Environmental Product Declaration
In accordance with ISO 14025:2006 for:

Urea Fertilizers

From

PT Petrokimia Gresik

Programme
The International EPD® System
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Programme Operator
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PETROKIMIA GRESIK
Solusi Agroindustri

THE INTERNATIONAL EPD® SYSTEM

Southeast Asia

Programme Information

Programme	**The International EPD® System** **EPD International AB** Box 210 60 SE-100 31 Stockholm Sweden www.environdec.com info@environdec.com EPD registered through the fully aligned regional hub: **EPD Southeast Asia** Kencana Tower Level M, Bussiness Park Kebon Jeruk Jl. Raya Meruya Ilir No.88, Jakarta Barat 11620 Indonesia www.epd-southeastasia.com

Accountabilities for PCR, LCA and Independent, Third-party verification
Product Category Rules (PCR)
Product Category Rules (PCR) Mineral or chemical fertilizer, UN CPC 3461 2010:20 Version 3.0.1
PCR review was conducted by: **The Technical Committee of the International EPD® System. See www.environdec.com/TC for a list of members.** **Review chair: Flippo Sessa** The review panel may be contacted via the Secretariat www.environdec.com/contact
Life Cycle Assessment (LCA)
LCA Accountability: PT Properindo Enviro Tech
Third-Party Verification
Independent third-party verification of the declaration and data according to ISO 14025:2006, via: ☒ EPD verification by individual verifier Third-party verifier: Gloria FJ Kartikasari, Life Cycle Indonesia Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity third-party verifier: ☐ Yes ☒ No

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EPDs within the same product category but registered in different EPD programmes may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of

data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see ISO 14025.

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Southeast Asia EPD

Table of Content

Company Information

Owner of the EPD: PT Petrokimia Gresik

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Company Description

PT Petrokimia Gresik is the most complete fertilizer factory in Indonesia, which at its inception was called the Surabaya Petrokimia Project, and is the oldest fertilizer producer after PT Pupuk Sriwijaya (Pusri) Palembang. The construction contract was signed on August 10, 1964, and came into effect on December 8, 1964. This project was inaugurated by the President of the Republic of Indonesia on July 10, 1972, which date was then designated as the anniversary of PT Petrokimia Gresik with the form of business entity being a public company with its products still in the form of Urea fertilizer and ZA fertilizer.

Initially this company was under the Ministry of Industry and Trade, namely under the Directorate of Basic Chemical Industry. Then in 1992 it was under the Directorate of Metal Industry, namely since the establishment of the subsidiary PT Puspetindo which produces equipment for factories. But since 1998 this company has been under the auspices of the Ministry of Finance.

The name Petrokimia comes from the words "Petroleum Chemical" shortened to "Petrochemical", which means chemicals produced with petroleum and gas as raw materials. This company produces several chemical fertilizers such as Urea, ZA, SP-36, Phonska, DAP, NPK Kebomas, ZK and organic fertilizer. Apart from that, PT Petrokimia Gresik is engaged in the production of urea and chemicals such as liquid CO2, dry ice, ammonia, sulfuric acid, phosphoric acid, cement retarder, purified gypsum, aluminum fluoride and liquid N2 as well as services in construction, engineering and other services. PT Petrokimia Gresik occupies 450 hectares of land located in Gresik Regency, East Java Province.

Certification

- SNI OSP/IEC 17025:2017
- ISO 50001:2018
- ISPS Code
- Gold PROPER
- Green Port Award
- Green Building 2023

Name and Location of Production Site

Jl. Jenderal Ahmad Yani – Ngipik Village, Gresik Sub-District, Gresik Regency,
East Java, 61119, Indonesia

Product Information

Product Name

Prill Urea Fertilizers.

Product Identification

Prill urea fertilizer products with the formula (NH2)2CO or CH4N2O with CAS No. 57-13-6 is used as fertilizer, animal feed, resin, variously including chemical intermediates, stabilizer in explosives, pharmaceuticals, and adhesives.

Product Composition

Nitrogen 46%, Biuret 1% and H_2O 0,5%.

UN CPC Code

UN CPC 3461 Nitrogenous Fertilizers

Geographical Scope

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

- The location of the urea supplier is in Gresik City Industrial Area, East Java and Karawang, West Java.
- The location of the plant is in Gresik City Industrial Area, East Java.
- The distribution urea location to 38 district in East Java.

Agronomic Efficiency Index

Agronomic Efficiency Index (AEI) is an indicator of the effect of urea use on soybean productivity. The AEI of urea fertilizer is estimated to be between 4 - 14 kg soybeans/kg urea based on field studies conducted by the internal R&D team.

Uptake Index

The urea uptake index is represented by nitrogen uptake. If urea is applied to the soil, 27% of the N will be absorbed by plants, while 68% will remain in the soil and the remaining 5% will be lost and carried away by water. Meanwhile, the application of urea on soil is 23,460 kg/2000 m2 of agricultural land.

LCA Information

Declared Units

1000 kg of produced and its packaging by PT Petrokimia Gresik.

Database

The databases used in this EPD are Ecoinvent 3.8. are used in calculating the impact of *upstream, core,* and *downstream* processes.

Time Representativeness

The data period of upstream used within 6 years (2015-2020), data core period within 1 year (January 01 – December 31 2022), and data downstream used within 2 years (2015-2016).

LCA Software

The LCA study was conducted using SimaPro 9.4 and Microsoft Excel software.

Assumptions

There are several assumptions contained in this LCA study:

1. Calculation of the impact of fertilizer use by consumers using the IPCC conversion factor and PCR.
2. Calculation of the impact of end of life packaging in accordance with the journal Chen et al (2019) using a scenario of 10% recycling, 50% burning through an incinerator, and 40% landfilling.
3. The urea product used by consumers is assumed to be used entirely in one year.

Cut-off rules

The cut-off rules in this LCA are followed in accordance with the Product Category Rules (PCR) Mineral Or Chemical Fertilizer, UN CPC 3461 2010:20 Version 3.0.1 where the data is for base flow and from product systems that contribute at least 99% of the declared environmental impact have been included.

Data Quality

This LCA has followed the data quality requirements according to Product Category Rules (PCR) Mineral Or Chemical Fertilizer, UN CPC 3461 2010:20 Version 3.0.1. For upstream processes, it is collected from generic data which contains production process data from raw materials or supporting materials used in the production cycle but is not actually collected from Petrokimia Gresik. Specific data used for the core process was collected from the actual factory, namely PT Petrokimia Gresik. Meanwhile, downstream processes are collected from generic data, namely data from generally available data sources that meet the specified data quality characteristics for precision and completeness. Generic data were selected because specific data were not available.

The quality of specific data in the core scope is based on data from the entire fertilizer manufacturing life cycle which is equipped with the company's process units, raw materials, chemicals, fuel/electricity used and the real emissions resulting from the process. The quality of the upstream and downstream generic data is based on the dataset used in the research which is no more than 10 years old (upstream 6 years and downstream 2 years) so that the data quality is suitable for this research. Data quality checks must be carried out during the data collection process to provide evidence that the data quality requirements meet the SNI ISO 14040:2016 and SNI ISO 14044:2017 standards.

Allocations

This LCA has followed the allocation rules in accordance with the Product Category Rules (PCR) Mineral Or Chemical Fertilizer, UN CPC 3461 2010:20 Version 3.0.1. The principle applied in this LCA is that all The allocation case follows the 100% product rule so that the total impact generated for all products from each process is equal to the output load for each process. The PT Petrokimia Gresik factory only produces urea products, so there is no co-product allocation.

System Boundaries

The boundaries of PT Petrokimia Gresik's LCA study in 2022 are Upstream to Downstream in accordance with the National Fertilizer Environmental Association Agreement regarding the LCA Implementation Plan for Fertilizer Activities in the 2021 PROPER assessment and Product Category Rules (PCR) Mineral Or Chemical Fertilizer, UN CPC 3461 2010:20 Version 3.0.1. The production system

starts from the Upstream stage, there are natural gas production processes, catalyst production, chemical production, oil lubricant production, rag production, and fertilizer packaging production. The main process (Core) in this system is divided into natural gas transportation data, catalyst transportation, chemical transportation, oil lubricant transportation, fabric transportation, ammonia core process which consists of feed treating unit, reforming unit, Syngas Purification unit, ammonia synthesis unit, ammonia purification unit, process condenser stripper, and maintenance process, the core urea process which consists of synthesis unit, purification unit, concentration unit, prilling unit, recovery unit, process condensate treatment, bagging plant, and process maintenance. Apart from the Urea Production process, other processes in the core are WTP, WWTP utilities, steam generation, generators, maintenance of ammonia and urea plants and on-site transportation. Then the Downstream stage consists of the fertilizer transportation process to distributors, kiosks and consumers, use by consumers, and end of life packaging.

The reason for choosing system boundaries is in accordance with the agreement with the association and Product Category Rules (PCR). Data that can be collected and is available at PT Petrokimia Gresik can cover Upstream to Downstream study system boundaries. The company's overall production process flow diagram can be seen in Figure 1.

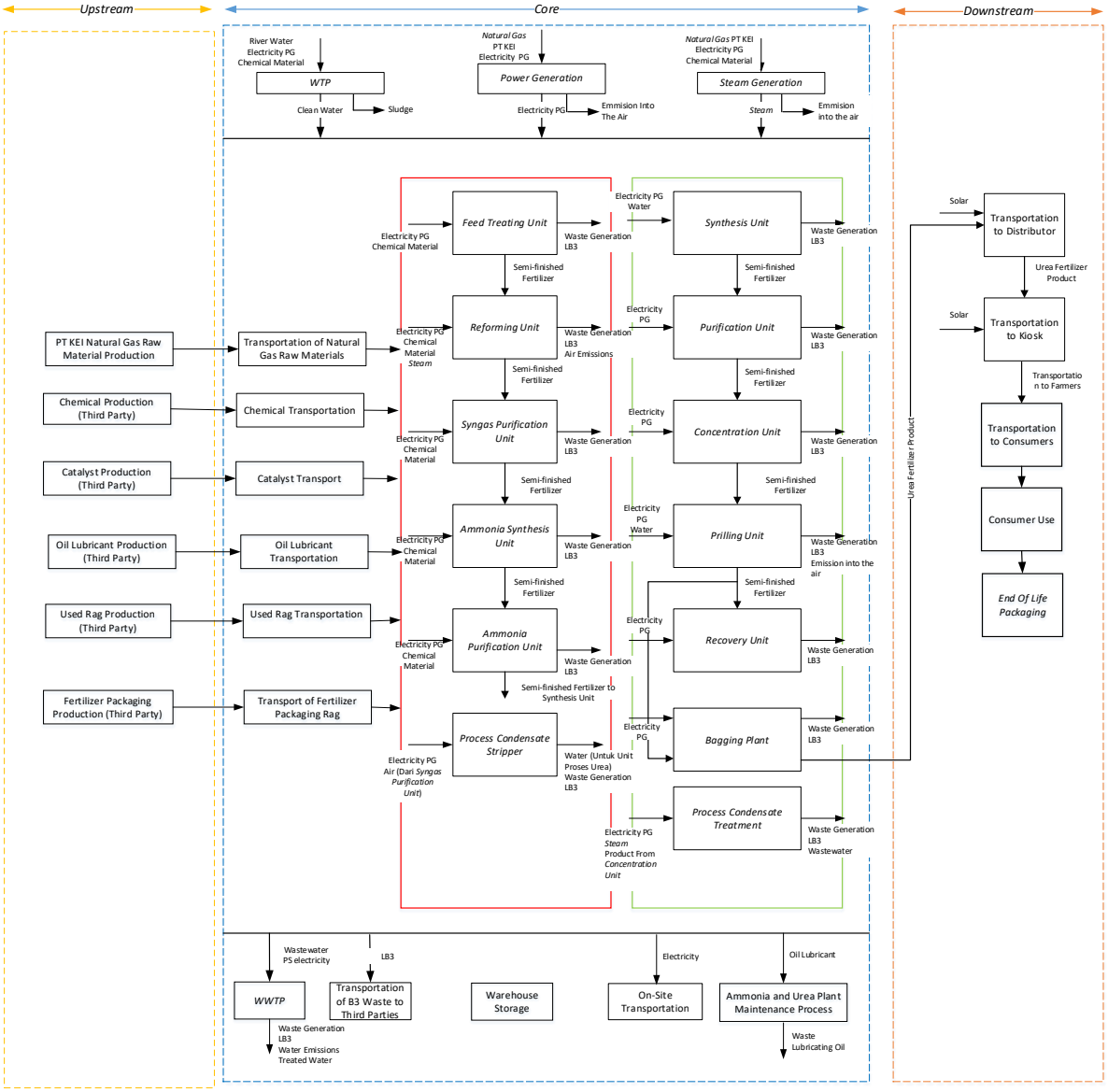

Figure 1 PT Petrokimia Gresik Production System and System Boundaries

Procedur of Data Collection

PT Petrokimia Gresik collects data on each process unit included in the system boundary including data on raw materials, fuel, use of electrical energy, emissions to air, emissions to water, and land use data. The data collected is grouped into 2 types of data namely primary data and secondary data in accordance with those stipulated in the National Fertilizer Energy Environmental Association Agreement regarding the LCA Implementation Plan for Fertilizer Activities in the 2021 PROPER assessment and Product Category Rules (PCR) Mineral Or Chemical Fertilizer, UN CPC 3461 2010:20 Version 3.0.1. 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 Material: Natural Gas.
  b. Fuel/energy: Electrical.
  c. *Chemicals:* Nickel Oxide Catalyst, zinc oxide catalyst, UCON 50 HB-5100, diethanol amine, potassium carbonate, Kalgen 352-C, Kurita H-6070, Oxynon M-757, Promoted Iron, Sulfuric acid, NaOH, alum, chlorine gas, and chlorine.
  d. Water use: River Water.
  e. Other material uses: Rag, packaging, oil lubricant.
- *Output* and/or Product
  a. Emissions into the air: Nitrogen Oxide, Sulfur Oxide, Total Particulates, Ammonia, Nitrogen Dioxide, Sulfur Dioxide, Carbon dioxide, and Carbon Monoxide.
  b. Emissions into water: BOD, COD, NH3-N, Phosphorus, Methane, Ammonia, Hydrogen Sulfide, TKN, Ethanol and iron.
  c. *Hazardous waste*: Used rag, used oil and used catalyst.
  d. Main product: Urea Fertilizers.

Content Declaration

Product Component	Unit	Amount	Dangerous Nature
Nitrogen	%	46.26	Contains gas under pressure; can explode if heated. Can displace oxygen and cause rapid suffocation
Carbon	%	19.83	A gas that can interfere with the blood's ability to carry oxygen to body tissues.
Oxygen	%	26.43	Not classified as a hazardous chemical
Hydrogen	%	6.61	Gas can cause respiratory tract irritation and coughing.
Water	%	0.42	Not classified as a hazardous chemical
Biuret	%	0.44	Causes severe burns to the skin and eye damage

Packaging

Distribution Packaging:

The product are distributed in 50 kg bag packaging.

Consumer Packaging:

The product is packaged in a bag of 50 kg capacity plastic packaging weighing min. 136 grams and is composed of min. 40 grams of polyethylene and min 96 grams of polypropylene.

Recycled Materials:

The product does not contain any recyled material.

Potential Environmental Impact

No	Impact Category		Unit/ ton	Upstream	Core	Downstream	Total
1	**Global Waming Potential (GWP)**	**Global Waming Potential – Fossil Fuels**	Kg CO_2 eq/ton	1.93E+02	4.48E+02	4.58E+03	5.22E+03
		Global Waming Potential – biogenic	Kg CO_2 eq/ton	3.14E-01	4.27E-03	3.76E-01	6.95E-01
		Global Waming Potential – Land use and LU change	Kg CO_2 eq/ton	4.15E-02	2.29E-01	1.78E-01	4.49E-01
		Global Waming Potential – Total	Kg CO_2 eq/ton	1.93E+02	4.48E+02	4.58E+03	5.22E+03
2	**Acidification Potential (AP)**		Mol H+ eq/ton	1.13E+00	2.31E-01	2.73E+01	2.87E+01
3	**Eutrophication Potential (EP)**	**Eutrophication Potential, Aquatic freshwater**	Kg P eq/ton	7.81E-03	1.10E-02	3,89E-02	5.77E-02
		Eutrophication Potential, Aquatic marine	Kg N eq/ton	6.09E-02	6.28E-02	6.83E+00	6.95E+00
		Eutrophication Potential, Terrestrial	Mol N eq/ton	5.53E-01	7.03E-01	2.62E+02	2.63E+02
4	**Photochemical Ozone Creation Potential (POCP)**		Kg NMVOC eq/ton	7.59E-01	2.12E-01	9.77E+00	1.07E+01
5	**Ozone Depletion Potential (ODP)**		Kg CFC 11 eq/ton	2.75E-06	2.85E-03	5.18E-05	2.90E-03
6	**Abiotic Deplation Potential**	**For mineral and metal (non-fossil resources)**	Kg Sb eq/ton	4.74E-04	1.19E-02	3.86E-03	1.58E-02
		For fossil resources	MJ, *net calorific value*/ton	2.18E+04	4.59E+02	3.80E+03	2.61E+04
7	**Water Deprivation Potential (WDP)**		M^3 World eq, Deprived/ton	3.86E+00	1.16E+01	2.01E+01	3.55E+01

Use of Resources

Parameter		Unit/Ton	Non-Contruction Products:			
			Upstream	Core	Downstream	Total
Primary energy resource-Renewable	Use as energy carrier	MJ, net calorific value/ton	2.91E+01	2.56E+01	1.01E+01	6.48E+01
	Use as energy materials	MJ, net calorific value/ton	0	0	0	0
	TOTAL	MJ, net calorific value/ton	2.91E+01	2.56E+01	1.01E+01	6.48E+01
Primary energy resource Non-Renewable	Use as energy carrier	MJ, net calorific value/ton	2.14E+04	4.43E+02	3.45E+03	2.53+04
	Use as energy materials	MJ, net calorific value/ton	0	0	0	0
	TOTAL	MJ, net calorific value/ton	2.14E+04	4.43E+02	3.45E+03	2.53+04
Secondary material		Kg/ton	0	0	0	0
Renewable secondary fuels		MJ, net calorific value/ton	0	0	0	0
Non-renewable secondary fuels		MJ, net calorific value/ton	0	0	0	0
Net use of fresh water		m^3 /ton	1.31E+00	6.40E+00	1.92E+01	2.69E+01

Waste Production

Parameters	Unit/Ton	Upstream	Core	Downstream	Total
Hazardous waste disposed	Kg/ton	2.29E-01	7.32E-05	0	2.29E-01
Non-hazardous waste disposed	Kg/ton	1.12E+00	0	1.54E+00	2.66E+00
Radioactive waste disposed	Kg/ton	0	0	0	0

Output Flows

Parameters	Unit/Ton	Upstream	Core	Downstream	Total
Component for reuse	Kg/ton	0	0	0	0
Material for recycling	Kg/ton	0	0	1.54E-01	1.54E-01
Material for energy recovery	Kg/ton	0	0	0	0
Exported energy, electricity	MJ/ton	0	0	0	0
Exported energy, thermal	MJ/ton	0	0	0	0

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Environmental Product Declaration