EPD® Southeast Asia EPD

Environmental Product Declaration
In accordance with ISO 14025 for:

Electricity

from

PT PLN (PERSERO)

Unit Induk Pembangkitan Tanjung Jati B

PLN

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Company Information

Company Description

PT PLN (Persero) Tanjung Jati B (PLN UIK TJB) is a company that produces electrical energy from steam power plant units (PLTU) using coal as its primary energy. PLN UIK TJB has four power plants with production capacity of 4 x 710 MW (gross) or 4 x 660 MW (nett). The four units are managed by PLN UIK TJB as asset manager through a leasing system with PT Central Java Power as asset owner. The operation and maintenance of PLTU Tanjung Jati B units 1 & 2 are carried out by PT TJB Power Services (TJBPS) as the asset operator and PT Komipo Pembangkitan Jawa Bali (KPJB) as the asset operator of units 3 & 4. The total production capacity of PLN UIK TJB currently accounts for about 11% of the total electricity needs in Java–Bali. PLN UIK TJB applies the latest technology in handling coal combustion emissions, that is FGD (Flue Gas Desulfurization).

Certification

PLN UIK TJB has several certifications related to the production, such as:

- ISO 9001:2015.
- ISO 14001:2015.
- ISO 45001:2018.
- ISO 26001:2010.
- ISO 31000:2018.
- ISO 50001:2018.

Location

Tubanan Village, Kembang District, Jepara Regency, Central Java Province, Indonesia.

Product Information

Product

Electricity.

Description of Product

Electricity is used as an energy resource to support activities both in the community and industry. The LCA PLN UIK TJB study has included its 100% of the electricity produced in 2020.

UN CPC Code

UN CPC 171 Electrical Energy.

Geographical Scope

The location of the entire process is in Indonesia with the following details:

- The location of all coal suppliers is in East Kalimantan.
- The location of the plant is in Jepara Regency, Central Java.
- The electricity distributed to Java-Bali electricity grid.

LCA Information

LCA Software

The LCA study was conducted using SimaPro 9.3 software. EN15804 has been used to calculate the environmental impact in accordance with The International EPD® System.

Database

Selected generic data used in this EPD was taken from Ecoinvent 3.8. The database used in the calculation of the impact of upstream, core, and downstream processes.

Data Collection Period

The period of speficic data used is 1 year (January 1-December 2020) and the generic data range from 2012-2021.

Functional Unit

. 1 kWh of net of electricity generated and thereafter distributed to the customer.

Reference Service Life

PLN UIK TJB is assumed to operate for 40 years. The lifetime capacity according to the service life is 701.348.432.000 kWh.

Cut-off Rules

The cut-off rules in this LCA are followed according to the Product Category Rules (PCR) Electricity, Steam, and Hot Water Generation and Distribution, 2007:08, Version 4.2 and UN CPC 171, 173 where the data for elementary flow to and from product systems contributing to a minimum of 99% of the declared environmental impact has been included. All input and output data related to mass, energy, and environment in each process unit in the electricity production system have been collected in the inventory, but there are three chemicals for which the dataset cannot be found so the impact calculation cannot be studied. These chemicals include Antiscalant compounds, PC-1020T (Anti Scalant for RO Membrane), and PC-11 (Biocide for RO Membrane). The cut-off calculation of these materials has been carried out and the conclusion is obtained, namely: the cut-off used is at the level of 0.0036% (as required in PCR, the cut-off is not more than 1%).

Assumptions in the LCA Study

Some of the assumptions used in this LCA study are as follows:

- Calculation of GHG emissions assuming complete combustion.
- The assumption of a density of 1 m3 of water is equal to 1 ton of wastewater.
- Emissions resulting from coal transportation are approached from the conversion of the fuel used.
- The use of annual data on greenhouse gases (CO_2, N_2O and CH_4) which is a conversion of the company's quarterly monitoring data.
- The calculation of the impact from hazardous and non-hazardous waste is carried out by aggregating the inventory of each type of waste and calculated using datasets.
- The calculation of the impact of the process on the distribution of electricity to the community uses the approach of distances per 100 km, 500 km, and 1000 km.
- Power Plant in PLN UIK TJB is assumed to operate for the next 40 years, based on the typical technical service life table in appendix 3 PCR it is stated that for plants that use combustion technology can operate for 40 years.

System Boundary and Data Sources

The boundary of the LCA study of PT PLN (Persero) Tanjung Jati B Generation Main Unit in 2021 are upstream to downstream according to Product Category Rules (PCR): Electricity, Steam and Hot/Cold Water Generation and Distribution, 8:2007 Version 4.2 UN CPC 171, 173. The production system starts from the upstream (coal mining processes, coal transportation, limestone production, limestone transportation, HSD and fuel oil production, HSD and fuel oil transportation, as well as the production and transportation of chemicals).

The decommissioning process at the upstream was not included in this study. The core processes in this system are divided into infrastructure data (construction and decommissioning), fuel combustion processes (coal, HSD and fuel oil), conversion of thermal energy into electrical energy, as well as other additional processes such as the fuel preparation process, maintenance process, use of backup power, on-site transportation, and waste treatment. Lastly, the downstream consists of infrastructure (construction and decommissioning), transmission, distribution, as well as losses of transmission and distribution.

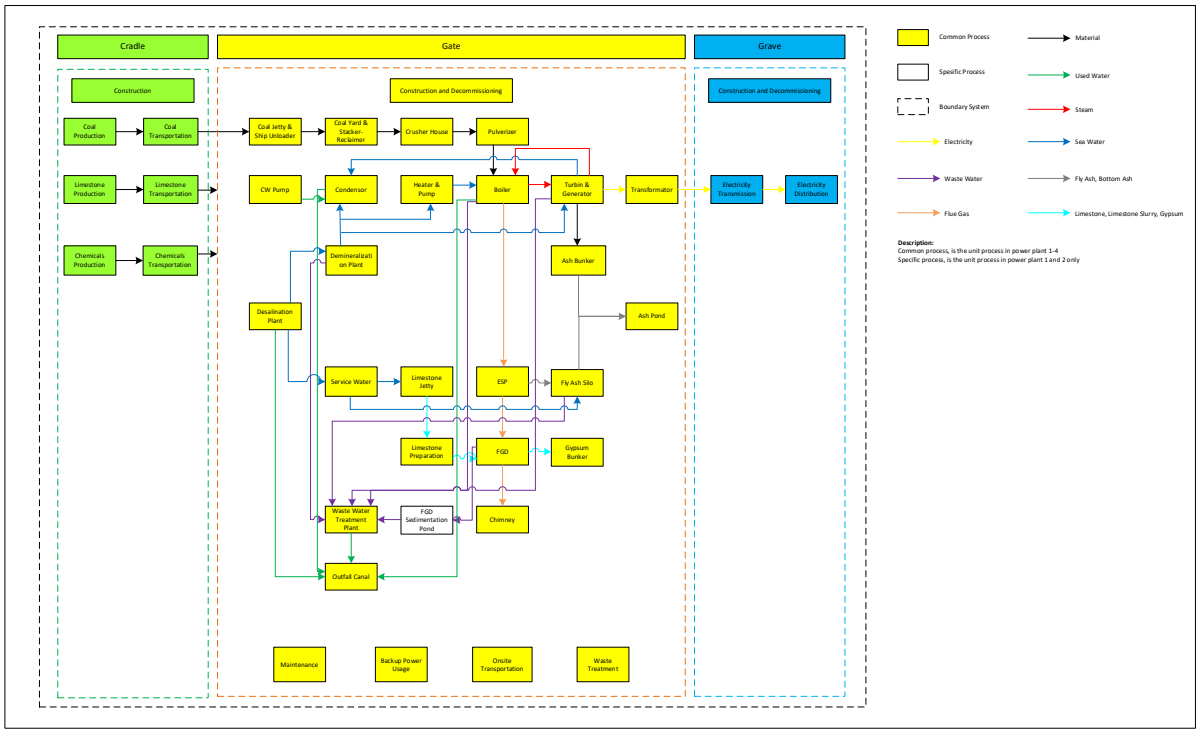

Figure 1. Diagram of Production System in PLN UIK TJB

Procedure of Data Collection

PLN UIK TJB collects data on each process unit covered by the system boundary including data on raw materials, fuel, electrical energy use, emissions into the air, emissions to water, hazardous and non-hazardous waste, and land use data in 2020. The data collected is grouped into 2 types of data, namely primary data and secondary data in accordance with what has been determined at the National Electricity Environmental Association (ALLIN) related to the LCA Implementation Plan for Power Plant Activities in the 2021 PROPER and Product Category Rules (PCR): Electricity, Steam and Hot/Cold Water Generation and Distribution, 8:2007 Version 4.2 UN CPC 171, 173.

The definitions of primary data and secondary data are:

a. Primary data: the data obtained either by measuring or calculated according to the company's monitoring results.
b. Secondary data: data derived from literature studies or journals relating to the required calculations.

The details of the inventory data used in this LCA study are as follows:

- Input
  a. Raw materials : Limestone, air
  b. Fuel/energy : Coal, heavy equipment fuel, fuel oil, electricity
  c. Chemicals : NH_3, antiscalant, cation resin, citric acid, Eliminox, $FeCl_3$, H_2SO_4, HCl, N 352, Na-EDTA, Nalco Parmaclean PC-77 and PC-98, NaOCl, NaOH, PAC, PC-1020T, PC-11, Polymer N 8100 and Polymer N 9901, SBS, STPP, strong anion resin, and weak resin
  d. Water use : Seawater
  e. Land use
- Output and/or Product
  a. Emissions into the air : CH_4, CO, CO_2, Hg, N_2O, NO_2, SO_2, and total particulates
  b. Emissions to water : Fe, Cr, Cu, Zn, TSS, Oils & Fats
  c. Hazardous Waste : Used oil, used rags, sand blast, fly ash, bottom ash, sludge, contaminated goods, used chemical packaging, used resin, used accu & battery, used toner, insulation waste, used oily filter, expired chemical, used grease, gypsum, rockwool, glass wool
  d. Non-Hazardous Waste : Wood waste, intake waste (jellyfish and marine biota)
  e. Main product : Electricity
  f. By product: -

Methodology of Impact Assessment

The impact categories analyzed in this LCA study are adjusted to the environmental impact assessment carried out based on the Product Category Rules (PCR): Electricity, Steam and Hot/Cold Water Generation and Distribution, 8:2007 Version 4.2 UN CPC 171, 173 which obtained one method used in the LCA assessment process, EN 15804.

In general, environmental impact assessments in this study include the impact of Global Warming Potential (GWP) Acidification Potential (AP), Eutrophication Potential (EP), Photochemical Ozone Creation Potential (POCP), Ozone Depletion Potential (ODP), Abiotic Depletion Potential Element, Abiotic Depletion Potential Fossil Fuels and Water Scarcity Footprint.

Environmental Performance

Potential Environmental Impact

The indicators related to the potential environmental impact of electricity produced by PLN UIK TJB are declared per functional unit and per life cycle stage as listed in Table 1 below.

Table 1. Potential Environmental Impact of Electricity Produced by PLN UIK TJB

No	Impact Category		Unit	Upstream	Core	Core-Infra	Total Generated	Downstream	Downstream-Infra	Total Distributed
1	Global Warming Potential (GWP)	Global Waming Potential (GWP) - fossil fuels	kg CO_2 eq/kWh	6.31E-02	1.06E+00	8.95E-04	1.12E+00	3.98E-03	2.78E-03	1.13E+00
		Global Waming Potential (GWP) - biogenic	kg CO_2 eq/kWh	-5.47E-03	1.07E-07	2.39E-06	-5.46E-03	-1.94E-05	4.62E-05	-5.46E-03
		Global Waming Potential (GWP) - Land use and land use change (luluc)	kg CO_2 eq/kWh	7.88E-05	2.46E-08	8.51E-07	7.97E-05	2.83E-07	4.72E-06	8.50E-05
		Global Waming Potential (GWP) – total	kg CO_2 eq/kWh	5.78E-02	1.06E+00	8.99E-04	1.12E+00	3.96E-03	2.83E-03	1.13E+00
2	Acidification Potential (AP)		mol H^+ eq/kWh	4.19E-04	3.29E-03	6.36E-06	3.71E-03	1.32E-05	1.06E-04	3.85E-03
3	Eutrophication Potential	Eutrophication Potential Aquatic Freshwater	kg P eq/kWh	4.59E-04	1.23E-08	4.86E-07	4.60E-04	1.63E-06	8.16E-06	4.71E-04
		Eutrophication Potential Aquatic Marine	kg N eq/kWh	2.45E-04	6.34E-04	1.17E-06	8.80E-04	3.12E-06	6.39E-06	8.93E-04
		Eutrophication Potential Terrestrial	mol N eq/kWh	1.74E-03	6.95E-03	1.25E-05	8.70E-03	3.09E-05	8.38E-05	8.84E-03
4	Photochemical Ozone Creation Potential (POCP)		kg NMVOC eq/kWh	4.41E-04	1.76E-03	4.61E-06	2.20E-03	7.82E-06	2.44E-05	2.24E-03
5	Ozone Depletion Potential		kg CFC-11 eq/kWh	5.82E-09	3.18E-11	5.38E-11	5.91E-09	2.10E-11	2.39E-10	6.19E-09
6	Abiotic Depletion Potential	For minerals and metals (non-fossil resources)	kg Sb eq/kWh	1.02E-07	3.88E-10	5.65E-08	1.59E-07	5.65E-10	2.40E-06	2.56E-06
		For fossil resources	MJ/kWh	9.31E+00	4.28E-03	9.33E-03	9.33E+00	3.31E-02	3.19E-02	9.43E+00
7	Water Deprivation Potential (WDP)		m^3 world eq deprived/kWh	1.20E-02	8.94E-04	2.92E-04	1.31E-02	4.66E-05	2.00E-03	1.52E-02

Use of Resources

The indicators related to the use of resources of electricity produced by PLN UIK TJB are declared per functional unit and per life cycle stage as listed in Table 2 below.

Table 2. Indicators Describing the Use of Resources of PLN UIK TJB

Parameter		Unit	Impact Potential Value						
			Upstream	Core	Core-Infra	Total Generated	Downstream	Downstream-Infra	Total Distributed
Primary energy resources - Renewable	Use as energy carrier	MJ, net calorific value/kWh	1.23E-01	2.23E-05	6.56E-04	1.23E-01	4.37E-04	6.78E-03	1.31E-01
	Used as raw materials	MJ, net calorific value/kWh	0	0	0	0	0	0	0
	TOTAL	MJ, net calorific value/kWh	1.23E-01	2.23E-05	6.56E-04	1.23E-01	4.37E-04	6.78E-03	1.31E-01
Primary energy resources – Non Renewable	Use as energy carrier	MJ, net calorific value/kWh	9.77E+00	4.72E-03	7.21E-03	9.78E+00	3.46E-02	2.31E-02	9.84E+00
	Used as raw materials	MJ, net calorific value/kWh	0	0	0	0	0	0	0
	TOTAL	MJ, net calorific value/kWh	9.77E+00	4.72E-03	7.21E-03	9.78E+00	3.46E-02	2.31E-02	9.84E+00
Secondary material		Kg/kWh	0	0	0	0	0	0	0
Renewable secondary fuels		MJ, net calorific value/kWh	0	0	0	0	0	0	0
Non-renewable secondary energy		MJ, net calorific value/kWh	0	0	0	0	0	0	0
Net use of fresh water		MJ, net calorific value/kWh	1.69E-03	1.34E-04	8.38E-06	1.84E-03	6.49E-06	4.70E-05	1.89E-03

Waste Production

The indicators related to the waste production of electricity produced by PLN UIK TJB are declared per functional unit and per life cycle stage as listed in Table 3 below.

Table 3. Indicators Describing Waste Production of PLN UIK TJB

Parameter	Unit	Upstream	Core	Core-Infra	Total Generated	Downstream	Downstream-Infra	Total Distributed
Hazardous waste disposed	kg / kWh	2.20E+00	1.36E-02	1.73E-02	2.23E+00	7.89E-03	3.51E-05	2.24E+00
Non-hazardous waste disposed	kg / kWh	5.23E-09	2.20E-05	0	2.20E-05	7.79E-08	8.47E-03	8.49E-03
Radioactive waste disposed	kg / kWh	0	0	0	0	0	0	0

Output Flow

Table 4. Indicators Describing Output Flows of PLN UIK TJB

Parameter	Unit	Upstream	Core	Core-Infra	Total Generated	Downstream	Downstream-Infra	Total Distributed
Component for reuse	kg/kWh	0	0	0	0	0	0	0
Material for recycling	kg/kWh	0	0	0	0	0	0	0
Material for energy recovery	kg/kWh	0	0	0	0	0	0	0
Exported energy, electricity	MJ/kWh	0	0	0	0	0	0	0
Exported energy, thermal	MJ/kWh	0	0	0	0	0	0	0

Impact Contribution

The distribution of impact contribution from total electricity distributed at PLN UIK TJB can be seen in Figure 2. Most of the contributor comes from the upstream, core, and core-infrastructure. Impact in the upstream mostly contributed by the coal and chemical production and transportation. On the other hand, impact in the core contributed by the infrastructure (construction and decommissioning) process, emission from the boiler emits through the chimney, activities in coal yard and stacker reclaimer, and the maintenance process. While in the downstream process, the impact of resource use mostly caused by the transmission and distribution networks infrastructure.

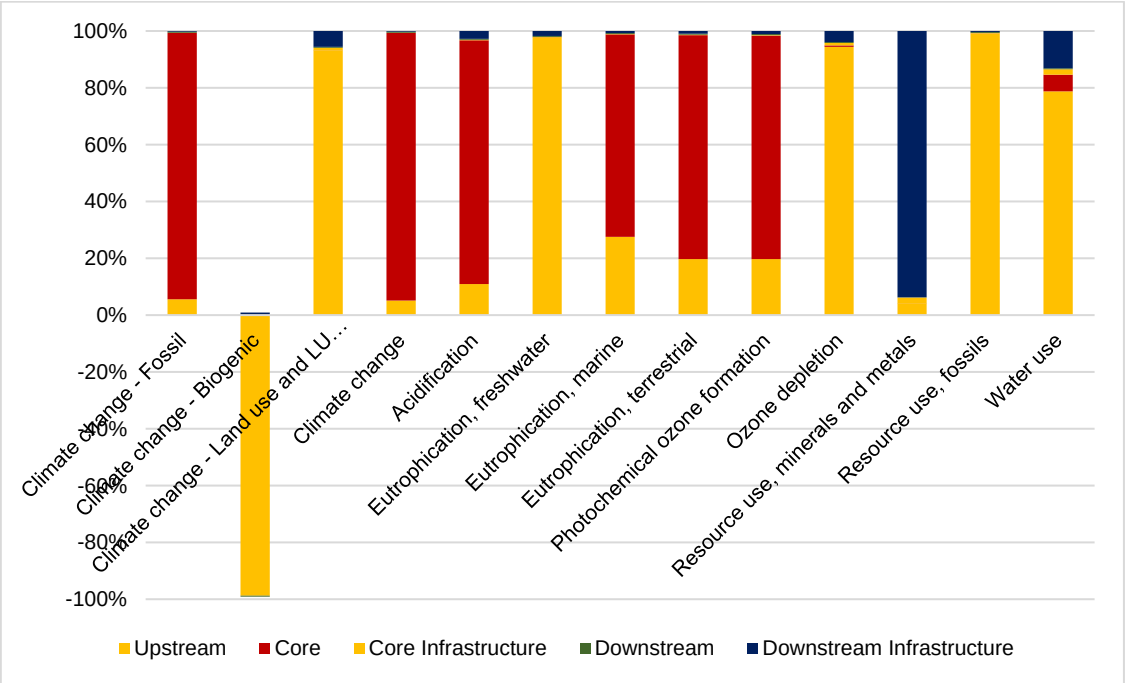

Figure 2. The Distribution of the Upstream to Downstream Impact Contribution

Biodiversity Conservation Development

1. Long Island Seagrass Transplantation with Anchor Method

   Through observations, it is known that the types of seagrasses found are evenly distributed in each location. The condition of the percentage of seagrass closures in the waters of Panjang Island in 2021 increased from the previous year to 77.11% and the area of the cover area also increased by 15 m^2 to 2,810 m^2.

2. Long Island Coral Reef Transplantation with APR (Artificial Patch Reef)

   This Programme has succeeded in bringing in new habitats in the waters of Panjang Island. This is indicated by the emergence of coral reefs after the sinking of APR, where after transplantation in 2015 until now the condition of coral reef diversity continues to experience an increase and in 2021 it has reached H'=1.33.

3. ALPHART (Artificial Patch Fish Apartment)

   The decline in fish apartments near the bagan and the new Long Island pier has a positive impact on the diversity of reef fish and megabenthos. This is shown from the existence of reef fish communities and target fish catches at fish apartment locations with a diversity value of 1.80 and megabenthos of 1.13.

4. ECOTOURISM (Timor Deer Conservation)

   Deer breeding in the PLTU TJB Area has obtained a permit through the Decree of the Head of the Central Java Natural Resources Conservation Center No. SK. 26/IV-K11/KKH/ 2017 dated January 30, 2017. The breeding location is within the power plant area. This activity began to be carried out in 2016 with an initial number of 9 heads (2 males and 7 females). In 2021 it increased to 41 heads (14 males and 27 females) with the number of births of 32 heads within 4.5 years.

Environmental Risks

PLN UIK TJB has consistently managed environmental risks that occur due to its production process through the identification of significant risks to the environment. The potential risks are identified as energy, water, waste water, air, hazardous waste and non-hazardous waste pollutions. The environmental management performance is calculated annually and reported through a verification report on the integration of LCA studies to the Ministry of Environment and Forestry, Republic of Indonesia. Some of the environmental risk control programs carried out by PLN UIK TJB can be seen in the table below.

Table 5. Environmental Risks Management Programs of PLN UIK TJB

Aspect	Program
Energy	• Degradation control of the main equipment unit • Water system interconnection • Closed Cycle Refrigeration (CCCW) • Rehabilitation of turbine units • Excess water (oxygen) control in water heater inlets
Hazardous Waste	• Utilization of gypsum waste as an industrial raw material product • Reducing ash waste with the coal blending method
Non-hazardous Waste	• Installation of additional Rubber Seals at FFB
Water	• Optimization of soot blow operations & addition of sequence 8 in the soot-blow operational scheme • Reusing the overflow cooling tower water for make-up water in DCC
Waste water	• Reducing the volume of waste water by optimization of soot blow operations & addition of sequence 8 in the soot-blow operational scheme • Reusing the overflow cooling tower water for make-up water in DCC
Air Pollutant	• Turbine rehabilitation • Restoration the transformator • Maintenance outage

Noise

Generally, the noise produced by a power plant comes from the operating machines i.e. boiler, pumps, turbines, etc. and it can be reduced by installing the silencer at the power plant building.

Electromagnetic Field

According to the Indonesian law, there is no restriction on electromagnetic fields (EMF) and no data available from the power plant.

Land Use

PLN UIK TJB consist of four power plants. The total land used by PLN UIK TJB equal to 1,798,854 m^2, where each power plant occupies an area of 449,713.5 m^2. According to Corine Land Cover Classes, the land was used to be an open-spaces with little or no vegetation (class 3.3) dan now became and industrial area (class 1.2). Power plant units 1 and 2 are the first to operate, it has been operated for 17 years, continue by the 3rd unit that has been in operating for 12 years and the newest one is the 4th unit which operating for 11 years. The area of PLN UIK TJB consists of various main processing units and supporting facilities, among others are ash pong, boiler, condensor, ESP, pulverizer, transformator, turbin & generator, ash bunker, chimney, coal jetty & ship unloader, et cetera.

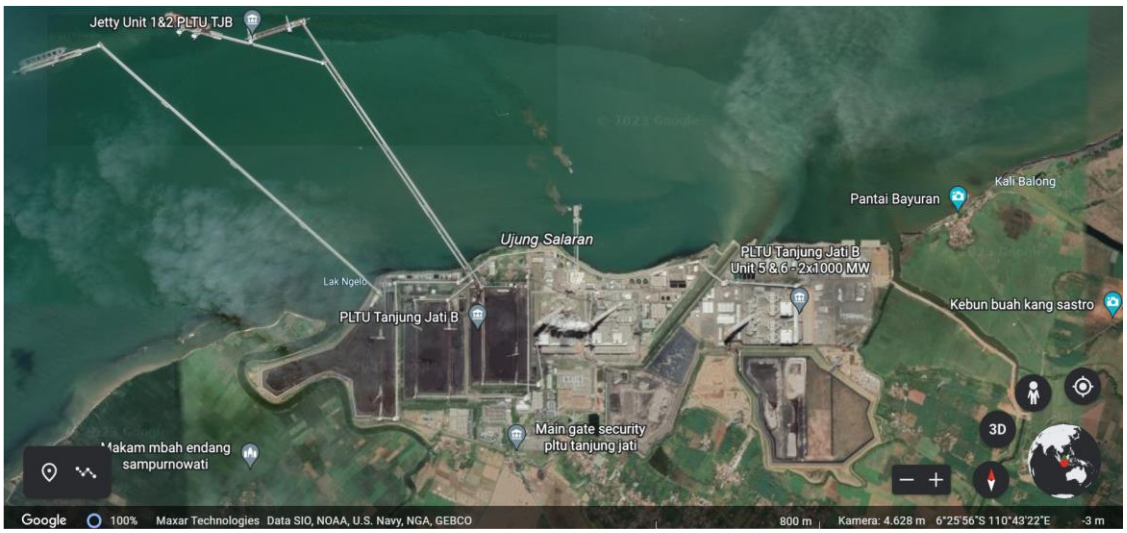

Figure 3. PLN UIK TJB seen from Google Earth

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References

General Programme Instructions of the International EPD® System. Version 4.0.

Guidelines for the Preparation of the 2021 Life Cycle Assessment Report (LCA).

Regulation of the Minister of Environment and Forestry No. 01 of 2021. **Company Performance Rating Assessment Programme in Environmental Management**.

IPCC. 2006. **IPCC Guidelines for National Greenhouse Gas Inventories**. Japan: IGES.

IPCC. 2019. **IPCC Guidelines for National Greenhouse Gas Inventories**. Japan: IGES.

ISO 14025:2010 Environmental labels and declarations – **Type III environmental declarations – Principles and procedures.**

ISO 14040. 2006. **Environmental management-life cycle assessment-principles and framework.**

ISO 14044:2006 **Environmental management – Life cycle assessment – Requirements and guidelines.**

PCR 2007:08 **PCR for Electricity, steam and hot water generation and distribution**, version 4.2, valid until 2024-03-16, www.environdec.com

Widodo, N. A., et al. 2022. Biodiversity Development for Future Sustainability. Jepara: PT PLN (Persero) Tanjung Jati B.

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