN, and listed Appendix-II in CITES, Ficus benjamina (local name: Beringin) listed as UU No 7 Tahun 1999 are found. However these two species are being planted for greening or cultivated for timber.

Total number of transmission towers is estimated to be about 210 units from Indramayu power station to Cibatu substation, and total for transmission towers will require 131,250m2 (25 x 25 x 210 tower) areas. Land preparation will be conducted by avoiding the area in which precious vegetations exist as much as possible.

Even if these precious vegetations might disappear by land preparation; these species exist abundantly and widely.

Based on the above-mentioned, the impact on terrestrial ecosystem due to land preparation is considered to be small in its significance

b. Operation phase (Electrical transmission (existence of tower))

Based on document investigation, some protected species (avian) live in West Java, such as Crimson Sunbird *(Aethopyga siparaja*), Great Egret (*Ardea alba*), and Javan Kingfisher (*Halcyon cyanoventris*). However these precious wildlife species were not found during the field survey, neither during the wet season nor the dry season. However, some species categorized in Appendix II* by CITES or as Least Concern (LC)** by IUCN were observed around the proposed transmission line route.

* Appendix II, about 32,500 species, are species that are not necessarily threatened with extinction, but may become so unless trade in specimens of such species is subject to strict regulation in order to avoid utilization incompatible with their survival.
**Least Concern (LC) is an IUCN category assigned to extant taxon or lower taxa which have been evaluated but do not qualify for any other category. As such they do not qualify as threatened, Near Threatened, or conservation dependent.

Wildlife such as mammal, reptile and amphibian may be influenced by the existence of the towers. However the extent of each tower foundation is limited .and wildlife can avoid the tower areas and not be impacted in any way.

Based on the abovementioned, the impact on terrestrial ecosystem due to existence of the towers is considered negative insignificant.

(7) Marine ecosystem

1) Power plant

(a) Construction phase

- Construction of base camp, plant, ash disposal site, and intake channels

The negative impacts on aquatic biota due to the run off water from bare ground during land preparation and water derived from the dredging work for the intake channel are considered to be potentially significant.

Preventive measures, described in section 9.4.3(2), describe how the rainwater run off and the water associated with the dredging work will be treated. As a result, degradation of water quality will be tightly controlled and negative impacts will be limited.

(b) Operation phase

- Operation of power plant (existence of plant)

The negative impact on aquatic biota due to wastewater from the facility, the run off water from bare ground during land preparation and water derived from the dredging work for the intake channel flowing in to ecosystems is considered to be potentially significant

The preventive measures, section 9.4.3(2), state that the wastewater form facilities will be treated appropriately to meet water quality regulations. Therefore, any negative impacts will be limited .

- Operation of power plant (thermal effluent)

The negative impact that thermal effluent could have on aquatic biota is considered to be significant. The temperature of thermal effluent will be discharged within ΔT 8℃. compared intake water and will be less than 40℃.

According to the dispersion extent (dimension) of raised 2℃ compared with sea water temperature, in case of cumulative IR-B1 and IR_A1-3, thermal effluent will reach 1-2km from outtake toward offshore, and 3-4km along coast line toward southeast and toward northwest.

Diffusion extent result of raised 2℃compared with sea water temperature is as shown in Table 9.4.15.

Aquatic biota will be influenced with thermal effluent. However, fishes which can actively move can avoid the thermal effluent. Moreover aquatic biota will be accustomed to the change of sea condition by thermal effluent gradually. Therefore negative impacts are assumed to be limited.

- Operation of power plant (ash disposal site and coal storage)

The negative impacts on aquatic biota due to rain water run off, waste water from ash pond and coal storage is considered to be potentially significant.

According to preventive measures described in section 9.4.3(2), rain water, waste water from ash pond and coal storage will be treated appropriately, inline with water quality regulations. Therefore negative impacts are assumed to be limited

2) Coal unloading jetty

(a) Construction phase

- Dredging for water way and dumping of the dredged materials/ Construction the bases of offshore breakwater / Construction of the jetty structure

According to Section 9.4.3(2), simulation results show the maximum increase of turbidity of water (15 mg/L). For this maximum condition, dispersion of the turbid water will be over a relatively short distance (<about 300 m).

The negative impact on aquatic biota due to turbidity of water due to dredging work is considered to be potentially significant.

Aquatic biota such as plankton, benthos will be influenced with dredging work. Fishes which can actively move can avoid the turbidity. However moving capability of benthos is limited. Therefore negative impact caused construction activity will be assumed to a limited to the area directly located at the dredging and dumping sites..

(b). Operation phase

- Incoming and outgoing ships

The negative impacts on aquatic biota due to ballast water and wastewater is considered to be potentially significant.

According to Section 9.4.3(2), prevention of pollutant of the marine environment by ships will correspond with the considerations of the treaty. The impact on aquatic biota due to ballast water and wastewater is considered negative significant, because impact intensity, duration and coverage area will be medium –high, short term and limited respectively.

- Coal transportation (operation of the jetty)

The width of berth is about 30m.The supporting structure of the berth will be steel pipe piles. Therefore habitat loss of benthos will be small.

According to Section 9.4.3(2), preventive measure for coal spills such as enclosure of conveyers will be carried out accordingly.

The impact on aquatic biota due to coal transportation is considered negative insignificant, because impact intensity, duration and coverage area will be low, long term and limited respectively.

(8) Global warming

1) Power plant

(a) Operation phase

- Operation of power plant (exhaust gas)

The exhaust gas containing CO_2 (greenhouse gas) will be created during operation of the power plant. Operation of the power plant will create greenhouse gas containing CO_2, however, the coal-fired thermal power plant will utilize ultra supercritical technology for the production of highly efficient energy with reduced emissions of greenhouse gases (from Chapter 6.2).

In case of adoption of ultra supercritical technology, the reduction amount of CO_2 per year is estimated to be about 334,000 ton/year compared with sub critical technology as shown in Table 9.4.20

Table 9.4.20 Comparison of performances

Type	Subcritical technology	Ultra supercritical technology
Plant gross efficiency, (%)	38.08	40.16
Capacity factor (%)	80	80
Carbon content in coal (wt. %)	41.79	41.79
Coal Consumption (t/year)	3,970,000	3,752,000
CO2 gas emission (t/year)	6,083,200	5,749,200
Reduction of CO2 gas emission (t/year)	Base	334,000

Note, Conversion: 1kWh = 3.6MJ

The impact on global warming due to operation of the power plant is considered negative significant, however, the introduction of ultra supercritical technology for the production of highly efficient energy will also result in the reduction of CO_2.

(9) Involuntary resident resettlement, Burden on vulnerable groups (women, children, aged, impoverished, minorities, indigenous people and such) and Uneven distribution of benefit and loss (damage)

1) Power plant and Transmission line

(a) Pre-construction phase (Land clearance)

The project site is personal land, so land acquisition and resettlement with compensation may be required. In Indonesia, land acquisition, the compensation regarding loss of houses, shops and trees is conducted in the scheme set forth in President Decree No.36 (2005), No.65 (2006) after EIA approval.

Moreover, the management regarding loss of business opportunity (places) etc., will be conducted in accordance with the Environmental Management Plan (RKL).

Based on the abovementioned, the impact due to land clearance will be reduced as much as possible.

(10) Employment /Livelihood, Local economy

1) Power plant and Coal unloading jetty

(a) Pre-construction phase

The project site is personal land, so land acquisition and resettlement with compensation will be required. In Indonesia, land acquisition, the compensation regarding loss of houses, shops and trees is conducted in the scheme set forth in President Decree No.36 (2005), No.65 (2006) after EIA approval.
These detail methods are described with Chapter 9.5 of the Environmental Management Plan.

Moreover the management regarding loss of business opportunity (places) etc., will be conducted in accordance with Environmental Management Plan.

Based on the abovementioned, the impact due to land clearance will be reduced as much as possible.

The impact on employment /livelihood and local economy due to mobilization of personnel and equipment is considered positive significant, because impact intensity, duration and coverage area will be high, short term and limited respectively.

(b) Construction phase

- Mobilization of personnel and equipment

Personnel will be mobilized in the first stages of civil construction activities. 4,000 personnel will be needed during the peak of the construction of IR_B1 project and 80 percent of them will come from the different parts of Indonesia and from abroad. Therefore job opportunities will be expected for about 800 people in the Indramayu/Bekasi areas. Moreover, local and migrant workers, with their incomes, will generate business opportunities due to their demand for various services and goods.

The impact on employment /livelihood and local economy due to mobilization of personnel and equipment is considered positive significant, because impact intensity, duration and coverage area will be high, short term and limited respectively.

- Dredging for water way and dumping of the dredged materials

In the case of breakwater and piled jetty type, dredging works will be needed. The dredger will use a CSD (Cutter Suction Dredger) and grab dredger and other equipment. Therefore fisheries will be disturbed around the dredging works.

Table 9.4.21 construction equipment

No	Equipment	Output power(kW)	Number (unit/month)
1	Cutter suction dredger	110,00	18
2	Grab dredger	2,000	90
3	Crane vessel	600	234
4	Pilot vessel	70	90

Source: Quotation based on EIA regarding Higashidoori nuclear power plant (1992) as similar activity.

The negative impacts on local commercial fishing due to the dredging and dumping works is considered to be potentially significant, however the impacts will be assumed to be limited...

(c) Operation phase

- Mobilization of personnel and equipment

Some personnel will be recruited for the IR_B1 project and employed people will generate income. Local and migrant workers with their income will generate business opportunities at the same time because they will use various services, and consume various goods.

The impact on employment/livelihood and local communities due to mobilization of personnel and equipment is considered positive significant, because impact intensity, duration and coverage area will be high, long term and limited respectively.

- Incoming and outgoing ships /Operation of jetty

The negative impact on local commercial fishing due to the dredging and dumping works is considered to be potentially significant. In case of a 12,500 DWT class ship will be used for the unloaded coal, unloading of fuel coal is finished in approximately 14 hours (1 set/ship). Therefore disturbance of sailing by 12,500 DWT class ship will be estimated limited area and period, however the impacts from sailing is assumed to a limited (from Chapter 5.5.3).

(11) Social infrastructure/service facilities

1) Power plant and Coal unloading jetty

(a) Construction phase

- Mobilization of personnel and equipment

The negative impact on Social infrastructure/service facilities due to mobilization of personnel and equipment is considered to be potentially significant.

Personnel will be mobilized in the first stages of civil construction activities. 4,000 personnel will be needed during the peak of the construction of IR_B1 project (from Chapter 7.14). The gap between supply and demand of infrastructure/ service might be occurred by mobilization of workers and their families. To combat these issues, preventive measure such as control of construction schedule, route-setting will be conducted throughout the project.

(b) Operation phase

- Mobilization of personnel and equipment

Some personnel will be recruited by IR_B1 project. The negative impact on Social infrastructure/service facilities due to mobilization of personnel and equipment is considered to be potentially significant. The gap between supply and demand of infrastructure/ service might be occurred by mobilization of workers. However the gap will be smaller compared with construction phase..

(12) Transportation

1) Power plant and Coal unloading jetty

(a) Construction phase

- Mobilization of personnel and equipment

The negative impacts on transportation due to mobilization of personnel and equipment are considered to be potentially significant

The level of service factors in respect to the usage of the road network during the construction phase are estimated to be within the range of 0.16 - 0.36 in the Jakarta-Cirebon direction, and 0.15 - 0.31 in the Cirebon-Jakarta direction as shown in Table 9.4-22. The condition of the roads for mobilization of equipment and materials is classified “Stable flow, yet operation speed is limited by the traffic, driver has adequate freedom of speed choice”.

Since preventive measure such as control of construction schedule, route-setting will be conducted as required, the impacts will be assumed to be limited.

Table 9.4.22.Level of service with road around the site

Duration / Item	Jakarta-Cirebon (2 lanes)			Cirebon-Jakarta (2 lanes)		
	Background	In case including this project	Decline of service	Background	In case including this project	Decline of service
6:00 ～ 7:00	0.21	0.24	0.03	0.22	0.22	0.00
7:00 ～ 8:00	0.19	0.22	0.03	0.21	0.21	0.00
8:00 ～ 9:00	0.20	0.23	0.03	0.27	0.27	0.00
9:00 ～10:00	0.20	0.23	0.03	0.28	0.28	0.00
10:00 ～11:00	0.28	0.31	0.03	0.30	0.30	0.00
11:00 ～12:00	0.34	0.34	0.00	0.29	0.29	0.00
12:00 ～13:00	0.30	0.30	0.00	0.23	0.23	0.00
13:00 ～14:00	0.30	0.30	0.00	0.27	0.27	0.00
14:00 ～15:00	0.29	0.29	0.00	0.28	0.31	0.03
15:00 ～16:00	0.36	0.36	0.00	0.25	0.27	0.03
16:00 ～17:00	0.29	0.29	0.00	0.23	0.26	0.03
17:00 ～18:00	0.25	0.25	0.00	0.21	0.24	0.03
18:00 ～19:00	0.16	0.16	0.00	0.13	0.15	0.03
Range	0.16-0.36	0.16-0.36	-	0.13-0.30	0.15-0.31	-

Equivalence of level of service is set up as follows:

Characteristic	Level of service (Tp)
Condition of high speed flow load, driver may choose preferred speed without obstruction	0.00 – 0.20
Stable flow, yet operation speed is limited by the traffic, driver has adequate freedom of speed choice	0.21 – 0.44
Stable flow, with controlled speed and movement	0.45 – 0.74
Nearly unstable flow, controlled speed, tolerated v/c	0.75 – 0.84
Traffic volume is heading or on its capacity, unstable flow, stoppage occurred	0.85 – 1.00
Forced or jammed flow, low speed, volume under capacity, long queue occurred, large obstructions	> 1.00

Source Manual of Indonesia road capacity

(b) Operation phase

- Mobilization of personnel and equipment

The maximum traffic quantity is less than that estimated to occur during the construction phase. Therefore, the proportion of vehicles related to the project to the total amount is less than that estimated during the construction phase too.

The impact on transportation due to mobilization of personnel and equipment will be assumed to be limited.

2) Transmission line

The maximum traffic quantity during the construction phase is estimated to be less than 10 (one-way) cars per day for each tower.

The number of vehicles being used during the construction works is limited compared with that of the background. Moreover, the construction period for each tower is short and any gridlock of traffic would be within a limited area and be for a relatively short period.

Based on the above-mentioned, the impact on increase of traffic due to mobilization of personnel and equipment is considered insignificant.

(13) Heritage

1) Transmission line

According to the results of the field survey and a documentary search, one heritage site exists within about 10km from the transmission line. The proposed route of the transmission line should therefore be planned so as not to traverse the heritage site.

Based on the above-mentioned, the impact on heritages due to existence of the transmission line is considered to be insignificant.

(14) Sanitation/ Risks for infectious diseases such as (HIV/AIDS)

1) Power plant and Coal unloading jetty

(a) Construction phase

- Mobilization of personnel and equipment

The negative impacts on sanitation/ risks for infectious diseases such as (HIV/AIDS) due to mobilization of personnel and equipment are considered to be potentially significant

The increase of contagious disease prevalence will occur due to the recruitment and mobilization of a large number of migrant workers into project area, namely about 4000 workers in total of which 80% will be recruited from outside the project area.

The gathering of a number of workers is estimated to create significant impact on contagious disease prevalence. Poor sanitation including the lack of access to clean water, lack of toilet facilities, exposed solid waste disposal areas all will facilitate fly breeding and also result in a prevalence of diseases and infections.

The interaction between thousands of migrants and the local people will result in the two directional transfer of contagious diseases due to direct contact such as sexual intercourse, and indirect contact. The diseases that will spread include but are not limted to respiratory tract infection, skin disease, sexually transmitted diseases, etc. Moreover, presence of foreign workers might introduce new types of diseases.

Mobilization of equipment and materials will use Cirebon-Jakarta routes. Transportation from this route to the project site will pass a residential area. The increase of traffic will cause air quality degradation due to vehicle emissions along the route. This might cause upper respiratory tract infection among the community.

Since preventive measure such as installation of a waste water treatment system (e.g. septic tank), control of construction schedule, route-setting will be conducted, any impacts will be assumed to be limited.

(b) Operation phase

- Mobilization of personnel and equipment

The negative impacts on sanitation/ risks for infectious diseases such as (HIV/AIDS） due to mobilization of personnel and equipment are considered to be potentially significant.

Regarding increase of contagious disease prevalence, the same conditions mentioned above for the construction phase are also relevant however for the operation of the power plant the proportion of migrant workers employed will be much less than that during the construction phase. Therefore, any impacts will be assumed to be limited.

(15) Local custom

1) Power plant and Coal unloading jetty

(a) Construction phase

- Mobilization of personnel and equipment

These might cause negative impacts on project related activities when not properly managed. The negative impacts on local customs due to mobilization of personnel and equipment are considered to be potentially significant. A change of community behavior will occurs due to recruitment and mobilization of workers.

The migrants from areas of different behavior (custom) and traditions will cause interaction with the community around the project area. This interaction is estimated to effect adaptation or change of community behavior due to social and natural factors.

A large number of migrant workers, staying temporarily around the project area, might influence existing customs and behavioral standards, and there is the potential of conflict with locals and the potential to raise public concern. Another impact of workers recruitment is social resentment due to competition in the job market. Therefore, contractor will plan to speak of local resident positively and promote communication between the project personnel and the local people

(b) Operation phase

- Mobilization of personnel and equipment

The change of community behavior will occur due to recruitment and mobilization of workers.

The migrants staying around the project site might cause infiltration of influence and customs, a potential to conflict with locals and the potential to raise public concern. These might cause negative impacts on the power plant project operations when not properly managed. Therefore, contractor will promote communication between the project personnel and the local people.

(16) Landscape

1) Power plant and Coal unloading jetty

According to the results of the field survey and a documentary search, there is no aesthetic landscape within a radius 10km from the project site.

Landscape in the vicinity of the project site may be diminished by existence of the plant and jetty. The color of the plant buildings, stack and jetty will harmonize with the color combinations of the surrounding environment where practicable.

Moreover, the boundary of the power plant, ash disposal area and coal yard should be revegetated with appropriately selected native trees and shrubs, as much as is practicable. Therefore any negative impacts on landscape due to existence of the plant and jetty is considered to be insignificant

2) Transmission line

According to the result of field survey and a documentary search, there are some aesthetic landscapes within about 10km from the transmission line. Aesthetic landscapes may diminish by the existence of the transmission line. However based on the planned alignment, there is a distance of at least 2km from the transmission line to the identified landscapes.

Based on the above-mentioned, the impact on landscape due to the existence of the transmission line is considered to be insignificant.

(17) Electromagnetic field (Transmission line)

In respect of electromagnetic field, the scientific community has not reached a consensus on specific biological responses. Avoiding the impact of electro and magnetic field by complying with relevant regulations and law is expected. In this project, the transmission line is planned based on Indonesia national standard regarding transmission line design, SNI04-6918-2002.

The regulations stipulate "free zones" within which particular activities are not permitted. The free zone from transmission line is a determined based on the following requirements and considerations:

- the free zone is regulated by the minimum vertical/horizontal free distance.
- the average of the span length between towers is set to be 450m, minimum
- conductor height will be at least 12.5m above ground
- temperature and wind pressure affecting the conductor, insulator and tower
- system voltage, support and transmission design
- minimum safe distance from the conductors

Based on the above technical design requirements, the impact due to the electromagnetic field of the power transmission line is considered insignificant (the limit of EMF is less than 5kV/m). This project meets the relative regulations and laws and therefore, it will be conducted to reduce the impact of the electromagnetic field as much as possible.

(18) Safety/ Accident

Accidents invariably occure on construction sites due to the large number of workers carrying out tasks in conditions and with equipment having the potential to cause harm. To minimize the rik of accidents on the project site the project management is committed to ensuring that all employees, contractors and equipment working on this project comply with established safe work practices and requirements.

Moreover, the safety management systems and procedures must comply with the Indonesian government regulations. The safety management plan will be provided before starting any construction works for the project. The framework of this plan will include the achievement of environment, health and safety outcomes (hereinafter referred to as EHS outcomes).

This plan is intended to manage the EHS outcomes of the project through application of the following five principles:

- Policy
- Planning
- Implementation
-Checking & Action

- Management Review

The safety management plan provides for the following outcomes.

- Implementing safe work procedures, effective safety actions, preventative control actions, regular monitoring and site inspections
- Ensuring health and safety of employees, contractors and the community is given top priority
- Communicating positive health and safety values and behaviors throughout all phases of the project activity
- Setting up high personal safety standards;
- Allocating adequate human, financial resources to environment, health and safety management
- Committing to measurable objectives, performance indicators and targets aimed at the elimination of work related injury and illness
- Maintaining corrective action systems

9.5 Environmental management plan and environmental monitoring plan

9.5.1 Environmental Management Plan

The main purpose of the environmental management plan is to ensure and record the implementation of mitigation measures, in order to cut impacts on the environment stemming from the power station.

The environmental management plan basically achieves the following:

- To decrease impacts on the environment to the allowable level (emission standard and environmental standard) by implementing mitigation measures so as to prevent hazardous impacts on the environment during construction and operation
- To set up an organization responsible for the implementation of the environmental management plan
- To conduct appropriate implementation of the environmental management plan during construction and operation

(1) Power plant

1) Pre-construction phase

Table 9.5.1 shows the descriptions of the environmental management plan of the power plant during pre-construction phase. The most important impact on the environment prior to construction is land acquisition, which will be described otherwise. The land to be acquired for the construction of the power plant is mostly farmland and shrimp farm, with only one empty house. A shop selling water and other necessities is located near the border of the site, which could also be included in the acquisition. In this way, a major resettlement will not occur by land acquisition concerning the power plant. The compensation will be implemented to shrimp farmers and land owners according to the laws of Indonesia.

Meanwhile, there will be potential loss of workplace for workers at the shrimp farm and landless farm workers. Measures will be taken to help their livelihood such as priority of employment in project construction work and training to encourage new business. It is to be noted that the equal employment condition should be developed with adequate consideration to socially vulnerable groups.

Table 9.5.1 Environmental impacts and mitigation measures at the pre-construction

Factor	Potential impact	Planned environmental mitigation measures	Responsible person
Land acquisition	Loss of the land and shrimp farm within the site Loss of house, shop and trees within the site	- Land acquisition should be conducted in compliance with the relevant laws and regulations - Help towards the relocation costs for relocated residents will be provided	PLN
Jobs and Incomes	Farm and shrimp farm laborers who lose their jobs Person who lose their business places	- Priority of employment for the people who lose their jobs and business places in simple work - Implementation of the job training programs to person who wants the job training. - Stipulate a standard for employment	PLN

2) Construction phase

PLN's project manager is required to make building constructors fully understand and implement the necessary environmental management plan and monitoring in construction work.

To this end, PLN's project manager needs to set up necessary organizations. In particular, since the number of inflowing workers and vehicles will increase during construction, PLN's project manager is required to give adequate explanation of the contents of the construction works, schedule, and safety measures to the communities in the surrounding areas. Moreover, PLN's project manager needs to understand the opinions of local residents and take flexible measures.

Major impacts on the environment during construction are as follows:

- Inflow of workers and increase in vehicles for construction
- Generation of building material waste
- Scattering of soil and dust and emission gas from vehicles and machines during construction
- Generation of noise from vehicles and machines during construction
- Increase in the turbidity of seawater due to dredging for the pier construction

Proactive employment of local workers will have a positive impact on the local economy. In addition, prior to employment, an educational training program needs to be implemented to give sufficient consideration to safe sanitation.

Table 9.5.2 shows the descriptions of the environmental management plan of the power plant during construction phase. PLN and other administrative organs concerned shall hold adequate consultation with each other to form an environmental management plan including environmental monitoring. The project owner is required to instruct building constructors to prepare reports on the implementation status of the environmental management plan, submit it to other organs concerned, and study and consult for further measures.

Table 9.5.2 Environmental impacts and mitigation measures during the construction phase

Factor	Potential impact	Planned environmental mitigation measures	Responsible person
Air quality	Dust resulting from construction work	- Watering access road and construction site, especially in the dry season - Using cover sheet on trucks for the transportation of soils.	Contractor (PLN)
	Gas emission from construction machine	- Periodic maintenance and management of all the construction machines and vehicles	
	Gas emission from vehicles used for mobilization of equipment and workers		
	Air pollution arising from inappropriate disposal of construction materials and waste	- Prohibition to open burning and illegal dumping	
Water quality	Run off water from construction area	- Excavate channels and ditches around the construction area - Construct silt basin.	Contractor (PLN)
	Domestic wastewater of workers	- Install waste water treatment facility for workers such as septic tank	
	In appropriate disposal of waste	- Prohibition illegal waste disposal	

Factor	Potential impact	Planned environmental mitigation measures	Responsible person
	Dredging and dumping the dredged material	- To choose dredging method and equipment that will minimized the turbidity	
	Landfill for land preparation	- Discharge the sea water after the sand settles - Install the fence for water pollution prevention at the sea area facing the construction area	
Noise/ Vibration	Noise and vibration caused by construction machine	- Construction work should be performed during daytime, especially piling work. - Use of noise reduction devices to effectively reduce potential noise by earthmoving and excavating equipments.	Contractor (PLN)
	Noise caused by vehicles used for mobilization of equipment and workers)	- Determine the traffic control plan including route-setting - Arranged truck speed, especially around residential area	
Waste	Construction waste from construction work	- Conduct separate waste collection and promote recycling and reuse - Appropriate disposal of non-recyclable waste according to rule	Contractor (PLN)
	Domestic waste from workers		
	Inappropriate handling of hazardous waste	- Hazardous waste should be treated under the related regulation.	
Terrestrial ecosystem	Loss of habitat of animals and vegetation	- Construction area should be re-vegetated with native plants after the groundwork of the site has been completed.	Contractor (PLN)
	Potential impact due to air pollution and noise caused by construction activities	- Implement the mitigation measures as same as those to address air pollution and noise.	
Marine ecosystem	Potential impact due to water pollution caused by construction activities	- Implement the mitigation measures as same as those to address water pollution.	Contractor (PLN)
-Employment/ Livelihood -Local economy	Increase in employments and business opportunities	- Employment of local residents as many as possible. - Use of the services (i.e. laundry and catering service etc.) and products offered in the local community.	Contractor (PLN)
	Cut the irrigation channel	- Change route of the irrigation channel	
	Interference to fishery activity during dredging and dumping the dredged material	- Public awareness of dredging plans and construction schedule among the local fishermen	
	Interference to fishery activity due to the construction vessels		
Social infrastructure/ Service facilities	Insufficient social infrastructure and/or service facilities due to the increased workers	- Construct schools, hospitals and other service facilities as required.	Contractor (PLN)
	Damage of the roads caused by heavy machinery for construction	- Repair roads as required.	

Factor	Potential impact	Planned environmental mitigation measures	Responsible person
Transportation	Traffic jam caused by the increased vehicles during construction	- Properly control construction schedule and processes. - Determine the traffic control plan including route-setting - Training safe operation of vehicles.	Contractor (PLN)
	Increase the number of the construction vessels	- Setting the water route under the council with concerned authority.	
Sanitation/ Risks for infectious diseases	Domestic wastewater generated from workers	- Install waste water treatment system for workers, such as septic tank	Contractor (PLN)
	Increase in infectious diseases due to influx of workers	- Installation of medical center and implementation of periodic medical check - Education and training on health care of the workers	
Local custom	Conflict between local residence and workers	- Hire as many local residents as possible. - Promote communication between workers and local people (e.g. join local in events).	Contractor (PLN)
Accident /Safety	Labor accident - Fire - Handling heavy loads - Working at heights - Electric shock	- Establish a manual for labor accident prevention including safety education and training - Provide workers with appropriate protective equipments - Install fire extinguishers in handling places of fire - Install fire fighting system - Inspect and ensure that any lifting devices such as cranes are appropriate for the expected load. - Keep them well maintained and perform maintenance checks as appropriate during the period of construction. - Use equipments that is protected against electric shock.	Contractor (PLN)
	Traffic accident - Land traffic - Off-shore traffic	- Observation of traffic regulations, installation of traffic signs, and education on driving safety - Placing work warning buoys, and signals. The definitions and meanings of these will also be publicized among sea users	
	Disease caused by air pollutant, water pollutant, and noise by construction work.	- Observe related standards and provide workers appropriate facilities	

3) Operation Phase

During operation, PLN is responsible for conducting environmental management by setting up an organization necessary for the power station. The organization is required to understand the opinions of the surrounding local residents, handle complaints, and take necessary steps. It is also important that PLN cooperates with the local communities to explain the method of environmental management around the power station.

Major impacts on the environment during operation are as follows:

- Generation of exhaust gas and waste water
- Generation of noise from operating machines
- Generation of waste from operation

Since operators are required to have expertise, employing unskilled local people for operation is unlikely. However, the project owner needs to pay sufficient attention to economic aspects whereby employing simple labor workers and making transactions in the local areas will have a positive impact on the local economy.

Table 9.5.3 lists the description of a basic environmental management plan during operation.

An environmental management plan, covering monitoring, must be prepared after PLN and other administrative organs concerned have held adequate consultation. PLN is required to prepare a report on the implementation of such an environmental management plan and submit the report to the administrative organs concerned for further study and consultation on measures.

Table 9.5.3 Environmental impacts and mitigation measures during the operation phase

Factor	Potential impact	Planned environmental mitigation measures	Responsible person
Air pollution	Exhaust gas from the boilers	- Using low-surfer coal (up to 0.35%), SO_2 emissions complies with the gas emission standards and IFC guideline - To reduce PM emissions, Electrostatic Precipitator (EP; 99.66% efficiency) will be installed. - To reduce NO2 emissions, firing system will use low NOx combust technology - As the stack design, the height is 220m and the velocity of the emission gas is 20.3m/sec to reduce extent of emission spread (from Chapter 7.7). - The stack will be provided with CEMS (Continuous Emission Monitoring System) with the supported infrastructure as required under the gas emission standards and IFC guideline	PLN
	Dust from ash disposal activity	- Installation of a dust control fence - Shifting the fly ash and the bottom ash to the ash pond using water sealed conveyer - Watering in ash disposal area as required. - Re-greening especially along boundary of project, surrounding ash pond with domestic plants according to the local climate conditions and ability to hold wind and dust	
	Gas emission from vehicles used for mobilization of equipments and workers	- Periodic maintenance and management of vehicles	

Factor	Potential impact	Planned environmental mitigation measures	Responsible person
Air pollution	Dust from coal handling activity at jetty and coal yard	- A cover will be installed on the conveyor for coal transportation from jetty - Unloading of coal will be minimized (e.g. reduce the frequency of activity, etc) during times of high wind speed. - Watering coal yard to keep the coal surface wet and prevent wind blow. - Installation of a dust control fence - Re-greening especially along boundary of project, surrounding coal yard with domestic plants	
	Gas emission from vessels	- Hire vessels compliant to MARPOL 73/78 treaty	
- Water pollution - Marine ecosystem	Thermal effluents from cooling system	- Cooling water is taken from bottom layer and discharged to upper layer in order to reduce rising water temperature consisting re-circulation	PLN
	Waste water from plant process	- Installation of waste water treatment system and so any waste water complies with waste water standards and IFC guideline - Separate spillage of lubricant oil or heavy fuel oil brought in oil separator collected in a drum to be used by 3rd party	
	The runoff water from ash disposal site and coal yard	- Runoff water collected in pond and discharged after appropriate treatment	
	Operation of the jetty may create coal spill. As a result, water pollination occurs.	- Cover installation on conveyor for coal transportation from jetty to coal yard.	
	Waste water from vessels will cause water pollution.	- Prohibition on dumping of any contaminating material - Hire vessels compliant to MARPOL 73/78 treaty	
Noise/ vibration	Noise and vibration from steam turbine, generator, and pumps etc.	- Maintenance of equipments. -Installation of low noise type equipments -Adequate basis of equipments to reduce vibration.	PLN
	Noise by ash disposal activity		
	Noise caused by vehicles used for mobilization of equipment and workers		
	Noise from coal handling activity at jetty ,and coal yard		
Waste	Fly ash and bottom ash.	- Ash pond is designed the capacity of 30 years' operation and 500m away from coast line (from Chapter 6.4)water body. - The bottom of the ash pond should be designed an impermeable layer (less than 10^{-6}cm/sec) such as impermeable geo-membrane, sheet and clay.	PLN

Factor	Potential impact	Planned environmental mitigation measures	Responsible person
Waste	Sludge from waste water treatment and waste oil from equipment etc. Sewage and garbage from workers	- Waste management program consisting of reduction, reuse, and recycling of materials. - Systematic collection and protected-storage - Hazardous waste should be treated under the related regulation - Waste away from the site and their appropriate disposal location. - Prohibition on dumping of any contaminating material	PLN
Hydrology	Impact to current caused by discharge of thermal effluents	- Reduce discharged flow velocity of the thermal effluents as possible.	PLN
Global warming	CO_2 emission	- Using USC of high efficiency for power generation	PLN
-Employment / Livelihood - Local economy	Increase in employments and business opportunities	- Employment of local residents as many as possible. - Use of the services (i.e. laundry and catering service etc.) and products offered in the local community	PLN
	Interference to fishery activity by coal unload	- Public announcement of coal unloading schedule	
	Interference to fishery activity by discharge of thermal effluent	-Reduce discharged flow velocity of the thermal effluents as possible	
Social infrastructure / Service facilities	Insufficient social infrastructure and/or service facilities due to the increased workers	- New service facilities, such as medical center, are made available to local residents, as required.	PLN
Transportati on-	Traffic jam caused by increase vehicles	- Determine the traffic control plan including route-setting - Training safe operation of vehicles.	PLN
	Increase number of vessels for coal transportation	- Setting the water route under the council with concerned authority.	
Sanitation/ Risks for infectious diseases	Domestic wastewater generated from workers	- Install waste water treatment system	PLN
	Increase in infectious diseases due to influx of workers	- Installation of medical facilities and implementation of periodic medical check - Education and training on health care of the workers	
Local custom	Conflict between local residence and workers	-Hire local residents as many as possible. - Promote communication between workers and local people (e.g. join in local events).	PLN
Landscape	Aesthetic landscape in the vicinity of project site may be diminished by existence of power plant and jetty	- Harmonized coloring of building, stack and jetty. - Boundary of power plant, ash pond and coal yard should be re-vegetated with native trees, as possible.	PLN

Factor	Potential impact	Planned environmental mitigation measures	Responsible person
Accident /Safety	Labor accident - Fire - Handling heavy loads - Working at heights - Electric shock	- Establish a manual for labor accident prevention including safety education and training - Provide workers with appropriate protective equipments - Install fire extinguishers in handling places of fire - Install fire fighting system(from Chapter 6.4.11) - Inspect and ensure that any lifting devices such as cranes are appropriate for the expected load. - Keep them well maintained and perform maintenance checks as appropriate during the period of construction. - Use equipments that is protected against electric shock.	Contractor （PLN）
	Traffic accident - Land traffic - Off-shore traffic	- Observation of traffic regulations, installation of traffic signs, and education on driving safety - Placing work warning buoys, and signals. The definitions and meanings of these will also be publicized among sea users	
	Disease caused by air pollutant, water pollutant, and noise by construction work.	- Observe related standards and provide workers appropriate facilities	

(2) Transmission line

1) Pre-construction phase

The main environmental impact of the transmission line construction is related to land acquisition. In this project, resettlement of local people will be minimized by setting the transmission line route bypassing the residential area. Land acquisition regarding the transmission line involves only the land for tower construction, and disturbance of an entire piece of farm field will not occur. Consequently, the impact of the land acquisition will be limited only to the land owners. Additionally, vegetation and construction within the buffer zone should be removed and compensated. In Indonesia, the compensation covers not only the buffer zone, but also the land under the transmission line

The compensation payment for the above cases is specified by Indonesian law. It is to be noted that the equal compensation condition should be ensured to socially vulnerable group.

Table 9.5.4 shows the descriptions of the environmental management plan of the transmission line during pre-construction phase.

Table 9.5.4 Environmental impacts and mitigation measures at the pre-construction

Factor	Potential impact	Planned environmental mitigation measures	Responsible person
Involuntary resident resettlement	Loss of the land within tower bases Loss of houses, shops and trees within tower bases	- Towers are constructed on the non-residential area to the maximum extent. - Land acquisition should be conducted in compliance with the relevant laws and regulations	
Compensation of ROW	Loss of houses, shops and trees within the buffer zone Lands and houses under ROW	- Towers are constructed on the non-residential area to the maximum extent. - Compensation should be conducted in compliance with the relevant laws and regulations	

2) Construction phase

The construction activity concerning the transmission tower is small in both scale and period, and the potential environmental impact such as air pollution and noise is also limited. The major environmental impact is loss of vegetation resulting from land clearing. The site will be revegetated with native species after construction activity to the maximum extent to enhance rehabilitation of vegetation.

Table 9.5.5 shows the descriptions of the environmental management plan of the transmission line during construction.

Table 9.5.5 Environmental impacts and mitigation measures at the construction

Factor	Potential impact	Planned environmental mitigation measures	Responsible person
Terrestrial ecosystem	Removal of vegetation	- Tower construction areas should be selected to minimize the loss of vegetation - Tower construction area should be re-vegetated with native plants	Contractor (PLN)
	Loss of protected species	- Consult with specialists about transplant individual if protected species was discovered	
Transportati on-	Traffic jam caused by the increased vehicles during construction	- Properly control construction schedule and processes. - Determine the traffic control plan including route-setting - Training safe operation of vehicles	Contractor (PLN)
Cultural heritage	Further destruction of buried cultural heritages due to engineering work	- The transmission line route should avoid the place of heritages - Stop construction work if cultural heritage was discovered and immediately consult with specialists	Contractor (PLN)

Factor	Potential impact	Planned environmental mitigation measures	Responsible person
Accident/ Safety	Labor accident - Fire - Handling heavy loads - Working at heights - Electric shock	- Establish a manual for labor accident prevention including safety education and training - Provide workers with appropriate protective equipments - Install fire extinguishers in handling places of fire - Inspect and ensure that any lifting devices such as cranes are appropriate for the expected load. - Keep them well maintained and perform maintenance checks as appropriate during the period of construction. - Use the facilities and equipments that are protected against electric shock.	Contractor (PLN)
	Traffic accident	- Observation of traffic regulations, installation of traffic signs, and education on driving safety	
	Disease caused by air pollutant, water pollutant, and noise by maintenance work	- Observe related standards and provide workers appropriate facilities	

3) Operation phase

The main potential environmental impact during operation phase of the transmission line includes bird crash and health impact caused by electromagnetic waves. Bird crash may be minimized by bypassing the migratory route, ponds, and other bird habitat when selecting the transmission line route. Also, the transmission line must be constructed with the design that meets the Indonesian environmental standard and WHO Guideline concerning electromagnetic waves.

Table 9.5.6 shows the descriptions of the environmental management plan of the transmission line during operation.

Table 9.5.6 Environmental impacts and mitigation measures during the operation phase

Factor	Potential impact	Planned environmental mitigation measures	Responsible person
Terrestrial ecosystem	Collision of birds to transmission line and towers by those existence	- The transmission line route should avoid the bird migratory path. - The transmission line route should avoid bird habitat such as ponds to the maximum extent.	PLN
Landscape	Change scenery caused by those existence	- The transmission line route should avoid scenic area.	PLN
Electromagnetic field	The generation of electromagnetic field from power transmission	- The height of the tower should follow the guideline.	PLN
Accident/ Safety	Labor accident	- Establish a manual for labor accident prevention including safety education and training - Provide workers with appropriate protective equipments - Inspect and ensure that any lifting devices such as cranes are appropriate for the expected load. - Keep them well maintained and perform maintenance checks as appropriate - Use the facilities and equipments that are protected against electric shock.	PLN

9.5.2 Environmental Monitoring Plan

The main purpose of environmental monitoring is to check and record impacts on the environment from the power station. A monitoring plan is required to cover the following basic points:

- To check mitigation measures can cut impacts on the environment to the allowable level (environmental standards) during construction and operation phases
- To set up an organization that is responsible for the implementation of monitoring
- To perform appropriate monitoring during construction and operation phases

PLN is responsible for establishing organization that ensures the appropriate implementation of environmental monitoring, and the environmental manager, who is the senior engineer of environment, should take the role of managing the organization. The environmental manager should understand the content and implementation of the environmental management plan and environmental monitoring plan in every phase of the project including the construction phase and operation phase, and report it to the director of the power plant, who has the final responsibility on the above issue.

The environmental manager is also responsible for providing the environmental management training to the plant staffs prior to the start of operation, and confirming their understanding through the operation phase and give adequate instruction as necessary.

It is also the environmental manager's task to understand the status of relation with the local people and NGO, the result of environmental monitoring, and training of the staffs, and to report it to the relevant environmental agency and organization including JICA.

(1) Power plant

1) Pre-construction phase

The procedure of the compensation for land acquisition will be done by the Committee for Land Acquisition. On the other hand, it is necessary that people who lose job are monitored about the status of recovery of their livelihood.

2) Construction phase

Table 9.5.7 shows the main monitoring items during the construction phase.

- Air quality monitoring: TSP, SO_2, and NO_2 are used as parameters for the measurement.
  Air quality is monitored in the residential areas in principle. If there are any places susceptible to impact such as schools, select those places as the target of the measurement.
- Waste water monitoring: TSS is used as a parameter for the measurement.
  Waste water is monitored at the outlet from the settling tank.
- Noise monitoring: Noise level is used as the parameter for the measurement.
  Noise is monitored in the residential areas in principle. If there are any places susceptible to impact such as schools, select those places as the target of the measurement.
- Biotic monitoring: Marine ecosystem
  The change in the species, the number of individuals, and the cover degree of vegetation is monitored.
- Social monitoring: Local economy, Social infrastructure, Sanitation etc.
  The local economy (employment and income, etc.), social infrastructure (roads damage), sanitation condition, etc. in the surrounding area is monitored.

- Transportation
  Traffic volume at the peak of construction is monitored.
- Accident / Safety
  Labor accident (fire, handling heavy loads, working at heights, electric shock), traffic accident (land and marine), health problem caused by environmental pollution in the construction area is recorded.

Table 9.5.7 Monitoring schedule during the construction phase

Item	Parameter	Place	Frequency
Air quality	TSP, SO_2, NO_2	Residential areas	Once every three month
Water quality	TSS	Drain outlet	Once every three month
Noise	Noise level	Residential areas	Once every three month
Biotic monitoring	Marine biota	- In and around the site - Surrounding sea areas	Twice a year at dry and rainy season
Social monitoring	- Local economy - Social infrastructure - Sanitation etc.	Residential areas	Once a year
Transportation	Traffic volume	Roads in the surroundings of the construction area	Once at the peak of construction
Accident /Safety	- Labor accident - Traffic accident - Disease caused by environmental pollution	Construction areas	Once a year

3) Operation phase

Table 9.5.8 shows the main monitoring items during the operation phase.

- Gas emission monitoring: TSP, SO_2, and NO_2 are used as parameters for the measurement.
  Gas emissions are monitored in the stack.
- Air quality monitoring: TSP, SO_2, and NO_2 are used as parameters for the measurement.
  Air quality is monitored in the residential areas in principle. If there are any places susceptible to impact such as schools, select those place as the target of measurement.
- Waste water monitoring: Water temperature, DO, SS, oil, BOD, and precious metals are used as parameters for the measurement.
  Waste water is monitored at the outlet where the waste water is discharged from treatment plant.
- Water quality monitoring: Water temperature, DO, SS, oil, BOD, and precious metals are used as parameters for the measurement.
  Water quality is monitored in the surrounding sea areas.
- Noise monitoring: Noise level is used as the parameter for the measurement.
  Noise is monitored on the boundary of the site and in the residential areas in principle. If there are any places susceptible to impact such as schools, select those places as the target of the measurement.
- Biotic monitoring: Terrestrial ecosystem and marine ecosystem
  The change in the species, the number of individuals, and the cover degree of vegetation is monitored.
- Social monitoring: local economy, sanitation etc.
  The local economy (employment and income, etc.), sanitation condition, etc. in the surrounding area is monitored.

- Transportation
  Traffic volume at the regular inspection is monitored.

- Accident / Safety
  Labor accident (fire, handling heavy loads, working at heights, electric shock), traffic accident (land and marine), health problem caused by environmental pollution in the power plant is recorded.

Table 9.5.8 Monitoring schedule during the operation phase

Item	Parameter	Place	Frequency
Gas emission	TSP, SO_2, NO_2	Flue	Monitor on a continuous basis (by a continuous monitoring system)
Air quality	TSP、SO_2, NO_2	Residential areas	Once every three month
Waste water	Water temperature, DO, SS, oil, BOD, and heavy metals	Drain outlet	Continuous measurement
Water quality	Water temperature, DO, SS, oil, BOD, and precious metals	Surrounding sea areas	Once every three month
Noise	Noise level	On the border of the site and in the residential areas	Once every three month
Biotic monitoring	- Terrestrial biota - Marine biota	- In and around the site - Surrounding sea areas	Twice a year at the dry and the rainy season
Social monitoring	- Local economy - Sanitation etc.	Residential areas	Once every three month
Transportation	Traffic volume	Roads in the surroundings of the power plant	Once at regular inspection
Accident /Safety	- Labor accident - Traffic accident - Disease caused by environmental pollution	Power plant	Once a year

(2) Transmission line

1) Pre-construction phase

The procedure of the compensation for land acquisition will be done by the Committee for Land Acquisition, it is necessary to confirm the target person is agreed with the compensation.

2) Construction phase

Table 9.5.9 shows the main monitoring items during the construction phase. Construction period per a tower is short term such as land preparation is within three months, construction of tower is one month and stringing work is one month. Construction work is around area including the center of tower site (25m x 25m). Therefore the dispersion of environmental pollution due to construction is assumed limited area and the monitoring for environmental pollution such as air pollution and noise in not necessary.

- Cultural heritage
  Record of buried cultural heritage if such heritage should been discovered.

- Accident / safety
  Labor accident (handling heavy loads, working at heights, electric shock) and traffic accident in the construction area is recorded.

Table 9.5.9 Monitoring schedule during the construction phase

Item	Parameter	Place	Frequency
Cultural heritage		Construction area	Once a year
Accident /Safety	- Labor accident - Traffic accident	Construction area	Once a year

3) Operation phase

Table 9.5.10 shows the main monitoring items during the operation phase.

- Terrestrial ecosystem
  If collision of birds with transmission lines and towers occurs, the incident is recorded.
- Accident /Safety
  Labor accident (handling heavy loads, working at heights, electric shock) at the maintenance work is recorded

Table 9.5.10 Monitoring schedule during the operation phase

Item	Parameter	Place	Frequency
Cultural heritage	Collision of birds to transmission line and towers	ROW	Twice a year at dry and rainy season
Accident /Safety	- Labor accident - Traffic accident	Construction area	Once a year

9.6 Land acquisition

9.6.1 Laws concerning land acquisition

The land acquisition concerning facility of public interest including power plant and transmission line is regulated by the following laws in Indonesia:

- Decree of president on Land Acquisition for Development Projects of Public Interest (Decree of President No.36/ 2005)
- Revision of the above the decree of president (Decree of President No.65/ 2006)

The decrees of president mentioned above stipulates that a person entitled to receive compensation is an individual, judicial person, organization, or store who has a right of possession to the land or who has registered structure(s) and crops on the land. Compensation means to compensate the abovementioned person for a stable livelihood that is not lower than their socio-economic livelihood standard prior to land acquisition (Article 1).

Land acquisition is conducted in cooperation with the Committee for Land Acquisition (Team P2T) organized by the head of the local government (Article 6). The Committee for Land Acquisition is responsible for conducting the listing and measurement of the land, construction, vegetation (cultured) and other properties concerning the land to be acquired, and ensuring that compensation is appropriately conducted for the owners of all superficies, construction, vegetation, and other properties concerning the land to be acquired (Article 7). Compensation includes, besides financial compensation, provision of alternative land/residence, or the combination thereof, and other form of compensation agreed through discussion (Article 13).

Basis for calculating the amount of compensation is as follows.

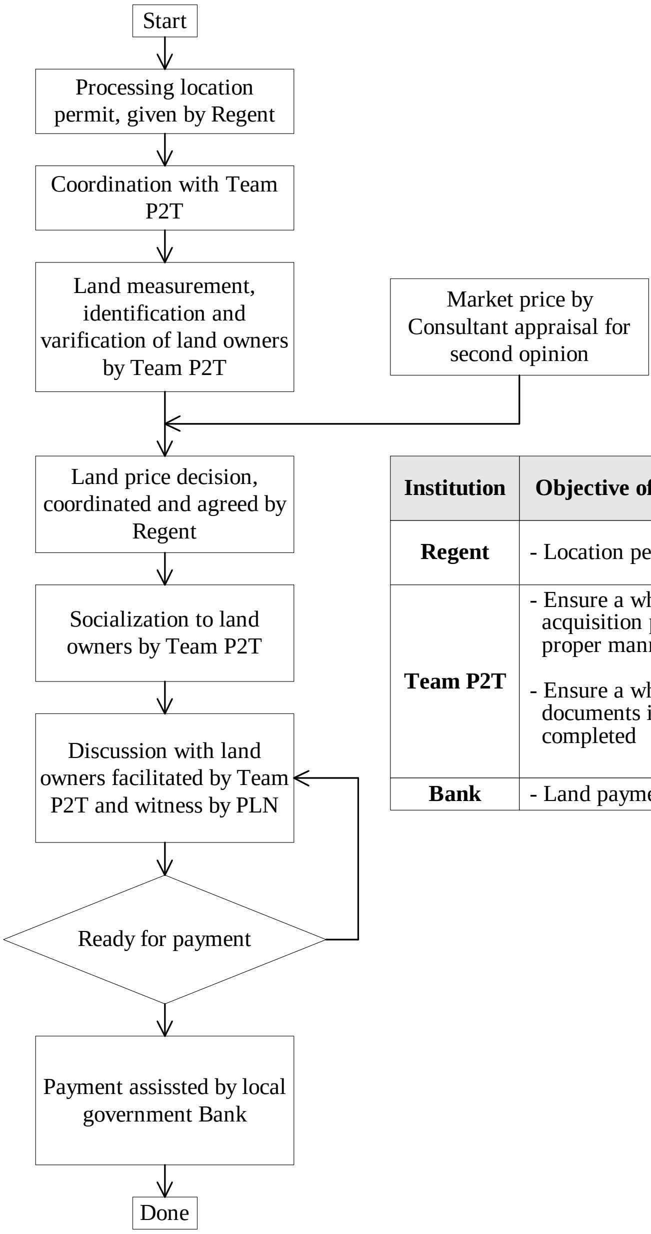
a. Taxable sale price, or the actual land price considering of taxable sale price at the fiscal year based on evaluation of the land price assessment team designated by the Land Acquisition Committee

b. Building sale price estimated by the construction department of Local Authorities

c. Sale price of agricultural products estimated by the agriculture department of Local Authorities

Although the discussion concerning the land acquisition is held directly between land owners, the Committee for Land Acquisition, and national or local authorities requiring the land, the land owners may designate a deputy to ensure efficient discussion with national or local authorities (Article 9). The discussion period is set for a maximum of 120 days in view of the public interest of the facility (Article 10).

Figure 9.6.1 describes the compensation process of PLN-related land acquisition and the role or the respective organization. Land acquisition process starts with submission of location approval, followed by verification and listing of the land owners and land measurement by the Committee for Land Acquisition, and land price decision in view of market price. Thereafter, discussion with the land owners is held facilitated by the Committee for Land Acquisition, with attendance of PLN as witness. Compensation payment is transferred to the local government Bank.



Institution	Objective of Institution	Details of role in land acquisition process
Regent	- Location permit	- Location permit - Land acquisition clearance
Team P2T	- Ensure a whole land acquisition process in proper manner - Ensure a whole land documents is a legal and completed	- As a mediator - Conduct public expose - Measure of land - Identify of land owner - Certify of land - Giving a legal opinion - Ensure the whole land cquisiontion process in proper manner
Bank	- Land payment	- Payment bank

Figure 9.6.1 Compensation process in case of PLN-related land acquisition

9.6.2 Laws concerning compensation of ROW

This project requires land for the power station and small plots of land for the foundations for transmission line towers. The land to be acquired for the bases of towers, and the land and buildings under transmission lines fall on objects for compensation. This is stipulated in the following ministerial decrees:

- Ministerial Decree on High Voltage Transmission Line and Ultra-High Voltage Transmission Line (Decree of the State Minister of Energy and Mineral Resources No.01/ 1992)

- Decision on a revision of the ministerial decree mentioned above (Decision of State Minister of Energy and Mineral Resources No.975/ 1999)

High voltage transmission line is defined 35- 245 kV and ultra high voltage transmission line is defined more than 245kV in these decrees. According to Decree of the State Minister of Energy and Mineral Resource No.01/ 1992, all or part of standing timbers and/or buildings under transmission lines located in free zone area were subject to compensation because they needed to be removed. However, standing timbers and buildings not located on the land itself concerned or free zone area were not subject to compensation. The Revised Decision of the State Minister of Energy and Mineral Resource No.975/ 1999 stipulates, however, that the land and/or buildings under transmission lines (up to a width of 34 m) shall be subject to compensation too. In the Revised Decision, the compensation is based on the property value of taxable objects. In the first place, since the land use under transmission lines remains unchanged, only 10% of the property value of the land is compensated (land optimization), not the full amount. The compensation amount is calculated by multiplying the function coefficient (function index) of the land or building by the land status coefficient (land status). The compensation is paid only once. The formula is as follows:

Compensation = land optimization (0.1) × function index × land status × property value

Table 9.6.1 lists the land and building function coefficients (function index) and land status coefficients (land status):

Table 9.6.1 Function index and Land status of land and building

Function index		Land status	
Building	1	Private property (certified)	1
Land for building construction	1	Traditional property	0.9
Yard	0.5	Leased land (for buildings)	0.6
Field, plantation	0.3	Leased land (for business)	0.5
Paddy field	0.1	Leased land (for traditional use right)	0.7
		Land contributed under religion	1

Note: For leased land (for buildings), leased land (for business), and leased land (for traditional use right), the period of the remaining usage right is considered.

9.6.3 Compliance with the regulation and JICA guideline and World Bank OP 4.12

Like this project, however, a yen credit project is required to comply not only with the laws and regulations of the country where the project is implemented but also with JICA environmental social consideration guidelines. Table 9.6.2 lists a comparison between Indonesian regulations and the JICA guidelines regarding land acquisition.

In addition, it is considered preferable in JICA's policy that resettlement plan encompasses the proposition established in World Bank Operational Policy 4.12. Table 9.6.3 lists a comparison between Indonesian regulations regarding land acquisition and World Bank Operational Policy 4.12.

In this project, the power plant site is mostly farmland and shrimp farm and is not residential area. The transmission line route is selected to avoid residential area and the acquired lands in the transmission line are only bases of the towers. Since each base area is small size (25m×25m max) and there are large intervals between each of the towers, the tower position is selected to avoid houses. Therefore, the large scale of involuntary resettlement in this project, more than 200 residences, is not anticipated.

Only the owners of property of registered land or construction are entitled to receive compensation. The power plant site is mostly farmland and shrimp farm, and landless farmers and workers on the site are not subject to compensation.

Compensation is calculated based on land value considering taxable sales value, and may not be equivalent to full replacement cost.

Public disclosure related land acquisition will be provided to communities/owners of superficies which are relevant to the construction plan, through explanatory meetings, printed material and electronic media. It should be noted that public closure is to be made by Land Acquisition Committee and therefore is conducted after land acquisition application by the project owner.

In Indonesian law, monitoring after survey on livelihood or land acquisition is not required. The complaint handling for the target people for compensation is regulated in Indonesia. However, grievance mechanisms for other residents or communities are not provided.

Table 9.6.2(1) Comparison between Indonesian regulation and JICA guideline regarding land acquisition

Items	Indonesian regulation (Decree of President No.36/2005 & Decree of President No.65/ 2006)	JICA guideline	Point of difference
RAP (LARAP) report	Not necessary (Land Acquisition Committee surveys objects for compensation and prepares a list of such objects)	If displaced population is large, RAP is necessary.	Number of resident to be resettled does not exceed 200 in this project, so large-scaled resettlement will not be generated.
Compensation target	Person entitled to receive compensation is an individual, judicial person, organization, or store who has a right of possession to the land or who has registered structure(s) and crops on the land.	People to be resettled involuntarily and people whose means of livelihood will be hindered or lost	In Indonesian law, only the owners of property of registered land or construction are entitled to receive compensation.
Compensation policy	- To compensate the abovementioned person for a stable livelihood that is not lower than their socio-economic livelihood standard prior to land acquisition. - Compensation for land is calculated based on land value considering taxable sales value, estimated by Land Value Evaluation Team designated by Land Acquisition Committee. - Compensation for construction and crops is calculated based on sales value estimated by local government.	- Compensation should be based the full replacement cost as possible. - To enable people affected by projects to improve their standard of living, income opportunities and production levels, or at least to restore them to pre-project levels.	In Indonesia, compensation is calculated based on land value considering taxable sales value, and may not be equivalent to full replacement cost.

Table 9.6.2(2) Comparisons between Indonesian regulation and JICA guideline regarding land acquisition

Items	Indonesian regulation (Decree of President No.36/2005 & Decree of President No.65/ 2006)	JICA guideline	Point of difference
Compensation method	Offering money, alternative land or residence, or a combination of these, or what is agreed in consultation among a person seeking compensation, the Land Acquisition committee, and an institution that needs the land.	Providing land and monetary compensation for losses (to cover land and property losses), supporting means for an alternative sustainable livelihood, and providing expenses necessary for relocation and the re-establishment of communities at resettlement sites.	- The Indonesian regulation stipulates the land acquisition process as a period before the actual construction and after detailed project plans are determined after approval of EIA (whereas the JICA guideline stipulates that a Resettlement Action Plan shall be reviewed at the same time as EIA). - Given that power plant and transmission lines are facilities conducive to public interests, land acquisition is subject to the survey and review on the listing and compensation performed by the Land Acquisition Committee of province or regency. PLN will participate in negotiations on compensation but is not likely authorized to assume further roles. - The details of compensation (amount, location of alternative land, and others) will be determined in the above-mentioned land acquisition process after EIA approval. Preparation of a detailed LARAP report seems impossible at this point in time.
Disclosure of information	Information will be made known to communities and owners of surface rights relevant to construction plans through explanatory meetings, printed materials and electronic media.	In case of project generated large-scale involuntary resettlement, adequate information should be disclosed and the discussion with affected people and community should be conducted for preparing RAP document.	Number of resident to be resettled does not exceed 200 in this project, so large-scaled resettlement will not be generated.

Table 9.6.2(3) Comparisons between Indonesian regulation and JICA guideline regarding land acquisition

Items	Indonesian regulation (Decree of President No.36/2005 & Decree of President No.65/ 2006)	JICA guideline	Point of difference
Monitoring	Land Acquisition Committee is responsible for monitoring compensation execution.	Appropriate participation by affected people and their communities must be promoted in the monitoring of involuntary resettlement plans and measures against the loss of their means of livelihood.	Participation by affected people and their communities is not requested.
Grievance mechanism	- Affected person who cannot agree with the Land Acquisition Committee's decision may appeal to the local chief executive or Minister of State, according to Indonesian land acquisition law. - The local chief executive or Minister of State should, within the scope of their mandate, review the grievance and opinion from affected person and take an appropriate solution, - The local chief executive or Minister of State should, within the scope of their mandate, take a decision to modify/support the decision of Land Acquisition Committee on system and amount of compensation.	Grievance mechanism should be provided for the community to deal with complaints from those who are affected.	The complaint handling for the target people for compensation are regulated in Indonesia. However, grievance mechanisms for other residents or communities are not provided.

Table 9.6.3(1) Comparison between Indonesian regulation regarding land acquisition and World Bank OP 4.12

Items	Indonesian regulation (Decree of President No.36/2005 & Decree of President No.65/ 2006)	World bank OP 4.12	Point of difference
RAP (LARAP) report	Not necessary (Land Acquisition Committee surveys objects for compensation and prepares a list of such objects)	A project causing a large-scale resettlement involving 200 or more residents needs a submission of draft resettlement plan prior to approval by World Bank.	Number of resident to be resettled does not exceed 200 in this project.
Definition of a person entitled to receive compensation	Person entitled to receive compensation is an individual, judicial person, organization, or store who has a right of possession to the land or who has registered structure(s) and crops on the land.	(a) those who have formal legal rights to land (including customary and traditional rights recognized under the laws of the country); (b) those who do not have formal legal rights to land at the time the census begins but have a claim to such land or assets--provided that such claims are recognized under the laws of the country or become recognized through a process identified in the resettlement plan (c) those who have no recognizable legal right or claim to the land they are occupying	In Indonesian law, only the owners of property of registered land or construction are entitled to receive compensation.

Table 9.6.3(2) Comparisons between Indonesian regulation regarding land acquisition and World Bank OP 4.12

Items	Indonesian regulation (Decree of President No.36/2005 & Decree of President No.65/ 2006)	World bank OP 4.12	Point of difference
Compensation policy	- To compensate the abovementioned person for a stable livelihood that is not lower than their socio-economic livelihood standard prior to land acquisition. - Compensation for land is calculated based on land value considering taxable sales value, estimated by Land Value Evaluation Team designated by Land Acquisition Committee. - Compensation for construction and crops is calculated based on sales value estimated by local government.	Loss of land and other property should be compensated with full replacement cost.	In Indonesia, compensation is calculated based on land value considering taxable sales value, and may not be equivalent to full replacement cost.
Compensation method	Offering money, alternative land or residence, or a combination of these, or what is agreed in consultation among a person seeking compensation, the Land Acquisition committee, and an institution that needs the land.	- Compensation at full replacement cost - Livelihood recovery measure will be taken as necessary in addition to compensation.	Provisions are mostly similar between the Indonesia Regulation and World Bank OP 4.12
Disclosure of information	Information will be made known to communities and owners of surface rights relevant to construction plans through explanatory meetings, printed materials and electronic media.	The project involving a large-scale resettlement of residents and requiring draft resettlement plan should be made public prior to World Bank approval. The project information is publicized in World Bank website	Number of resident to be resettled does not exceed 200 in this project.

Table 9.6.3(3) Comparisons between Indonesian regulation regarding land acquisition and World Bank OP 4.12

Items	Indonesian regulation (Decree of President No.36/2005 & Decree of President No.65/ 2006)	World bank OP 4.12	Point of difference
Socioeconomic studies	Preparing inventory and survey is conducted concerning acquired land, buildings, agricultural crops and other properties related to the land.	The findings of socioeconomic studies to be conducted in the early stages of project preparation and with the involvement of potentially displaced people, including - current occupants of the affected area - standard characteristics of displaced households - the magnitude of the expected loss - information on vulnerable groups or persons - the displaced people's livelihoods and standards of living at regular intervals - land tenure and transfer systems - the patterns of social interaction in the affected communities - public infrastructure and social services - social and cultural characteristics of displaced communities	In Indonesia, it is not required to conduct socioeconomic survey related to living/ livelihoods of residence.
Monitoring	Land Acquisition Committee is responsible for monitoring compensation execution.	The borrower is responsible for preparing, implementing, and monitoring a resettlement plan, a resettlement policy framework, or a process framework (the "resettlement instruments"), as appropriate, that conform to this policy.	In Indonesian law, monitoring after compensation is not required.

Table 9.6.3(3) Comparisons between Indonesian regulation regarding land acquisition and World Bank OP 4.12

Items	Indonesian regulation (Decree of President No.36/2005 & Decree of President No.65/ 2006)	World bank OP 4.12	Point of difference
Grievance mechanism	- Affected person who cannot agree with the Land Acquisition Committee's decision may appeal to the local chief executive or Minister of State, according to Indonesian land acquisition law. - The local chief executive or Minister of State should, within the scope of their mandate, review the grievance and opinion from affected person and take an appropriate solution, - The local chief executive or Minister of State should, within the scope of their mandate, take a decision to modify/support the decision of Land Acquisition Committee on system and amount of compensation.	Affordable and accessible procedures for third-party settlement of disputes arising from resettlement; such grievance mechanisms should take into account the availability of judicial recourse and community and traditional dispute settlement mechanisms.	The complaint handling for the target people for compensation are regulated in Indonesia. However, grievance mechanisms for other residents or communities are not provided.

9.6.4 Necessity of land acquisition

In the area surrounding Jakarta, the construction of new thermal power plants, such as Muara Karang, Tanjung Priok, and Muara Tawar, has vastly reduced the number of suitable available thermal power plant sites. Two (2) potential sites were identified and investigated for suitability for this project; Sumuradem village and Indramayu regency; both these sites consist of predominantly flat land that extends to the coast.

As mentioned in Chapter 9.3.2, the current location was chosen due to the ease of land acquisition and the land value.

9.6.5 PAP; Project Affected People

(1) Definition of PAP

The list of compensation targets and the compensation policy related to the project is shown in Table 9.6.4.

The construction site for the power plant and access routes consists of mostly farmland and a shrimp farm; the area does not contain large residential areas, therefore a major resettlement is not necessary. Compensation would be awarded to the shrimp farmers and land owners. As mentioned above, compensation will be implemented pursuant to the Decree of President, through negotiations between the subject persons of compensation, Committee for Land Acquisition, and the national or local authorities requiring the land. Compensation will be in the form of payment, alternative land or residence, or any other form of agreeable compensation.

The loss of employment for workers of the shrimp farm and farmland is not covered by compensation, however, as described in the Environmental Management Plan, measures will be taken to help their livelihood; initiatives such as priority employment and specialized training to enable them to gain work in the power plant construction and operation.

The transmission line route, with the exception of the Cikanpek residential area, passes predominantly through farmland and rice fields. The land acquisition will only cover the land on which the tower bases are situated, however, vegetation and structures within the buffer zone would be removed. Resettlement as a result of the transmission line should be avoided by bypassing residences and other structures within the ROW.

The tower bases will be approximately 25m×25m; meaning that a single base will only use a small percentage of land. Additionally, the access road will be installed only temporarily, or if permanently, in a manner that minimizes land use. Due to this design the loss of entire workplaces for farmers will be prevented, reducing social impacts. Compensation will be paid to the land owners only for land required for the project, not entire farms, pursuant to the above-described Decree of President.

Note that in Indonesia the compensation covers not only the buffer zone, but also the land under the transmission line excluding the tower base. The compensation is carried out in the form of a once off payment, pursuant to the MEMR Decree. The amount of payment is decided through discussion in accordance with the taxable land value.

As most of the land to be acquired in this project is farmland, the crops and trees grown on the land will also be covered by compensation. The amount of payment is determined according to the respective condition by the local government.

Table 9.6.4(1) Entitlement matrix of land acquisition (Power plant)

Type of loss	Object person	Definition of entitled projects affected people
Loss of land	Project affected people with land located within the site boundary	Projects affected people with a valid land certificate included in the inventory or can prove land occupancy prior to cut-off date
Loss of structure	Structure located within the site boundary	Owner of the structure
Loss of workplace	Farmland and shrimp farm located within the site boundary	Farm laborers and shrimp farm laborers
Loss of crops	Crops located within the site boundary	Famers who cultivate land
Loss of trees	Trees located within the site boundary	PAP who utilize the land where trees are located

Table 9.6.4(2) Entitlement matrix of land acquisition (Transmission line)

Type of loss	Object	Definition of entitled projects affected people
Loss of land (Tower bases)	Projects affected people with land located in tower base areas	Projects affected people with a valid land certificate included in the inventory or can prove land occupancy prior to cut-off date
Loss of structure and building (Tower bases)	Structure and building located in tower base areas or at least part of them within the buffer zone	Owner of the structure and the building
Loss of crops (Tower bases)	Crops located in tower base areas	Famers who cultivate land
Loss of trees (Tower bases)	Trees located in tower base areas or within the buffer zone	Projects affected people who utilize the land where trees are located
Compensation of land (Under the ROW)	Projects affected people with land under the ROW without the tower bases	Projects affected people with a valid land certificate included in the inventory or can prove land occupancy prior to cut-off date
Compensation of structure and building (Under the ROW)	Structure and building under the ROW without the tower base and not within the buffer zone	Owner of the structure and the building

(2) Compensation policy

The policies of compensation for these affected residents are shown in Table 9.6.5. These policies were defined in view of not only laws and regulations in Indonesia but also JICA guidelines and World Bank Operational Policy 4.12

Table 9.6.5(1) Policy of compensation for land acquisitions (Power plant)

Type of loss	Compensation policy	Implementation issues
Loss of land	Projects affected people will be compensated by cash or substitute land of equal value, or other forms on President decree No.36/2005 and No.65/2006. Local Government will provide the information on the available land to be bought by PAP.	Classification and measurement of the land in each PAP is required. The other forms of compensation based on President decree will be negotiated with project affected people. The socioeconomic survey, how project-affected people lived and made their livings, needs to be conducted before the land acquisition.
Loss of structure	Project affected people will be compensated by cash, equivalent to the cost of constructing a new structure. The cost related to the relocation will be helped to the relocated resident	Classification and measurement of structures that will be affected is required. Amount of compensation will be made by appraisal
Loss of workplace	Projects affected people who lost their income or means of livelihood as consequence of land acquisition should be assisted in their effort to recover their income and re-gain their means of livelihood.	The socioeconomic survey, how project-affected people lived and made their livings, needs to be conducted prior to the land acquisition.
Loss of crops	Cash compensation for affected crops based on local regulation for crops. Compensation will only be granted to farmers who lost revenue due to earlier than usual harvest.	Prices of the crops in local area will be made during an appraisal. Quantity of lost crops will be surveyed. Projects affected people will be given notice several months in advance regarding evacuation. Crops grown after the issuing of the notice will not be compensated.
Loss of trees	Compensation in cashed based on type, age and size of trees	Prices of the trees in local area will be made during an appraisal. The quantity of trees to be removed will be surveyed.

Table 9.6.5(2) Policy of compensation for land acquisitions (Transmission line)

Type of loss	Compensation policy	Implementation issues
Loss of land (Tower bases)	Projects affected people will be compensated by cash or substitute land equal to the value, or in other forms based on President decree No.36/2005 and No.65/2006.	Classification and measurement of the land of each of the project affected people is required. The other forms of compensation based on President decree will be negotiated with PAP.
	The costs relating to the relocation will be paid by PLN	
Loss of structure and building (Tower bases)	Project affected people will be compensated by cash, equivalent to the cost of constructing a new structure.	Classification and measurement of structure in projects affected people is required. Amount of compensation will be made by appraisal
Loss of crops (Tower bases)	Cash compensation for affected crops based on local regulation for crops. Compensation will only be granted to farmers who lost revenue due to earlier than usual harvest.	Prices of the crops in local area will be made during an appraisal. Quantity of lost crops will be surveyed. Projects affected people will be given notice several months in advance regarding evacuation. Crops grown after the issuing of the notice will not be compensated.
Loss of trees (Tower bases)	Value of cash based compensation is based on type, age and size of trees	Prices of the trees in local area will be made during an appraisal. Quantity of lost trees to be removed will be surveyed.
Compensation of land (Under the ROW)	Projects affected people will be compensated by cash based upon the Ministry of Energy and Mineral Resources decision No.975.K/47/MPE/1999	Classification and measurement of the land in projects affected people are required. Amount of compensation will be made by appraisal
Compensation of structure and building (Under the ROW)	Projects affected people will be compensated by cash on Ministry of Energy and Mineral Resources decision No.975.K/47/MPE/1999	Classification and measurement of structure and building in projects affected people are required. Amount of compensation will be made by appraisal

(3) Scope of affected areas

The scope of affected areas and the number of affected residents is shown in Table 9.6.6.

The names of landowners in areas affected by the power plant construction were sourced during a hearing investigation at the village office. However, as the Location Permit has not been obtained, these names have not been checked with the cadastre, it is considered necessary to recheck the names once the Location Permit has been received. The approximate numbers of Farm laborers was obtained during the hearing investigation at the village office.

The locations of steel towers have not yet been determined, as the soil survey has not been conducted. There is also a possibility that the route will be changed. The names of the landowners have not been checked with the cadastre, as is the case with the power plant location, because the Location Permit has not been obtained. The interview survey is ongoing.

Table 9.6.6(1) List of affected areas (Power plant)

Type of loss	Affected areas	Projects affected people
Loss of land	Farmland : approx.260 ha Shrimp farm: approx.16 ha Coast line : approx.33 ha	Land Owners : approx.260 people
Loss of structure	1 shrimp farm	Private company
Loss of workplace	-	Farm labor : approx.700 people Shrimp farm labor : -
Loss of crops	Depend on season	Land Owner : approx.260 peoples Farm labor : approx.700 peoples
Loss of trees	-	-

Table 9.6.6(1) List of affected areas (Transmission line)

Type of loss	Affected areas	Projects affected people
Loss of land (Tower bases)	Farmland :approx.11.6 ha Residential area : approx.0.5 ha Forest : approx.2.0ha	Land owner : approx.210 peoples (same as tower number)
Loss of structure and building (Tower bases)	Tower bases are to be constructed avoiding residential areas to the extent practicable.	None
Loss of crops (Tower bases)	Depend on season	Land owner : approx. 210 peoples (same as tower number)
Loss of trees (Tower bases)	-	-
Compensation of land (Under the ROW)	Farmland :approx.300 ha Residential area : approx.13 ha Forest : approx.46 ha	-
Compensation of structure and building (Under the ROW)	-	-

9.6.6 Implementation of land acquisition

(1) Schedule

Gaining a Location Permit is the first step in the land acquisition process, as shown in Figure 9.6.1. The Location Permit, for this project, is effective for three to four years, within which time the land acquisition must be completed. After that, a land acquisition committee will be organized; this committee will conduct a land survey and create a comprehensive list of effected property. Meanwhile, a land price evaluation team and the local government will calculate compensation costs for the land and buildings to be effected. Then, the land acquisition committee will start negotiations with residents eligible for compensation; the time limit for such negotiations is 120 calendar days.

According to the schedule of this project, construction will start in October 2011, by which time the land acquisition for the power plant must be completed. In addition, construction of transmission lines must be completed before trial operations begin. Considering that construction is expected to take 30 months, the land acquisition and compensation of the land that lies under the transmission lines will have to be completed by October 2013.

(2) Cost and financial resources

The project owner is to prepare the cost for land acquisition, as shown in Figure 9.6.1.

9.6.7 Proposition from JICA team

(1) Persons entitled for compensation

Landless farmers and workers living within the project site are not subject to compensation according to Indonesian law. Based on JICA and World Bank guideline, the project owner should compensate landless farmers and workers. As PLN is a national company and may not act beyond the scope of regulations, JICA will propose to compensate the loss of livelihood of landless farmers and workers by giving them priority in employment as construction worker and opportunity for job specific training.

As described in Chapter 9.1.3, monthly income of farm worker is between Rp.250,000 to Rp.500,000, and that of building worker is Rp.700,000 to Rp. 900,000, which means a job change will not cause them decrease of income.

(2) Calculation of compensation

Calculation of compensation for acquired land by Land Acquisition Committee is based the taxable sales value of the land. The JICA Team proposes that the full replacement cost of the land considered when in negotiation with an affected person subject to compensation.

(3) Public disclosure

As the number of residents to be resettled does not exceed 200 in this project, a disclosure of a draft resettlement plan, required by World Bank, is not necessary. However, in accordance with Indonesian law, there is no opportunity to disclose the EIA result including the Environmental Management Plan and Environmental Monitoring Plan to the affected residents, which is included in the requirement of JICA guideline. Consequently, JICA recommends for PLN to schedule a meeting with the affected residents to explain the EIA result and compensation policy. An explanatory meeting should be held as soon as possible after location permit is submitted, since the compensation policy for land acquisition should also be explained.

(4) Socioeconomic survey and livelihood monitoring

Although the list of land, structures and other properties will be prepared before resettlement, a survey on livelihoods as well as a monitoring survey after land has been acquired is not legally required.

A stable quality of life for every resident, either affected or unaffected, is essential for stability of the local community. Consequently, JICA recommends PLN to conduct a livelihood survey before land acquisition and a monitoring survey after the land has been acquired to monitor the living quality of unaffected residents.

(5) Grievance mechanism

Affected person who cannot agree with the Land Acquisition Committee’s decision may appeal to the local chief executive or Minister of State, however a grievance mechanism for people deemed unaffected is not established.

Good relationship with local residents is essential for stability of local community. Consequently, JICA recommends PLN to establish a mechanism to collect opinions from local people.

A: In the contract with EPC contractors, PLN consistently set conditions for the benefit of employment of local people.

The other questions and concerns about the project expressed in the Public hearing were as follows:

Public hearing held at this phase in the EIA procedure has been conducted for the purpose of making KA-ANDAL. The final answers to the questions and concerns given at this meeting will be stated in ANDAL and RKL.

- The local communities, around the project area, expect to be involved in and receive benefits from the construction activity and not just become a ‘viewer’ of the process.
- It is necessary to notice the existing environmental condition, especially the areas that are already damage (before the project), such as erosion problem areas
- It is necessary to eliminate the space between the IR_A 1-3 and the new project (IR_B1)
- It is necessary to plant a mangrove greenbelt along the beach.
- Utilization of the ash as the cement material
- It is necessary to explain the possibility impacts that elevated levels of dust and noise may have to human health.
- The institution/company responsible for the EIA monitoring needs to be established prior to construction and before any problems/issues are created.
- IR_B1 should only be constructed in the Patrol District area.
- The person in charge must be ready to rectify any problems that occur during the construction phase of the project.
- Recently it has been very difficult for the fishermen to find fish, will the project further hamper fishing? What effects will the construction and operation of a tanker jetty and coal traffic, including waste vessels, have on the fishing grounds?
- Noise, what are the limits? At what level does damage to human hearing begin?
- Although such impact on the health of the SUTET is not major, however, if ignored or tolerated, could create a large problem.
- Utilization of skilled manpower and technology / equipment certified. Identification of foreign workers involved.
- The public should be properly informed on land acquisition. There will be 328 hectares of wetland which will be released with a production of about 8 tons / hectare.
- Community concerns on the impact SUTET should also be considered.
- Amount of raw materials of coal, 651 tons / hour, the impact on environmental conditions generally, including the possibility of a global warming climate anomaly that could trigger significant impacts on agricultural activities in the community.
- Recruitment of labor must be coordinated with the Department of Manpower and Transmigration Indramayu District.
- It is necessary to have an assessment on land use.
- It is necessary to prepare the program Company Social Responsibility (CSR) and Community Development (CD) from the beginning.
- It is necessary to have an assessment on the access road plan

- The project needs to consider the impact of dredging activities, especially for fishing and shipping traffic.
- Disposal of waste from ships that will operate also need to be supervised.

9.5.2 Transmission line

(1) Date, Venue and Attendees

The transmission line will pass 5 districts (Indramayu, Subang, Purwakarta, Kurawang, and Bekasi). In Indramayu district, the public hearing concerning the transmission line was held within the public meeting concerning the power plant. The dates and number of attendees of the public hearing in 4 other districts are shown below.

The Public hearings were held in the local governments' office halls. The office halls are located in the area which population is relatively concentrated. It seems that traffic accessibility is convenient. The motorcycle is the main means of transportation in the rural area.

<Subang district_1st meeting>

Date: 4th/ August/ 2010

Venue: Tambak Dahan Village office all (Pusaka Jaya Sub-district)Attendees: Mr. Nicko (PLN Jawa Barat), Mr. Dadang & Mr. Edi (UNPAD: University of Padjadjaran) and residence from Karanganyar, Kebondanas, Bojongjaya, Bojongtengah, Rancaudik, Tambakdahan, Kertajaya, Bojongjaya, Mariuk, Wanajaya, and Tanjungrasa villages; 40 persons in total

Proceedings:

- Opening address: (Mr. Dadang, Mr. Nicko and Mr. Edi)
- Objective and necessity of the project and overview of transmission line: (Mr. Edi & Mr. Nicko)
- Closing address: (Mr.Dadang)

<Subang district_2nd meeting>

Date: 5th/ August/ 2010

Venue: Patok Beusi Sub Distric Office Hall (Patok Beusi Sub-district)

Attendees: Mr. Nicko (PLN Jawa Barat), Mr. Edi (UNPAD: University of Padjadjaran), Mr. Dikdik and residence from Jatibaru, Dukuh, Rancabango, Tanjungrasa kidul, and Pabuaran villages; 50 persons in total

Proceedings:

- Opening address: (Mr. Dikdik, Mr. Nicko and Mr. Edi)
- Objective and necessity of the project and overview of transmission line: (Mr. Edi & Mr. Nicko)
- Closing address: (Mr. Dikdik)

<Purwakarta district>

Date: 24th/ August/ 2010

Venue: Campaka Sub Distric Office Hall (Campaka Sub-district)

Attendees: Mr. Nicko (PLN Jawa Barat), Mr. Edi (UNPAD: University of Padjadjaran), Mr. Jaenal and residence from Cijunti, Bungursari, Cigelam, Hegarmanah, and Cicadas villages; 45 persons in total

Proceedings:

- Opening address: (Mr. Jaenal, Mr. Nicko and Mr. Edi)
- Objective and necessity of the project and overview of transmission line: (Mr. Edi & Mr. Nicko)
- Closing address: (Mr. Jaenal)

<Karawang district>

Date: 24th/ August/ 2010

Venue: Teluk Jambe Barat Sub Distric Office Hall (Teluk Jambe Barat Sub-district)

Attendees: Mr. Nicko (PLN Jawa Barat), Mr. Edi (UNPAD: University of Padjadjaran), Mr. Coyokand residence from Mulyasejati, Kutamaneuh, Kutalanggeng, Ciptasari, Tamansari, and Tamanmekar villages; 31 persons in total

Proceedings:

- Opening address: (Mr. Coyokand, Mr. Nicko and Mr. Edi)
- Objective and necessity of the project and overview of transmission line; (Mr. Edi & Mr. Nicko)
- Closing address; (Mr. Coyokand)

<Bekasi district>

Date: 1st/ September/ 2010

Venue: Cikarang Pusat sub Distric Office Hall (Cikarang Pusat Sub-district)

Attendees: Mr. Nicko (PLN Jawa Barat), Mr. Edi (UNPAD: University of Padjadjaran) Mr. Iyan and residence from Sukabungah, Sukamukti, Sukamahi, Pasirranji, and Nagasari villages; 52 persons in total

Proceedings:

- Opening address: (Mr. Iyan, Mr. Nicko and Mr. Edi)
- Objective and necessity of the project and overview of transmission line; (Mr. Edi & Mr. Nicko)
- Closing address (Mr. Iyan)

The list of attendees and the process of the meeting is included in Appendix-1; a photo of the meeting is shown in Appendix-2.

(2) Question and concern

Main questions and answers are as follows

Q: The mechanisms and the regulations for compensation of loss, compensation for land and for cases already settled should be swiftly explained to local people and especially the communities affected by the project. This needs to be done, to prevent the intervention of third parties (land brokers). All compensation relating to the transmission line must been completed before construction of the transmission line begins.

A: With PLN, the determination of compensation is conducted consistently based on SOP (Standard Operation Process). An explanatory meeting is held first and compensation is determined through negotiation. Construction work sets out only after compensation payment is completed.

Q: The ultra high voltage transmission line (SUTET) construction is expected by the affected communities to contribute to rural development, e.g. the development of community empowerment programs.

A: PLN will provide local development program.

Q: A safety briefing regarding the dangers of the transmission lines, with regards to no-go zones, dangerous activities etc., needs to be given to all of the small community groups (village level) in the vicinity of the project.

A: The SUTET is designed to meet the SNI (Indonesian National Standards), and there is no danger in the vicinity of the towers unless stepping into the no-go zone.

Q: Management and surveillance of the SUTET network should be performed routinely throughout the operation period, this need to be performed in case of tower material theft. The documents pertaining to land and building tax payments should be managed throughout the year.

A: The officer of the local village will be required to report any act of stealing immediately to PLN.

Q: NGOs are also recommended to attend the explanatory meeting. The meeting should be held on a village-to-village basis as well as in sub-district office.

A; PLN does not refuse NGOs to monitor the construction activity. Universities are requested to hold the meeting as an independent organization. PLN will conduct a meeting after the field survey is completed with newly-recognized PAP (Project affected people) included

Q: We understand that the acquisition of land for tower construction will be conducted only for a part of the property. Why doesn’t the acquisition cover the whole property?

A: PLN determines the area of land for tower based on the technical calculation, and acquisition of additional land may be negotiable if there is reasonable cause, or no other land use is conceivable.

Q: How many times will the compensation be paid? We understand that no compensation was implemented in the former SUTET case: are the PAP in those cases currently able to receive compensation?

A: According to Decision of MEMR No.975/ 1999, compensation is paid only once, and compensation applies to the project after the point of time when the Decision was validated.

Q: Is the land under the transmission line available for sale after SUTET is completed? Is there a possibility that construction of SUTET produces unproductive farmland?

A: Agricultural activity, such as cultivation and planting, is basically possible on the land under transmission line, except for no-go area, although amenity of people’s life living there may be spoiled to a certain degree.

The other questions and concerns about the project expressed in the Public hearings were as follows:

The final answers to the questions and concerns given at this meeting will be stated in ANDAL and RKL as well as the Public hearing for the power plant. Therefore, it was explained that the questions and concerns will be only evaluated or considered.

- It is the local community's expectation, in project affected areas, that they will be involved in and receive benefit from the construction; they do not want to become only a 'viewer' of the process.
- Which institution/company will be responsible for the monitoring outlined in the EIA? The responsible institution/company should be decided upon before any work takes place, before any problems can arise.
- The on-site project managers must be ready to act quickly and efficiently if a problem becomes apparent during the construction.
- Health effects identified in the EIA were minimal; however, if precautions are not taken they could become lasting localized generational problems, e.g. hearing loss.
- A recruitment program that favors the local work force, e.g. one door, is necessary to for the local community to benefit from the construction. Local workers should have a presence of greater than 60%. The construction company must follow the procedures and rules applicable employment.
- Community concerns concerning the SUTET must be considered.
- The Company Social Responsibility (CSR) and Community Development (CD) programs need to be set up and running from the beginning of the construction project.
- Planning activities, etc should also consider the current site conditions and activities, e.g the Pertamina pipeline in Rancaudik
- The use of agricultural land by the project must be minimized; in addition works that are conducted on land that had not been acquired need to take special care as not to damage crops or infrastructure.
- Project implementation must consider agricultural land. During topographic surveys and other similar works, care should be taken not to ruin the agricultural land or crops when passing.
- It is necessary to hold public hearing on the dangers and security regulations of the SUTET cables within smaller community groups (village level), e.g. whether farmers are safe when doing activities under the tower / transmission line, especially using metal equipment.
- Implementation schedule of the SUTET construction must involve locally sourced labor and develop the skills of local people.
- Detailed maps need to be created or updated, including administrative boundaries, due to the division level between the districts and villages.
- Fair wages need to be paid to local people who are employed to construct the SUTET.
- If possible, the route of SUTET should not utilize residential properties (farmer's houses); vacant land or other land types should be used in preference.
- There is no mechanism for calculating the compensation for homeowners who lose their comfort and safety due to the construction and operation of the transmission lines. It is necessary to pay compensation to the owners of affected houses in the vicinity of the transmission line route.
- The project affected people need to clearly know who has total responsibility for the project and who they can voice concerns or problems to.

- PLN's compensation given does not include compensation for land owners whose properties are devalued due to the presence of the transmission lines.
- Land and Building Tax problems continue to be a burden on the village; government has not been helpful in alleviating these issues. PLN should be proactive in dealing with these issues, for example by cooperating fully with the local tax office.
- Applicable regulations or rules should be reconsidered or updated, e.g., a rule is required that stipulates that compensation is to be paid to land owners if the SUTET lines traverse their property.
- There needs to be coordination between PLN with local governments concerning the issuance of Building Permits for existing buildings under the lines.

9.6 Review the results based on JICA’s checklist

9.6.1 Power plant

The result of the environmental social consideration related to the power plant is reviewed based on the JICA‘s environmental checklist for “Thermal Power Plant” (Table 9.8.1).

9.6.2 Transmission line

The result of the environmental social consideration related to the transmission line is reviewed based on the JICA‘s environmental checklist for "Power Transmission and Distribution Lines" (Table 9.8.2).

Table 9.8.1(1) Review the results of environmental social consideration for the power plant

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been officially completed? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) EIA-TOR（KA-ANDAL）is currently in preparation. PLN will submit the EIA report (ANDAL), Environmental Management Plan (RKL), Environmental Monitoring Plan (RPL) in early October. (b) - (c) - (d) -
	(2) Explanation to the Local stakeholder	(a) Are contents of the project and the potential impacts adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Is the comment from the residents reflected in the project details?	(a) Public hearing was held in July 16, 2010. After the public hearing, technical consulting meeting will be held as required by the EIA review committee in West JAWA Province. KA-ANDAL will be prepared and submitted by PLN, taking into consideration the result of the meeting. During KA-ANDAL review period, a commission meeting will be held by the EIA review committee to determine the survey content of EIA, and ANDAL, RKL, and RPL will be prepared based on the survey content. A commission meeting will be also held during review period as needed. (b) -
	(3) Consideration of the alternative plans	(a) Are there any alternative plans under consideration? (including environmental-social items)	(a) Alternative plans are considered in regard to site location, power plant type, coal unloading jetty type, FDG equipment type.

Table 9.8.1(2) Review the results of environmental social consideration for the power plant

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
2 Mitigation Measures	(1) Air Quality	**[Power plant]** (a) Do air pollutants, such as sulfur oxides (SOx), nitrogen oxides (NOx), and soot and dust emitted by power plant operations comply with the country's emission standards? Is there a possibility that air pollutants emitted from the project will cause areas that do not comply with the country's ambient air quality standards? (b) In the case of coal-fired power plants, is there a possibility that fugitive coal dust from coal piles, coal handling facilities, and dust from coal ash disposal sites will cause air pollution? Are adequate measures taken to prevent the air pollution?	**[Power plant]** (a) The following measures will be taken against air pollution, to comply with the Indonesian environmental standard as well as IFC Guideline. - Low-sulfur coal (up to 0.35%) will be used and SO_2 emissions concentration will comply with the environmental standard without FDG equipment. - Installation of Electrostatic Precipitator (EP; 99.66% efficiency) - The firing system will use low NO_2 combust technology - As the stack design, the height is 220m and the velocity of the emission gas is 20.3m/sec to reduce extent of emission spread. - The stack will be provided with CEMS (Continuous Emission Monitoring System) with the supported infrastructure as required under the gas emission standards and IFC guideline (b) The following measures will be conducted against air pollution concerning "coal yard" and "ash pond". **"Coal yard"** - A cover will be installed on the conveyor for coal transportation from jetty - Unloading of coal will be minimized (e.g. reduce the frequency of activity, etc) during times of high wind speed. - Watering coal yard to keep the coal surface wet and prevent wind blow. - Installation of a dust control fence - Re-greening especially along boundary of project, surrounding coal yard with domestic plants **"Ash pond"** - Installation of a dust control fence - Shifting the fly ash and the bottom ash to the ash pond using water sealed conveyer - Watering in ash disposal area as required - Re-greening especially along boundary of project, surrounding ash pond with domestic plants according to the local climate conditions and ability to hold wind and dust

Table 9.8.1(3) Review the results of environmental social consideration for the power plant

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
2 Mitigation Measures	(1) Air Quality	**[Port]** (a) Do air pollutants, such as sulfur oxides (SOx), nitrogen oxides (NOx), and soot and dust emitted from various sources, such as ships, vehicles, and the ancillary facilities comply with the country's emission standards and ambient air quality standards?	**[Port]** (a) The jetty will be used only for coal unloading, and therefore increased traffic will not occur. Additionally, ancillary facilities will include only cranes and belt conveyers. Coal will be carried by hired vessel that complies with the AnnexIV of MARPOL 73/78 treaty.
	(2) Water Quality	**[Power plant]** (a) Do effluents including thermal effluents from the power plant comply with the country's effluent standards? Is there a possibility that the effluents from the project will cause areas that do not comply with the country's ambient water quality standards or cause a significant temperature rise in the receiving waters? (b) In the case of coal-fired power plants, do leachates from coal piles and coal ash disposal sites comply with the country's effluent standards? (c) Are adequate measures taken to prevent contamination of surface water, soil, groundwater, and seawater by the effluents	**[Power plant]** (a) Low-temperature bottom layer water will be used for cooling water to minimize temperature rise in receiving water. Thermal effluent will be discharged at 40℃ and lower to comply with Indonesian effluent standard. In Indonesian ambient sea water quality standard, temperature rise should be not higher than 2℃, and the thermal effluent dispersion simulation shows that the temperature rise of that level appears only in a very limited area. Additionally, effluent is treated prior to discharge in a waste water treatment system to comply with the effluent standard, and occurrence of water area exceeding ambient sea water quality standards is not anticipated. (b) Leachates from coal yard and ash pond is collected into the pond and appropriately treated before discharge. (c) The bottom of the ash pond should be designed an impermeable layer (less than 10^{-6}cm/sec) such as impermeable geo-membrane, sheet and clay.

Table 9.8.1(4) Review the results of environmental social consideration for the power plant

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
2 Mitigation Measures	(2) Water Quality	**[Port]** (a) Do general effluents from the related facilities comply with the country's effluent standards and ambient water quality standards? (b) Do effluents from ships and ancillary facilities (e.g., dock) comply with the country's effluent standards and ambient water quality standards? (c) Are adequate measures taken to prevent spills and discharges of materials, such as oils and hazardous materials to the surrounding water areas? (d) Is there a possibility that oceanographic changes, such as alteration of ocean currents, and reduction in seawater exchange rates (deterioration of seawater circulation) due to modification of water areas, such as shoreline modifications, reduction in water areas, and creation of new water areas will cause changes in water temperature and water quality? (e) In the case of the projects including land reclamation, are adequate measures taken to prevent contamination of surface water, seawater, and groundwater by leachates from the reclamation areas?	**[Port]** (a) As related facilities will include only cranes and belt conveyer, no effluent will be discharged. The belt conveyer will be covered to prevent coal leakage. (b) Water discharge from vessels will be prohibited and hired vessel that complies with MARPOL 73/78 treaty. (c) as above (d) Approximately 320,000 m^2 of coast line area will be reclaimed with the construction of the power plant's front quay, but reclamation line is parallel to the coast line and will not cause oceanographic change. (e) Soil for reclamation will be supplied from the sea area in front of the project site. Effluent will be discharged into the front sea area, thus preventing adverse effect on river- and ground water. Concentration of heavy metal in bottom sediment being rather low in the front sea area, turbidity is the only potential for water contamination, but simulation result shows that SS will rapidly decrease.
	(3) Wastes	**[Power plant]** (a) Are wastes, (such as waste oils, and waste chemical agents), coal ash, and by-product gypsum from flue gas desulfurization generated by the power plant operations properly treated and disposed of in accordance with the country's standards?	**[Power plant]** (a) Waste will be appropriately treated as follows: - Systematic collection and protected-storage - Waste away from the site and their appropriate disposal location. - Hazardous waste should be treated under the related regulation - Prohibition on dumping of any contaminating material

Table 9.8.1(5) Review the results of environmental social consideration for the power plant

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
2 Mitigation Measures	(3) Wastes	**[Port]** (a) Are wastes from ships and the related facilities properly treated and disposed of in accordance with the country's standards? (b) Is offshore dumping of dredged materials and soils properly performed in accordance with the country's standards to prevent impacts on the surrounding waters? (c) Are adequate measures taken to prevent discharge or dumping of hazardous materials to the surrounding water areas?	**[Port]** (a) Waste disposal from vessels will be prohibited and hired vessel that complies with MARPOL 73/78 treaty. (b) Approximately 30,000 m^3 of soil will be dredged in jetty area for coal transport vessel operation. Dredging material will be disposed of at the disposal site agreed with the local transportation bureau (presumably in a coastal area more than 6 nautical miles offshore from the coast line and more than 12m deep). (c) Waste disposal from vessels will be prohibited and hired vessel that complies with MARPOL 73/78 treaty.
	(4) Noise and Vibration	**[Power plant] & [Port]** (a) Do noise and vibrations comply with the country's standards?	**[Power plant] & [Port]** (a) The following noise countermeasures will be conducted. The noise simulation result indicated that noise level does not exceed Indonesian standard and IFC Guideline at any point. - Maintenance of equipments. - installation of low noise type equipments - Adequate basis of equipments to reduce vibration Additionally, the jetty is located 1.5km offshore from the coast line, which means it is distant from residential area and noise impact is not anticipated.
2 Mitigation Measures	(5) Subsidence	**[Power plant] & [Port]** (a) In the case of extraction of a large volume of groundwater, is there a possibility that the extraction of groundwater will cause subsidence?	**[Power plant] & [Port]** (a) Fresh water used at the power plant is generated from RO equipment and therefore ground water will not be used. Additionally, no ground water will be used in jetty operation.
2 Mitigation Measures	(6) Odor	**[Power plant] & [Port]** (a) Are there any odor sources? Are adequate odor control measures taken	**[Power plant] & [Port]** (a) No odor creating material will be handled in both the power plant and the jetty.

Table 9.8.1(6) Review the results of environmental social consideration for the power plant

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
2 Mitigation Measures	(7) Sediment	**[Port]** (a) In the case of extraction of a large volume of groundwater, is there a possibility that the extraction of groundwater will cause subsidence?	**[Port]** (a) Waste disposal and water discharge from vessels will be prohibited and hired vessel that complies with MARPOL 73/78 treaty.
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) The project site does not encompass designated protected areas.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate environmental protection measures taken to reduce the impacts on ecosystem? (d) Is there a possibility that the amount of water (e.g., surface water, groundwater) used by the project will adversely affect aquatic environments, such as rivers? Are adequate measures taken to reduce the impacts on aquatic environments, such as aquatic organisms? (e) Is there a possibility that discharge of thermal effluents, intake of a large volume of cooling water or discharge of leachates will adversely affect the	(a) The project site is mostly farmland and shrimp farm, and does not encompass primeval forests or ecologically valuable habitats. (b) In the field survey of the power plant site, 19 species of Least Concern, as listed in IUCN (15 Aves, 2 Mammals and 2 Amphibians) were observed. Since the irrigation channel is planning to divert the route in order not to interrupt water path, the impact to Amphibian and fish, which live in the fresh water body and its bank, is expected to be minimal. Sukra sub-district is located in a farming area, and the area size of the farmland in the sub-district is more than 4,000ha. Most part of the power plant site is now used as farmland, and the site is not a recognized special area for biota, as the characteristics of biota in the site are the same as those found in the surrounding area. The area-size of the farmland in the planning power plant site is around 260ha. Since the size of the farmland in the power plant is about 5% of that in whole Sukra sub-district, impact to the terrestrial animals (such as birds) will be limited. (c) The project site consists mostly of farmland and a shrimp farm, a significant impact on the surrounding ecosystem is not anticipated. (d)Fresh water is generated from RO equipment and therefore no impact on

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
		ecosystem of surrounding water areas?	river and ground water is anticipated. (e) -

Table 9.8.1(7) Review the results of environmental social consideration for the power plant

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
4 Social Environment	(1) Resettlement	(a) Is large-scaled involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on relocation and compensation given to affected persons prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Is compensation paid prior to resettlement? (e) Is it the compensation policy developed in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or persons, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected persons obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Is a plan developed to monitor the impacts of resettlement?	(a) The project site consists mostly of farmland and a shrimp farm, only 1 or 2 houses are subject to resettlement, with about 270 land owners are subject to land acquisition. The alternate site is mostly residential area, and would involve a large scale resettlement. (b) In Indonesian land acquisition law, if resettlement occurs related to land acquisition for a facility of public interest, such as power plant, adequate explanation on land acquisition and negotiation of compensation (amount and form) will be given to affected person. (c) If resettlement occurs, the affected person is ensured socioeconomic living standards higher than before the land acquisition, according to Indonesian land acquisition law. The list of land, construction, vegetation and other land-related objects will be created, and the compensation amount and form will be discussed based on the market price surveyed by an independent and expertise land-price research team. (d) If resettlement occurs, the compensation is transferred into the local bank account, according to Indonesian land acquisition law. Accordingly, nonpayment of compensation is not anticipated. (e) Land Acquisition Committee creates a document determining compensation amount and form at the agreement of land acquisition, according to Indonesian land acquisition law. (f) - (g) Compensation amount and form are determined through negotiation, according to Indonesian land acquisition law. (h) If resettlement occurs relating to land acquisition for a facility of public interest such as transmission line, Land Acquisition Committee will be organized, according to Indonesian land acquisition law. The budget related to compensation will be paid

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
			by the project operator. (i) If resettlement occurs, Land Acquisition Committee will confirm the proper implementation of compensation for affected persons, according to Indonesian land acquisition law.

Table 9.8.1(8) Review the results of environmental social consideration for the power plant

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
4 Social Environment	(1) Resettlement	(j) Is an appropriate complaint handling system prepared?	(j) If resettlement occurs, affected person who cannot agree with the Land Acquisition Committee’s decision may appeal to the local chief executive or Minister of State, according to Indonesian land acquisition law. In case one does not agree on the compensation amount and refuse to receive it, one has the right to appeal to a higher court.
	(2) Living and Livelihood	(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (b) Is sufficient infrastructure (e.g., hospitals, schools, roads) available for the project implementation? If existing infrastructure is insufficient, is a plan developed to construct new infrastructure or improve existing infrastructure? (c) Is there a possibility that large vehicle traffic associated with the project will affect road traffic in the surrounding areas? Are adequate measures considered to reduce the impacts on traffic, if necessary? (d) Is there a possibility that diseases (including communicable diseases, such as HIV) will be introduced due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary? (e) Is there a possibility that the amount of water used (e.g., surface water, groundwater) and discharge of thermal effluents by the project will adversely affect existing water uses and uses of water	(a) Landless farmers and workers at shrimp farm are not subject to compensation concerning land acquisition and lose their source of income due to the project. Consequently, they will be given priority in employment as construction worker and chance for job training on request. (b) New social infrastructure, including medical facility, will be constructed on request. (c) The traffic control plan including route-setting will be established. Traffic safety education for workers will also be given. (d) Medical facility will be constructed and periodic medical check will be conducted. Also, health education for workers will be conducted. (e) Fresh water is generated from RO equipment and ground- and river water will not be used. Fishery is not active in the sea area in front of the power plant.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
		areas (especially fishing)?	

Table 9.8.1(9) Review the results of environmental social consideration for the power plant

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
4 Social Environment	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage sites? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) No historical or cultural heritage site was observed in the field research. Additionally, the project site is mainly farmland and shrimp farm, and discovery of new historical heritage is not anticipated.
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) The project building, stack and jetty will be colored in the same tone. The border of the power plant site, ash pond, and coal yard will be revegetated with native trees to the possible extent.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Will the rights of ethnic minorities and indigenous people on land and resources respected?	(a) According to the field research, no ethnic minorities or indigenous people live within the project site. (b) No ethnic minorities or indigenous people live within the project site.
	(6) Working Environment (including Working Safety)	(a) Will the compliance to the domestic law related to working environment ensured in the project? (b) Will hardware working safety measures installed to protect project members including labor accident prevention, hazardous materials management? (c) Will software working safety measures to protect project members planned and installed, including working health plan, safety education for workers (including traffic safety public health)? (d) Will adequate measures be installed to prevent security guards of the project from threatening safety of the local residents and project members?	(a) HSE (Health, Safety, and Environment) section will be organized regarding the operation of the power plant to ensure compliance to Indonesian labor and employment regulations. (b) The following safety equipment will be supplied to workers. - Provide workers with appropriate protective equipment - Use equipment that is protected against electric shock - Install fire extinguishers in handling places of fire and fire fighting system (c) Safety and health plan will be developed including working health plan, safety education for workers (including traffic safety and public health). (d) -

Table 9.8.1(10) Review the results of environmental social consideration for the power plant

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
5 Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)?	(a) PLN will instruct EPC contractor to develop an environmental management plan during construction period. **[Noise/Vibration]** - Construction work should be performed during daytime, especially piling work. - Use of noise reduction devices to effectively reduce potential noise by earthmoving and excavating equipments - Determine the traffic control plan including route-setting - Limit truck speeds, especially around residential areas **[Water pollution]** - Excavate channels, ditches and temporary settling pond around construction area - Construct silt basin. - Install waste water treatment facility for workers such as septic tank - Prohibition illegal waste disposal - To choose dredging method, dumping method and equipment that will minimize the turbidity - Discharge the sea water after the sand settles - Install the fence for water pollution prevention at the sea area facing the construction area **[air pollution]** - Watering access road and construction site, especially in the dry season - Using cover sheet on trucks for the transportation of soils - Periodic maintenance and management of all the construction machines and vehicles - Prohibit open burning and illegal dumping **[Waste]** - Conduct separate waste collection and promote recycling and reuse. - Appropriate disposal of non-recyclable waste according to rule - Hazardous waste should be treated under the related regulation

Table 9.8.1(11) Review the results of environmental social consideration for the power plant

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
5 Others	(1) Impacts during Construction	(b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(b) Adequate measures will be taken to mitigate air and water pollution and noise for reduction of environmental impact by the project. The site will be revegetated with native trees after construction work. (c) PLN will instruct EPC contractor to take appropriate measures for the social environment in the local community. **[Employment/ Livelihood, Local economy]** - Employment of local residents as many as possible. - Use of the services (i.e. laundry and catering service etc.) and products offered in the local community. **[Social infrastructure/ Service facilities]** - Construct service facilities such as medical center, as required. - Construction of new accesses road - Repair roads as required **[Transportation]** - Properly control construction schedule and processes. - Determine the traffic control plan including route-setting - Training safe operation of vehicles. - Setting the water route under the council with concerned authority. **[Sanitation/ Risks for infectious diseases]** - Install waste water treatment system for workers, such as septic tank - Installation of medical center and implementation of periodic medical check - Education and training on health care of the workers **[Local custom]** - Hire as many local residents as possible. - Promote communication between workers and local people (e.g. join in local events).
	(2) Accident Prevention Measures	(a) In the case of coal-fired power plants, are adequate measures planned to prevent spontaneous combustion at the coal piles? (e.g., sprinkler systems).	(a) The following measures will be taken against spontaneous combustion. - Temperature monitoring of inside of coal stock - Roller compaction by bulldozer - Sprinkling

Table 9.8.1(12) Review the results of environmental social consideration for the power plant

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
5 Others	(3) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(a) Appropriate monitoring plan will be developed by PLN concerning the environmental items that are considered to have potential impacts. (b) Appropriate monitoring plan will be developed by PLN concerning the environmental items that are considered to have potential impacts. (c) The project owner will create a monitoring report and submit to the Environmental authority, according to Indonesian law. (d) The project owner will create a monitoring report and regularly submit to the Environmental authority, according to Indonesian law.
6 Note	Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Power Transmission and Distribution Lines checklist should also be checked (e.g., projects including installation of electric transmission lines and/or electric distribution facilities). (b) Where necessary, pertinent items described in the Ports and Harbors checklist should also be checked (e.g., projects including construction of port and harbor facilities).	(a) 500kV transmission line will be constructed from the power plant to Cibutu transforming station 100km away. The pertinent items are reviewed separately based on "Power Transmission and Distribution Lines" checklist. (b) A jetty will be constructed for carrying coal. The jetty has a ladder structure, and with the breakwater being constructed parallel to the coast line, oceanographic change will be minor. Since the scale of the facilities is rather small, only the part of “Pollution countermeasure” in “Ports and Harbors” checklist was reviewed.
	Note on Using Environmental Checklist	(a) If necessary, the impacts to trans-boundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as trans-boundary waste treatment, acid rain, destruction of the ozone layer, and global warming).	(a) High-efficiency Ultra Super Critical power-generating system is to be introduced, meaning CO2 generation will be low for a coal fueled power plant. Also, exhaust gas will be treated to comply with the environmental standard (ambient air quality standard), and environmental impact to trans-boundary or global issues is not anticipated.

Table 9.8.2(1) Review the results of environmental social consideration for the transmission line

<table>
<tr><th>Category</th><th>Environmental Item</th><th>Main Check Items</th><th>Confirmation of Environmental Considerations</th></tr>
<tr><td rowspan="3">1 Permits and Explanation</td><td>(1) EIA and Environmental Permits</td><td>(a) Have EIA reports been officially completed?
(b) Have EIA reports been approved by authorities of the host country’s government?
(c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied?
(d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country’s government?</td><td>(a) EIA-TOR（KA-ANDAL） is currently in preparation. PLN will submit the EIA report (ANDAL), Environmental Management Plan (RKL), and Environmental Monitoring Plan (RPL) in early November.
(b) -
(c) -
(d) -</td></tr>
<tr><td>(2) Explanation to the Public</td><td>(a) Are contents of the project and the potential impacts adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders?
(b) Is the comment from the residents reflected in the project details?</td><td>(a) Public hearing will be held in 5 related districts with the following schedule.
<table>
<tr><th>District</th><th>Date</th></tr>
<tr><td>Indramayu</td><td>16th July, 2010</td></tr>
<tr><td>Subang</td><td>3rd week in August</td></tr>
<tr><td>Purwakarta</td><td>3rd week in August</td></tr>
<tr><td>Karawang</td><td>3rd week in August</td></tr>
<tr><td>Bekasi</td><td>3rd week in August</td></tr>
</table>
After the public hearing, technical consulting meeting will be held as needed by EIA review committee in West JAWA Province. KA-ANDAL will be prepared and submitted by PLN, taking into consideration the result of the meeting. During KA-ANDAL review period, commission meeting will be held by EIA review committee to determine the survey content of EIA, and ANDAL, RKL, and RPL will be prepared based on the survey content. Commission meeting will be also held during review period as needed.
(b) -</td></tr>
<tr><td>(3) Consideration of the</td><td>(a) Are there any alternative plans under</td><td>(a) The transmission line route is selected to avoid residential and forest area as much as</td></tr>
</table>

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
	alternative plans	consideration? (including environmental-social items)	possible.

Table 9.8.2(2) Review the results of environmental social consideration for the transmission line

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
2 Mitigation Measures	(1) Water Quality	(a) Is there a possibility that soil runoff from the bare lands resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas? If water 0quality degradation is anticipated, are adequate measures considered?	(a) As soil survey has not been carried out, the possibility of soil runoff is not determined, but the construction site of transmission towers will be selected to avoid riverbed and riverbank to the possible extent.
3 Natural Environmen t	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) According to the document research, no protected areas exist within the transmission line route.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Are adequate measures taken to prevent disruption of migration routes and habitat fragmentation of wildlife, and livestock? (e) Is there a possibility that improved access by the project will cause impacts, such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystem due to introduction of exotic (non-native invasive)	(a) No primeval forests, tropical rain forests, or ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats) exist within the transmission line route. (b) In the field survey of the transmission line route, 35 species of Least Concern (29 Aves, 3 Mammals, 3 Amphibians) listed in IUCN, were observed. However, the impact of the project will be limited to the tower base area, and considering each base area size (25m×25m max) and the large intervals of the towers, the impact on the ecosystem will be very limited. If protected species was discovered, PLN consults with specialists about transplant individual (c) The ecological impact due to land transformation by transmission line construction will be very limited. Additionally, the transmission line route will be selected to avoid bird migratory path and habitat to the possible extent. (d) The transmission line route will be selected to avoid bird migratory path to the possible extent. (e) The transmission line route is mostly farm land and no destruction of forest is anticipated. Domestic materials will be used and non-native species and

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
		species and pests? Are adequate measures for preventing such impacts considered?	pests will not be introduced.

Table 9.8.2(3) Review the results of environmental social consideration for the transmission line

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
3 Natural Environment	(2) Ecosystem	(f) In cases where the project site is located in undeveloped areas, is there a possibility that the new development will result in extensive loss of natural environments?	(f) The transmission line route is mostly farm land and encompasses no undeveloped area.
	(3) Topography and Geology	(a) Is there a soft ground on the route of power transmission lines that may cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides, where needed? (b) Is there a possibility that civil works, such as cutting and filling will cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides? (c) Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measures taken to prevent soil runoff?	(a) As soil survey has not been carried out, the possibility of slope failure or landslide is not determined. However, as the transmission towers will be located in a flat area; slope failure and landslides are not anticipated. (b) The construction site of transmission towers is located in a flat area, and slope failure and landslide are not anticipated. (c) -
4 Social Environment	(1) Resettlement	(a) Is large scale of involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on relocation and compensation given to affected persons prior to resettlement? (c) Is the resettlement plan, including proper compensation, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement?	(a) The transmission line route was selected to avoid residential area to the possible extent to prevent resettlement. (b) According to Indonesian land acquisition law, if resettlement occurs related to land acquisition for a facility of public interest such as transmission line, adequate explanation on land acquisition and negotiation on compensation (amount and form) will be given to affected persons. (c) According to Indonesian land acquisition law, if resettlement occurs; the affected person is ensured socioeconomic living standards higher than before the land acquisition. The list of land, construction, vegetation and other land-related object will be created, and the compensation amount and form will be discussed based on the

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
			market price surveyed by an independent and expertise land-price research team.

Table 9.8.2(4) Review the results of environmental social consideration for the transmission line

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
4 Social Environment	(1) Resettlement	(d) Is compensation paid prior to resettlement? (e) Is it the compensation policy developed in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or persons, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected persons obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Is a plan developed to monitor the impacts of resettlement? (j) Is an appropriate complaint handling system prepared?	(d) If resettlement occurs, the compensation is transferred into the local bank account, according to Indonesian land acquisition law. Accordingly, nonpayment of compensation is not anticipated. (e) If resettlement occurs, Land Acquisition Committee creates a document determining compensation amount and form at the agreement of land acquisition, according to Indonesian land acquisition law. (f) - (g) If resettlement occurs, compensation amount and form is determined through discussion, according to Indonesian land acquisition law. (h) If resettlement occurs related to land acquisition for a facility of public interest such as transmission line, Land Acquisition Committee will be organized, according to Indonesian land acquisition law. The budget related to compensation will be paid by the project operator. (i) If resettlement occurs, Land Acquisition Committee will confirm the proper implementation of compensation for affected persons, according to Indonesian land acquisition law. (j) If resettlement occurs, affected persons who cannot agree with the Land Acquisition Committee's decision may appeal to the local chief executive or Minister of State, according to Indonesian land acquisition law. In case one does not agree on the compensation amount and refuse to receive it, one has the right to appeal to a higher court.
4 Social Environment	(2) Living and Livelihood	(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (b) Is there a possibility that diseases, including communicable diseases,	(a) The transmission line route is mostly farm land. Additionally, the impact of the project will be limited to the tower base area, and considering each base area size (25m×25m max) and the large intervals of the towers, the impact on the inhabitants will be very limited. (b) The work concerning the transmission line is maintenance work, and an

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
		such as HIV will be introduced due to immigration of workers from other areas? Are adequate considerations given to public health, if necessary?	increase of staff is not necessary, and introduction of communicable disease is not anticipated.

Table 9.8.2(5) Review the results of environmental social consideration for the transmission line

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
4 Social Environment	(2) Living and Livelihood	(c) Is there a possibility that installation of structures, such as power line towers will cause radio interference? If significant radio interference is anticipated, are adequate measures considered? (d) Will the land under transmission line be compensated concerning the construction of transmission line, according to Indonesian law?	(c) - (d) According to Indonesian law, the land under the transmission line is compensated only one time, and the calculation of compensation amount is determined based on the land price.
	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage sites? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) The transmission line route is selected to avoid the local archeological, historical, cultural, and religious heritage sites, based on the document research. If artifacts or culturally significant areas are unearthed, the construction work will be stopped immediately and conservation measures will be discussed with experts.
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) The transmission line route is selected to avoid scenic landscape.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Will the rights of ethnic minorities and indigenous people on land and resources respected?	(a) According to the document research, no ethnic minorities or indigenous people live within the transmission line route. (b) According to the document research, no ethnic minorities or indigenous people live within the transmission line route.
4 Social Environment	(6) Working Environment (including Working Safety)	(a) Will the compliance to the domestic law related to working environment ensured in the project? (b) Will hardware working safety measures installed to protect project members including labor accident prevention, hazardous materials management?	(a) HSE (Health, Safety, and Environment) section will be organized within the transmission line maintenance department to ensure compliance to Indonesian labor and employment regulations. (b) The following safety equipment will be supplied to workers for maintenance work: - Provide workers with appropriate protective equipments - Use equipments that is protected against electric shock - Install fire extinguishers in handling

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
			places of fire and fire fighting system

Table 9.8.2(6) Review the results of environmental social consideration for the transmission line

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
4 Social Environment	(6) Working Environment (including Working Safety)	(c) Will software working safety measures to protect project members planned and installed, including working health plan, safety education for workers (including traffic safety public health)? (d) Will adequate measures be installed to prevent security guards of the project from threatening safety of the local residents and project members?	(c) The transmission line maintenance department will develop health and safety plans including working health plan and safety education for workers (including traffic safety and public health). (d) No security guard will be employed for transmission line construction.
5 Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(a) Considering each tower base area size (25m×25m max) and the construction period per tower being only 5 months, water, air and noise pollution due to construction work will be very limited. (b) Considering limited area of transformed land and large intervals, the impact on natural environment is expected to be minor. (c) The following measures will be taken for the local community: - Properly control construction schedule and processes. - Determine the traffic control plan including route-setting - Training safe operation of vehicles.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) Are the items, methods and frequencies included in the monitoring program judged to be appropriate? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to	(a) Appropriate monitoring plan will be developed by PLN concerning the potentially-impacted environmental items. (b) Appropriate monitoring plan will be developed by PLN concerning the potentially-impacted environmental items. (c) The project operator will create a monitoring report and submit to the Environmental authority, according to Indonesian law. (d) The project operator will create a monitoring report and regularly submit to the Environmental authority, according to Indonesian law.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
		the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	

Table 9.8.2(7) Review the results of environmental social consideration for the transmission line

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
6 Note	Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Roads checklist should also be checked	(a) The transmission line route is mostly farm land, and construction of new road will be only for a short distance. Accordingly, the review based on "Road" checklist will not be necessary.
	Note on Using Environmental Checklist	(a) If necessary, the impacts to trans-boundary or global issues should be confirmed, (e.g., the project includes factors that may cause problems, such as trans-boundary waste treatment, acid rain, destruction of the ozone layer, or global warming)	(a) The environmental impact to trans-boundary or global issues due to transmission line construction is not anticipated.

Appendix-2 Photo of Public hearing

Indramayu district (16^{th}/ July/ 2010)

Subang district (4th/ August/ 2010)

Purwakarta district (24th/ August/ 2010)

Karawang district (24th/ August/ 2010)

Bekasi district (1st/ September/ 2010)