Initial Environmental Examination Report (Draft)

Project Number: 51139-001
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REG: Agricultural Value Chain Development Project

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INITIAL ENVIRONMENTAL EXAMINATION (IEE)

OPERATION OF REFINED CRYSTAL SUGAR FACTORY

PT. DHARMAPALA USAHA SUKSES

KOMPLEK PELABUHAN INDONESIA III

CABANG TANJUNG INTAN CILACAP

October 26th, 2017

ABBREVIATION

DUS	:	PT. Dharmapala Usaha Sukses
SFCOP	:	Sugar Factory Capacity Optimalization Project
IEE	:	Initial Environmental Examination
ADB	:	Asian Development Bank
EME	:	Environmental Management Effort
SPS	:	Safeguard Policy Statement
EIA	:	Environmental Impact Assessment
AMDAL	:	Analisis Mengenai Dampak Lingkungan Hidup (Environmental Impact Assessment)
EMME	:	Environmental Management and Monitoring Effect
UKL	:	Upaya Pengelolaan Lingkungan Hidup (Environmental Management Effort)
UPL	:	Upaya Pemantauan Lingkungan Hidup (Environmental Monitoring Effort)
SPPL	:	Surat Pernyataan Pengelolaan Lingkungan Hidup (Env. Management Statement)
KA	:	Kerangka Acuan (Term of Reference)
ANDAL	:	Analisis Dampak Lingkungan Hidup (Environmental Impact Analysis)
RKL	:	Rencana Pengelolaan Lingkungan Hidup (Environmental Management Plan)
RPL	:	Rencana Pemantauan Lingkungan Hidup (Environmental Monitoring Plan)
GHG	:	Green House Gas
IER	:	Ion Exchange Resin

RVP : Ref Vacuum Pan

FFE : Fire Fighting Equipment

WWTP : Waste Water Treatment Plant

SNI : Standar Nasional Indonesia (Indonesian National Standard)

TSS : Total Suspended Solid

ISPA : Infeksi Saluran Pernapasan Atas (Upper Respiratory Tract Infection)

SOP : Standard Operating Procedure

ESP : Electrostatic Precipitator

BRS : Brine Recovery System

CSR : Corporate Social Responsibility

PDAM : Perusahaan Daerah Air Minum (Regional Water Company)

PLN : Perusahaan Listrik Negara (State Owned Electricity Company)

LCG : Local Consultative Group

NGO : Non Government Organization

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I.EXECUTIVE SUMMARY

1. The Sugar Factory Capacity Optimalization Project (SFCOP) will be financed by Asian Development Bank (ADB) through a Project loan to be implemented over two years. The Project will install and operate a new power plant consisting of a boiler with capacity of 75 metric ton steam/hour and a Steam Turbo-Generator with capacity of 6,000 kW along with new process equipment in the Refined Crystal Sugar Factory of PT. Dharmapala Usaha Sukses (DUS) located in the Cilacap District, Central Java Province, Indonesia.

2. This initial environmental examination (IEE) has been prepared based on ADB's Safeguard Policy Statement (ADB SPS 2009). The IEE covers the general environmental profile of all the power plant components and includes an overview of the potential environmental impacts during various project phases. The IEE also includes "environmental management effort" (EME) with a set of mitigation and management measures to be taken during project implementation to avoid, reduce, mitigate, or compensate for adverse environmental impacts

3. Individual environmental categorization of the power plant was conducted in accordance with ADB's SPS (2009) to determine the overall environmental categorization of the Project. The project power plant could have some adverse environmental impacts but duration and nature are short-term, temporary, reversible, and could be managed by implementing mitigation measures, thus, the Project is classified as environment category B.

4. The Project area is about 1,500 m^2 within DUS's refined crystal sugar factory area of 62,647.77 m^2 located in Laut Jawa Street, Complex of Pelabuhan Indonesia III Branch of Tanjung Intan Cilacap, bordered by Pelindo truck parking field in the north, Laut Jawa Street in the west, Pelindo Office, Animal Quarantine Office, Coastal Radio and Navigation Office in the south and Port Administrative Office, Naval Army Military Base and Water and Air Police Office in the east.

5. The Project will use some amount of electricity, water and fuel. Transportation of raw material and sugar product will also be conducted. To produce refined crystal sugar, the Project will operate some type and number of machinery and employ some numbers of labor.

6. According to Minister of Environment Regulation No. 05/2012 on Activities Required to Have an EIA/AMDAL Appendix I, this type of activities will result in some environmental impacts to this components: air quality, noise, water quality, biota, social and occupational health. Individual assessment of the Project's impact on those components suggest that the impacts are not significant. Thus, in accordance with Minister of Environment Regulation No. 05/2012 Appendix I, the Project is required to have an EMME/UKL-UPL. Preparation of EMME/UKL-UPL refers to the Minister of Environment Regulation No. 16/2012 on Preparation of Environmental Documents Appendix IV.

7. Mitigation measures for operation phase have been developed in accordance with UKL-UPL Recommendation from the Bupati Cilacap Decree No. 660.1/608/30/2015 dated June 14th, 2015 and have been compliantly and successfully performed in timely manner. These mitigation measures will be adopted in this Project. Additional mitigation measures have been identified and proposed for any affected activities during construction phase and presented in a table.

8. DUS requires to have a permit for waste water disposal and temporary hazardous waste dumping. DUS has been granted Waste Water Disposal Permit through the Bupati Cilacap Decree No. 660.1/691/24/2017 dated May 12th, 2017. In addition, DUS also has been awarded Temporary Hazardous Waste Storage through Bupati Cilacap Decree No. 660.1/21/30/2014 dated April 22nd, 2014.

9. DUS has signed responsibility statement to implement mitigation measures written in the EMME/UKL-UPL document.

II. INTRODUCTION

A. POLICY FRAMEWORK

The productivity of refined crystal sugar factory of PT. Dharmapala Usaha Sukses (DUS) is currently less than permitted capacity of 250,000 tons/year. Operation of new power plant with higher capacity will elevate productivity of the existing sugar factory up to the allowable capacity.

The Sugar Factory Capacity Optimization Project (SFCOP) ("Project") will install and operate a new power plant consisting of a boiler with capacity of 75 tons/hour and a turbine with capacity of 6,000 kW along with new process equipment in the Refined Crystal Sugar Factory of DUS located in the Cilacap District, Central Java Province, Indonesia. The new power plant along with new process equipment will be operated interchangeably with the existing power plant which has a boiler with capacity of 45 tons/hour and a generator turbine with capacity of 3,000 kW.

The Project will be financed by Asian Development Bank (ADB) through a Project loan that will be implemented over two years. The project proponent and executing agency is DUS.

ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in ADB's SPS 2009. This states that ADB requires environmental assessment of all project loans, program loans, sector loans, sector development program loans, loans involving financial intermediaries, and private sector loans.

The nature of the environmental assessment required for a project depends on the significance of its environmental impacts, which are related to the type and location of the project, the sensitivity, scale, nature and magnitude of its potential impacts, and the availability of cost-effective mitigation measures.

In addition to national regulation where the project executed, ADB requires environmental assessment to comply with IFC's Performance Standard set in the General Environmental, Health and Safety Guidelines of IFC.

III.POLICY, LEGAL AND ADMINISTRATIF FRAMEWORK

A. LEGAL AND ADMINISTRATIVE FRAMEWORK

A.1. ADB Environmental Requirements

As described in ADB's SPS 2009, Projects are screened based on their expected environmental impacts and assigned to one of four defined categories.

Category A: Projects could have significant adverse environmental impacts. An environmental impact assessment (EIA) is required to address significant impacts.

Category B: Projects could have some adverse environmental impacts, but of lesser degree or significance than those in category A. An IEE is required to determine whether significant environmental impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report.

Category C: Projects are unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are reviewed.

Category FI: Projects involve a credit line through a financial intermediary or an equity investment in a financial intermediary. The financial intermediary must apply an environmental management system, unless all project roads will result in insignificant impacts.

The overall environmental categorization of the Project was conducted in accordance with ADB SPS (2009). The project power plant has potential to have adverse environmental impacts but could be managed by implementing mitigation measures thus, **the Project is classified as environment category B**.

A.2. Government of Indonesia Environmental Requirements

A.2.1. Indonesian Regulation

According to the Law of the Republic of Indonesia No. 32/2009 on Environmental Protection and Management, environmental assessment of power plant projects is divided into 3 categories: Environmental Impact Assessment (EIA/AMDAL), Environmental Management and Monitoring Effort (EMME/UKL-UPL), and Brief Mitigation and Monitoring Statement (SPPL). The category is based on scale of generated electric power.

According to the Law of the Republic of Indonesia No. 32/2009 on Environmental Protection and Management Article 22 Clause (1), any activities that have significant impacts must have an EIA/AMDAL.

Projects that meet EIA/AMDAL criteria, a Terms of Reference (KA) for the proposed environmental study, Environmental Impact Analysis (ANDAL), Environmental Management Plan (RKL), and Environmental Monitoring Plan (RPL) are to be prepared to address the significant impacts.

According to the Law of the Republic of Indonesia No. 32/2009 on Environmental Protection and Management Article 34 Clause (1), activities that are not required to have an EIA/AMDAL are required to have an EMME/UKL-UPL.

Projects that meet EMME/UKL-UPL criteria require the preparation of an Environmental Management Effort (UKL) and Environmental Monitoring Effort (UPL) to be prepared with mitigation and monitoring procedures to address insignificant impacts.

According to the Law of the Republic of Indonesia No. 32/2009 on Environmental Protection and Management Article 35, activities that are not required to have an UKL-UPL are required to have a SPPL.

According to the Government Regulation No. 27/2012 on Environmental Permit Article 2, any activities required to have an EIA/AMDAL and EMME/UKL-UPL are required to have an **environmental permit (izin lingkungan)**.

According to the Minister of Environment Regulation No. 05/2012 on Activities Required to Have an EIA/AMDAL Appendix I, power plant project with capacity of more than 100 MW or occupying an area of more than or equal to 20 ha or building area of more than or equal to 10.000 m^2 must have an EIA/AMDAL.

SFCOP will install a power plant consisting of boiler with capacity of 75 ton/hour and turbine with capacity of 6.000 kW along with new process equipment, therefore an EMME/UKL-UPL is required. Preparation of EMME/UKL-UPL refers to the Minister of

Environment Regulation No. 16/2012 on Preparation of Environmental Documents Appendix IV.

SFCOP that located on area of 62,647.77 m^2 (6.27 ha) is under the authority of Bupati Cilacap by which examination of EMME/UKL-UPL is conducted by EMME/UKL-UPL Inspection Team, Cilacap District, hence EMME/UKL-UPL Recommendation and Environmental Permit are issued by Bupati Cilacap.

A.2.2. Relevant International Convention

Environmental component that potentially affected by construction and operation of power plant in the SFOP is air ambient quality due to the emission of green house gas (GHG) into the atmosphere that potentially contributes to the climate change whereby international convention applies.

Indonesia has ratified the following international conventions:

a. Kyoto Protocol to the United Nations Framework Convention on Climate Change through the Indonesia Act No. 17/2004.

b. Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal through the Presiden Republik Indonesia Decree No. 61/1993.

c. The Rio “Earth Summit” Convention on the Biological Diversity through the Indonesia Act No. 5/1994.

IV.PROJECT DESCRIPTION

A. Project Components and Location

The Project will install and operate a power plant consisting of boiler with capacity of 75 ton/hour and turbine with capacity of 6.000 kW along with new process equipment inside the area of existing refined crystal sugar factory of DUS which located in Laut Jawa Street, Complex of Pelabuhan Indonesia III Branch of Tanjung Intan Cilacap. The Project is under the administrative authority of Tambakreja Village, South Cilacap Subdistrict, Cilacap District, Central Java Province.

PT DUS Sugar Factory is bordered by Pelindo truck parking field in the north, Jalan Laut Jawa in the west, Coastal Radio and Navigation Office in the south and Port Administrative Office, Naval Army Military Base and Water and Air Police Office as presented in **Figure** IV-1. The existing DUS's refined crystal sugar factory has an area of 62,647.77 m^2 with layout shown in **Figure** IV-2. The power plant will be built on an area of ±1,500 m^2 inside the sugar factory area.

PT DUS Sugar Factory location is about 2.5 km from the Cilacap Square and can be reached during construction and operation phase through the Tanjung Intan Port entrance in the crossing of Jalan RE. Martadinata and Jalan Niaga.

To the west of PT DUS Sugar Factory is Donan river which receives storm water and waste water from the existing refined crystal sugar factory of DUS.

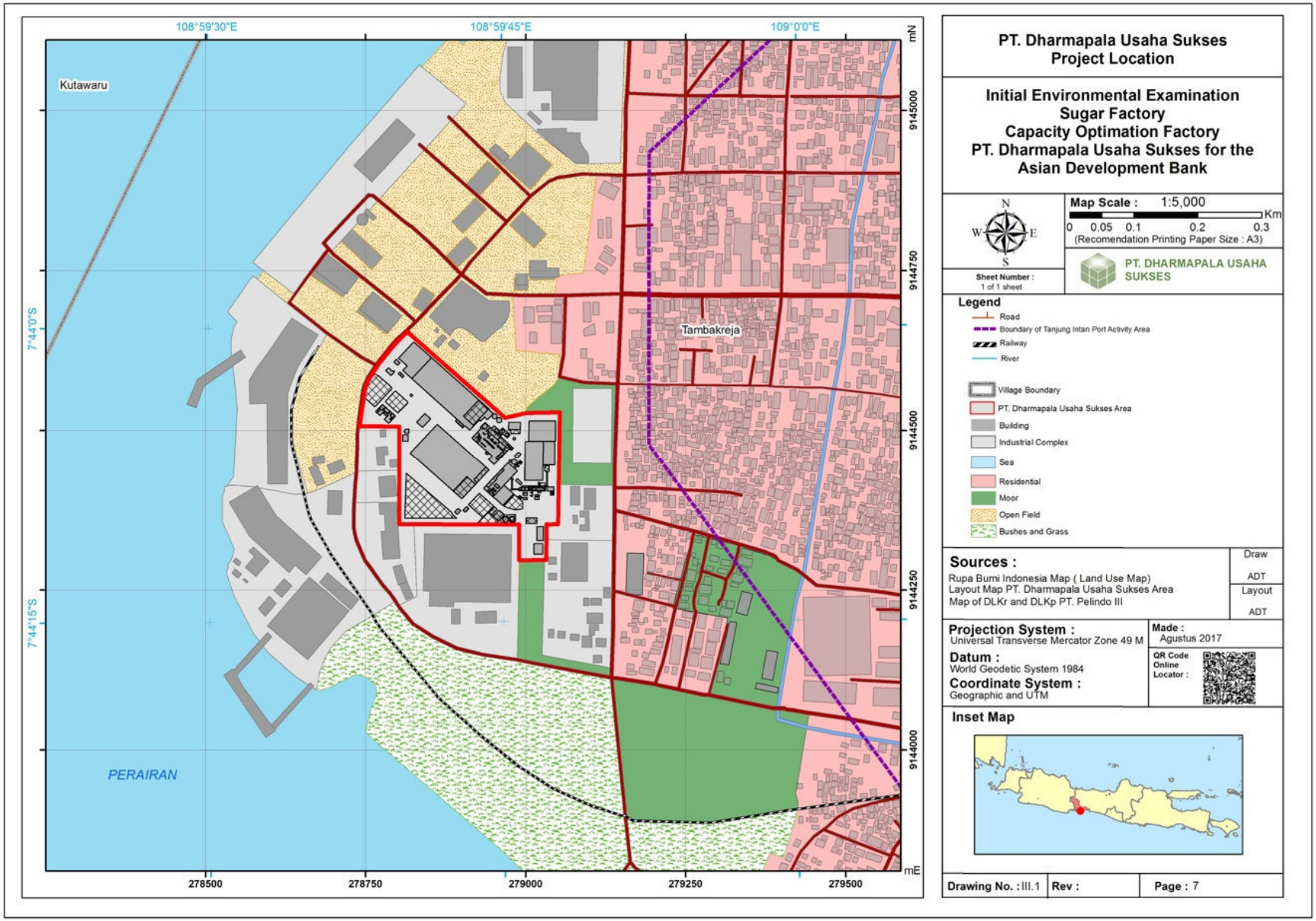


Figure IV-1. PT DUS Sugar Factory location

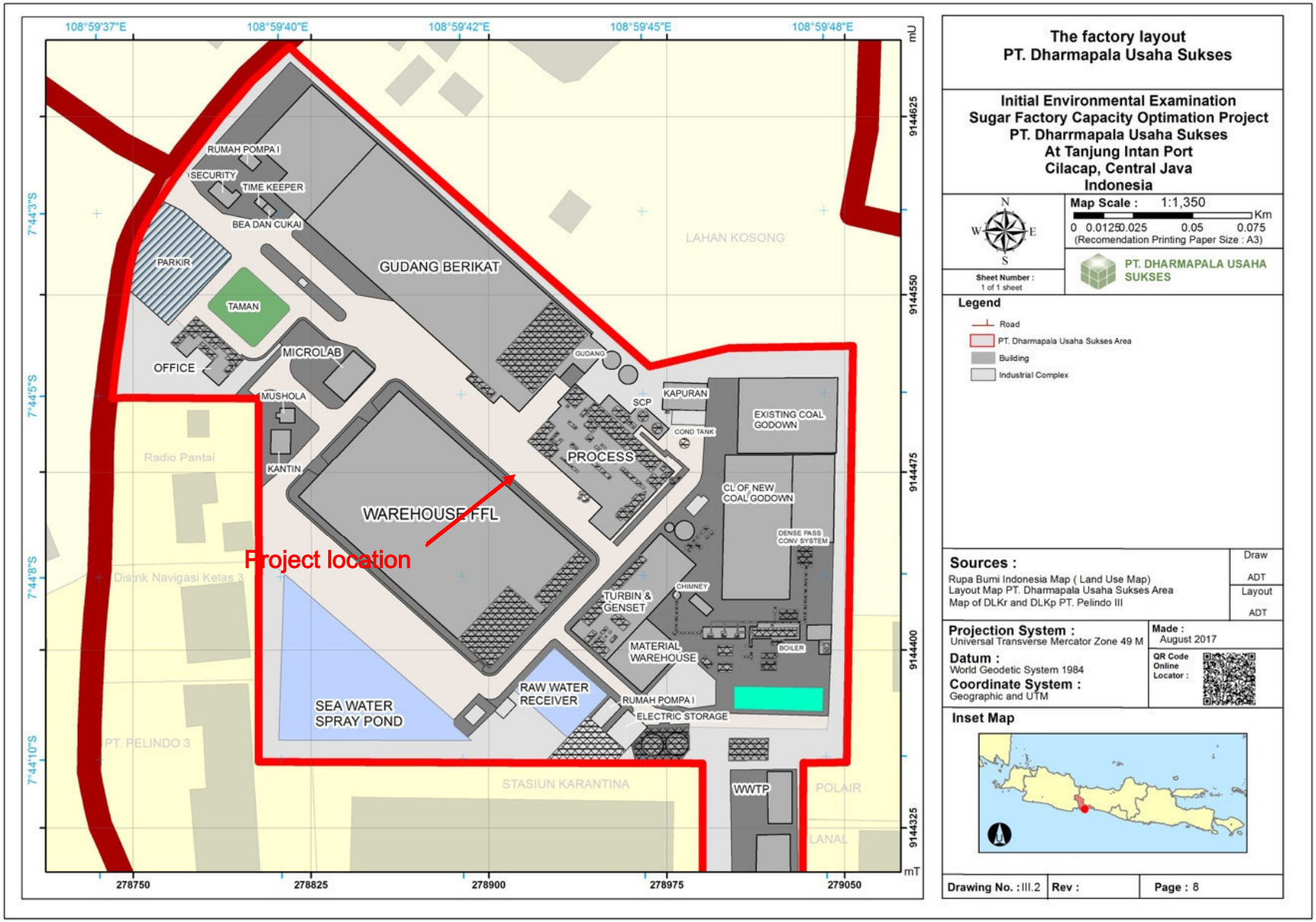


Figure IV-2. The project location

Land uses of the factory is described in Table IV-1.

Table IV-1. Land use in DUS's refined crystal sugar factory

No	USE	EXISTING		EXPANSION	AFTER PROJECT	
		AREA (M^2)	PERCENTAGE (%)	AREA (M^2)	AREA (M^2)	PERCENTAGE (%)
TOTAL AREA		**62,647.77**	**100.00**		**62,647.77**	
COVERED AREA		**21,441.57**	**34.23**		**22,285.04**	**35.57**
1	Security Pos	67.20			67.20	
2	Pump House	42.40			42.40	
3	Custom Office	15.30			15.30	
4	Time Keeper	19.72			19.72	
5	Raw Sugar Silo	6372.00			6,372.00	
6	Main Office	405.00			405.00	
7	Main canteen	80.00			80.00	
8	Mosque	36.00			36.00	
9	Product Warehouse	6480.00			6,480.00	
10	Engineering Office	24.00			24.00	
11	HSE Office	24.00			24.00	
12	Workshop	130.00			130.00	
13	Processing Area	1708.00			1,708.00	
14	Lime Storage	348.00			348.00	

No	USE	EXISTING		EXPANSION	AFTER PROJECT	
		AREA (M^2)	PERCENTAGE (%)	AREA (M^2)	AREA (M^2)	PERCENTAGE (%)
15	Salt Storage	67.80			67.80	
16	Coal Storage	1158.00			1,158.00	
17	Toilet II	30.40			30.40	
18	Turbine house	1080.00		480.00	1,560.00	
19	MWH	480.00			480.00	
20	Raw Water Storage	720.00			720.00	
21	Spray Pump Area	41.25			41.25	
22	Toilet II	30.40			30.40	
23	Electric WH	120.96			120.96	
24	Spare part Store 1	272.40			272.40	
25	Spare part Store 2	144.00			144.00	
26	Hydrant Pump house	72.00			72.00	
27	Hazardouse Waste Temporary Storage	46.80			46.80	
28	Silika storage	82.84			82.84	
29	Coal crusher	31.50			31.50	
30	Boiler	74.30		74.30	148.59	
31	Coal Bunker	36.00		36.00	72.00	
32	Economiser	35.00		35.00	70.00	

No	USE	EXISTING		EXPANSION	AFTER PROJECT	
		AREA (M^2)	PERCENTAGE (%)	AREA (M^2)	AREA (M^2)	PERCENTAGE (%)
33	Deaerator & Feed Tank	55.25		55.25	110.50	
34	ESP	66.42		66.42	132.84	
35	ESP panel room	24.51		24.51	49.02	
36	Control room Boiler	72.00		72.00	144.00	
37	WWTP	574.00			574.00	
38	Waste storage WWTP	38.71			38.71	
39	Fly Ash / Bottom Ash Silo	37.50			37.50	
40	Brine Recovery Sys	111.35			111.35	
41	Micro Lab	186.56			186.56	
OPEN SPACE		**41,206.21**	**65.77**		**40,362.73**	**64.43**
BUILT-UP AREA RATIO			**34.23**			**35.57**
PLANT AREA RATIO			**27.19**			**27.19**

B. Project Scale

B.1. Energy Consumption

Energy source for DUS's refined crystal sugar factory is electricity supplied by the existing power plant with turbine capacity of 3,000 kW and boiler capacity of 45 tons/hour. Two sets of diesel generator with capacity of 930 kW and 1418 kW are used in case of emergency. Electricity for management office is supplied by PT. PLN Co. Ltd. with installed capacity of 66 kW.

The scope of Project consists of 6,000 kW power generation using 75 tons/hour steam to operate DUS's refined crystal sugar using new process equipment. Existing power plant with turbine capacity of 3,000 kW and boiler capacity of 45 tons/hour along with existing process

equipment will be operated alternately. No further change will be made on the electricity power supply for management office.

B.2. Raw and Auxiliary Material

Raw and auxiliary material consumed to satisfy maximum allowable sugar production capacity of 250,000 tons/year is presented in **Table IV-2**. Interchangeably operation of existing and planned power plant along with new process equipment will make no change on the type of raw and auxiliary material.

Table IV-2. Raw and auxiliary materials used in DUS's refined crystal sugar factory

TYPE	CAPACITY	FORM	ORIGIN	STORAGE METHOD	DELIVERY METHOD	DELIVERY FREQUENCY	E&S REQUIREMENTS
RAW MATERIALS							
1. Raw Sugar	250,000 ton/year	Solid	Thailand, Cuba, Brazil, Australia, Africa		Shipped and ground delivery using truck	1 ship/month	No specific requirement
AUXILIARY MATERIALS							
1. Limestone	11 kg/ton raw sugar	Solid	Local	Closed and waterproof warehouse	Packaged in plastic bag and tranported using truck	Weekly	Delivery risk class is 8 (corrosive), packaging risk class is III (small risk)
2. Salt	5 kg/ton raw sugar	Solid	Local	Closed and waterproof warehouse	Packaged in plastic bag and transported using truck	Biweekly	No specific requirement
3. CO_2	1.2 m3/ton raw sugar	Gas	Power Plant	Circulated	Produced on site from boiler flew gas	N/A	No specific requirement

TYPE	CAPACITY	FORM	ORIGIN	STORAGE METHOD	DELIVERY METHOD	DELIVERY FREQUENCY	E&S REQUIREMENTS
4. Filter Aids	0.6 kg/ton raw sugar	Liquid	Local	Closed and waterproof warehouse	Packaged in plastic bag and tranported using truck	Weekly	No specific requirement
5. NaOH	1.4 kg/ton raw sugar	Liquid	Local	Closed and waterproof warehouse	Packaged in plastic jar and transported using truck	Weekly	Delivery risk class is 8 (corrosive), packaging risk class is III (small risk)
6. HCl	1.2 kg/ton raw sugar	Liquid	Local	Closed and waterproof warehouse	Packaged in plastic jar and transported using truck	Weekly	Delivery risk class is 8 (corrosive), packaging risk class is II (medium risk)
7. Fresh water	1.95 m3/ton raw sugar	Liquid	PDAM		Piped from PDAM	N/A	No specific requirement
8. Slurry	0.07 kg m3/ton raw sugar	Powder	Local	Closed and waterproof warehouse	Packaged in plastic jar and transported using truck	Biweekly	No specific requirement
9. Resin	0.011 ltr/ton raw sugar	Solid	Local	Closed and waterproof warehouse	Packaged in plastic bag and tranported using truck	Every 6 month	No specific requirement
Coal	300MT/ day	Solid		Canopy storage	Pulverized	(info to follow)	(info to follow)

B.3. Water Consumption

Water used in DUS's refined crystal sugar factory is fresh water supplied by PDAM Cilacap with flow rate of 1,300 m^3/day (15 liter/second). This water is mainly used for processing house, boiler, spray pond and domestic consumption. After being used in the factory, 180 m^3/day will turn into waste, 30 m^3/day evaporates in process area , 60 m3/day evaporates at Boiler and Turbine area ,1000 m^3/day lost during spray pond and 30 m3/day water lost along with the product and by product. Water balance of the factory is presented in Table IV-3 with detail water flow diagram shown in Figure IV-3.

By installing and operating new process equipment, surface condensers will help to recover more condensate for process use, multiple effect evaporator/concentrator helps to extract more condensate from sugar liquor resulting in more return condensate available for boiler. Therefore, implementation of the Project will make no change on the existing water consumption due to increased recovered condensate, reuse and recycle of water (Table IV-4).

Table IV-3. Water consumption for operation of DUS's refined crystal sugar factory

Input	Usage	Output
Fresh Water : 1300 m^3/day	Processing House : 220 m^3/day	Waste from WWTP to River : **Total : 180 m^3/day** (From Process house: 45 m^3/day, From DM Plant:100 m^3/day From Domestic Waste: 30m^3/day, Floor Washing : 5 m^3/day)
	Boiler : 710 m^3/day	Evaporation/ Venting loss from process area : **30 m^3/day**
	Spray Pond make up water : 340 m^3/day	Lost with product & by products : **Total 30 m^3/day** (Sugar : 1 m^3/day, Final Molasses: 6 m^3/day, Filter Cake : 23 m^3/day)
	Domestic use 30 m^3/day	Water Lost due to Blow Down, vent Loss, evaporation Loss in Tubune CT : 60 m^3/day
		Evaporation loss in Spray Pond : 1000 m^3/day
Total : 1300 m^3/day	**Total : 1300 m^3/day**	**Total : 1300 m^3/day**

Figure IV-3. Water flow diagram

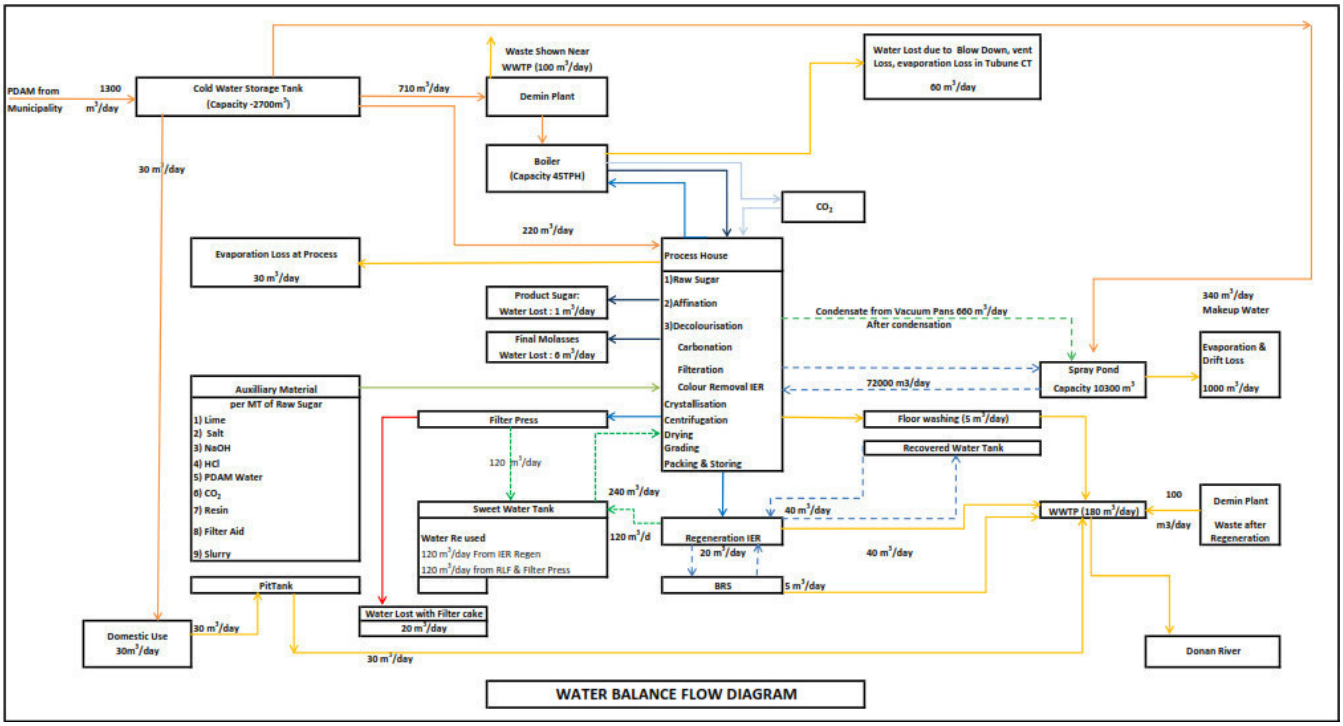


Table IV-4. Reused and recycled water during refined crystal sugar process

Water Reused / Recycled	Quantity
Recycled as sweet water from RLF & Filter Press Sluicing	120 m³/day
Recycled as sweet water from IER sweetening On & Off	120 m³/day
Re use of rinsing water from IER during regeneration	40 m³/day
Reuse of brine solution after membrane treatment of spent brine	20 m³/day

Recycling of spray pond water for condensing system	72.000 m^3/day

B.4. Factory Equipment

The main equipment used in DUS's refined crystal sugar factory are crystallizer, mixer, evaporator, carbonator, boiler and generator. The type and number of each equipment used in the factory is presented in **Table IV-5.**

Table IV-5. DUS's factory equipment

NO	TYPE	AMOUNT	CAPACITY	DRIVING ENERGY
1	Affination Centrifugal	3	1,750 kg/charge	Generator
2	Carbonator	2	30 m^3/hour/units	Generator
3	1st stage Filter	4	30 m^3/hour/units	Generator
4	2nd stage Filter	3	30 m^3/hour/units	Generator
5	IER	7	12 m^3/hour/colum	Generator
6	Concentrator	2	50 m^3/hour	Generator
7	FFE (Transformer)	1	1100 m^2 H.S	Generator
8	Transformer (Robert Type)	2	200 m^2 H.S/Unit	Generator
9	RVP (Ref Vacuum Pan)	4	50 MT/Strike	Generator
10	RVP (Ref Vacuum Pan)	3	25 MT/Strike	Generator
11	RVP (Ref Vacuum Pan)	1	30 MT/Strike	Generator
12	Cont. Vacuum Pan (high grade)	2	40 MT / hour/unit	Generator
13	High Grade Centrifugal	6	1750 kg/charge	Generator

NO	TYPE	AMOUNT	CAPACITY	DRIVING ENERGY
14	Low grade Centrifugal	6	5 - 10 MT/day	Generator
15	Low grade Centrifugal	1	1750 kg/Charge	Generator
16	Sugar Dryer and Cooler	2	40 MT/hour/unit	Generator
17	Bagging	4	360 bag/ hour (each)	Generator
Utilities				
1	Boiler	1	45 MT/Hour	Coal
2	Genset	2	930 kVA and 1418 kVA	Diesel
3	Turbine	1	3 MW	Steam

Optimization of refined crystal sugar processing requires not only new power plant but also new process equipment. To achieve the Project's goals, many equipment in the process area will be replaced with efficient equipment along with additional energy saving feature. List of proposed equipment is presented Table IV-6.

Table IV-6. List of equipment which installed as a standby, replacement or additional to eliminate the bottle neck

NO	TYPE	QTY	CAPACITY	DRIVING ENERGY	STATUS	IMPACT ON NOISE QUALITY	IMPACT ON AIR QUALITY
1	Affination Centrifugals	2	1,750 kg/charge	Generator	Standby	1)*	2)*
2	Carbonator	set of 3 vessels	70 m^3/hour/units	Generator	Replacement	Nil	2)*

NO	TYPE	QTY	CAPACITY	DRIVING ENERGY	STATUS	IMPACT ON NOISE QUALITY	IMPACT ON AIR QUALITY
3	CO_2 Pumps	2		Generator	Replacement	1)*	Nil
4	1st stage Filter	1	30 m^3/hour/units	Generator	Standby	Nil	Nil
5	2nd stage Filter	1	30 m^3/hour/units	Generator	standby	Nil	Nil
6	IER Column	2	12 m^3/hour/col.	Generator	Replacement	Nil	Nil
7	Concentrator	2 / 3	70 m^3/hour	Generator	Repalcement	1)*	2)*
8	Steam Transformer	1		Generator	Replacement	1)*	2)*
9	Vacuum Pan	4	60 MT/Strike	Generator	Replacement	1)*	2)*
10	Crystallisers	3	60 MT	Generator	Additional	1)*	2)*
11	Product Centrifugal with Accessories	3	1750 kg/charge	Generator	1 Additional + 2 standby	1)*	2)*
12	Low grade Centrifugal with Accessories	3	5 - 10 MT/hr	Generator	1 Additional + 2 standby	1)*	2)*
13	Sugar Dryer	1	40 MT/hour/unit	Generator	Standby	1)*	2)*
14	Bucket Elevator	2	60 MT/ hr	Generator	Additional	1)*	2)*
15	Condensers	3 +		Generator	Replacement	1)*	2)*

1) Impact on noise level is considered same as equipment planned, either from existing system or will go for the advanced technologies having less noise
2) Impact on air quality is considered same as equipment planned, either from existing system or will go for the advanced technologies having less emissions

B.5. Utilities - Power Plant Technology

The power plant will use a co-generation technology which is similar to the conventional power plants, except that here low-pressure steam coming out of the Turbine is used for heating and other applications in the user plants. Co -generation plant simultaneously produces both electricity and heat. The residual energy in steam is used for another application, this helps in avoiding the use of additional source of energy in the process plant. By using a single fuel source for electrical power and process heating, the cycle efficiency is much higher and cost of energy for the final product is much lower. Also, reduces Green House emissions by generating both electricity and useful heat from the same fuel input. The typical method of separate centralized electricity generation has a combined efficiency of about 45% whereas cogeneration systems can reach efficiency levels of 80 %.

The boiler type chosen for the project is Atmospheric fluidised-bed combustion (AFBC) boiler AFBC technology provide a viable alternative to conventional coal-fired other solid fuel-fired boilers. AFBC boilers are designed with no moving parts in the combustor, which ensures reduced maintenance costs, uniform temperature distribution in the bed along with the agitating characteristic of the fluid bed provide optimum combustion, resulting in a minimum of unburnt fuel, reduced carbon monoxide emissions, improved efficiency and reduce noise pollution. The boilers is equipped with electrostatic precipitator (ESP) which is a filtration device that removes fine particles, like dust and smoke, from a flowing gas using the force of an induced electrostatic charge minimally impeding the flow of gases through the unit. ESP ensures the suspended particulate matter (SPM) levels in the flue gas meets the international norms. The Boiler for the project is designed for to run on either full load coal, or mixed load of: 80% coal + 20% Rice Husk.

The non-condensing steam turbine component uses high-pressure steam for the rotation of blades. This steam then leaves the turbine at the atmospheric pressure or lower pressure. The pressure of outlet steam depends on in the load, therefore, this turbine is also known as the back-pressure steam turbine. This low-pressure steam uses for processing (Sugar plant) and no steam is used for condensation. There are lots of benefits of this steam turbine: (i) the configuration of this steam turbine is very simple; (ii) Its efficiency is higher as it does not reject heat in the condensation process, and (iii) it requires very less or no cooling water.

B.6. Carrier Vehicle

Depending on the Project stage, user, usage and location of each process in the factory, the type and number of vehicle operated in the sugar production process in DUS's refined crystal sugar factory are different. The main vehicles employed in the sugar production process are ship, dump truck, truck, fork lift, container truck, motorcycle, bicycle and car. Detail utilization of these vehicles is shown **in Table IV-7**.

Table IV-7. Vehicle employed of DUS's factory operation

NO	USAGE	TYPE AND CAPACITY	AMOUNT
CONSTRUCTION PHASE			
1.	Mobilization of equipment and material	Truck 10 ton	300 deliveries/month during construction
OPERATION PHASE			
1.	Raw material	Ship 30.000 ton/shipment (once a month) Dump truck 25 Ton	1 unit 1,200 deliveries/month
2.	Auxiliary material	Truck 10 ton	5 deliveries /month
3.	Product	Forklift,3 Ton Truck, 30 Ton Truck, 50 Ton	3 Shift 360 deliveries /month 200 deliveries /month

Equipment and material for construction and raw and auxiliary material for refined sugar crystal process will be transported from distant location through access road from the crossing of Jalan Niaga and Jalan R.E. Martadinata (port entrance) to the factory location. On the other hand, delivery of sugar product uses access road from Jalan Laut Jawa (in front of factory) to the port exit.

B.7. Waste

During construction phase, the type of waste produced are scrap, domestic waste, wood packaging, plastic packaging, paper packaging. The quantity, attribute and storage method of this waste is described in **Table III-7.**

Table IV-8. Type and quantity of waste produces during construction phase

No	Waste Type	Source	Quantity	Attribute	Storage / Delivery
1	Scrap	Construction activities	0.01 Ton/day	Non-hazardous waste	Scrap will be collected and stored in the scrap area and will be periodically delivered to third party (Dinas Cipta Karya dan Tata Ruang Kabupaten Cilacap)
2	Domestic waste, wood packaging, plastic packaging, paper packaging	Domestic activities during project construction	0.05 Ton/day	Non-hazardous waste	Scrap will be collected and stored in the temporary waste storage and will be periodically delivered to third party (Dinas Cipta Karya dan Tata Ruang Kabupaten Cilacap)

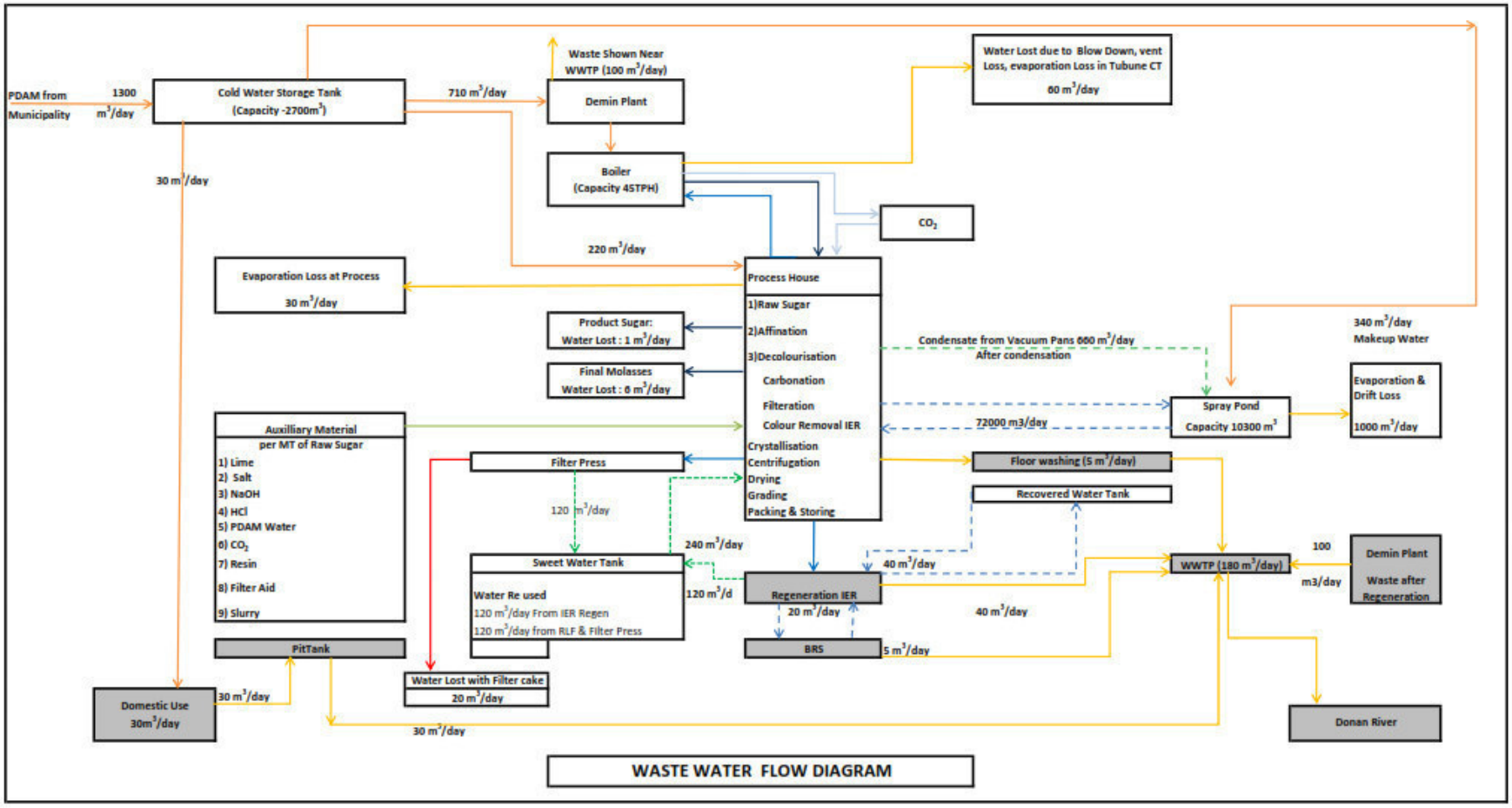
During the operation, the PT DUS Sugar Factory produces hazardous and non-hazardous wastedepending on the source. Detail information of waste generated by current operation of DUS's refined crystal sugar factory can be seen in **Table III-7.**

Table IV-9. Waste produced from DUS's refined crystal sugar processing

NO	TYPE	SOURCE	AMOUNT	ATTRIBUTE	STORAGE AND DISPOSAL
1.	Filter cake	Process Filter Press	10 ton/day	Harmless	Stored and disposed by PT. Tenang Jaya Sejahtera that has been certified by Ministry of Environment and Forestry to treat hazardous waste
2.	Waste water	Demin and Process IE regeneration , BRS,floor washing and Domestic	180 m^3/day	Harmless	Stored in Brine Recovery system, treated in Waste Water Treatment Plant and disposed in the Donan river
3.	Used grease	Machinery lubrication Turbine generator	0.0135 m^3 /day	Harmful	Stored in barrel within temporary hazardous waste disposal and periodically delivered to PT. Tri Guna Abadi that has been certified by

NO	TYPE	SOURCE	AMOUNT	ATTRIBUTE	STORAGE AND DISPOSAL
					Ministry of Environment and Forestry to treat hazardous waste
4.	Fly ash and bottom Ash	Coal boiler	35 ton/day	Harmful	Daily stored and disposed by PT. Tenang Jaya Sejahtera that has been certified by Ministry of Environment and Forestry to treat hazardous waste
5.	WWTP sludge	WWTP	600 kg/day	Harmful	Stored in barrel within temporary hazardous waste disposal and periodically delivered to PT. Tenang Jaya Sejahtera that has been certified by Ministry of Environment and Forestry to treat hazardous waste
6.	Laboratory waste	Operational and laboratory processing	2 kg/day	Harmful	Stored in barrel within temporary hazardous waste disposal and periodically delivered to PT. Tri Guna Abadi that has been certified by Ministry of Environment and Forestry to treat hazardous waste
7.	Domestic	Domestic use	5 kg/day	Harmless	Stored in waste disposal and periodically disposed by Dinas Cipta Karya dan Tata Ruang, Cilacap District, government agency for waste treatment

Figure IV-4. Waste water flow diagram



The wastewater treatment plant (WWTP) treats the effluent from DUS's refined crystal sugar factory. The treated effluent is then disposed into Donan river. The existing WWTP has capacity of 300 m^3/day, with current load of waste water treated in WWTP is 180 m^3/day, which is quite far from its maximum capacity. It is expected that waste water which will be generated from the process expansion is less than 100 m^3/day.

The influent and effluent quality of the WWTP is presented in Table III-10. Recent measurement on the waste water quality was done in May 6th, 2017 and the result is presented in Table IV-5. As can be seen in Table IV-5, waste water quality in the WWTP outlet is still below the threshold regulated by the Regulation of Central Java Province No. 5/2012 Appendix 9 on Quality Standard for Waste Water from Sugar Factory. However, BOD content is above the threshold set by IFC Performance Standard on Environmental Waste Water Quality for Sanitary System which is not specific for waste water from refined sugar industry.

Table IV-10. Waste water quality of WWTP

NO	LOCATION	pH	TSS	BOD	COD	Sulfide	FAT, OIL AND GREASE
UNIT			mg/l	mg/l	mg/l	mg/l	mg/l
1	Inlet	7.8	1,382	2,483.6	3.149	0.328	18
2	Outlet	7.3	24	39.6	81	0.042	4
Quality Standard		6-9[(1),(2)]	100[(1)],50[(2)]	50[(1)],30[(2)]	100[(1)],125[(2)]	0.05[(1)]	5[(1)],10[(2)]

1) Regulation of Central Java Province No. 5/2012 on Amendment of Central Java Province No. 10/2004 on Waste Water Quality Standard
2) IFC's Performance Standard on Environmental Waste Water Quality (General EHS Guideline).

B.8. Labor

A number of labors (temporary) will be employed in the construction phase of the Project, the majority of labor employed during construction is skilled labor. In the operation stage, existing skilled manpower will handle DUS's refined crystal sugar factory operation. Table IV-11 presents existing labor working in the factory and estimated labor during power plant construction. No change on the labor type and number expected in the operation of the factory.

Table IV-11. Labor employed in DUS factory

NO	TYPE OF LABOR	AMOUNT
Construction Phase		
1	Construction labor	100
Operation Phase		
1.	Manager + Coordinator	23
2.	Supervisor + Superintendent	45
3.	Foreman	67
4.	Technician, operator, clerk, driver	201
5.	Security	25
6.	Cleaning service, office boy, etc	78
	Total During Operation phase	439

C. PROJECT ACTIVITIES

C.1. Pre-Construction and Construction Phase

Prior to construction, survey and design are required.

Construction of power plant will consist of limited land clearance, cut and fill, piling process, construction of power house, chimney and mechanical-electrical installation.

To do the proposed works during construction phase, a number of labor will be employed. It is estimated that at least 100 labors will be required during construction. The proponent will prioritize local workers as many as possible in accordance with their qualifications.

A number of equipment and some amount of materials will be transported to the Project site before and during construction phase. Equipment and materials will be shipped to port and then mobilized to the Project site using truck and trailer. On the other hand, construction materials in form of sand, aggregate and cement will be provided by local supplier.

C.2. Operation Phase

Activities conducted during the operation phase of DUS's refined crystal sugar factory, are operation and maintenance of sugar factory along with its utilities. The Project will not make any design / Process change on the refined crystal sugar production processes. Raw sugar processing can be briefly described as a series of affination, affinated sugar melting, purification, carbonation, filtration and color removal & crystallization. Crystallization process consists of evaporation, crystallization, centrifugal separation, drying, grading, packaging and storage. Flow diagram of refined crystal sugar production process is presented in **Figure IV-5**.

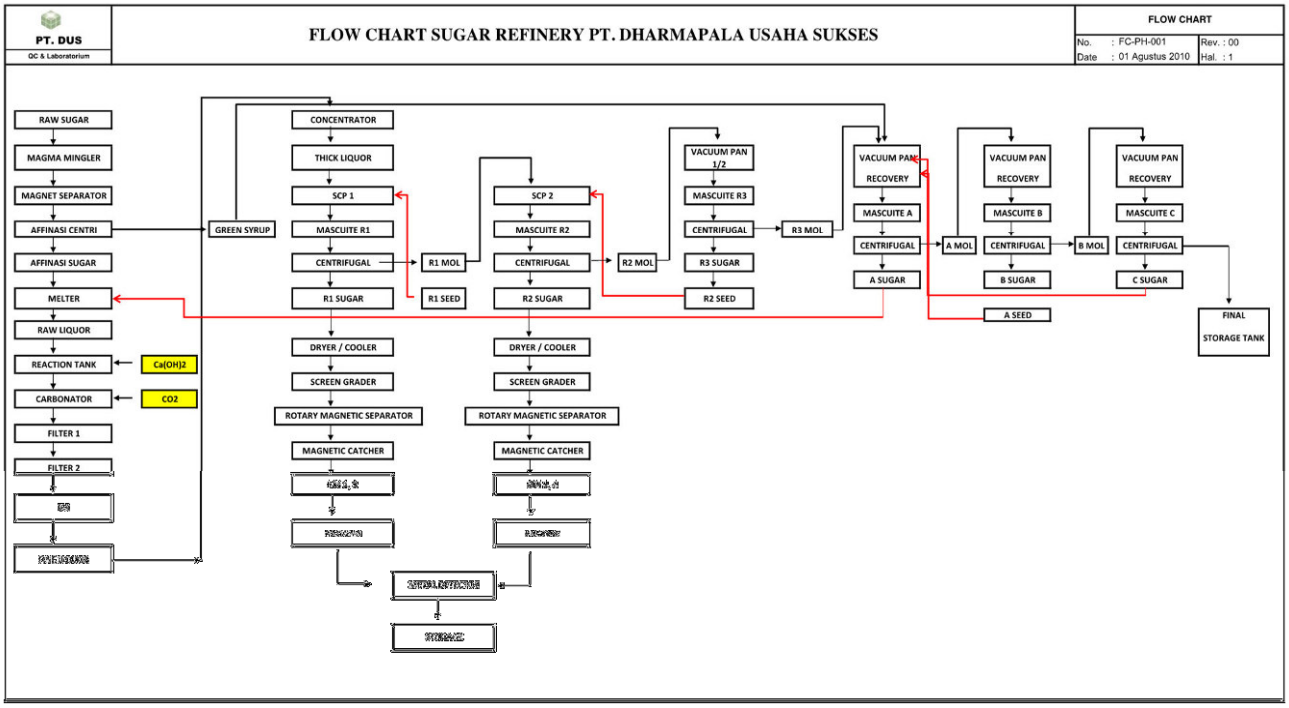


Figure IV-5. Refined sugar crystal processing diagram

Refined crystal sugar is the highest graded sugar which satisfy specific requirements as raw materials of sugar based industry (food, beverage and pharmacy). Refined crystal sugar is obtained by processing raw sugar from field which have color level of 1,200 ICUMSA. According to Indonesian National Standard (SNI), color level for refined crystal sugar is less than or equal 45 ICUMSA for R1 and up to 80 ICUMSA for R2. To meet this standard, refinery process is required.

The followings illustrate detail process of each stage in the refinery.

Entire surface of raw sugar crystal is initially covered by very thin molasses containing non-sugar substance (impurities) including color and ash. Affination process is performed to separate this thin molasses from sugar crystal surface as much as possible. Separation process is done mechanically through molasses layer softening by adding green molasses in the mingler having retention of 20 minutes to maximize friction between crystal surfaces at 92^{o} brix viscosity & at 70 ^{o}C. Using sugar centrifugal spinning tool, sugar crystal is detached from their surrounding

molasses layer. Detachment process is amplified by pouring hot water (60ºC-70ºC) into spinning tool.

Molasses-free raw sugar crystal, called affinated sugar, has purity of more than 99%. This affinate sugar is then inserted into sugar melter using screw conveyor. This process yields raw liquor that will be filtered using vibro machine having 80 mesh screen. The product is then pumped into purification process.

Purification process consists of carbonation, filtration and color removal processes. Carbonation process is a process of raw liquor purification by supplementing lime milk (product of calcium oxide blackout using hot water) and CO2 into raw liquor under controlled temperature and acidity to configure voluminous CaCO3 crystals & flocs. CaCO3 crystals adsorb non-sugar substance contained in raw liquor.

Raw liquor and lime milk are pumped from corresponding tank into reaction tank through flow meter which regulates the amount of raw liquor and lime milk discharged into reaction tank. The mixture of raw liquor and lime milk is completely stirred to reach acidity of 10.5-11.0 and temperature of 80 ºC-82 ºC.

From reaction tank, limed raw liquor flows into a series of carbonation tank. In carbonation tank 1, limed raw liquor is mixed with CO_2 gas to obtain acidity of 9.5-9.8. To this carbonated liquor, CO_2 is passed to reach acidity of 8.3-8.5 and temperature of 82 ºC in carbonation tank 2. The carbonated liquor then flows into carbonation tank 3 where acidity is set to 7.8-8.2 and temperature to 85 ºC. The whole process in carbonation tank is to produce $CaCO_3$ crystals & flocs as described in the following reaction:

$CaO + CO_2 + H_2O \rightarrow CaCO_3 + H_2O$. This reaction is completed in 45 minutes at 80 ºC.

To separate clear liquor from $CaCO_3$ flocs, rotary leaf fitter is used. This equipment produce homogeneous thickness of filter cake as the screening blade spins along with the filter. The homogeneous thickness of filter cake is required to reduce water consumption and to minimize sugar losses within filter cake.

Color removal is key process in the refined crystal sugar processing. Even though color removal has been performed in the affination and carbonation process, color level of the sugar liquor needs to be reduced further to produce high quality refined crystal sugar.

Color removal is conducted through ion exchange process using resin. In this process, resin is used to absorb color from solution to make shiny white sugar. There are seven columns of ion exchange resin. The product is called fine liquor which is sugar solvent that as clear as water. Cycle time in each resin ranges 12-16 hours.

By the time, resin will lose ion exchange ability. To restore the ion exchange ability, regeneration is performed in IER using NaCl, NaOH, HCl and water. Waste water from IER is treated using Brine Recovery System (BRS) to recover salt content from chemical content. Water containing salt is recycled, while water containing chemical substance is discharged into waste water treatment plant.

Fine liquor from previous process needs to be crystallized. First, water contained in the sugar solvent is evaporated through heat transfer process. After evaporation process, crystallization is continued in vacuum pan until good quality sugar crystal is formed.

Sugar crystal formed in the vacuum pan contains syrup, hence additional treatment using centrifuge is applied to separate the crystal & mother liquor. However, the sugar crystal produced from centrifuge has an amount of humidity. To produce dry sugar, drying process is employed by blowing hot and dry air into sugar crystal.

Dry sugar is passed through grading process to get relatively homogeneous size sugar crystal. After being graded, the crystalline sugar is weighed and packed of 50 kg sack for both R1 sugar and R2 sugar product. The sacked crystalline sugar is then stored in warehouse and ready to market.

Based on the refined crystal sugar processing explained above, during operation phase, transportation of raw sugar from Tanjung Intan port to the factory and sugar product from the factory to customer will continue as existing. Vehicle used for the transportation is truck. In addition, there are also daily activities of labors and management staffs.

C.3. Post-Operation Phase

DUS has a maintenance procedure to sustain the operation of their refined crystal sugar factory.

IV. DESCRIPTION OF THE EXISTING ENVIRONMENT

A. Climate

PT DUS Sugar Factory is located in a tropical wet climate with annual precipitation of 3,712 mm. Temporal distribution of precipitation is characterized by monsoonal pattern with distinct wet and dry seasons. Wet season occurs in the period of November-April, while dry season happens in the period of May-October. The distribution is also described by unimodal distribution where maximum mean monthly precipitation occurs in November (469 mm) and minimum mean monthly precipitation happens in August (55 mm).

Mean monthly minimum temperature ranges from 20.7ºC to 23.6ºC, mean monthly average temperature spans from 25.6ºC to 27.8ºC and mean monthly maximum temperature extent from 30.5ºC to 34.1ºC. Average temperature in dry season is less than it is in wet season due to the influence of cloud existence. The more the cloud, the more the reflected heat coming back to the earth surface, and the higher the temperature. In addition, humidity in this area ranges from 81% to 85%.

Wind direction varies from one month to another month. In January-March, wind direction is dominated from west along with west monsoon and produce more precipitation. In April, westerly wind is reduced, and more wind coming from southeast. From June through September, dominant wind blows from southeast and east where dry season occurs affected by east monsoon wind. During October and November, easterly wind diminishes and more wind blows from southeast. December is a transition month where dominant wind backs to west and southwest.

B. Air Quality

A periodic air quality monitoring has been performed in compliance to UKL-UPL Recommendation from Bupati Cilacap No. 660.1/608/30/2015 dated June 14th, 2015. Three sites established for emission monitoring are boiler chimney, generator I chimney and generator II chimney, while two sites for ambient air quality monitoring are DUS parking area and Klega field in the east of DUS factory.

B.1. Emission

Emission parameters measured in accordance with the Governor of Central Java Regulation No. 10/2010 on Emission Standard for Static Source (NO2, SO2, CO2, Velocity, Particle and Opacity) and the IFC Performance Standard on Environmental Air Emission Quality (General EHS Guideline).

The latest measurement was conducted on May 29th, 2017 in relation to expansion of the facility and the result is presented in **Table IV-1**. Based on **Table IV-1**, current level of all emission parameters under existing operation of DUS's refined crystal sugar factory are still below the threshold.

Table IV-1. Emission from power plant chimney

NO	PARAMETER	UNIT	METHOD	RESULT	THRESHOLD
1	NO_2	mg/m^3	SNI 19-7117.5-2005	216.981	700(1), 320(2)
2	SO_2	mg/m^3	SNI 19-7117.3.1-2005	256.765	700(1), NA(2)
3	CO_2	mg/m^3	Gas Detector	0.560	-
4	Total Particulate	mg/m^3	SNI 19-7117.3.12-2005	173.483	200(1)
5	Opacity	%	SNI 19-7117.11-2005	14	15(1)
6	Velocity	m/s	SNI 19-7117.1-2005	8.862	-

(1) Governor of Central Java Regulation No. 10/2010 on Air Emission Quality Standard in Central Java Province

(2) IFC Environmental Health and Safety Guidelines on Environmental Air Emission Quality (General EHS)

B.2. Ambient Air

Air quality parameters measured in accordance with the Governor of Central Java Regulation No. 8/2001 on Air Ambient Quality Standard in Central Java (NO_2, SO_2, CO, O_3, NH_3, H_2S, TSP, HC and PM10) and the IFC Performance Standard on Environmental Ambient Air Quality (General EHS Guideline). To comply the UKL-UPL Recommendation, a measurement was conducted on May 29th, 2017 and the result is presented in **Table IV-2**.Based on Table IV-2 current level of all ambient air parameters under existing operation of DUS's refined crystal sugar factory are still below the threshold.

Table IV-2. Ambient air quality

NO	LOCATION	PARAMETER							
		NO_2	SO_2	CO*)	O_3	NH_3	H_2S	TSP	HC
1	Parking area	65.93	66.63	2508	8.45	0.0570	0.0041	210.66	51.67
2	Klega field	56.64	85.11	2088	8.37	0.0655	0.0061	208.56	6058
Governor of Central Java Regulation (1)		316	632	15000	200	2.0	0.02	230	160
Unit		µg/m	µg/m^3	µg/m^3	µg/m^3	ppm	ppm	µg/m^3	µg/m^3

1) Quality standard in accordance with Governor of Central Java Regulation No. 8/2001 on Air Ambient Quality Standard in Central Java Province

In addition, a measurement was also conducted on August 17th, 2017 to assess spatial distribution of PT DUS Sugar Factory impacts on ambient air quality. The sampling location is shown in Figure IV-1. It can be seen that there are 2 sampling locations inside the factory and 2 sampling locations outside the factory. The result is presented in **Table IV-3**.

Table IV-3. Ambient air quality measured on August 17th, 2017

NO	PARAMETER	UNIT	RESULT				METHOD	THRESHOLD
			a	b	c	d		
1	TSP	µg/N m^3	222	199	64	57	SNI 19-7119.3-2005	230(1)
2	$PM_{2.5}$	µg/N m^3	59	50	14	12	ASTM D 4096	65(1), 75(2)
3	PM_{10}	µg/N m^3	135	121	46	38	ASTM D 4096	150(1),(2)

*Annotation : (a) Boiler area, (b) Klega field, (c) Crossing of Jl. Srikaya (150 m to the east), (d) Custom office (1200 m to the north); (1) Governor of Central Java Regulation No. 8/2001 on Air Ambient Quality Standard in Central Java Province. (2) IFC's Environmental Health and Safety Guidelines on Environmental Ambient Air Quality (General EHS Guideline).

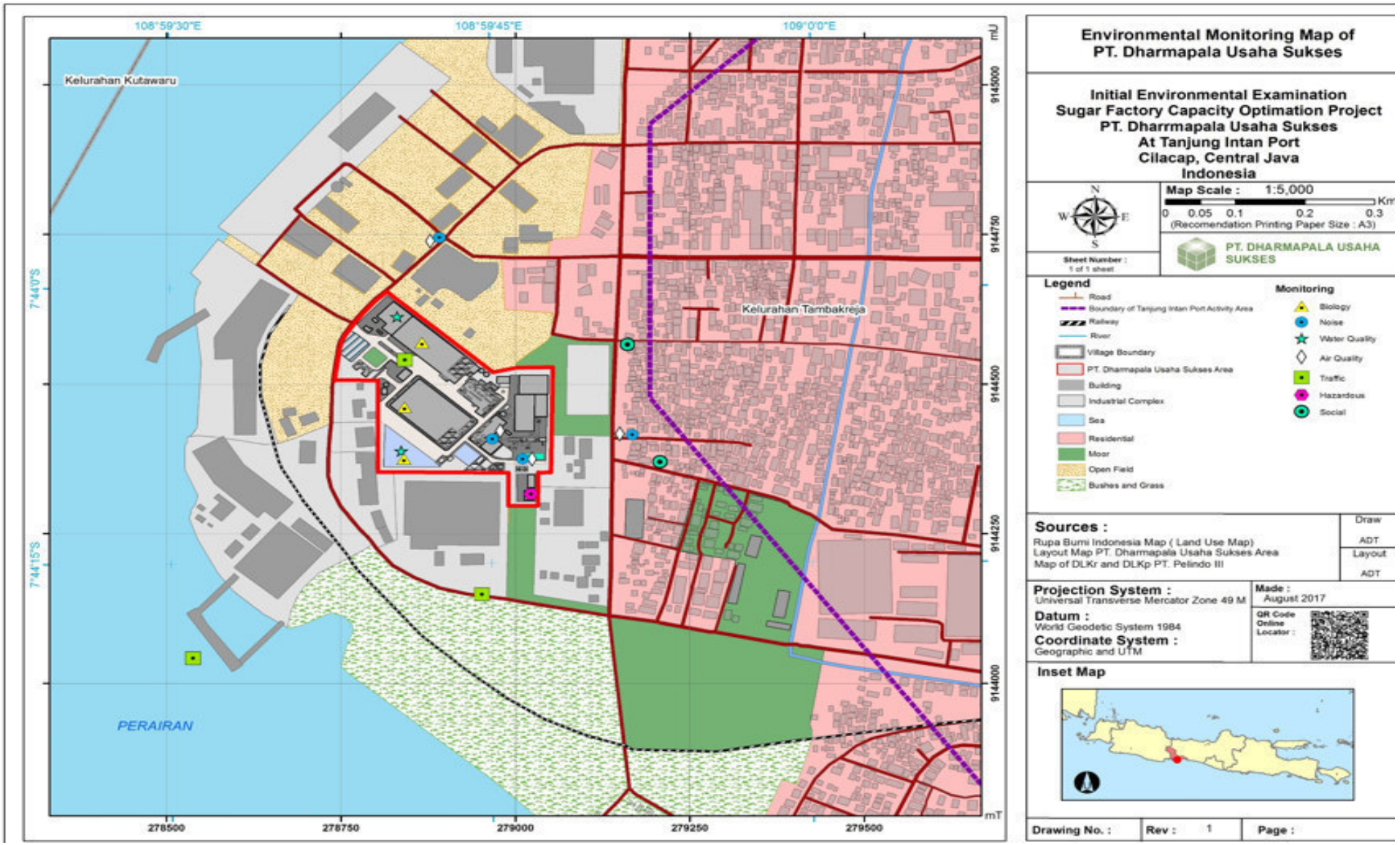


Figure IV-1. Monitoring Sampling locations

C. Noise

Refined crystal sugar processing requires operation of machine for production process, turbine for power generator and truck for transportation of raw materials and packaged sugar. These activities naturally produce certain level of noise. Measurement has been lately done in May 19th, 2017 in four locations, 2 sampling locations are inside the factory and 2 others are outside the factory, in accordance with existing UKL-UPL Recommendation and the result is presented in **Table IV-4**. The threshold is the Minister of Environment Decree No. KEP-48/MENLH/11/1996(1), IFC Performance Standard on Environmental Noise Management(2), and Minister of Labor and Transmigration Regulation No. Per.13/MEN/X/2011(3).

During the operation of DUS's refined crystal sugar factory, noise emitted from the factory is still less than the maximum allowable level.

Table IV-4. Noise level monitoring

NO	LOCATION	RESULT	THRESHOLD (dBA)
1	Parking area	60.2	70(1),(2)
2	Klega field	58.9	70(1),(2)
3	Settlement	54.1	55(1),(2)
4	Power House	82.4	85(3)

(1) Minister of Environment Decree No. KEP-48/MENLH/11/1996: 70 dBA for Industrial Zone and 55 dBA for Residencial (3 dBA tolerance).

(2) IFC Environmental Health and Safety General Guidelines: 70 dBA for Industrial and Commercial and 55 dBA for Residencial (daytime).

(3) Minister of Labor and Transmigration Regulation No. Per.13/MEN/X/2011: 85 dBA for 8 hours exposure on labor.

D. Water Quality

Due to the nature of refined crystal sugar processing, operation of DUS's refined crystal sugar factory and its utilities produces waste water of 180 m^3/day. To overcome this, DUS has managed and operated a waste water treatment plant (WWTP) to treat waste water from the factory before disposing to Donan river, 1 km in the west PT DUS Sugar Factory. In addition, DUS has been granted Waste Water Disposal Permit through Bupati Cilacap Decree No. 660.1/691/24/2017 dated May 12th, 2017.

D.1. Effluent

WWTP is employed to treat effluent from DUS's refined crystal sugar factory. The effluent coming from this WWTP is then disposed into Donan river. The existing WWTP has capacity of

300 m^3/day with current load of waste water treated in WWTP is 180 m^3/day, which is quite far from its maximum capacity. It is expected that waste water produced by the Project is less than 100 m^3/day.

Recent measurement on the waste water quality was done in May 6th, 2017 and the result is presented in Table IV-5. As can be seen in Table IV-5, waste water quality in the WWTP outlet is still below the threshold regulated by the Regulation of Central Java Province No. 5/2012 Appendix 9 on Quality Standard for Waste Water from Sugar Factory. However, BOD content is above the threshold set by IFC Performance Standard on Environmental Waste Water Quality for Sanitary System.

Table IV-5. Waste water quality of WWTP

NO	LOCATION	pH	TSS	BOD	COD	Sulfide	FAT, OIL AND GREASE
1	Inlet	7.8	1,382	2,483.6	3.149	0.328	18
2	Outlet	7.3	24	39.6	81	0.042	4
Quality Standard		6-9[(1),(2)]	100[(1)],50[(2)]	50[(1)],50[(2)]	100[(1)],250[(2)]	0.05[(1)]	5[(1)],10[(2)]

1) Regulation of Central Java Province No. 5/2012 on Amendment of Central Java Province No. 10/2004 on Waste Water Quality Standard
2) IFC's Environmental Health and Safety Guidelines on Sugar Manufacturing.

D.2. Stream Water

PT DUS Sugar Factory is located in the Donan watershed. In the downstream of Donan river where waste water from DUS WWTP discharged, the river flow rate is about 2900 m^3/s. While total suspended solid (TSS) concentration in Donan river is still below the regulated threshold for Class III water body, total dissolved solid (TDS) remains big issue. Many activities in the river upstream contribute to the high TDS in the river downstream. Thus, any stream water parameter measured in this river does not necessarily reflect the contribution of DUS's refined crystal sugar factory. No recent measurement on stream water quality in the Donan river can be reported.

D.3. Sea Water

The downstream of Donan river where the PT DUS Sugar Factory located is directly connected to the sea. Hence, any particular matter discharged from the PT DUS Sugar Factory into Donan river will be immediately flowed into the sea. Recent measurement on sea water quality have been conducted in April 8th, 2017 in accordance with Minister of Environment Decree No. 51/2004 on Sea Water Quality Standard for Harbor Water and the result is presented in Table IV-6. It can be seen that all parameters are still below the regulated threshold.

Table IV-6. Sea water quality

NO	PARAMETER	UNIT	RESULT		THRESHOLD
			Station 1	Station 2	
PHYSICAL					
1	Clarity	m	3,1	3,2	> 3 m [(a)]
2	Odor	-	Natural	Natural	No odor
3	Total suspended solid	mg/L	52	31	> 3 m [(b)]
4	Solid waste	-	Nil	Nil	Nil
5	Temperature	°C	28	28	Air temperature ± 3
6	Oil layer	-	Nil	Nil	Nil
7	Turbidity	NTU	4	2	< 5
CHEMICAL					
1	pH	-	8,1	8,0	6,50 - 8,5 [(b)]
2	Salinity	%	Natural	Natural	Natural [(b)]
3	Total ammoniac (NH3-N)	mg/L	0,264	0,281	0,3
4	Sulfide (H2S)	mg/L	0,022	<0,014	0,03
5	Total Hidrocarbon	mg/L	0,841	0,562	1
6	Total fenol	mg/L	0,001	0,001	0,002
7	PCB (*Polychlor Biphenyl*)	mg/L	-	-	0,01

NO	PARAMETER	UNIT	RESULT		THRESHOLD
			Station 1	Station 2	
8	Surfactan (MBAS)	mg/L	0,925	0,634	1
9	Fat, oil and grease	mg/L	4,69	4,27	5
10	TBT (Tri Butil Tin)	mg/L	-	-	0,01
11	Mercury (Hg)	mg/L	<0,002	<0,002	0,003
12	Cadmium (Cd)	mg/L	0,003	0,003	0,01
13	Copper(Cu)	mg/L	0,31	0,024	0,05
14	Zinc (Zn)	mg/L	0,87	0,069	0,1
BIOLOGICAL					
1	Coliform Total	MPN/100 ml	724	481	1000

Annotation : Station 1 and Station 2 are sampling points located 100 m and 200 m to the south of Tanjung Intan jetty respectively.

E. Biota

Biota is one of bioindicators which used to asses the quality of environment in terrestrial and aquatic environment and how it changes over time due to anthropogenic disturbances or natural stressors.

E.1. Terrestrial Biota

Biodiversity of terrestrial biota is a measure to assess the impact of human activities on birds, amphibians, etc. As DUS's refined crystal sugar factor location is primarily an industrial zone where terrestrial biota is not mandatory in the applicable UKL-UPL Recommendation. Accordingly, it is not described in this study.

E.2. Aquatic Biota

The disposal of WWTP output into Donan river and subsequently into sea water results in the derivative impacts in term of disturbance to aquatic biota. Recent condition shows that the biodiversity index in sea water downstream of the Donan river is quite low as can be seen in *station 1 and station 2 are sampling points located 100 m and 200 m to the south of Tanjung Intan jetty respectively.

. This data was obtained from field measurement in May 19th, 2017 in accordance to existing UKL-UPL Recommendation. Based on field monitoring, there is no fishing activities or coral presence since the area is inside harbor pool and shipping line.

Table IV-7. Biodiversity index in sea water

NO	GENUS	IND/L	
		Station 1	Station 2
A. Plankton			
1	Actinastrum	0	2
2	Ankistrodesmus	2	1
3	Asterionella	1	3
4	Chorella	1	1
5	Cyclotella	1	1
6	Diatoma	2	3
7	Fragilaria	18	24
8	Gyrosigma	1	0
9	Lyngbya	2	1
10	Naviculla	3	1
11	Nodularia	1	3
12	Oscillatoria	1	1
13	Phormidium	0	2
14	SISPAella	1	4
15	Synedra	1	0

NO	GENUS	IND/L	
		Station 1	Station 2
16	Ulothrix	0	1
17	Zygnema	5	7
	Total species	14	15
	Total individual	40	55
	Biodiversity index	1,00	1,00
	Dominance index	0,45	0,43
B. Bentos			
1	Epinebalia	14	18
	Total species	1	1
	Total individual	14	18
	Biodiversity index	1	1
	Dominance index	1	1

*station 1 and station 2 are sampling points located 100 m and 200 m to the south of Tanjung Intan jetty respectively.

F. Transportation

DUS's refined crystal sugar factory is located within Pelindo industrial zone such that the number of vehicle passing by the internal road is limited. As a result, the traffic in Jalan Laut Jawa is significantly light. Traffic flow recorded during the latest survey is 3 vehicles/minute during peak hours. During construction of the Project, it is predicted that the average number of truck operated for mobilization of materials and equipment will be about 10 vehicles/day which yields very small impact on the traffic along Jalan Laut Jawa.

G. Social

A series of periodic survey have been made during the operation of DUS's refined crystal sugar factory and the result is presented in Appendix 1 (Social Monitoring Report). Recent survey was conducted in 2017. The result shows that the majority of people in the affected area positively accept the existence of DUS's refined crystal sugar factory. Job opportunity has been increased during the operation of DUS's refined crystal sugar factory in formal and informal sector. In formal sector, many people work in the factory. In informal sector, many people were able to create new job in form of boarding house, store, restaurant, etc. No complaint, grievance, negative perspective nor social jealousy were found during the survey.

H. Occupational Health

Emission of TSP into the air can potentially cause adverse impacts to people's health in the surrounding community. The common diseases that usually found due to TSP is Upper Respiratory Tract Infection (ISPA). The data collected the Cilacap Public Health Center show that 2318 people suffer from ISPA disease. In addition, there is also increasing trend in the number of people suffering from ISPA with a rate of ±0.2%. On the other hand, the population growth in South Cilacap District is ±0.5% which is larger than the trend of people suffering ISPA.

V.ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

The new 6MW power plant will be built inside the existing area of DUS's refined crystal sugar factory. No change is expected in the affected area. Thus for this project, administrative, social and ecological boundaries are still applicable in the analysis of anticipated environmental impacts.

Considering its successful application to avoid, and when avoidance is not possible, minimize, mitigate, and/or offset adverse impacts and enhance positive impacts during the operation phase of DUS's refined crystal sugar factory. Current mitigation measures will be adopted if no change in the scale of impacts identified. If new impacts identified and/or scale of impacts augmented, enhancement of current mitigation measures will be proposed.

A. ANTICIPATED ENVIRONMENTAL IMPACTS

Air quality is anticipated to be decreased due to activities performed in the Project during construction and operation phase. Some activities that identified to cause adverse impacts on air quality in the construction phase are mobilization of materials and equipment. Materials and equipment for construction will be transported into the Project location using truck that will contribute to greenhouse gas generation. Considering the Project scope, it is anticipated that this impact will be spatially limited from port entrance in the crossing of Jalan Laut Jawa and Jalan Niaga to PT DUS Sugar Factory location.

A.1. Air Dispersion Modelling

To understand spatial variability of air quality, an air quality model has been developed using actual air quality measurement. The method of developing air quality is attached as an annex along with this document. The result is presented below.

The model used on mapping of particulate as well as gaseous air pollutants due to stack activities at PT. DUS is advanced model type. Yet we modeled in narrowed area (receptor at the radius of 10 – 20 km from the investigated sources). In the course of modeling it requires source emission characteristics (such as bulk gaseous exit velocity from the stack, exit plume temperature, inner stack diameter, land contour i.e surface roughness, local topography and building, atmospheric condition i.e wind speed-direction, atmospheric stability and mixing height). Dispersion model that will be used is based on AERMOD developed by EPA. Receptor area, in which ground air pollutant concentration was estimated, was gridded at 50 m x 50 m with Cartesian network.

A.1.1. Input Model Description

Several parameters should be collected to run the model properly. These parameters and the related sources were depicted in **Table V-I** as follows:

Table V-1. Data Input for the Model

No.	Parameter	Unit	Data Sources
A. Emission Sources Characteristics			
1	Stack location (dust and gaseous emitter)	UTM coordinates	Data from PT.DUS
2	Emission load flow	g/s	Data from PT.DUS
3	Stack elevation	meter	Data from PT.DUS
4	Plume exit velocity	m/s	Data from PT.DUS
5	Exit gas temperature	K	Data from PT.DUS
6	Stack inside diameter	meter	Data from PT.DUS
B. Receptor Information			
1	Location and the boundary	UTM coordinates	Map interpolation, field observation
2	Reseptor-Source distance	meter	Map interpolation, field observation
C. Hourly meteorology data			
1	Wind speed	meter/detik	Data from BMKG
2	Wind direction	derajat (°)	Data from BMKG
3	Ambient temperature	K	Data from BMKG
4	Atmospheric stability	A - F	Pasquil method
5	Mixing height	meter	Typical to other location
D. Ambient-Emission Measurement			
1	Conventional pollutants (NOx, SOx)	µg/m3	Data from PT.DUS
2	Dust (TSP, PM10)	µg/m3	Data from PT.DUS

Note: Hourly meteorological data was derived from meteorological station of Cilacap (code 111) ; Lat,-07:43:48 E, Long +110:30:00 E, at elevation 6 m

Meteorological Data

Based on the analysis of wind (windrose) at the location, it can be concluded that the wind direction tends to blow to Southeast and Northwest direction during January to June with mild speed. Except in February where a portion of wind blows from Northeast. The same pattern also took place during July to December period, however different pattern of blowing wind was shown at August (certain portion blowing from Southwest) and December (certain portion blowing from Northeast).

In the meteorological module, we estimated atmospheric stability class due to inconsistency of solar radiation data and no data on cloud cover at night then we had an assumption as follows:

Table V-II Stability Class Used in This Study

Period	Stability class*	Number stability class
01 – 05 hr	F	6
06 – 09 hr	E	5
10 – 15 hr	B	2
16 – 18 hr	E	5
19 – 24 hr	F	6

* Pasquill Turner stability class

For mixing height data, we adopted typical mixing height data in other city in Indonesia i.e Surabaya city (Sari et.al, 2015) and theroretical diurnal mixing height in the literatures. Based on this work, then the mixing height data are set as follows: during 1 – 8 hr : 700 m, 9 – 16 hr : 800 m and 17 – 24 hr: 700 m. All of this condition applied throughout the year.

A.1.2. Ambient Air Modelling Results

TSP Parameters

Based on the results of air dispersion model, we get the result of spatial distribution as shown in the following pages. Based on particulate ambient concentration measurement (Table 3.4), we can conclude the remote concentration of particulate (TSP) was around 50 – 70 µg/Nm^3 **(Figure VI-1)**. This concentration was located far and not in downwind position from the factory stack. Generally the 24 hours maximum concentration (30 µg/Nm^3 at Southwest in the sea) derived from this stack were still under ambient air quality standard. The contribution of stack emission to ambient concentration was quite small relative to surrounding TSP ambient concentration i.e around 3 µg/Nm^3. Proposed stack with slightly different characteristic also show less ambient concentration than existing stack. This might be higher exit velocity of the proposed stack than the existing stack.

PM_{10} Parameters

Likewise TSP parameter, the maximum daily concentration of PM_{10} was still below the ambient air quality standard. It shows around 1 µg/Nm^3 compare to existing remote concentration i.e the PM_{10} remote concentration around 30 – 50 µg/Nm^3.**(Figure VI-2)**. Thus from the particulate view (TSP and PM_{10}), the contribution of particulate stack emission to particulate ambient concentration is relatively small. Likewise as in TSP parameter, the proposed stack also emit

a little bit less emission therefore the ambient concentration between existing and proposed project were comparable.

Table V-1. The ambient concentration taken from field measurement

Parameter	Unit	Results				Threshold
		Boiler area	Parking area	500 m to the East	1200 m to the North	
TSP	µg/Nm^3	222	208	64	57	230(1)
$PM_{2.5}$	µg/Nm^3	59	56	14	12	65(1), 75(2)
PM_{10}	µg/Nm^3	135	120	46	38	150(1),(2)

(1) Governor of Central Java Regulation No. 8/2001 on Air Ambient Quality Standard in Central Java Province.

(2) IFC's Performance Standard on Environmental Ambient Air Quality (General EHS Guideline).

Higher particulate ambient concentration inside the factory (the TSP was around 200 µg/Nm3) could be attributed to other sources than stack source related emission such as material handling (loading, unloading), road dust emission, other fugitive emission.

SOx parameters

Emission of SOx (which later refer to SO2), based on field measurement, was below the emission standard. However the spatial distribution was higher at little bit far from the stack. Maximum daily concentration shows 1000 µg/Nm3 at the Southwest of the factory (SO2 ambient standard is 365 µg/Nm3). While at the surrounding area, particularly in residential area maximum daily concentration i.e 100 µg/Nm3 meet the ambient standard (Figure VI-3). For proposed stack, the ambient concentrations is still under air quality standard.

NOx parameters

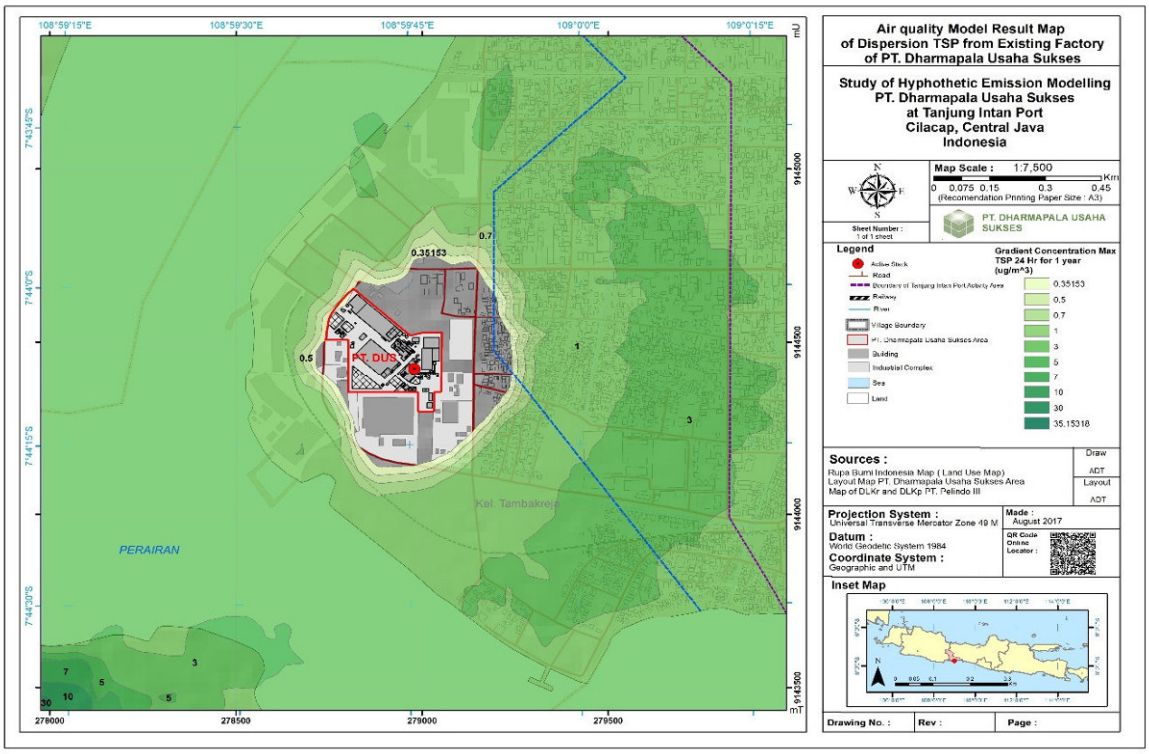
Based on emission measurement conducted by Balai Hiperkes Yogyakarta, the coal fired boiler emit NO2 below the emission standard. Maximum daily ambient concentration with refers to model output reached up to 500 µg/Nm3 (Southwest side). While at surrounding factory the ambient concentration reach 70 µg/Nm3 which is far from ambient quality standard i.e 150 µg/Nm3. For proposed stack, the ambient concentrations were still under air quality standard (Figure VI-4). Thus, based on air dispersion modeling, all the ambient parameters meet the Governor Decree No.8/2001 using existing stack as well as proposed stack design.

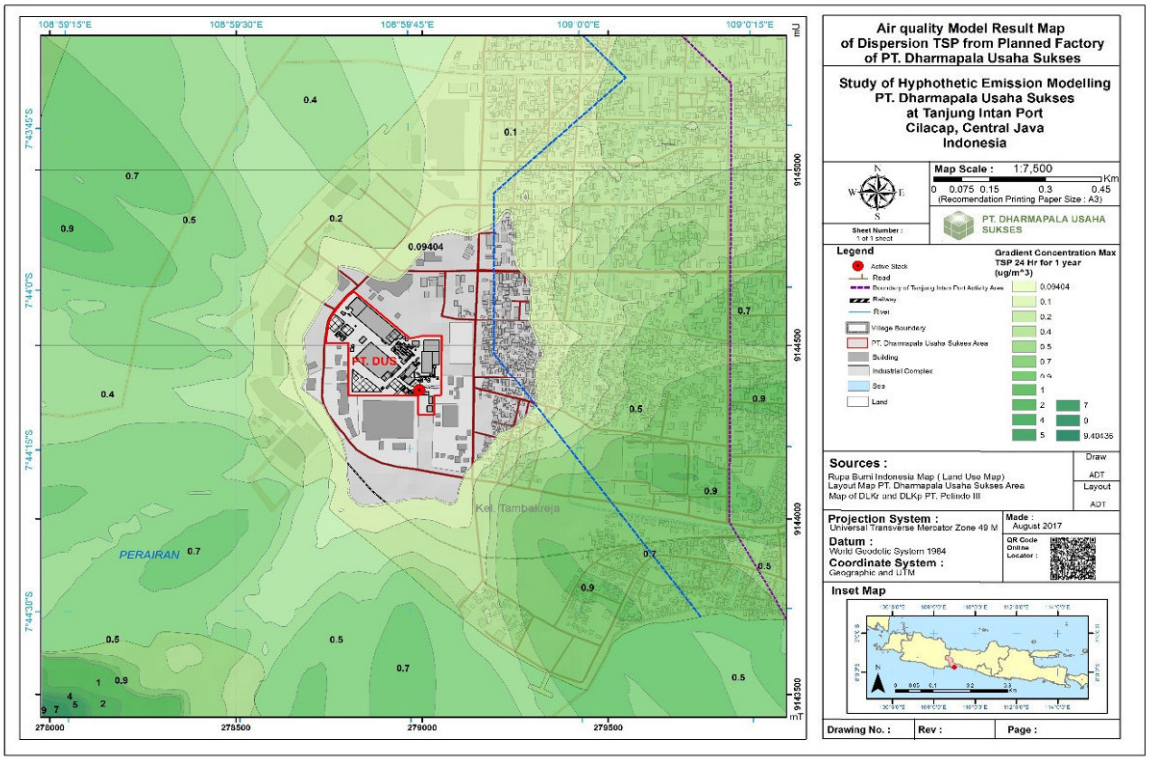
During operation phase, the new power plant along with new process equipment will be operated while the current power plant will be used as a backup. Operating power plant uses

coal for the boiler. Operation of power plant with boiler capacity of 75 ton/hour and turbine capacity of 6,000 kW will slightly increase coal requirement and subsequently rise green house gas emission from the stack/chimney. However, based on current air quality modeling, green house gas emission is still below the regulated threshold. The air quality modeling result also suggest that higher concentration of TSP in the factory area is not merely coming from stack/chimney. Instead, it is combined contribution of material handling, road dust emission and other fugitive emission. Hence, it could be assumed that operation of new power plant along with new process equipment will not make significant impact on air quality and can be managed with current mitigation measures.

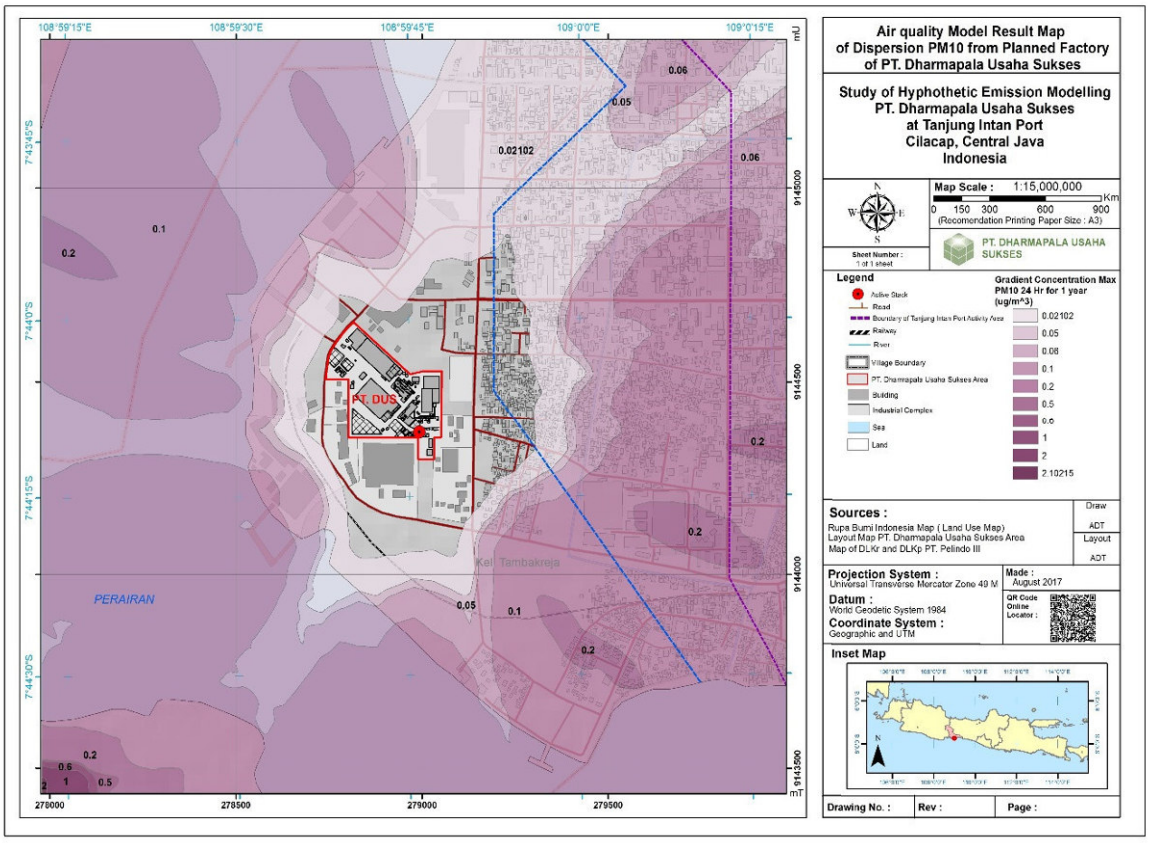
In addition to power plant operation, coal storage, operation of factory machinery, operation of vehicle for raw materials and sugar product transportation and vehicle for labor moving are identified to have adverse impact on air quality. However, new process equipment will be equipped with modern and more environmental-friendly technology which produces less green house gas into the atmosphere. Therefore, the impacts of new process equipment on the air quality is expected to be the same as or even better. On the other hand, two emergency generators are rarely operated. Thus, its impacts on air quality can be neglected.

- **Figure VI-1 Ambient Air Pollutant Dispersion TSP (Existing and Proposed Stack)**





- **Figure VI-2. Ambient Air Pollutant Dispersion PM_{10} (Existing and Proposed Stack)**



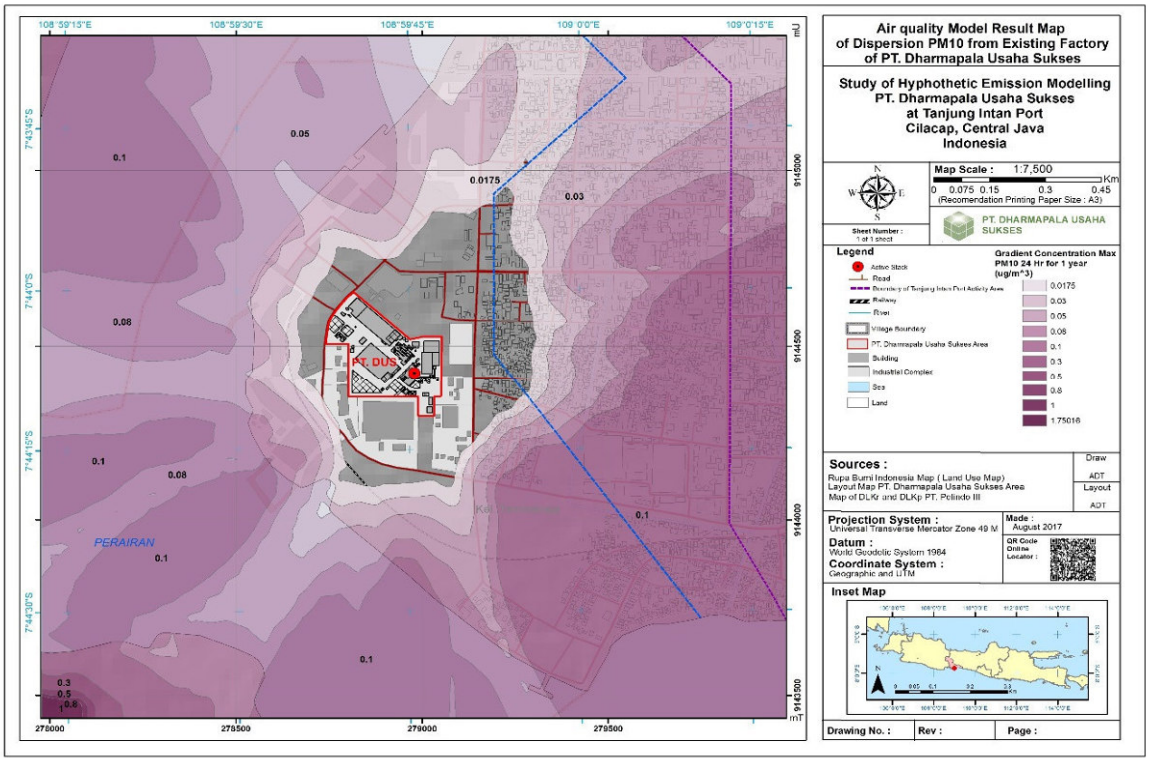
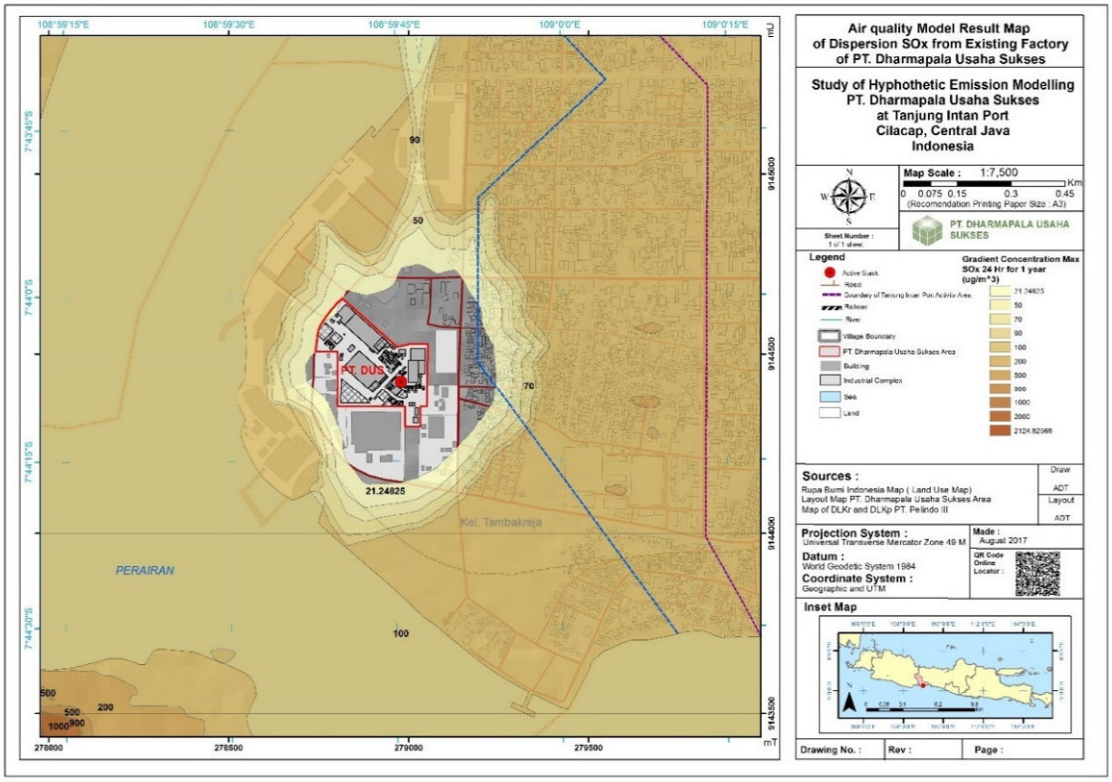
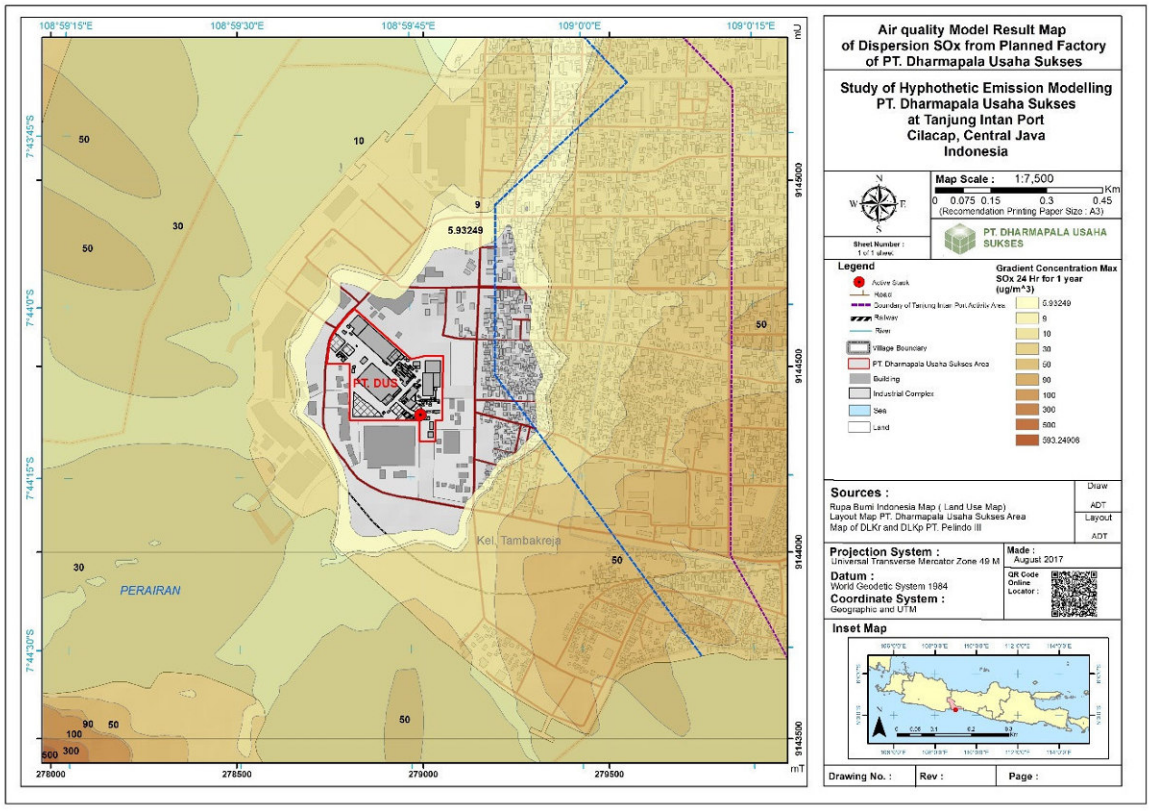
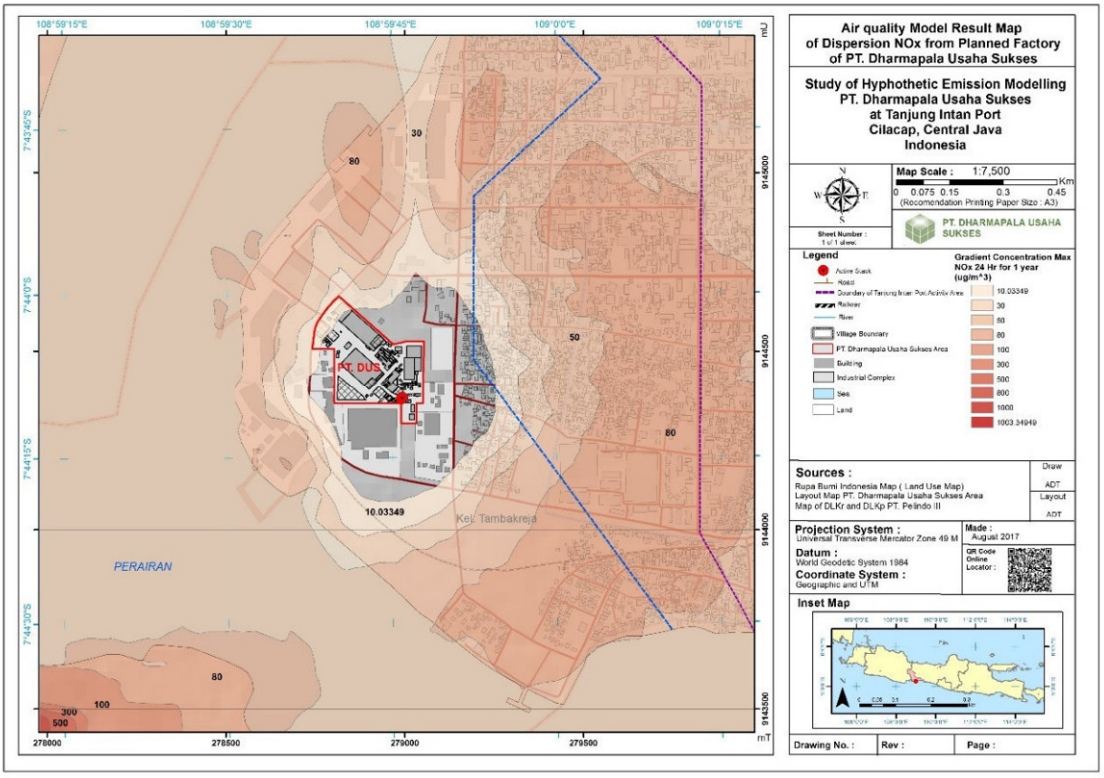


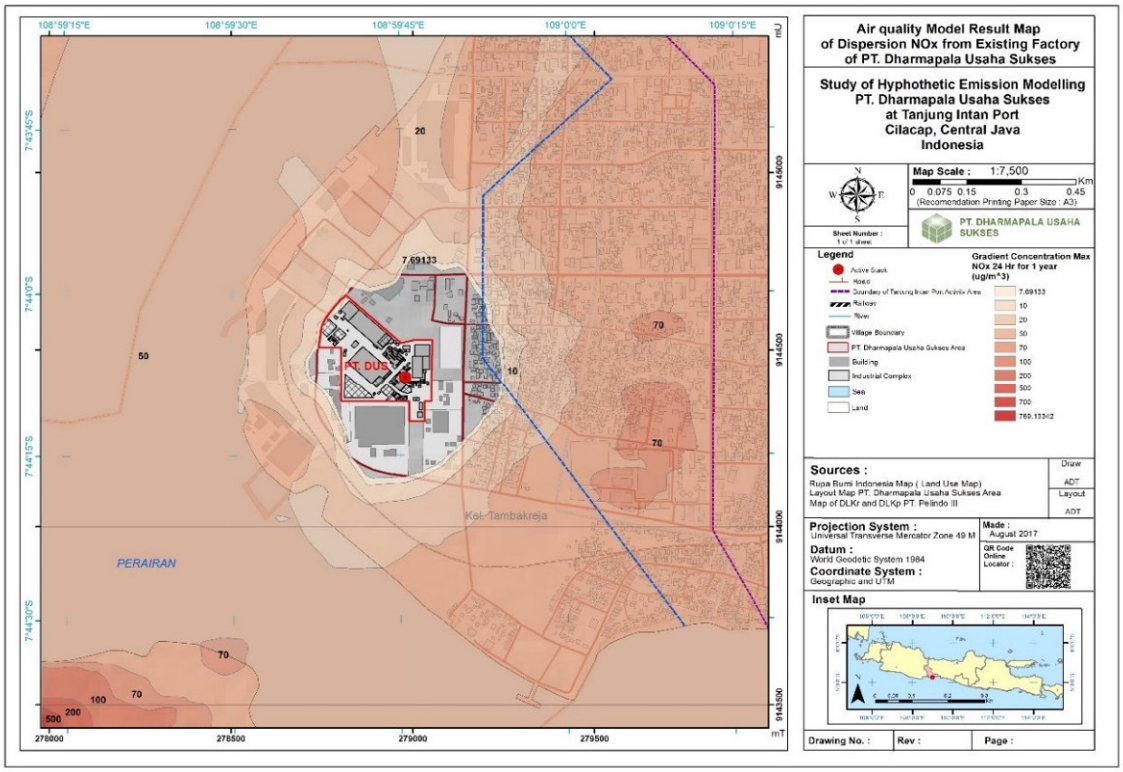
Figure VI-3 Ambient Air Pollutant Dispersion SOx (Existing and Proposed Stack)





- **Figure VI-4. Ambient Air Pollutant Dispersion NOx (Existing and Proposed Stack)**





A.2. Increased Noise

Considering the scale of the Project, it is expected that mobilization of materials and equipment will be completed in a short time. The impacts on noise level in PT DUS Sugar Factory location and its surrounding is anticipated to be delicate. . However, to describe the spatial distribution of noise from the factory machinery, a noise model has been developed using 39 measurement points. The method is attached as an annex along with this document. The result of noise modeling can be summarized below.

A.2.1. Dispersion Prediction Model

It is a situation where sound power level at known noise source difficult to measure. Luckily, sound level at that known source can be predicted using measured noise level at some points from the source using the following formula:

$$L_2 = L_1 - 20 \cdot \log\left(\frac{r_2}{r_1}\right) dBA \qquad 1)$$

Where :

L_2 = noise level at radius of r_2 from source (dBA)

L_1 = noise level at radius of r_1 from source (dBA)

In addition, cumulative noise from n sources with different noise level is:

$$L_{eq} = 10 \cdot log\left(\sum_{i=1}^{n} 10^{L_i/10}\right) dBA \qquad 2)$$

A.2.2. Data Collection

Day Night Noise Level Measurement Method

Day night noise level is measured using sound level meter every 5 seconds for 5 minutes in each sampling point. Day measurement is conducted from 06.00 in the morning until 22.00 at night, while night measurement is done form 8 hours between 22.00 at night until 06.00 in the morning. Every measurement should represent certain time interval for at least 4 measurements during daytime and 3 measurements on nighttime that can be seen in the following:

- L1 is taken at 7.00 representing time interval of 06.00 - 09.00
- L2 is taken at 10.00 representing time interval of 09.00 - 11.00
- L3 is taken at 15.00 representing time interval of 14.00 - 17.00
- L4 is taken at 20.00 representing time interval of 17.00.- 22.00
- L5 is taken at 23.00 representing time interval of 22.00 - 24.00
- L6 is taken at 01.00 representing time interval of 24.00 - 03.00
- L7 is taken at 04.00 representing time interval of 03.00 - 06.00

Equivalent Noise Level Measurement Method

Equivalent noise level is measured using sound level meter every 5 seconds for 5 minutes in each sampling point during working hour (8 hours) in accordance with working shift of 24 hours. Working shift in DUS is 07.00 – 15.00 (Shift I), 15.00 – 23.00 (Shift II) and 23.00 – 07.00 (Shift III).

Sampling Points

Sampling points are designed based on the sector or activities as stated in the applicable regulation : Minister of Environment Decree No. KEP-48/MENLH/1/1996 for industrial and settlement area and Minister of Labor and Transmigration Regulation No. Per.13/Men/X/2011 on Physical and Chemical Threshold in Work Place for work place. For the first category, 21 sampling points are located within factory area and 10 sampling points in the settlement area. For the second category, 24 sampling points are designed in the work place as shown in **Figure and Figure.**

A.2.3. Dispersion Mapping

Grid Method

Gridding method results in a regular grid size. A grid is a square consists of column and row space. Meeting point of column and row is called a node. Each row contains grid nodes with same Y coordinate and each column consists of grid nodes with same X coordinate. Gridding process yields Z value on each grid node by interpolation or extrapolation of irregular points. Grid size is set differently between inside and outside factory. Inside the factory, the grid size is 0.25 x 0.25 m, while outside the factory, the grid size is 2.5 x 2.5 m

A.2.4. Average Weighting Interpolation Method

There are many variants of gridding method based on how the weighting factor calculated and applied to predict value in the destination grid in during interpolation. In this study, average weighting interpolation algorithm. This algorithm implies that while all other components remain the same, the largest weight is produced in the grid joint. The following describes how average weighting applied given N number of Z values (Z1, Z2, …., ZN):

$$G_j = \sum_{i=1}^{N} W_{ij} Z_i \qquad 3)$$

Where :

G_j = interpolated value at grid j

N = number of values used in interpolation on each grid

Z_i = Z value at grid i

W_{ij} = weight of Z_i on interpolated point G_j

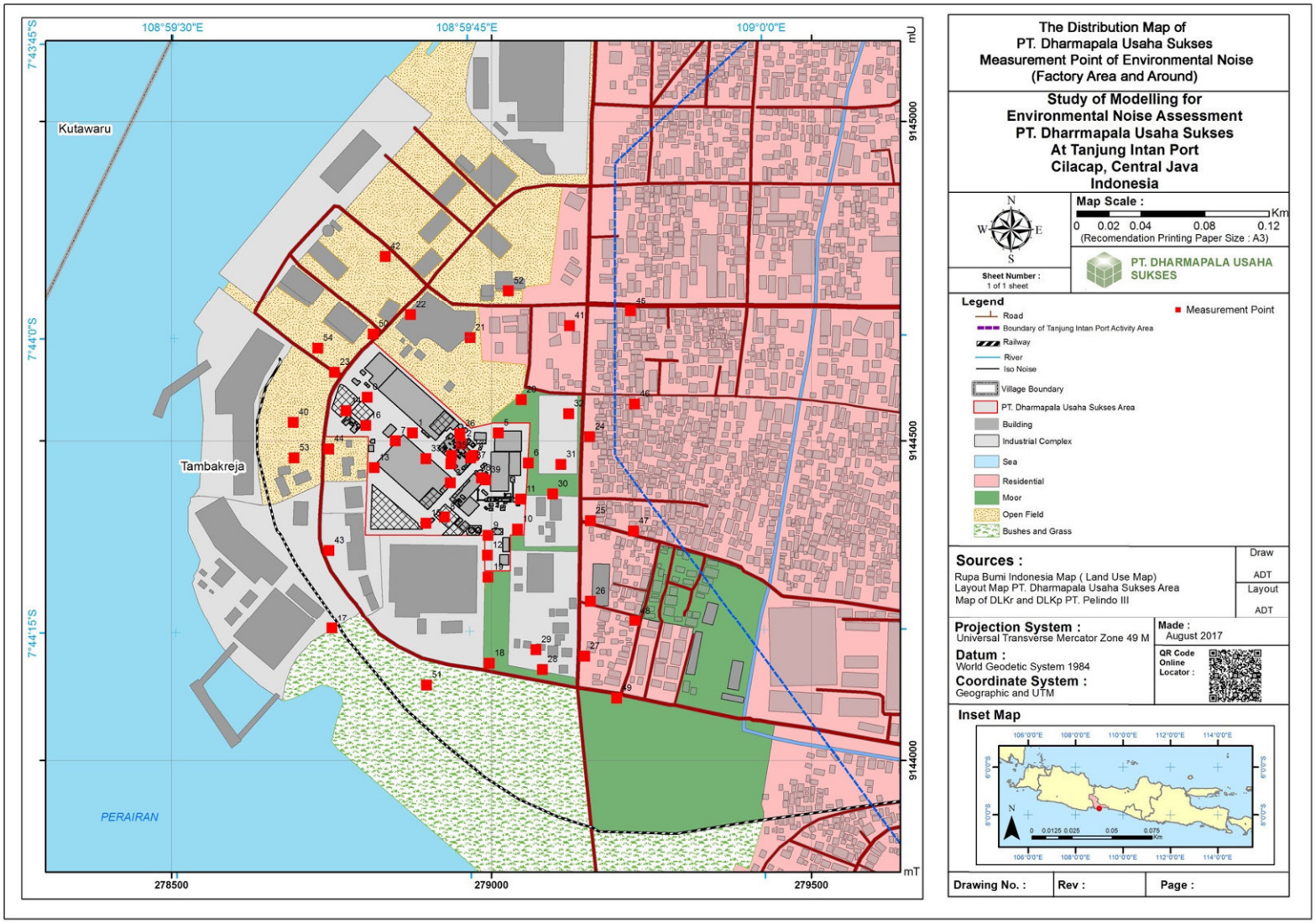


Figure VI-5. Sampling points location

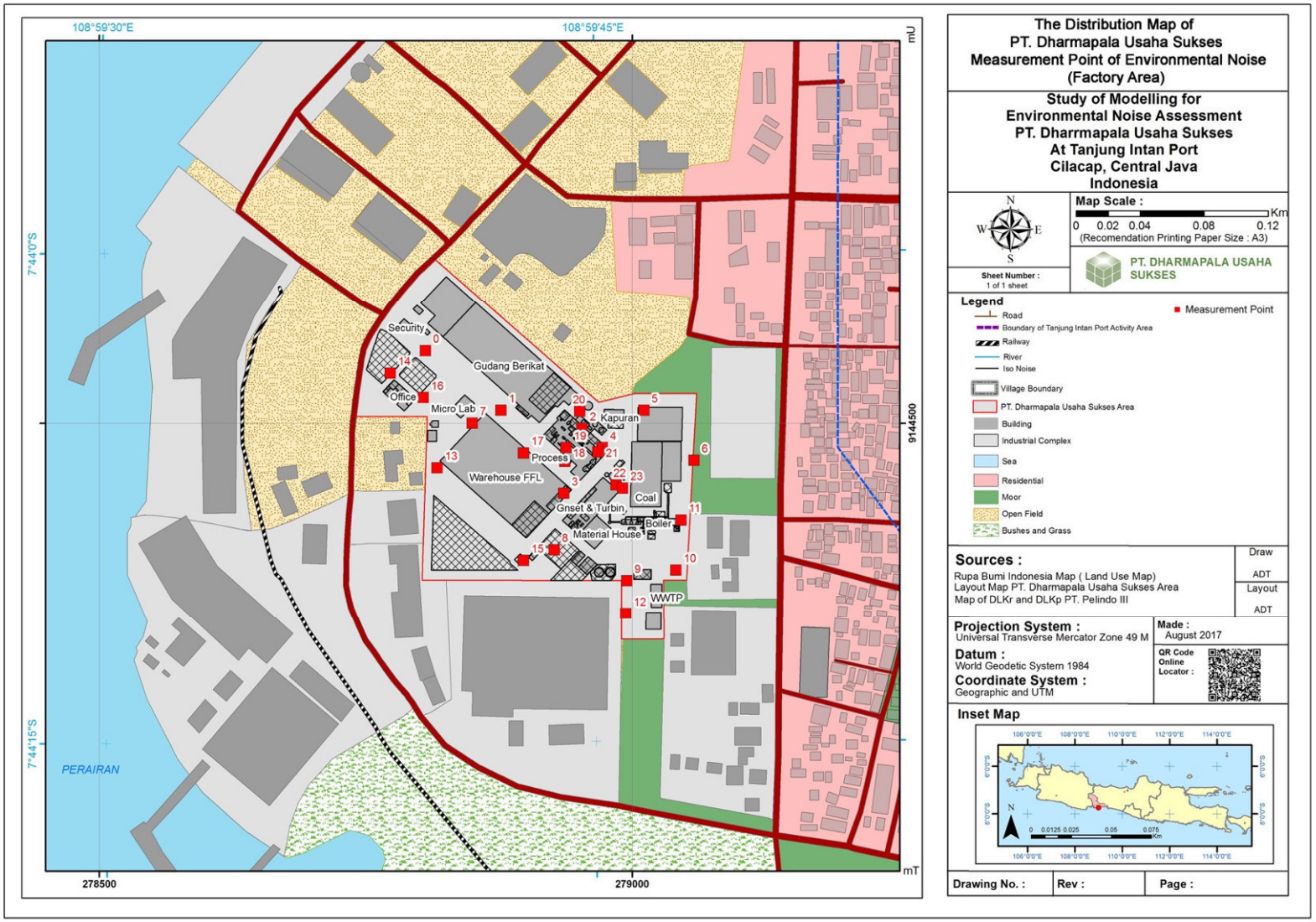


Figure VI-6 Sampling points location inside DUS factory

A.2.5. Noise dispersion in surrounding environment

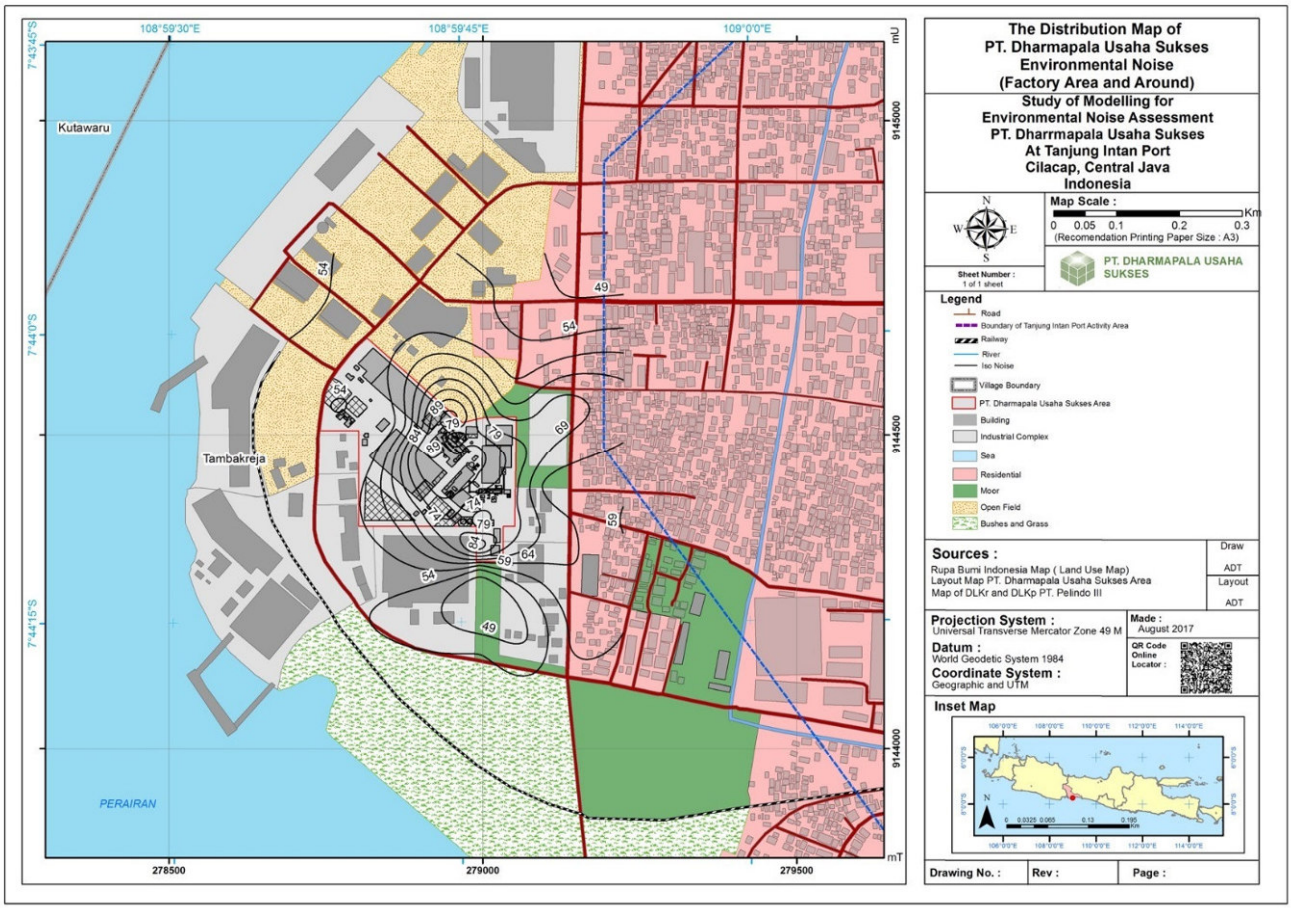
Noise dispersion in surrounding environment includes entire considered area such as noise level dispersion at work place, industrial zone and adjacent settlement.

In DUS's crystal sugar processing area, dominant sources of noise are processing equipment, turbine and WWTP blower. In this area noise level ranges 82 – 89 dBA. According to regulation, in a work place such as processing area, area between processing and turbine where noise level is more than 85 dBA / 8 hours, labor must wear earmuff. In addition, in a work place where noise level ranges 80 – 85 dBA such as boiler and WWTP blower, labor is required to wear earplug.

In the Pelindo industrial zone, noise level in the entire area is still below the threshold ad regulated by Minister of Environment Decree No. KEP-48/MENLH/1/1996 and Environmental, Health and Safety (EHS) Guideline for Noise Management issued by International Finance Corporation (IFC) where noise level threshold for industrial zone and harbor zone is 70 dBA.

Noise level for settlement ranges 59 – 69 dBA. However, as stated earlier, noise occurring in this area is originating from multiple sources. In addition, this settlement is within Pelindo industrial zone where the applicable threshold is 70 dBA (Figure VI-7)

Figure VI-7. Noise level at surrounding environment



A.2.6. Noise Level at DUS Factory Area

Noise level at DUS factory area varies from 57 dBA to 87 dBA. In the southwest and north side of processing area and locations between processing area and turbine, noise level is 87 dBA which is higher than the threshold designated by Minister of Labor and Transmigration Regulation No. Per.13/Men/X/2011. In all other work place, the noise level is less than regulated threshold.

Noise Level at Processing Division Floor 1

Noise level in this area ranges 84 – 87 dBA which is around the threshold (85 dBA per 8 hours) set by Minister of Labor and Transmigration Regulation No. Per.13/Men/X/2011.

Noise Level at Processing Division Floor 2

Noise level in this area ranges 84 – 86 dBA which is around the threshold (85 dBA per 8 hours) set by Minister of Labor and Transmigration Regulation No. Per.13/Men/X/2011.

Noise Level at Processing Division Floor 3

Noise level in this area ranges 87 – 92 dBA which exceeds the threshold (85 dBA per 8 hours) set by Minister of Labor and Transmigration Regulation No. Per.13/Men/X/2011. When noise level is 92 dBA, labor can only be permitted to work for 2 hours.

Noise Level at Processing Division Floor 4

Noise level in this area ranges 84 – 88 dBA which is around the threshold (85 dBA per 8 hours) set by Minister of Labor and Transmigration Regulation No. Per.13/Men/X/2011. When noise level is 88 dBA, labor can only be permitted to work for 4 hours.

Noise Level in Warehouse

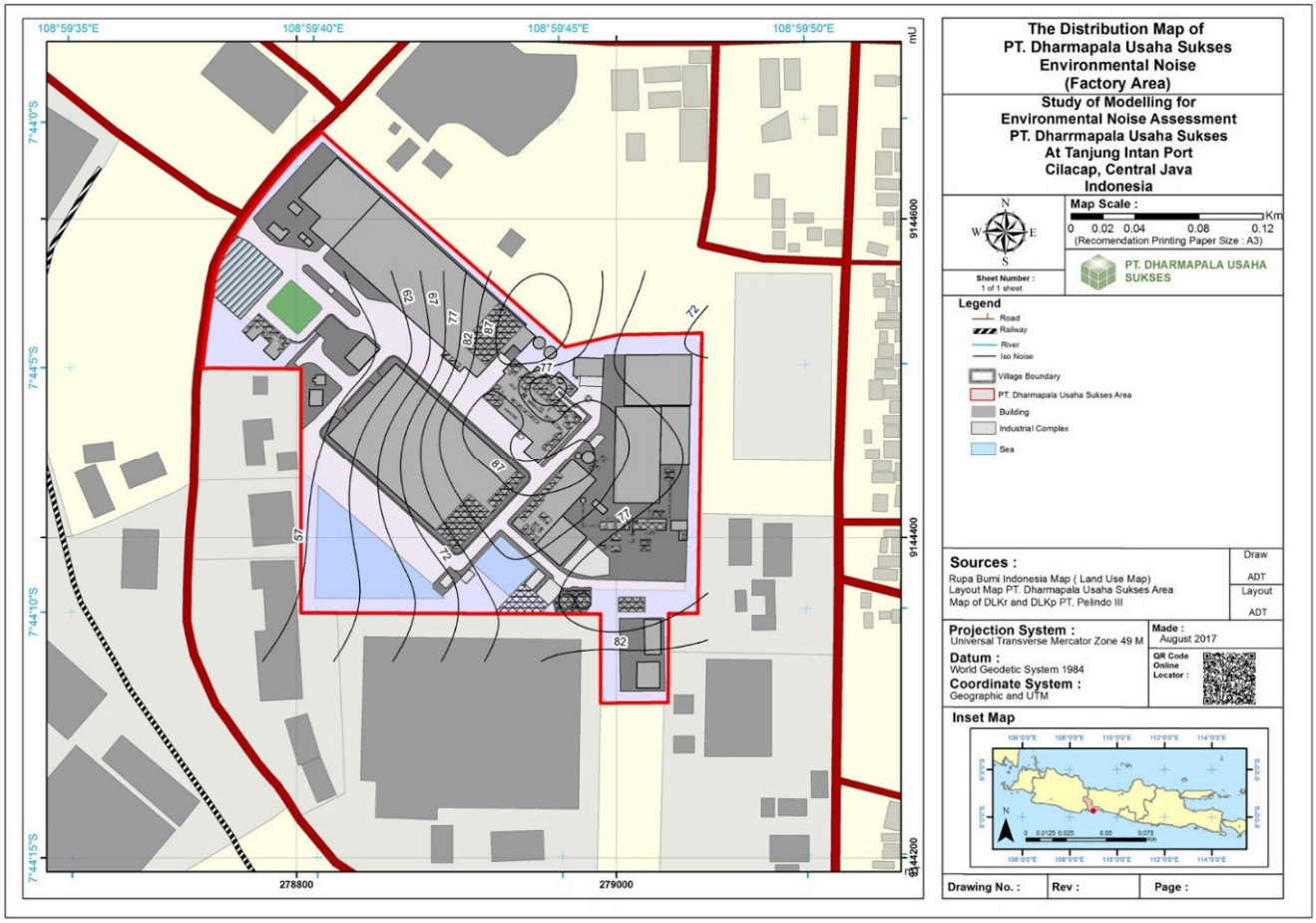
Noise level in this area ranges 70 – 76 dBA which is lower than the threshold (85 dBA per 8 hours) set by Minister of Labor and Transmigration Regulation No. Per.13/Men/X/2011.

Noise Level at Turbine Area

Noise level in this area ranges 93 – 105,5 dBA which is extremely higher than the threshold (85 dBA) set by Minister of Labor and Transmigration Regulation No. Per.13/Men/X/2011. Due to its severe high noise level, it is required that labor wears earmuff to reduce the impact of noise to health. When noise level is 93 dBA, labor can only be permitted to work for 2 hours. In addition, when noise level is 105,5 dBA, labor can only work in the area for 3,73 – 7,3 minutes without Personal Protection Equipment or shelter

The Project will operate steam-turbo generator which has modern technology and potentially produce lower sound level. Alternate operation of power plant will use transportation vehicles and modern factory machinery which apparently produces less noise, hence the noise level could be anticipated to be the same as or even lower than its current level. As two emergency generators are scarcely operated, its impacts on noise within the processing area should be continuously monitored.

Figure VI-8. Noise dispersion at DUS factory area



A.3. Decreased Water Quality

As the new power plant will reside in a very small area, no impact on water quality in the form of increased total suspended solid will be expected during construction phase. During operation phase, however, it is well-known that refined crystal sugar processing chain produces waste water. Existing waste water flow rate is about 180 m^3/day and have been treated thoroughly in the designated WWTP. As the Project will not change the scale of water consumption in the refined crystal sugar process, the rate of waste water production is expected to remain the same. In addition, existing WWTP will be also operated along with new power plant and factory machinery. As a result, the impact of waste water on stream water is anticipated to be retained.

A.4. Traffic Disturbance

Traffic disturbance potentially arises during mobilization of materials and equipment. However, due to the small volumetric and time scale of this activity and considering that the Project location is isolated from other public transportation activities, the impact of mobilization of materials and equipment during construction phase is predicted to be minor. During operation phase, transportation of raw sugar from the port and sugar product to the customer can cause traffic disturbance.

However, the traffic flow measured during the operation of DUS's refined crystal sugar factory is quite low. As no additional transportation is expected on the operation of PT DUS Sugar Factory, the impact on traffic disturbance is assumed to be the same.

A.5. Hazardous Waste

Classification of hazardous waste is based on Government Regulation No. 101/2014 on Hazardous Waste Management. Hazardous waste is anticipated to be produced during the operation of the Project in the form of used grease, laboratory ingredient residuals, auxiliary material residuals as presented in Table IV-2. In addition to those mentioned in the table, there are also hazardous wastes produced in a very small volume in form of used battery, used lamp and Freon tube.

A.6. Aquatic Biota Disturbance

Waste water disposal into Donan river affect not only physical components of the water but also biological components. Aquatic biota is one of bio indicators that is potentially affected by waste water from PT DUS Sugar Factory. However, due to small volume of waste water from PT DUS Sugar Factory compared to Donan river flow (180 m3/day against 250 million m3/day) and the quality maintained to meet effluent standards, the anticipated impact of PT DUS Sugar Factory on the aquatic biota disturbance is minimal.

A.7. Increased Job Opportunity and Job Creation

In the construction of the Project, both skilled and unskilled labor are required (on temporary basis). This job vacancy can be fulfilled by people living in the surrounding settlement, Tambakreja Village. In addition, incoming labor working in the Project construction will create a new job for nearby community in the form of boarding house, store and restaurant. This positive effect can significantly increase the income of Tambakreja people.

During operation phase, the number of labor required in the factory would be the same. As a result, no additional positive impacts expected on the job opportunity and job creation.

A.8. Lessened Comfort

Decreased air quality and increased noise during mobilization of materials and equipment, piling, operation of power plant, operation of factory machinery will potentially lessen the people's comfort particularly in the adjacent area at night time. The scale of decreased air quality and noise during construction is anticipated to be smaller than it is during operation. In addition, there is no scaling up during the Project execution against existing factory operation. Consequently, the impact of the Project operation will be quite the same as current impacts. It was reported that no complaint, grievance nor negative perspective from local community to the operation of DUS's refined crystal sugar factory.

A.9. Local Employment

Construction of the Project will create additional labor (temporary) requirement that can be fulfilled by local labor, thus increase positive people's perspective. It was reported that no complaint, grievance nor negative perspective from local community to the operation of DUS's refined crystal sugar factory.

A.10. Occupational Health

Particulate matter generated from the mobilization truck during construction and from coal storage, coal burning during operation of the Project is anticipated to contribute to elevation of TSP in the ambient air, which may contribute to upper respiratory track infection (ISPA) to the people living in the surrounding of the Project. The Project will slightly increase coal requirement The air quality modeling result also suggest that higher concentration of TSP in the factory area is not merely coming from stack/chimney. Instead, it is combined contribution of material handling, road dust emission and other fugitive emission. In addition, chemical (lime) handling is also potential source of occupational health disturbance. Current Standard Operating Procedure (SOP) on lime handling and personal protective equipment is not fully implemented. Hence, it is estimated that existing implementation of SOP will cause occupational health disturbance. However, operation of new power plant along with new process equipment which have modern technology will not make significant impact on air quality and ISPA and can be managed with current mitigation measures.

B. MITIGATION MEASURES

To effectively avoid, when avoidance is not possible, minimize, mitigate and/or offset adverse impacts emerged due to operation of PT DUS Sugar Factory, the mitigation measures proposed are based on these three approaches: i) technological approach; ii) socio-economical approach and; iii) institutional approach.

Technological approach aims to provide mitigation measures based on available technology. Some applications of technological approach are operation of Electrostatic Precipitator (ESP) to minimize decreased air quality, establishment of buffer zone to reduce noise from its corresponding sources, installation of traffic signs to avoid traffic jam and installation of WWTP to improve waste water quality.

Socio-economical approach provides mitigation measures based on social interaction and economical benefit of affected people. This can be usually done by involving local community in the environmental management efforts. Some examples include prioritizing local people based on the needs and available skill to work in in PT DUS Sugar Factory, engage collaboration with local clients to support operation of in PT DUS Sugar Factory.

Institutional approach provides institutional frameworks for mitigating adverse impacts of in PT DUS Sugar Factory through implementation of rules and regulations, integrated collaboration with corresponding agencies. Some examples of institutional approach are implementation of Standard Operating Procedure (SOP), enhancement of local institution (both formal and informal) involvement in the environmental management, monitoring the execution of environmental management efforts.

B.1. Decreased Air Quality

These mitigation measures are proposed to reduce decreasing level of air quality during construction phase:

a. Operating vehicle that passed emission test by Indonesian government

b. Limiting maximum vehicle speed of 10 km/hour

During operation phase, these mitigation measures are proposed:

a. Installing stack/chimney in accordance with regulated technical specification

b. Operating ESP

c. Maintenance of factory machinery and equipment

d. Keeping coal storage closed

e. Installation of shading with height of 12 m around the boiler

f. Vegetation planting in the factory area

g. Installing of scrubbing system to reduce SOx and NOx

B.2. Increased Noise

These mitigation measures are proposed to minimize increasing level of noise during construction phase:

a. Operating vehicle that passed goodness test by Indonesian government

b. Limiting maximum vehicle speed of 10 km/hour

During operation phase, these mitigation measures are recommended:

a. Periodic maintenance of factory machinery, equipment and operational vehicles

b. Using silencer in in all relevant safety valves, extraction & exhaust steam lines

c. Planting vegetation in the factory area

d. Providing labor to always wear Personal Protective Equipment (PPE)

B.3. Decreased Water Quality

These mitigation measures are advised to improve waste water quality prior to be discharged into Donan river during operation phase:

e. Maintenance of WWTP through weekly cleaning, monthly lubrication and annual general overhauling

f. Employment of Brine Recovery System (BRS)

g. Constructing impermeable waste water channel and/or pipe

B.4.Traffic Disturbance

To minimize traffic disturbance subsequently avoid traffic jam, these mitigation measures during construction and operation phase are recommended:

a. Operating vehicle that passed goodness test by Indonesian government

a. Installing traffic signs

b. Regulating vehicle speed

B.5. Hazardous Waste

These mitigation measures are proposed to minimize the impacts of hazardous waste during operation phase:

a. Identifying and recording of produced hazardous waste

b. Temporarily storage of hazardous waste

c. Delivering hazardous waste to certified hazardous waste treatment agency/company

d. Regularly reporting hazardous waste balance sheet

B.6. Aquatic Biota Disturbance

These mitigation measures are advised to mitigate derivative impacts of waste water on aquatic biota disturbance in Donan river during operation phase:

a. Continuing operation of WWTP with physical, chemical and biological system

b. Maintenance of WWTP

B.7. Increased Job Opportunity and Job Creation

To enlarge the positive impacts of PT DUS Sugar Factory on job opportunity and job creation for local people (on temporary basis), these mitigation measures are recommended during construction and operation phase:

a. Prioritizing labor from neighboring area

b. Coordinating with village administrative in recruitment process

B.8. Lessened Comfort

To reduce the lessening of local people's comfort, these mitigation measures are proposed during operation phase:

a. Executing all mitigation measures designed to reduce or minimize the impacts of PT DUS Sugar Factory on air quality, noise and water quality

b. Developing Community Social Responsibility (CSR) program for nearest community

B.9. People's Perspective

To minimize negative perspective and maximize positive perspective of local community, these mitigation measures are proposed during construction and operation phase:

a. Executing all mitigation measures designed to reduce or minimize the impacts of PT DUS Sugar Factory on air quality, noise and water quality

b. Performing all mitigation measures aimed to maximize the impacts on job opportunity and job creation

c. Developing Community Social Responsibility (CSR) program for nearest community

B.10. Occupational Health

Mitigation measures proposed to minimize derivative impacts of the Project on the ISPA incidents are the same as those for decreased air quality. In addition, mitigation measures for the impact of material handling are:

a. Keeping coal and lime storage closed
b. Installation of shading at the backside of the boiler
c. Vegetation planting in the factory area

VI.ANALYSIS OF ALTERNATIVES

Alternatives for energy source include: electricity supplied by PT. PLN Co. Ltd., internal power plant and emergency generator. This energy sources have been used by PT DUS Sugar Factory at different allocation. Main energy source for sugar processing is internal power plant as electricity. Cost for PT. PLN Co. Ltd will be very expensive and emergency generator will not be suitable.

Water sources could be fresh water from PDAM, desalinated water, groundwater or surface water. Currently, fresh water from PDAM is the most reliable source for PT DUS Sugar Factory operation.

There is no better alternative for Project location other than the proposed Project within inside existing factory. The only access to the Project site is through Jalan Laut Jawa from port entrance.

Considering the existence of current utilities such as machinery, coal storage, equipments and WWTP, a power plant with a boiler and turbine is assumed as the most efficient and cost effective technology. In addition, the proponent has a long time experience with the existing technology, thus proposing similar technology (boiler and turbine) is considered as the best option.

No project alternative will result in unimproved product capacity of PT DUS Sugar Factory.

VII.INFORMATION DISCLOSURE, CONSULTATION, AND PARTICIPATION

Public consultation was held with stakeholders in Tambakreja village on 27 August 2017 as part of the environmental assessment process. At the initial phase where the subproject has not been specified in term of site location, design, technology, and material, the discussions covered general hints to people that the subproject will generate both positive and negative impacts. In this case it is emphasized that the subproject will avoid, reduce, and mitigate the impacts. At the same time the subproject will enhance the positive impacts for community welfare. Some documentations were made during public consultation and presented in Figure VII-1.

Figure VII-1. Public consultation

Several remarks noticed during public consultation are:

a. Request for job opportunity from local community during construction and operation of PT DUS Sugar Factory

b. There is no environmental issue reported during public consultation. However, the local people address some advices to prepare more specific environmental efforts

c. Local people basically support the operation of DUS's refined crystal sugar factory and hope that DUS creates better Corporate Social Responsibility (CSR) program

d. Request for communication system between local community and DUS if there exist environmental related issues

This IEE will be disclosed on the ADB website pursuant to the ADB SPS 2009.

VIII.GRIEVANCE REDRESS MECHANISM

A grievance redress mechanism shown in Figure VIII-1 was set up to register grievances of the people regarding technical, social and environmental aspects. Figure VIII-2 was setup to redress grievances from affected people/community. The process was designed to be transparent, gender responsive, culturally appropriate and commensurate to the risks and adverse impacts of the project, as well as readily accessible to all segments of the affected people. Affected people are to be informed about the mechanism through media and public outlets. This participatory process shall ensure that all views of the people are adequately reviewed and suitably incorporated in the design and implementation process.

A Local Consultative Group (LCG) represents women's groups, NGOs, and local communities will be formed at the nearest community. The LCG's role will be very crucial during the planning and implementation of subproject activities. The group will be consulted during construction works and informed about the modality of project implementation. Their views will be considered in every stage of project implementation. During implementation LCG will observe/monitor the works carried out by the contractor/s and participate in grievance resolution procedures. As shown in Figure VIII-1 the affected person/community will submit grievances/complaints to the A&P Manager through direct meeting, via Internal Affair of Olam, Receptionist and Security. The affected people/community can submit grievances/complaints through company website, face to face meeting, telephone and mail. Moreover, the A&P Manager will investigate the issues and decide whether or not further actions is required as described in Figure VIII-2. In case more actions required, a team will be assigned to respond and solve the grievance. The team will conduct required efforts to assure that the grievance has been completely resolved. A documentation of the actions will be created and reported to the A&P Manager.

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STANDAR OPERATION PROCEDURE

DEPARTMENT : ADMINISTRATION & PERSONNEL
SECTION : GENERAL AFFAIR
PENANGANAN KELUHAN

I. Prosedur Penerimaan Keluhan

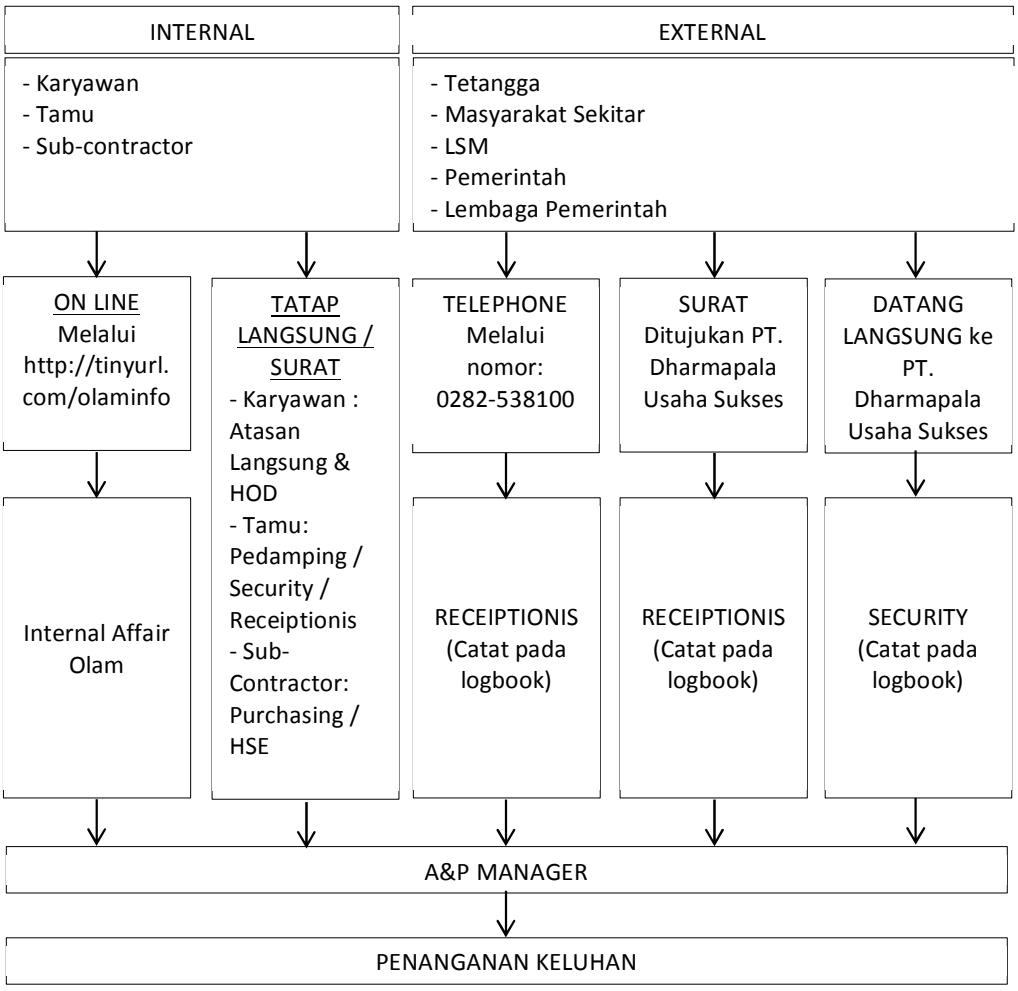

Figure VIII-1. Grievance acceptance mechanism

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STANDAR OPERATION PROCEDURE

DEPARTMENT : ADMINISTRATION & PERSONNEL

SECTION : GENERAL AFFAIR

PENANGGUNG JAWAB	ALUR PROSES	DOKUMEN
	MULAI	
A & P Manager	Penerimaan Keluhan:	Surat Masuk Laporan Masuk
	INTERNAL: - Karyawan - Tamu	
	EKSTERNAL: - Tetangga - Masyarakat Sekitar - LSM - Pemerintah - Lembaga Pemerintah	
A & P Manager HSE Manager	Investigasi Masalah	
A & P Manager	Perlu Tindak Lanjut ? (Tida)	Berita Acara
	Y	
Team	Bentuk Team	Berita Acara
Team	Analisa Penyebab	Berita Acara
	Tindakan Perbaikan	
A & P Manager	Efektif ? (Tida)	Berita Acara
	Y	
	Dokumentasi	
	SELESAI	

Figure VIII-2. Grievance redress mechanism

IX.ENVIRONMENTAL MANAGEMENT AND MONITORING EFFORT

The anticipated environmental impacts and mitigation measures discussed in the previous section is presented in Table IX-1. The table also shows who will be responsible for implementing the mitigation measure and for the conduct of monitoring activities. All mitigation measures in operation phase have been compliantly implemented. Periodic monitoring has also been conducted.

Table IX-1.Environmental Management and Monitoring Effort (EMP)

NO	IMPACT SOURCES	IMPACT TYPES	IMPACT MAGNITUDES	ENVIRONMENTAL MANAGEMENT EFFORT			ENVIRONMENTAL MONITORING EFFORT			INSTITUTION FOR MANAGEMENT AND MONITORING	ANNOTATION
				MITIGATION MEASURES	LOCATION OF MITIGATION	MITIGATION PERIOD	MEANS OF MONITORING	LOCATION OF MONITORING	MONITORING PERIOD		
1	2	3	4	5	6	7	8	9	10	11	12
I.	PRE-CONSTRUCTION AND CONSTRUCTION PHASE										
1	GEOPHYSICAL-CHEMICAL COMPONENTS										
	• Mobilization of materials and equipment	• Decreased air quality	• Measured ambient air quality parameters are below the allowable threshold in accordance with Governor of Central Java Decree No. 8/2001 on Ambient Air Quality Standard in Central Java Province	• Operating vehicle that passed emission test by Indonesian government • Limiting maximum vehicle speed of 10 km/hour	• Jalan Laut Jawa, Port of Tanjung Intan Complex • Jalan Laut Jawa, Port of Tanjung Intan Complex	• During construction phase • During construction phase	• Ambient air quality are measured and compared Governor of Central Java Decree No. 8/2001 on Ambient Air Quality Standard in Central Java Province : NO_2 (316 $\mu g/m^3$); SO_2 (632 $\mu g/m^3$); CO_2 (15000 $\mu g/m^3$); 0_3 (200 µg/m3); Particulate matter (233 $\mu g/m^3$); Ammoniac (2 ppm)	• At least 3 nearby settlements; covering downwind and upwind locations	• Once during construction phase	a. Implementing institution: DUS b. Supervising Institution: Environmental Agency, Cilacap District c. Report Receiving Institution : Environmental Agency, Cilacap District, Environmental Agency, Central Java Province, Minister of Environment and Forestry of Indonesia	

Table IX-1.Environmental Management and Monitoring Effort (EMP)

	• Mobilization of materials and equipment	• Increased noise	• Noise level is less than threshold in accordance with the Minister of Environment Decree No. Kep-48/MENLH/11/1996 on Noise Level Standard	• Operating vehicle that passed goodness test by Indonesian government • Limiting maximum vehicle speed of 10 km/hour	• Jalan Laut Jawa, Port of Tanjung Intan Complex • Jalan Laut Jawa, Port of Tanjung Intan Complex	• During construction phase • During construction phase	• Noise level is measured and compred to Minister of Environment Decree No. Kep-48/MENLH/11/1996 on Noise Level Standard : factory area = 80 dBA; settlement area = 55 dBA (allowable maximum)	• At least 3 nearby settlements; covering downwind and upwind locations	• Once during construction phase	a. Implementing institution: DUS b. Supervising Institution: Environmental Agency, Cilacap District c. Report Receiving Institution : South Cilacap Sub-dstrict, Environmental Agency, Cilacap District, Environmental Agency, Central Java Province, Minister of Environment and Forestry of Indonesia	
	• Labor recruitment	• Increased job opportunity and job creation	• Increasing number of local people work in PT DUS Sugar Factory and the emergence of informal sector business	• Prioritizing labor from neighboring area • Coordinating with village administrative in recruitment process	• DUS office • Tambakreja village	• During recruitment process • During recruitment process	• Collection of secondary data on working labor • The data is then descriptively analysed	• DUS office	• Once during construction phase	a. Implementing institution: DUS b. Supervising Institution: Environmental Agency, Cilacap District c. Report Receiving Institution : Environmental Agency,	

Table IX-1.Environmental Management and Monitoring Effort (EMP)

										Cilacap District, Environmental Agency, Central Java Province, Minister of Environment and Forestry of Indonesia	
II.	**OPERATION PHASE**										
1	**GEOPHYSICAL-CHEMICAL COMPONENTS**										
	• Operasion of boiler • Coal storage • Operation of factory machinery and equipment • Transportation of raw sugar and sugar product • Filter cake	• Decreased air quality	• Emission level is below the threshold in accordance with IFC EHS Guidelines for Small Combustion Facilities and Minister of Environment Regulation No. 7/2007 on Quality Standard for Emission from Static Source of Boiler and Coal Fuel and in accordance with Governor of Central Java Decree No. 8/2000 on Quality Standard for Emission from Static Source in Central Java Province • Measured ambient air quality parameters are below the allowable threshold in accordance with Governor of Central Java Decree No. 8/2001 on Ambient Air	• Installing stack/chimney in accordance with regulated technical specification • Operating ESP • Maintenance of factory machinery and equipment • Keeping coal and lime storage closed • Installation of shading with height of 12 m around the boiler • Vegetation planting in the factory area • Installing and operating CO_2 scrubbing system to arrest SOx and NOx	• Power house • Power house • Processing area • Material ware house • Around boiler site • Around factory fence	• During operation phase • During operation phase • During operation phase • During operation phase • During operation phase • During operation phase	• Emission level is measured and compared with IFC EHS Guidelines for Air Emissions on Small Combustion Facilities (particulate matter: 150ug/Ncm, 2000ug/Ncm, 650ug/Ncm at 6%O2 excess air) Minister of Environment Regulation No. 7/2007 on Quality Standard for Emission from Static Source of Boiler and Coal Fuel and Governor of Central Java	• Emission: Power plant chimney • Ambient air quality: Parking area and Klega field • Odor : Nearest settlements (at least 3)	• Every 6 months during operation • Every 6 months during operation •	a. Implementing institution: DUS b. Supervising Institution: Environmental Agency, Cilacap District c. Report Receiving Institution : Environmental Agency, Cilacap District, Environmental Agency, Central Java Province, Minister of Environment and Forestry of Indonesia	

Table IX-1.Environmental Management and Monitoring Effort (EMP)

			Quality Standard in Central Java Province • Odor level is below the threshold in accordance with Minister of Environment Decree No. 50/1996 on Odor Level Standard				Decree No. 8/2000 on Quality Standard for Emission from Static Source in Central Java : NO_2(825 mg/Nm^3); SO2(750 mg/Nm3); Particulate matter (230 mg/Nm^3); Opacity (20 %) • Ambient air quality are measured and compared Governor of Central Java Decree No. 8/2001 on Ambient Air Quality Standard in Central Java Province : NO_2 (316 µg/m^3); SO_2 (632 µg/m^3); CO_2 (15000 µg/m^3); 0_3 (200 µg/m3); Particulate matter (233 µg/m^3); Ammoniac (2 ppm) • Odor level is measured and compared with				

Table IX-1.Environmental Management and Monitoring Effort (EMP)

							Minister of Environment Decree No. 50/1996 on Odor Level Standard				
	• Operation of factory equipment and machinery	• Increased noise	• Noise level is less than threshold in accordance with the IFC EHS General Guidelines and Minister of Environment Decree No. Kep-48/MENLH/11/1996 on Noise Level Standard	• Maintenance of factory machinery, equipment and operational vehicles • Using silencer in all relevant safety valves, extraction and exhaust steam lines • Planting vegetation in the factory area • Requiring labor to always wear Personal Protective Equipment (PPE)	• Processing area • Processing area • Around factory fence • Processing area and power house	• Periodic during operation phase • Periodic during operation phase • Periodic during operation phase • Periodic during operation phase	• Noise level is measured and compred to IFC EHS Guidelines of (Industrial : 70dBA, and 55dBA daytime noise for residential and 45dBA for nighttime); and Minister of Environment Decree No. Kep-48/MENLH/11/1996 on Noise Level Standard : factory area = 80 dBA; settlement area = 55 dBA (allowable maximum)	• At least three nearby settlements considering upwind and downwind locations; • Processing area • Parking area • Klega field • Power House	• Every 6 months during operation phase	a. Implementing institution: DUS b. Supervising Institution: Environmental Agency, Cilacap District c. Report Receiving Institution : Environmental Agency, Cilacap District, Environmental Agency, Central Java Province, Minister of Environment and Forestry of Indonesia	

Table IX-1.Environmental Management and Monitoring Effort (EMP)

	• Operation of WWTP • Domestic use • Laboratory liquid waste	• Decreased water quality	• Waste water quality comply with the standard in accordance with Regulation of Central Java Province No. 5/2012 on Amendment of Central Java Province No. 10/2004 on Waste Water Quality Standard • Surface water quality are in accordance with Minister of Environment Decree No. 51/2004 on Sea Water Quality Standard	• Continuing operation of WWTP with physical, chemical and biological system • Maintenance of WWTP through weekly cleaning, monthly lubrication and annual general overhauling • Employment of Brine Recovery System (BRS) • Constructing impermeable waste water channel and/or pipe	• WWTP area • WWTP area • WWTP area	• During operation phase • During operation phase • During operation phase	• Waste water quality is measured and compared to Regulation of Central Java Province No. 5/2012 on of Central Java Province No. 10/2004 on Waste Water Quality Standard : TSS = 100 mg/L; BOD = 50 mg/L; COD = 100 mg/L; pH = 6,0-9,0; Sulfide = 0,05 mg/L; Fat, oil and grease = 5 mg/L (maximum allowable) or Minister of Environment Decree No. 5/2014 on Waste Water Quality Standard for Refined Sugar Industry • Surface water quality is measured and compared to Minister of Environment Decree No. 51/2004 on Sea Water	• WWTP Outlet Coordinate : 07°44'11.0". 108.59'46,4" • Donan river estuary : ± 100 m to the south of Tanjung Intan jetty	• Every month during operation phase • Every 6 months during operation phase	a. Implementing institution: DUS b. Supervising Institution: Environmental Agency, Cilacap District c. Report Receiving Institution : Environmental Agency, Cilacap District, Environmental Agency, Central Java Province, Minister of Environment and Forestry of Indonesia	

Table IX-1.Environmental Management and Monitoring Effort (EMP)

							Quality Standard				
	• Transportation of raw sugar and sugar product, labor movement	• Traffic disturbance	• Traffic disturbance	• Using certified vehicles • Installing traffic signs • Regulating vehicle speed •	• Jalan Laut Jawa, Port of Tanjung Intan Complex • Jalan Laut Jawa, Port of Tanjung Intan Complex • Jalan Laut Jawa, Port of Tanjung Intan Complex •	• During operation phase • During operation phase • During operation phase	• Field observation • Traffic survey	• Jl. Laut Jawa Kompleks Pelabuhan Tanjung Intan • Jl. Laut Jawa Kompleks Pelabuhan Tanjung Intan	• Every 6 months during operation phase	a. Implementing institution: DUS b. Supervising Institution: Environmental Agency, Cilacap District c. Report Receiving Institution : Environmental Agency, Cilacap District, Environmental Agency, Central Java Province, Minister of Environment and Forestry of Indonesia	
	• Usage of hazardous materials • Fly ash and bottom ash • Used grease • Laboratory substance residual • Auxiliary material residual • Used battery • Used lamp	• Increased hazardous waste	• Volume and type of hazardous waste comply Government Regulation No. 101/2014 on Management of Hazardous Waste	• Identifying and recording of produced hazardous waste • Temporarily storage of hazardous waste • Delivering hazardous waste to certified hazardous waste treatment agency/company • Regularly reporting hazardous waste balance sheet	• Temporary hazardous waste dumping site • Temporary hazardous waste dumping site • Temporary hazardous waste dumping site • DUS office	• During operation phase • During operation phase with dumping time in accordance with applicable regulation • During operation phase in accordance	• Field observation • Collection of secondary data on hazardous reporting	• Temporary hazardous waste • DUS office	• Every 3 months during operation phase	a. Implementing institution: DUS b. Supervising Institution: Environmental Agency, Cilacap District c. Report Receiving Institution : Environmental Agency,	

Table IX-1.Environmental Management and Monitoring Effort (EMP)

						with applicable regulation • Every 3 months during operation				Cilacap District, Environmental Agency, Central Java Province, Minister of Environment and Forestry of Indonesia	
2	**BIOLOGICAL COMPONENTS**										
	• Waste water produced from refined crystal sugar processing	• Aquatic biota disturbance	• Biodiversity index of plankton and benthos	• Continuing operation of WWTP with physical, chemical and biological system • Maintenance of WWTP	• Area IPAL • Area IPAL	• During operation phase • During operation phase	• Field measurement of plankton and benthos biodiversity index	• Donan river estuary : ± 100 m to the south of Tanjung Intan jetty	• Every 6 months during operation phase	a. Implementing institution: DUS b. Supervising Institution: Environmental Agency, Cilacap District c. Report Receiving Institution : Environmental Agency, Cilacap District, Environmental Agency, Central Java Province, Minister of Environment and Forestry of Indonesia	
3	**SOCIAL, ECONOMY AND CULTURAL COMPONENTS**										

Table IX-1.Environmental Management and Monitoring Effort (EMP)

	• Labor recruitment	• Increased job opportunity and job creation	• Number of local people working in the Project • Number of new business related to the Project	• Prioritizing labor from neighboring area • Coordinating with village administrative in selection process	• Tambakreja village • Tambakreja village	• During recruitment process • During recruitment process •	• Field observation and interview, collection of secondary data on the number of local people working in the factory. The data is descriptively analysed	• Tambakreja village • DUS office	• Every 6 months during operation phase	a. Implementing institution: DUS b. Supervising Institution: Environmental Agency, Cilacap District c. Report Receiving Institution : Environmental Agency, Cilacap District, Environmental Agency, Central Java Province, Minister of Environment and Forestry of Indonesia	
	• Operation of refined crystal sugar factory	• Lessened comfort	• Number or complaints and grievance	• Implementing SOP of PT DUS Sugar Factory • Executing all mitigation measures designed to reduce or minimize the impacts of PT DUS Sugar Factory on air quality, noise and water quality • Developing Community Social Responsibility (CSR) program for nearest community	• PT DUS Sugar Factory site • Location of mitigation measures for air quality, noise and water quality • Tambakreja village	• During operation period • Mitigation period for air quality, noise and water quality • During operation period	• Field observation and interview • Means of monitoring for air quality, noise and water quality • Field observation, interview and colletion of secondary data. The data is descriptively analysed	• DUS factory area • Monitoring locations for air quality, noise and water quality • Tambakreja village and DUS office	• Every 6 months during operation phase • Monitoring period of air quality, noise and water quality • Every 6 months during operation period	a. Implementing institution: DUS b. Supervising Institution: Environmental Agency, Cilacap District c. Report Receiving Institution : Environmental Agency, Cilacap District,	

Table IX-1.Environmental Management and Monitoring Effort (EMP)

										Environmental Agency, Central Java Province, Minister of Environment and Forestry of Indonesia	
	• Labor recruitment and operation of refined crystal sugar factory	• People's perspective	• Change in people's perspective	• Implementing SOP of PT DUS Sugar Factory • Executing all mitigation measures designed to reduce or minimize the impacts of PT DUS Sugar Factory on air quality, noise and water quality • Performing all mitigation measures aimed to maximize the impacts on job opportunity and job creation • Developing Community Social Responsibility (CSR) program for nearest community	• PT DUS Sugar Factory site • Location of mitigation measures for air quality, noise and water quality • Location of mitigation measures for job opportunity and job creation • Tambakreja village	• During operation period • Mitigation period for air quality, noise and water quality • Mitigation period for job opportunity and job creation • During operation period	• Field observation and interview • Means of monitoring for air quality, noise and water quality • Means of monitoring for job opportunity and job creation • Field observation, interview and colletion of secondary data. The data is descriptively analysed	• DUS factory area • Monitoring locations for air quality, noise and water quality • Monitoring locations for job opportunity and job creation • Tambakreja village and DUS office	• Every 6 months during operation phase • Monitoring period of air quality, noise and water quality • Monitoring period job opportunity and job creation • Every 6 months during operation period	a. Implementing institution: DUS b. Supervising Institution: Environmental Agency, Cilacap District c. Report Receiving Institution : Environmental Agency, Cilacap District, Environmental Agency, Central Java Province, Minister of Environment and Forestry of Indonesia	
4	**OCCUPATIONAL HEALTH COMPONENTS**										

Table IX-1.Environmental Management and Monitoring Effort (EMP)

	• Coal storage • Coal burning for power plant	• Increased number of ISPA incidents	• Number of people suffer from ISPA	• All mitigation measures for decreased air quality and noise • Keeping coal and lie storage closed • Installation of shading with height of 12 m at the backside of the boiler • Vegetation planting in the factory area	• Mitigation locations for decreased air quality and noise	• Mitigation period for decreased air quality and noise •	• Means of monitoring for for decreased air quality and noise •	• Monitoring locations for decreased air quality and noise	• Monitoring periods for decreased air quality and noise	a. Implementing institution: DUS b. Supervising Institution: Environmental Agency, Cilacap District c. Report Receiving Institution : Environmental Agency, Cilacap District, Environmental Agency, Central Java Province, Minister of Environment and Forestry of Indonesia	

X.CONCLUSION AND RECOMMENDATION

The Sugar Factory Capacity Optimization Project (SFCOP) will install and operate a new power plant consisting of a boiler with capacity of 75 metric ton steam/hour and a Steam Turbo-Generator with capacity of 6,000 kW along with new process equipment in the Refined Crystal Sugar Factory of PT. Dharmapala Usaha Sukses (DUS) located in the Cilacap District, Central Java Province, Indonesia. This " initial environmental examination (IEE)" is based on ADB's Safeguard Policy Statement (ADB SPS 2009) that covers **the general environmental profile** of all the refinery plant components and includes an overview of **the potential environmental impacts** during various project phases. The IEE also includes environmental management plan with a set of mitigation and management measures to be taken during project implementation to avoid, reduce, mitigate, or compensate for adverse environmental impacts.

The project anticipated environmental impacts on air quality, noise, water quality, biota, social and occupational health. Assessment of the Project's impact on those components suggest that **the impacts are not significant and can be reduced with implementation of mitigating measures** which will be adopted in this Project. Additional mitigation measures have been identified and proposed for any affected activities during construction phase and presented in a table. DUS also requires to have a permit for waste water disposal and temporary hazardous waste dumping. DUS has been granted Waste Water Disposal Permit through the Bupati Cilacap Decree No. 660.1/691/24/2017 dated May 12th, 2017. In addition, DUS also has been awarded Temporary Hazardous Waste Storage through Bupati Cilacap Decree No. 660.1/21/30/2014 dated April 22nd, 2014.

1. Using the noise dispersion model, the impact to ambient noise quality can be modeled so as to evaluate whether it further meet the ambient noise quality standards. Boiler Processing area and turbine are dominant source of noise and contribute largely to noise level in surrounding areas (factory, Pelindo zone and adjacent settlement) of DUS factory. In the Pelindo industrial zone, noise level in the entire area is still below the threshold ad regulated by Minister of Environment Decree No. KEP-48/MENLH/1/1996 and IFC's Performance Standard for Environmental Noise Management where noise level threshold for industrial zone and harbour zone is 70 dBA. Noise level for settlements within the industrial zone, is 59 – 69 dBA which is originating from multiple sources. These are above the IFC EHS Guidelines for residential areas where the applicable threshold is 55 dBA. Noise disturbance will be reduced by using vegetation that act as noise abatement. Noise level and processing area and turbine is severely beyond the threshold (85 dBA per 8 hours) regulated by Minister of Labor and Transmigration Regulation No. Per.13/Men/X/2011.

2. Using the air dispersion model, the impact to ambient air quality from stack emission either existing stack or proposed stack were modeled to evaluate whether it further meet the ambient air quality standards. Using historical detailed-meteorology data, the hypothetic emission dispersion, at maximum concentration, from stack emission under normal operation due to factory activity by means of AERMOD program. Ambient air quality originated from factory dust emission (TSP, PM_{10}) and gases (SO_2, NO_2) either current stack condition or proposed stack meet the ambient air quality standard based on Governor Regulation No.8/2001 and IFC's Performance Standard for Air Emission and Ambient Air Quality Standard. Prevailing wind direction came from Northwest and Southeast. Stack height 45 m is sufficient to disperse air pollutant safely with current atmospheric dynamics.

C. RECOMMENDATION

1. The air dispersion model results should be considered on preparing environmental management and monitoring program according to UKL-UPL document.
2. Prevailing wind direction which may carry air pollutants originated from factory activity should be considered for decision related to CSR program on impacted area and impacted people.
3. Conduct calculation and measure small portion of flowrate at stack which is reused to the production process.
4. Regular maintenance of factory machinery and equipment and installation of silencer are highly recommended to reduce noise from the source.
5. To further reduce noise level in the neighboring settlement, it is recommended to exalt peripheral fence or install permanent veil in the east of DUS factory area.
6. It is strictly recommended that labor working in processing area and turbine is required to wear Personal Protective Equipment (PPE) such as earmuff and immediately enter the shelter.

APPENDIX 1

11. Kesempatan Kerja dan Berusaha, Mata Pencaharian dan Pendapatan

PT. DHARMAPALA USAHA SUKSES (PT. DUS) memberikan kontribusi yang cukup besar bagi kesempatan kerja dan tumbuh kembangnya peluang usaha sektor informal di sekitar lokasi kegiatan seperti rumah kos, warung dan sebagainya.

12. Penurunan Estetika dan Kenyamanan

Pada periode Semester I tahun 2017 ini tidak ditemukan keluhan masyarakat terhadap operasional pabrik gula rafinasi. Hal ini merupakan upaya yang terus dilakukan manajemen PT. DHARMAPALA USAHA SUKSES (PT. DUS) dalam mengatasi segala permasalahan yang muncul akibat operasionalisasi pabrik gula rafinasi.

13. Kecemburuan Sosial

Pada saat ini (periode Semester I tahun 2017) tidak muncul keluhan masyarakat terhadap proses rekruitmen tenaga pabrik gula rafinasi PT. DHARMAPALA USAHA SUKSES (PT. DUS)

14. Persepsi Masyarakat

Diketahui pernah terjadi protes dari institusi lain di sekitar pabrik gula mengenai bau, air limbah dan kebisingan, namun tanggapan masyarakat terhadap keberadaan pabrik gula sebagian besar masih mengharapkan dan mempertahankan keberadaan pabrik gula rafinasi.

15. Perubahan Pola Penyakit Masyarakat

Berdasarkan data yang diperoleh dari Sistem Informasi Manajemen Puskesmas Cilacap, jumlah penderita ISPA di Kelurahan Tambakerja pada Semester I tahun 2017 adalah 2318 jiwa. Sebagai bentuk kepedulian pada lingkungan sekitarnya, pada Semester I tahun 2017 ini CSR (Coorporate Sosial Responsibility) PT. DHARMAPALA USAHA SUKSES (PT. DUS) sebagaimana biasa dikemas dalam bentuk pemberian sembako berupa minyak goreng yang diserahkan pada warga sekitar di Kelurahan Tambakreja serta pemberian sumbangan kepada instansi maupun warga sekitar.