

# Environmental Product Declaration

In accordance with ISO 14025 and EN 15804:2012+A2:2019 for:

## Hot Rolled Plate (Meeting AS/NZS 3678:2016)

From



**PT Gunung Raja Paksi Tbk**



### Programme

The International EPD® System,  
[www.environdec.com](http://www.environdec.com)

### EPD registered through the fully aligned regional hub

EPD Southeast Asia,  
<https://www.epd-southeastasia.com/>

### Programme operator

EPD International AB

### Regional Hub

EPD Southeast Asia

### EPD registration number

S-P-04682

### Publication date

2022-02-22

### Revision date

2024-01-24

### Valid until

2027-02-22

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at [www.environdec.com](http://www.environdec.com)

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# General information

## Programme information

Programme	<b>The International EPD® System</b> EPD registered through the fully aligned regional hub: <b>EPD Southeast Asia</b>	
Address:	<b>EPD International AB</b> Box 210 60, SE-100 31 Stockholm, Sweden  <b>EPD Southeast Asia</b> Kencana Tower Level M, Business Park Kebon Jeruk Jl. Raya Meruya Ilir No. 89, Jakarta Barat 11620, Indonesia	<b>Website</b> <a href="http://www.environdec.com">www.environdec.com</a> <a href="http://www.epd-southeastasia.com">www.epd-southeastasia.com</a> <b>Email</b> <a href="mailto:info@environdec.com">info@environdec.com</a>

ISO standard ISO 21930 and CEN standard EN 15804 serves as the core Product Category Rules (PCR)

**Product category rules (PCR):**

PCR 2019:14 Construction Products, Version 1.11, 2021-02-05 (valid until 2024-12-20)

**PCR review was conducted by:**

The Technical Committee of the International EPD® System.

**Review chair:**

Claudia A. Peña, University of Concepción, Chile.

The review panel may be contacted via the Secretariat [www.environdec.com/contact](http://www.environdec.com/contact).

Independent third-party verification of the declaration and data, according to ISO 14025:2006:

- EPD External Covering       EPD Internal covering  
 EPD process certification       EPD verification

**Third party verifier:**

Jeff Vickers, thinkstep-anz

**Approved by:**

The International EPD® System Technical Committee, supported by the Secretaria

Procedure for follow-up of data during EPD validity involves third party verifier:

- Yes       No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804. For further information about comparability, see EN 15804 and ISO 14025.

# Company information

## Description of the organisation

Established in 1970 in Medan, North Sumatra, the company with the name of PT Gunung Naga Mas, started the business by producing hot steel, gradually producing beams and steel sheets. In 1991, PT Gunung Naga Mas transitioned to PT Gunung Raja Paksi (GRP). GRP is located in Cikarang Barat, West Java Province, Indonesia, covering more than 200 hectares. By now, GRP has achieved production capacity of around 2.2 million tonnes per year. In the coming years, GRP will continue to grow and ensure the fulfillment of the need for high quality steel products.

As one of the largest private steel companies in Indonesia, PT Gunung Raja Paksi Tbk (GRP), a member of Gunung Steel Group, has a vision to be the most competitive and valuable benchmark for large private steel companies in Indonesia. To become a world-class integrated steel manufacturer, GRP always nurtures a culture of continuous improvement through achievement and advancement in all fields of development. The mission of the company is to ensure stakeholders' and customers' satisfaction through innovation, efficiency, productivity, quality products and services as well as company social responsibility.

GRP continues to show sustainable growth in all areas. Until now, there are more than 4500 qualified employees, who have undergone rigorous training, helping Gunung Steel Group (GSG) achieve corporate success in Indonesia. The company is committed to always operating beyond compliance, including on the aspect of the environment. Therefore, GRP is very concerned about the quality of products and its management systems. The ability of GRP has been proven by international market customers in Asia, South Asia, Australia, Africa, Europe, Middle East, and America.



## Product-related or management system-related certifications

This is evident from the many international certifications obtained such as

- ABS (American Bureau of Shipping) certification no STML -T1688104, T 1731450-2, and Task - T1740229 certification no. STML -T1731450-2
- ACRS (Australasian Certification Reinforcing and Structural Steel) 3678 certification no 171202
- BKI (Biro Klasifikasi Indonesia) certification no 00104.20.TP01195
- BSI (British Standards Institution) ISO 14001:2015
- BV (Bureau Veritas) certification no 53331, 53330, 10336/D0, and 14452/C0
- ISO 17025:2017
- ISO 45001:2018 certification no OHS 727495
- JIS-JQA certification no JQID16002-000G
- LR (Lloyd's Register) certification no LR2002980WA and QA ISO 9001:2015 no. 10115920
- Membership of Climate Action CO2 Worldsteel Association
- SIRIM (Standard and Industrial Research Institute of Malaysia) certification no PC001331
- SNI (Indonesian National Standard) 07-0601-2006

Details of GRP's commitment to sustainable development can be found in the company's sustainability report.

## Name and location of production site

Jl. Perjuangan No.8, RT.004/RW.006,  
Sukadanau, Kec. Cikarang Barat, Bekasi 17530,  
West Java, Indonesia

# Product information

## Product name

Hot Rolled Plate

## Product identification

AS/NZS 3678:2016, ACRS Certificate No.171202

## Product description

Hot rolled plate is made of steels which are deformed in the continuous/semi-continuous type hot rolling mill with Automatic Gauge Control (AGC) facilities using Gamma-ray or equivalent thickness gauge to monitor and control variation of thickness along the length to gain a desirable dimension of a steel plate.

There are several steel types in every specification i.e., structural Mild Steel and High Strength Steel as seen on the table below. Any differences in composition of steel grades is generally considered insignificant compared to the overall results (the average of overall variation of no more than 10% from cradle to gate). Hence, the environmental performance was grouped.



Table 1. Steel Type

Steel Type	Grade	General Description	Typical Uses	Specification Standard
Structural Mild Steel	200 250 300	Hot rolled Structural Mild Steel with nominal 250 MPa yield strength. Including additional testing requirements for impact with different range of temperature.	<ul style="list-style-type: none"> <li>Structural steel for general construction</li> <li>Structural Steel Work for fabrication and erection</li> <li>Bridge design</li> <li>Buildings</li> <li>Storage Tanks</li> </ul>	1. AS/NZS 3678 : 2016 2. AS/NZS 1365 : 1996 (reconfirmed 2016)
High Strength Steel	350 400	Hot rolled High Strength Steel with nominal 350 MPa yield strength. Including additional testing requirements for impact with different range of temperature.		

## Plate Size

Maximum width is 3000 mm and length is 12000 mm which GRP capable to supply. However, other dimensions (custom) may be ordered by agreement.

Table 2. Standard GRP Plate Size

Standard Plate Size	Width (mm)	1200	1219	1500	1520	1800	1830
	Length (mm)	2400	2438	6000	6096	6000	6096

**Fabricating Performance**

Fabricating performance is an indicator of the steel plate to show the level of facility and suitability of the material to perform into other products such as welding or cold forming. GRP Product is applicable to have bending and welding method with succesfull rate  $\geq 8$

Table 3. Fabricating Performance

1 = Limited	10 = Excellent
Method	Rating
Bending	8
Welding	9

**Specification Standard**

The standar specification is based on AS/NZS with the following grade of 200; 250; 300; 350 and 400. Additional thickness test i.e., L15; L20; L40 are also shown in table 4, table 5 and table 6.

Table 4. Mechanical Properties.

Specification & Grades	Applicable Thickness in GRP (mm)	Thickness Range (mm)	Tensile Test (Transversal)		
			YS (N/mm <sup>2</sup> )	TS (N/mm <sup>2</sup> )	Elongation (%)
			Min	Min	Min
AS/NZS 3678 :2016 Gr. 200, 200 L15; 200 L20	$\geq 5 - \leq 100$	$\leq 8$	200	300 <sup>A</sup>	22 <sup>B</sup>
		$> 8 \leq 12$	200	300	22 <sup>B</sup>
		$> 12 \leq 20$	-	300	22 <sup>B</sup>
		$> 20 \leq 50$	-	300	22 <sup>B</sup>
		$> 50 \leq 80$	-	300	22 <sup>B</sup>
		$> 80 \leq 150$	-	300	22 <sup>B</sup>
AS/NZS 3678 :2016 Gr. 250, 250 L15; 250 L20	$\geq 5 - \leq 100$	$\leq 8$	280	410 <sup>A</sup>	22 <sup>B</sup>
		$> 8 \leq 12$	260	410	22 <sup>B</sup>
		$> 12 \leq 20$	250	410	22 <sup>B</sup>
		$> 20 \leq 50$	250	410	22 <sup>B</sup>
		$> 50 \leq 80$	240	410	22 <sup>B</sup>
		$> 80 \leq 150$	230	410	22 <sup>B</sup>

Specification & Grades	Applicable Thickness in GRP (mm)	Thickness Range (mm)	Tensile Test (Transversal)		
			YS (N/mm <sup>2</sup> )	TS (N/mm <sup>2</sup> )	Elongation (%)
			Min	Min	Min
AS/NZS 3678 :2016 Gr. 300, 300 L15; 300 L20; 300 L40	≥8 - ≤100	≤ 8	320	430	21
		> 8 ≤ 12	310	430	21
		> 12 ≤ 20	300	430	21
		> 20 ≤ 50	280	430	21
		> 50 ≤ 80	270	430	21
		> 80 ≤ 150	260	430	21
AS/NZS 3678 :2016 Gr. 350, 350 L15; 350 L20; 350 L40	≥8 - ≤100	> 8 ≤ 12	360	450	20
		> 20 ≤ 32	340	450	20
		> 32 ≤ 80	340	450	20
		> 80 ≤ 100	330	450	20
AS/NZS 3678 :2016 Gr. 400, 400 L15; 400 L20	≥8 - ≤32	≤ 8	400	480	18 <sup>c</sup>
		> 8 ≤ 12	400	480	18 <sup>c</sup>
		> 12 ≤ 20	380	480	18 <sup>c</sup>
		> 20 ≤ 50	360	480	18 <sup>c</sup>
		> 50 ≤ 80	360	480	18 <sup>c</sup>

**Remarks:**

- <sup>A</sup> Minimum tensile strength (TS) is not applicable for material with thickness < 6 mm.
- <sup>B</sup> For cross sectional test piece area > 1000 mm<sup>2</sup>, minimum elongation decreased by 2%.
- <sup>C</sup> For cross sectional test piece area > 1000 mm<sup>2</sup>, minimum elongation decreased by 2%.

Table 5. Impact Properties.

Specification	Grades	Temp. (°C)	Minimum Absorbed Energy (J) <sup>B</sup>
			Avg.
AS/NZS 3678 : 2016	Gr. 250/300/350/400	-	-
	Gr. 200/250/300/350/400 (L15)	-15	27
	Gr. 200/250/300/350/400 (L20)	-20	27
	Gr. 300/350 (L40) <sup>A</sup>	-40	27
	Gr. 300 (S0)	0	70

<sup>A</sup> Supplied in normalized condition up to 100 mm thickness to guarantee impact value

<sup>B</sup> The frequency of sampling from plate is every 70 tonne

Table 6. Through Thickness (Z-Test) Properties

Through Thickness (AS/NZS 3678:2016)				
Grade	Standard Product AS 3678 (mm)	Z 15	Z 25	Z 35
200	5-100	✓	✓	✓
250	5-100	✓	✓	✓
300	8-100	✓	✓	✓
350	8-100	✓	✓	✓
400	8-32	✓	-	-

Through Thickness Test (Z-Test), the product is capable from thickness 15 mm to 35 mm.

**UN CPC code**

41211 -Flat-Rolled Products of Non-Alloy Steel, Not Further Worked than Hot-Rolled, of a Width of 600 mm or More

**ANZSIC code**

2110 - Iron Smelting and Steel Manufacturing

**Geographical Scope**

Manufactured in Indonesia, supplied to Australia and New Zealand





# LCA information

## Declared Unit

1 tonne of hot rolled plate

## Reference service life

Not applicable

## Time representativeness

specific data for the manufacturing collected from 2019-01-01 to 2019-12-31. The 10-year age requirement for generic data has been met.

## Database(s) and LCA software used

generic data for upstream and downstream processes use Ecoinvent 3.6 database and modelled by using SimaPro Developer software version 9.1.0.8. No datasets older than 10 years were used.

## Description of system boundaries

The system boundary was chosen based on the goal and scope of the study and in accordance with EN 15804:2012+A2:2019, i.e. “cradle-to-gate” plus transport to customer, end of life stages and benefits and loads beyond the system boundary (module A1-A4, C1-C4, D). Modules A5 and B1-B7 have not been included due to the inability to predict how the material will be used in the construction process and use stage. The processes below are included in the product system to be studied:

### 1. Upstream (A1-A2)

- a. Steel Scrap collection & processing
- b. Production of raw materials (Hot Briquetted Iron, Pig Iron, CaO, MgO)
- c. Production of auxiliary materials in the form of solid, liquid or gas (e.g. Alloy, Chemicals, Electrode, Acetylene, Argon, Nitrogen, Oxygen, LNG, etc.)
- d. Production of electricity from electricity mix in Indonesia from Ecoinvent Database
- e. Transportation of raw/auxiliary materials from the supplier to manufacturing plant

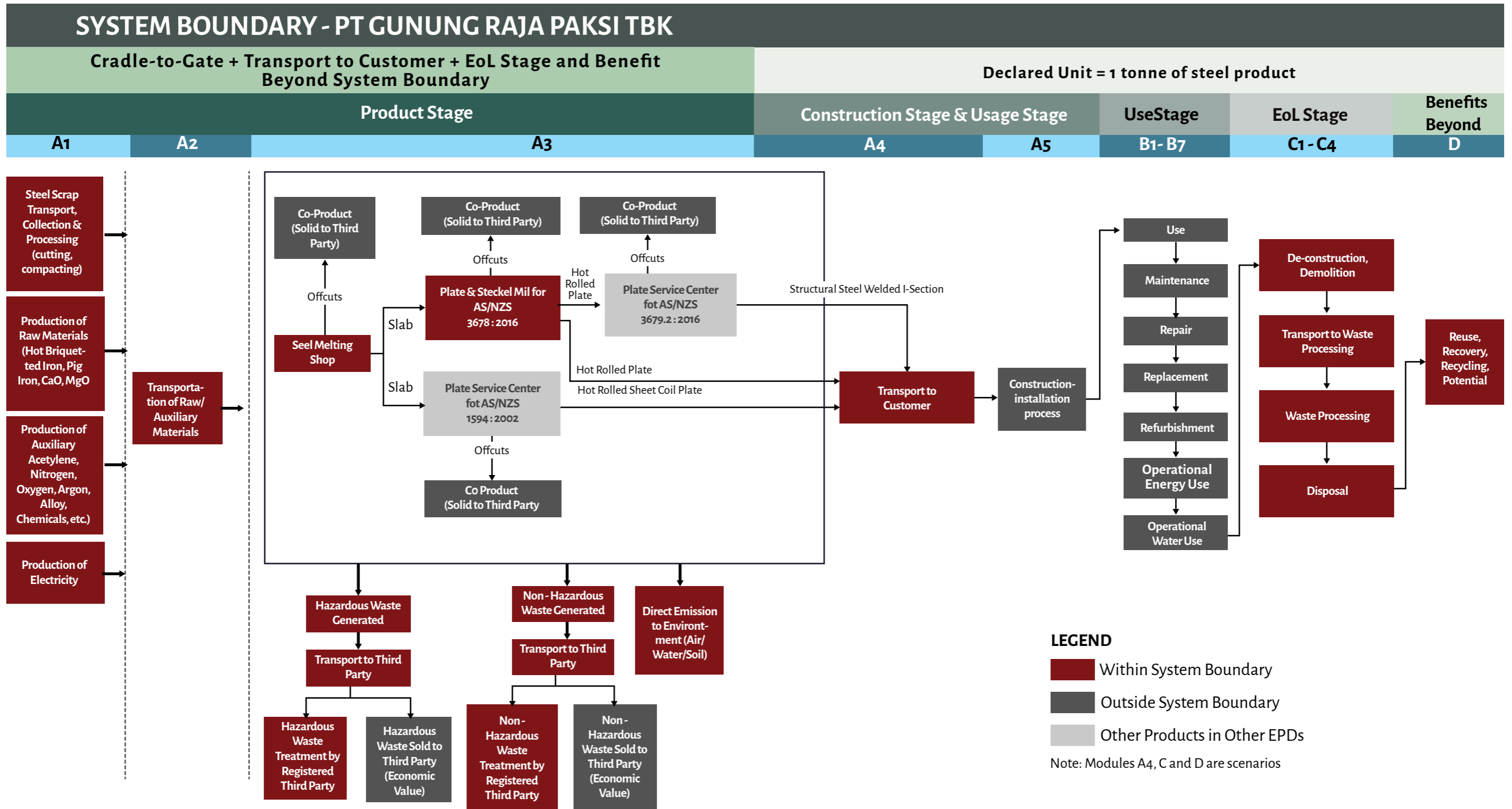
### 2. Core (A3)

- c. Steel Melting Shop (SMS): Electric Arc Furnace, Ladle Furnace, Tundish, Continuous Casting Machine, Cutting, Marking, Scarfing
- d. Plate & Steckel Mill (PSM): Reheating Furnace, Descale (Primary & Secondary), Roughing Mill, Steckel Furnace, Steckel Mill, Finishing Mill, Laminar Cooling, Up Coiler, Hot Leveler, Cooling Bed, Normalizing, AUT Machine, Shot Blasting & Painting, Inspection & Repair, Cooling, Equalizer, Cutting Process (Hot & Cold/Cold), Marking, Storage
- e. Clarifier (vessel)
- f. Dust collector & blower
- g. Waste treatment (slag, skull, scrap, welding wire, electrode, grinding disc, etc.)
- h. Hazardous waste generated and waste treatment by the registered third party
- i. Non-hazardous waste generated that is sold to third parties
- j. Direct emissions to the environment

### 3. Downstream (A4, C1-C4, D)

- d. Transport to the building/construction site
- e. Deconstruction & Demolition
- f. Transport to waste processing facilities
- g. Waste processing of the scrap steel
- h. Disposal
- i. Reuse/Recovery/Recycling at the end of life of the products

System diagram



### More information

Relevant website for more information regarding the manufacturing process:  
[www.gunungrajapaksi.com](http://www.gunungrajapaksi.com)

### Key Assumptions and Limitations

- Production process of materials in upstream process taken from Ecoinvent database reflects average or generic production and therefore does not correspond to actual suppliers.
- Any differences in composition of steel grades within the grade groups is generally considered insignificant compared to the overall results. The sensitivity analysis was conducted that shows the average of overall variation of no more than 10%. Hence, the impact assessment was grouped.
- Land use change emissions in module A3 were considered immaterial. The plant is in an industrial zone which was established in 1990 (more than 30 years ago).
- The water consumption was counted from the amount of makeup water to compensate the losses due to water evaporation.

### Cut-off rules

In case of insufficient input data or data gaps for a unit process, the cut-off criteria shall be 1 % of renewable and non-renewable primary energy usage and 1 % of the total mass input of that unit process. The total of neglected input flows per module, e.g., per module A1-A3, A4, C1-C4 and module D shall be a maximum of 5 % of energy usage and mass. In this study, all data in the product system is included. If there is missing specific data, generic data from the database or literature was used.

### Data Quality

- Time related coverage: specific data were collected from 2019-01-01 to 2019-12-31 and generic data are representative of the year 2019.
- Geographic coverage: specific data were collected from the area under study, i.e., West Java, Indonesia. Electricity production as a key input is sourced from Java-Madura-Bali (JAMALI) network, Indonesia. Therefore, Indonesian data that has been adjusted to represent JAMALI was used. Another key input is pig iron that is sourced from India. No specific data were available for pig iron production. Therefore, global data with some adjustments to the available India Ecoinvent database was used. This modelling choice affects less than 2% of the GHG results and is therefore considered appropriate.
- Technological coverage: specific data were collected from current steel making process under study. There is no specific data for upstream (module A1-A2) and downstream process (module A4, C1-C4), therefore generic data from the global average was used with similar technology aspects to describe the process under study.

Data quality for both specific and generic data were sufficient to conduct life cycle assessment in accordance with the defined goal and scope.

### Allocation

Economic allocation was applied in accordance with EN 15804:2012+A2:2019. Allocation was applied to allocate the main product and the steel scrap coming out the manufacturing i.e., cutting scale and mill scale. For the end-of-life of waste generated in the manufacturing process (e.g., slag), polluter pays principle are applied for each type of waste. This means that GRP will carry the full environmental impact until the end-of-waste state is reached.

Multi-input allocation is relevant for any material sent to landfill, i.e. steel scrap and also waste generated in the manufacturing. The emissions to air and soil (from leaching) are determined based on the physical/chemical composition of the inputs or physical properties of the material going to landfill. As a result, steel products or other waste generated (paint container, used spray paint containers, penetrant, etc.) that end up in landfill only contribute to those emissions that are likely to occur based on the input material. Overhead processes associated with landfill (e.g. energy used in equipment for managing the landfill site) are attributed to waste flows based on their mass. Mass allocation is considered a reasonable estimation for attributing overhead processes to various waste flows. This allocation is applied as well for any material sent to incineration, i.e. contaminated gloves and rags

In this study, the closed-loop process is applied between modules A-C and module D. When the scrap is used in the manufacture of a new product, there is an allocation (or debit) associated with the scrap input. Meanwhile the recovered steel scrap for recycling is allocated a credit (or benefit) associated with the avoided impacts of the virgin material. If the amount of recovered steel scrap for recycling is less than what the product system requires/steel scrap needed in the manufacture, then the environmental burdens associated with meeting the raw material demand are included in this closed-loop model. If, however, the amount of recovered steel scrap for recycling is larger than what the product system requires/steel scrap needed in the manufacture, then the product system receives a net credit, equivalent to the net amount of virgin material avoided.

The recovered steel scrap that is not looped back to the manufacture (leaving product system that have passed the end-of-waste state), goes to module D, except those which have been allocated as co-product. The end-of-waste state of the steel scrap is reached when the steel scrap is processed in the waste processing (Module C3). The steel scrap is sorted and pressed into blocks and ready to be used for other specific purposes. After the point of end-of-waste, the downstream emissions related to transportation process from recycler to manufacture is attributed to the processing unit that uses the secondary material.

The impacts assigned to the credit or burden that comes from module D are calculated by adding impact connected to secondary steel production from EAF plant (beyond system boundary) and subtracting the impacts resulting from primary steel production at BOS plant. The difference between 100% primary steel production (BOS plant) and 100% secondary steel production (EAF plant) is the result of the module D. The calculation is following worldsteel methodology of steel scrap. The benefit beyond system boundary (module D) is a credit estimation resulted from the system because in real-life there is a trans-continent boundary of the market in Australia/New Zealand and producers in Indonesia which do not share the recycled material market. The assessed products are exported to Australia and New Zealand. Therefore, the recovery rate for recycling is adjusted to the rate in each country, i.e., 90% in New Zealand and Australia. Around 10% of the steel scrap is considered as material losses that will go to another disposal scenario to landfill.

### LCA Scenarios and Additional Technical Information

- Electricity grid in module A3 was based on Ecoinvent database for Indonesia that was modified to represent JAMALI (Java-Madura-Bali) electricity network. The composition of electricity mix for JAMALI and the amount of electricity losses were adjusted based on Statistic from Directorate General of Electricity (2019) which is highly reliant on coal (66%), gas fired (27%), hydropower (4%), geothermal (2%), and diesel (<1%). The climate impact of the electricity is 1.27 kg CO<sub>2</sub> eq./kWh.
- The 'Resource depletion – water' (RDW) indicator requires water scarcity data for the production areas, and these were modelled using the specific watershed scarcity data for Bekasi, West Java, i.e., 0.4m<sup>3</sup>/m<sup>3</sup> for the characterisation factor.

- Pig iron was sent to GRP in solid form from the supplier in India. Therefore, the global Ecoinvent database was modified by using available India Ecoinvent databases. This modification was applied as well for Hot briquetted iron (HBI) that was imported from supplier in Singapore.
- Transportation using truck in Indonesia use EURO3 to represent the current condition. Meanwhile in Australia and New Zealand, EURO5 is used as a standard emission.
- Transport distance was calculated by Google Maps from GRP to Port of Tanjung Priok Indonesia (47 km) and calculated by Sea Route & Distance Calculator from Port of Tanjung Priok to destination port (Port of Melbourne, Australia = 6 300 km; Port of Lyttelton, New Zealand = 9 134 km).
- Amount of diesel used for demolition process was modelled using Ecoinvent database (Waste reinforcement steel {RoW} treatment of waste reinforcement steel, recycling | Cut-off, U) for global data, i.e., 0.626 MJ diesel/kg steel.
- Amount of diesel and electricity consumption for waste processing was modelled using Ecoinvent database for global data on sorting and pressing iron scrap, i.e., 0.1 MJ diesel/kg steel and 0.01 kWh/kg steel.
- Electricity was modelled using Ecoinvent database for Australia and New Zealand
- Average recycling rate for steel is 90% in New Zealand according to New Zealand Steel (2021). Meanwhile in Australia it is around 90% according to the Department of the Environment and Energy (2018). Around 10% of the steel scrap was considered as material losses that will go to landfill.
- GRP uses external scrap in its steel production. Net scrap was calculated by excluding the amount of internal scrap (home scrap). The potential environmental benefit calculated for the end-of-life stage (Module D) was based on the net amount of scrap left in the system in accordance with “value of scrap” worldsteel methodology.

**Modules declared, geographical scope, share of specific data (in GWP-GHG indicator) and data variation**

Module	Product stage			Construction process stage		Use stage							End of life stage			Resource recovery stage	
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	X	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	ID, IN, SG, GLO	ID	ID	ID, AU, NZ	-	-	-	-	-	-	-	-	AU, NZ	AU, NZ	AU, NZ	AU, NZ	GLO
Specific data used	>90%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	<10%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	Not Relevant			-	-	-	-	-	-	-	-	-	-	-	-	-	-

# Content declaration

Hot rolled steel plate AS/NZS 3678:2016 manufactured by GRP is made of low alloy steels with pig iron and approximately 88 % scrap-based material. GRP followed the chemical range of AS/NZS 3678:2016 as per spec, therefore, our typical chemical composition can be seen below .

Product content	Weight, %				
Iron (virgin sources)	Approx. 11.7%				
Recycled Material (pre- and post-consumer)	Approx. 88.3%				
Chemical composition, %	AS/NZS 3678 :2016 Gr. 200, 200 L15; 200L20	AS/NZS 3678 :2016 Gr. 250, 250 L15; 250 L20	AS/NZS 3678 :2016 Gr. 300, 300 L15; 300 L20; 300 L40; 300 S0	AS/NZS 3678 :2016 Gr. 350, 350 L15; 350 L20; 350 L40	AS/NZS 3678 :2016 Gr. 400, 400 L15; 400 L2
Iron (Fe)	97-99	97-99	97-99	97-99	97-99
Carbon (C)	0.12-0.15	0.16-0.20	0.17-0.20	0.17-0.20	0.12-0.20
Silica (Si)	0.10-0.20	0.20-0.30	0.20-0.30	0.20-0.30	0.20-0.30
Manganese (Mn)	0.40-0.60	0.4-0.9	0.8-1.20	1.20-1.40	1.25-1.35
Phosphorus (P)	≤0.015	≤0.015	≤0.015	≤0.015	≤0.015
Sulphur (S)	≤0.010	≤0.010	≤0.0010	≤0.010	≤0.010
Packaging materials					
No packaging used for the products					

# Environmental performance

The potential environmental impact indicators along with the characterization method are described in the table below.

Impact Category	Abbreviation	Unit	Characterization Method
<b>Potential Environmental Impact Indicators, in accordance with EN 15804:2012+A2:2019</b>			
Global Warming Potential - total	GWP-total	kg CO <sub>2</sub> eq.	IPCC 2013
Global Warming Potential - fossil fuels	GWP-fossil	kg CO <sub>2</sub> eq.	IPCC 2013
Global Warming Potential - biogenic	GWP-biogenic	kg CO <sub>2</sub> eq.	IPCC 2013
Global Warming Potential - land use and land-use change	GWP-luluc	kg CO <sub>2</sub> eq.	IPCC 2013
Depletion potential of the stratospheric ozone layer	ODP	kg CFC <sub>11</sub> eq.	WMO 2014
Acidification potential	AP	mol H <sup>+</sup> eq.	Accumulated Exceedance
Eutrophication potential - freshwater	EP-freshwater	kg P eq.	EURTREND model (ReCiPe)
Eutrophication potential - marine	EP-marine	kg N eq.	EURTREND model (ReCiPe)
Eutrophication potential - terrestrial	EP-terrestrial	mol N eq.	Accumulated Exceedance
Formation potential of tropospheric ozone	POCP	kg NMVOC eq.	LOTUS-EUROS
Abiotic depletion potential for non-fossil resources	ADP-minerals & metals	kg Sb eq.	CML 2002a
Abiotic depletion potential for fossil resources	ADP-fossil	MJ, net calorific value	CML 2002a
Water (user) deprivation potential	WDP	m <sup>3</sup> world eq. deprived	AWARE

Impact Category	Abbreviation	Unit	Characterization Method
<b>Additional Environmental Impact Indicators, in accordance with EN 15804:2012+A2:2019</b>			
Particulate Matter emissions	PM	Disease incidence	SETAC-UNEP, Fantke et al. 2016
Ionizing radiation - human health	IRP	kBq U235 eq.	Human Health Effect model
Eco-toxicity - freshwater	ETP-fw	CTUe	USEtox
Human toxicity - cancer effects	HTP-c	CTUh	USEtox
Human toxicity - non-cancer effects	HTP-nc	CTUh	USEtox
Land use related impacts / soil quality	SQP	dimensionless	Soil quality index (LANCA®)
<b>Environmental Impact indicators, in accordance with EN 15804:2012+A1:2013</b>			
Global Warming Potential	GWP	kg CO <sub>2</sub> eq.	IPCC 2007 (AR4)
Ozone depletion potential	ODP	kg CFC <sub>11</sub> eq.	WMO 2003
Acidification potential	AP	kg SO <sub>2</sub> eq.	CML 2002b
Eutrophication potential	EP	kg PO <sub>4</sub> <sup>3-</sup> eq.	CML 2002b
Photochemical ozone creation potential	POCP	kg C <sub>2</sub> H <sub>4</sub> eq.	CML 2002b
Abiotic depletion potential for non-fossil resources	ADPE	kg Sb eq.	CML 2002b
Abiotic depletion potential for fossil resources	ADPF	MJ	CML 2002b
<b>Climate Impact, in accordance with PCR 2019-14 Construction products v1.11</b>			
Climate Impact	GWP-GHG	kg CO <sub>2</sub> eq.	IPCC 2013 (AR5)
<b>Resource Use Parameters</b>			
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	PERE	MJ	N/A
Use of renewable primary energy resources used as raw materials	PERM	MJ	N/A
Total use of renewable primary energy resources	PERT	MJ	N/A



Impact Category	Abbreviation	Unit	Characterization Method
<b>Resource Use Parameters</b>			
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	PENRE	MJ	N/A
Use of non-renewable primary energy resources used as raw materials	PENRM	MJ	N/A
Total use of non-renewable primary energy resources	PENRT	MJ	N/A
Use of secondary material	SM	kg	N/A
Use of renewable secondary fuels	RSF	MJ	N/A
Use of non-renewable secondary fuels	NRSF	MJ	N/A
Use of net fresh water	FW	m <sup>3</sup>	N/A
<b>Waste Categories and Output Flows</b>			
Hazardous waste disposed	HWD	kg	N/A
Non-hazardous waste disposed	NHWD	kg	N/A
Radioactive waste disposed	RWD	kg	N/A
Components for reuse	CRU	kg	N/A
Materials for recycling	MFR	kg	N/A
Materials for energy recovery	MER	kg	N/A
Exported electrical energy	EEE	MJ	N/A
Exported thermal energy	EET	MJ	N/A

### Differences Versus Previous Versions

This EPD represents the first update since its initial publication on 2022-02-22. The primary goal of this update is to ensure accuracy. After a thorough review, a miscalculation was identified and promptly rectified. This adjustment was made to provide the most precise and reliable information.

The key differences between the previous and updated versions of the EPD are as follows:

1. Electricity consumption in the Steel Melting Shop has been revised due to a miscalculation in the previous version electricity metering. Consumption has changed from 1,409.63 kWh per tonne output to 960.41 kWh per tonne output, decrease around 32%.
2. The amount of slab production in the Steel Melting Shop has been updated, resulting in a decrease of approximately 7%. This has led to slight changes in the yield calculations for Module D, which have decreased by 3% compared to the previous version.
3. There was a characterization factor for water use that has not been updated to 0.4 m<sup>3</sup>/m<sup>3</sup> in the previous version. These factors have now been adjusted to the watershed level in the region, which stands at 0.4 m<sup>3</sup>/m<sup>3</sup>, differing from the average in Indonesia of 23.6 m<sup>3</sup>/m<sup>3</sup>.

In the table below, we present a comparison between the updated results and the initial publication from 2022. This comparison specifically focuses on module A1-A3, which is notably affected by the changes, while other modules exhibit comparatively minor alterations.

Impact Category	Unit	2022 Version	2023 Version	Difference	% Difference
GWP-total	kg CO <sub>2</sub> eq.	2.51E+03	2.02E+03	-4.89E+02	-19.5%
GWP-fossil	kg CO <sub>2</sub> eq.	2.51E+03	2.02E+03	-4.88E+02	-19.5%
GWP-biogenic	kg CO <sub>2</sub> eq.	6.01E+00	5.09E+00	-9.16E-01	-15.2%
GWP-luluc	kg CO <sub>2</sub> eq.	2.33E+00	1.79E+00	-5.40E-01	-23.2%
ODP	kg CFC <sub>11</sub> eq.	1.24E-04	1.20E-04	-3.48E-06	-2.8%
AP	mol H <sup>+</sup> eq.	1.31E+01	1.07E+01	-2.44E+00	-18.6%
EP-freshwater	kg P eq.	3.99E-01	2.95E-01	-1.04E-01	-26.0%
EP-marine	kg N eq.	2.92E+00	2.44E+00	-4.84E-01	-16.6%
EP-terrestrial	mol N eq.	3.19E+01	2.66E+01	-5.27E+00	-16.5%
POCP	kg NMVOC eq.	9.03E+00	7.72E+00	-1.32E+00	-14.6%
ADP-minerals & metals	kg Sb eq.	3.59E-03	3.04E-03	-5.55E-04	-15.5%
ADP-fossil	MJ, net calorific value	2.99E+04	2.54E+04	-4.57E+03	-15.3%
WDP	m <sup>3</sup> world eq. deprived	2.43E+03	3.15E+01	-2.40E+03	-98.7%

### Potential environmental impact – mandatory indicators according to EN 15804

Results for 1 tonne of Hot Rolled Plate (AS/NZS 3678:2016)								
Impact Category	Unit	Total A1-A3	A4	C1	C2	C3	C4	D
GWP-total	kg CO <sub>2</sub> eq.	2.02E+03	9.05E+01	5.37E+01	4.56E+00	1.15E+01	7.09E-01	2.30E+01
GWP-fossil	kg CO <sub>2</sub> eq.	2.02E+03	9.05E+01	5.37E+01	4.56E+00	1.15E+01	7.08E-01	2.28E+01
GWP-biogenic <sup>A</sup>	kg CO <sub>2</sub> eq.	5.09E+00	4.29E-02	1.94E-02	1.61E-03	2.64E-02	9.94E-04	1.21E-01
GWP-luluc	kg CO <sub>2</sub> eq.	1.79E+00	9.65E-04	7.88E-04	5.64E-05	3.25E-04	1.18E-05	6.32E-03
ODP	kg CFC <sub>11</sub> eq.	1.20E-04	1.93E-05	1.21E-05	1.03E-06	1.99E-06	1.55E-07	5.60E-07

Results for 1 tonne of Hot Rolled Plate (AS/NZS 3678:2016)								
Impact Category	Unit	Total A1-A3	A4	C1	C2	C3	C4	D
AP	mol H <sup>+</sup> eq.	1.07E+01	2.65E+00	5.81E-01	1.61E-02	1.04E-01	4.21E-03	6.76E-02
EP-freshwater	kg P eq.	2.95E-01	9.30E-05	4.21E-05	1.07E-05	4.38E-04	1.99E-06	1.06E-03
EP-marine	kg N eq.	2.44E+00	6.62E-01	2.60E-01	5.07E-03	4.34E-02	1.64E-03	8.99E-03
EP-terrestrial	mol N eq.	2.66E+01	7.35E+00	2.86E+00	5.59E-02	4.77E-01	1.80E-02	1.18E-01
POCP	kg NMVOC eq.	7.72E+00	1.87E+00	7.81E-01	1.52E-02	1.30E-01	4.97E-03	1.00E-01
ADP-minerals & metals	kg Sb eq.	3.04E-03	7.63E-06	2.40E-05	1.39E-06	4.56E-06	2.43E-07	4.51E-04
ADP-fossil	MJ, net calorific value	2.54E+04	1.18E+03	7.45E+02	6.40E+01	1.51E+02	9.76E+00	1.84E+02
WDP <sup>A</sup>	m <sup>3</sup> world eq. deprived	3.15E+01	-1.50E-01	1.45E-01	2.12E-02	2.02E-01	3.27E-03	4.93E+00

**Potential environmental impact**  
 – additional environmental information according to EN 15804:2012+A2:2019

Results for 1 tonne of Hot Rolled Plate (AS/NZS 3678:2016)								
Impact Category	Unit	Total A1-A3	A4	C1	C2	C3	C4	D
PM	Disease incidence	1.56E-04	3.16E-06	1.56E-05	2.90E-07	2.51E-06	9.78E-08	1.84E-06
IRP	kBq U235 eq.	2.14E +01	5.17E +00	3.25E +00	2.75E-01	5.24E-01	4.17E-02	9.85E-02
ETP-fw	CTUe	1.45E +04	4.17E +02	2.52E +02	2.88E +01	5.40E +01	4.59E +00	1.40E +03
HTP-c <sup>A</sup>	CTUh	2.38E-06	1.54E-08	3.24E-09	3.82E-10	8.38E-10	5.91E-11	1.65E-07
HTP-nc	CTUh	4.65E-05	4.47E-07	2.61E-07	4.30E-08	6.18E-08	6.83E-09	-2.61E-06
SQP <sup>A</sup>	dimensionless	6.46E +02	3.79E +00	2.10E +00	3.07E-01	1.05E +00	4.15E +00	4.55E +01

<sup>A</sup> The environmental performance results are grouped (annual average) that is representative for all grades of the product because the average overall variation is no more than 10%. However, the variation is slightly higher for GWP biogenic (15.30%), WDP (12.71%), HTP-c (16.75%), and SQP (20.45%). This is due to the variation of silica and manganese composition.

### Potential environmental impact – environmental information according to EN 15804:2012+A1:2013

Results for 1 tonne of Hot Rolled Plate (AS/NZS 3678:2016)								
Impact Category	Unit	Total A1-A3	A4	C1	C2	C3	C4	D
GWP	kg CO <sub>2</sub> eq.	1.98E+03	8.99E+01	5.31E+01	4.52E+00	1.14E+01	6.99E-01	2.07E+01
ODP	kg CFC <sub>11</sub> eq.	1.00E-04	1.52E-05	9.57E-06	8.12E-07	1.58E-06	1.23E-07	7.98E-07
AP	kg SO <sub>2</sub> eq.	8.67E+00	2.11E+00	4.13E-01	1.24E-02	7.53E-02	3.10E-03	5.58E-02
EP	kg PO <sub>4</sub> <sup>3-</sup> eq.	1.76E+00	2.31E-01	9.14E-02	2.12E-03	1.66E-02	6.11E-04	7.50E-03
POCP	kg C <sub>2</sub> H <sub>4</sub> eq.	7.61E-01	8.87E-02	4.89E-02	1.06E-03	8.24E-03	3.56E-04	3.81E-02
ADPE	kg Sb eq.	3.04E-03	7.64E-06	2.40E-05	1.39E-06	4.56E-06	2.43E-07	4.52E-04
ADPF	MJ	3.36E+04	1.16E+03	7.28E+02	6.31E+01	1.61E+02	9.66E+00	2.77E+02

### Climate impact (GWP-GHG) – according to PCR

Results for 1 tonne of Hot Rolled Plate (AS/NZS 3678:2016)								
Impact Category	Unit	Total A1-A3	A4	C1	C2	C3	C4	D
GWP-GHG	kg CO <sub>2</sub> eq.	2.00E+03	9.00E+01	5.32E+01	4.53E+00	1.14E+01	7.00E-01	2.15E+01

### Resource use

Results for 1 tonne of Hot Rolled Plate (AS/NZS 3678:2016)								
Parameter	Unit	Total A1-A3	A4	C1	C2	C3	C4	D
PERE	MJ	6.22E+02	1.55E+00	1.12E+00	7.77E-02	3.20E+01	2.05E-02	2.24E+01
PERM	MJ	0	0	0	0	0	0	0
PERT	MJ	6.22E+02	1.55E+00	1.12E+00	7.77E-02	3.20E+01	2.05E-02	2.24E+01
PENRE	MJ	2.80E+04	1.26E+03	7.91E+02	6.79E+01	1.62E+02	1.04E+01	1.91E+02
PENRM	MJ	0	0	0	0	0	0	0
PENRT	MJ	2.80E+04	1.26E+03	7.91E+02	6.79E+01	1.62E+02	1.04E+01	1.91E+02
SM	kg	9.17E+02	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0
FW	m <sup>3</sup>	9.36E+01	2.33E-01	1.97E-01	1.77E-02	2.25E-01	2.76E-03	2.00E-01

# Waste production and output flows

## Waste production

Results for 1 tonne of Hot Rolled Plate (AS/NZS 3678:2016)								
Parameter	Unit	Total A1-A3	A4	C1	C2	C3	C4	D
HWD	kg	3.26E+01	0	3.22E-01	0	5.14E-02	0	-6.94E-01
NHWD	kg	8.92E+01	0	0	0	0	100	-1.24E-01
RWD	kg	1.39E-04	0	0	0	0	0	0

## Output flows

Results for 1 tonne of Hot Rolled Plate (AS/NZS 3678:2016)								
Parameter	Unit	Total A1-A3	A4	C1	C2	C3	C4	D
CRU	kg	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	900	0	0
MER	kg	0	0	0	0	0	0	0
EEE	MJ	0	0	0	0	0	0	0
EET	MJ	0	0	0	0	0	0	0

## Interpretation of results

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- Module A1-A3 contributes significantly to the impact generated by the whole life cycle.
- The electricity production process is the largest contributor to majority of the potential impacts followed by pig iron production.
- From the production activities carried out in the GRP area (module A3), the emission to air in the reheating furnace appears as a hotspot for human toxicity potential (carcinogenic and non-carcinogenic) due to emissions such as mercury and arsenic.
- Transport to customer (module A4) makes a relatively small contribution to life cycle emissions for most indicators. However, it is significant for several impact categories, such as, ozone depletion potential, acidification potential, eutrophication potential, and formation potential of tropospheric ozone.
- Activities carried out on the end-of-life of the steel life cycle (module C1-C4) did not have a significant impact on the overall steel life cycle studied.
- Sensitivity analysis was conducted for different steel composition within the grade group of AS/NZS 3678:2016. The results show insignificant changes (with overall average variation of no more than 10%). Therefore, the results in this EPD are grouped (annual average) and representative for all grades in this group.

## Environmental Initiatives

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PT Gunung Raja Paksi Tbk cooperates with Institut Pertanian Bogor (IPB) or Bogor Agricultural University, are managing 7 green areas at GRP covering the employee mess area and the environment around the production area. This cooperation intends to reduce CO2 and maintain good and healthy air quality in those areas. PT Gunung Raja Paksi Tbk (GRP) officially signed a cooperation agreement with the Sharingyuk Community from Institut Pertanian Bogor (IPB) in September 2021.

The company is committed to support the Government program towards green industry that recognized for ten years in a row by the PROPER certificate awarded by the Republic of Indonesia's Ministry of Environment and Forestry. Aspects of the assessment include environmental permits, water pollution control, air pollution control and management of hazardous and toxic waste.

PT Gunung Raja Paksi Tbk has been obtained ISO 14001:2015 – Environmental Management System certificate. Every 6 months, PT Gunung Raja Paksi Tbk conduct environmental monitoring, such as measuring ground water, air, chimney emission, etc for reporting to UKL-UPL (Upaya Pengelolaan Lingkungan dan Upaya Pemantauan Lingkungan).

PT Gunung Raja Paksi Tbk (GRP) became Indonesia's first and one of Asia's first steel mills to purchase carbon credits. The carbon credits were purchased through Gunung Capital from Climate Impact X (CIX) as much as 10.000 tonnes of carbon credits in October 2021. The carbon credits were purchased from eight recognised Natural Climate Solution (NCS) projects at USD 8.00 per tonne. The NCS projects are global selection of quality projects with high environmental and social impact that spanning reforestation and avoided deforestation initiatives – across Africa, Asia and Latin America – demonstrate the high-performance of carbon sequestration and high levels of verified co-benefits, such as supporting biodiversity, along with social and economic development in local communities.

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## Environmental Product Declaration



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