EPD® THE INTERNATIONAL EPD® SYSTEM

Southeast Asia EPD

ECO PLATFORM EPD VERIFIED

Environmental Product Declaration

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

STRUCTURAL STEEL WELDED I-SECTION

(Meeting: AS/NZS 3679.2:2016)

From

GRP SHAPING TOMORROW

PT Gunung Raja Paksi Tbk

Programme
The International EPD® System, www.environdec.com

EPD registered through the fully aligned regional hub
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General information

Programme information

Programme	**The International EPD ® System** EPD registered through the fully aligned regional hub: EPD Southeast Asia	
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ISO standard ISO 21930 and CEN standard EN 15804 serves as the core Product Category Rules (PCR)
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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.
Independent third-party verification of the declaration and data, according to ISO 14025:2006: ☑ External ☐ Internal covering ☐ EPD process certification ☑ EPD verification
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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

- ACRS (Australasian Certification Reinforcing and Structural Steel) 3678 certification no 171202, ACRS 3679 certification no 171203, and ACRS ASNZS 3679 certification no T 1011
- American Standard of Building Fabricators (AWS, ASTM) – AISC American Institute of Steel Construction)
- Division 3 STEEL STRUCTURE FABRICATION CSA W 47.1 – CWB
- ISO 17025:2017
- ISO 3834 (Welding Management System) WTIA/Weld Australia certification no AU 030 - Rev.0
- License for Fabrication Activity in Los Angeles – LADBS
- LR (Lloyd’s Register) QA ISO 9001:2015 no 10115920
- Membership of Climate Action CO2 Worldsteel Association

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

Structural Steel Welded I-section

Product identification

AS/NZS 3679.2:2016, ACRS Certificate No. 171203 & T1011

Product description

Welded section manufactured from Hot rolled Steel with nominal 300/350/400 MPa yield strength. 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 impact assessment was grouped.

Typical Uses

- Structural steel for general construction
- Structural Steel Work for fabrication and erection
- Bridge design
- Buildings
- Storage Tanks

Specification Standard

1. AS/NZS 3679.2 : 2016
2. AS/NZS 1365 : 1996 (reconfirmed 2016)
3. AS/NZS 1554.1 : 2014
4. AS 3678 : 2016

Table 1. Steel Type

Steel Type	Structural Section	Range	Web Thickness	Flange Thickness
300 and 300 L15	Beams	700 WB; 800 WB; 900 WB; 1000 WB; 1200 WB	10 mm to 16 mm	Up to 40 mm
	Columns	350 WC; 400 WC; 500 WC	16 mm to 40 mm	Up to 40 mm
350 and 350 L15	Beams	700 WB; 800 WB; 900 WB; 1000 WB; 1200 WB	10 mm to 16 mm	Up to 40 mm
	Columns	350 WC; 400 WC; 500 WC	16 mm to 40 mm	Up to 40 mm
400 and 400 L15	Beams	700 WB; 800 WB; 900 WB; 1000 WB; 1200 WB	10 mm to 16 mm	10 mm to 32 mm
	Columns	350 WC; 400 WC; 500 WC	16 mm to 32 mm	16 mm to 32 mm

Note: Other sizes with different designation dimensions and masses (non-common welded I sections) may be produced as per standard (AS/NZS 3679.2: 2016). Dimensional tolerances will apply to the closest common designation

Table 2. Tensile Test Requirements for Welded Web-to-Flange Test

Specification & Grades	Applicable Thickness in GRP (mm)	Minimum Tensile Strength (Mpa)	Nominal Web Thickness (mm)	Minimum Test Load kN/mm
AS/NZS 3679.2 : 2016 Gr. 300 and 300 L15	≥5 - ≤100	430	10	4.3
			12	5.15
			16 & >16	6.88
AS/NZS 3679.2 : 2016 Gr. 350 and 350 L15	≥8-≤100	455	10	4.55
			12	5.46
			16 & >16	7.28
AS/NZS 3679.2 :2016 Gr. 400 and 400 L15	≥8 - ≤32	480	10	4.80
			12	5.76
			16 & >16	7.68

Table 3. Mechanical Properties GRP

Specification & Grades	Product Design	Mechanical Properties	10 mm	12 mm	16 mm	>16 mm
			Typical			
AS/NZS 3679.2 : 2016 Gr. 300 and 300 L15	WB & WC	Tensile Strength Rm(Mpa)	464	462	476	456
		Test Load (kN/mm)	4.94	5.96	7.21	9.21
AS/NZS 3679.2 : 2016 Gr. 350 and 350 L15	WB & WC	Tensile Strength Rm(Mpa)	496	530	518	511
		Test Load (kN/mm)	5.47	6.30	8.04	8.33
AS/NZS 3679.2 :2016 Gr. 400 and 400 L15	WB & WC	Tensile Strength Rm(Mpa)	528	530	567	508
		Test Load (kN/mm)	5.42	6.22	9.14	10.14

Table 4. Impact Properties

Grades	Temp. (°C)	Minimum Absorbed Energy (J) [A]
300	-	-
300 L15	-15	27
350	-	-
350 L15	-15	27
400	-	-
400 L15	-15	27

[A] Average Value of 3 Sample. The frequency of sampling from plate is every 70 tonne.

UN CPC code

41252 - Sheet piling of iron or steel and welded angles, shapes and sections of iron or steel.

ANZSIC code

2221 - Structural Steel Fabricating

Geographical Scope

Manufactured in Indonesia, supplied to Australia and New Zealand

LCA information

Declared Unit

1 tonne of Structural Steel Welded I-section

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

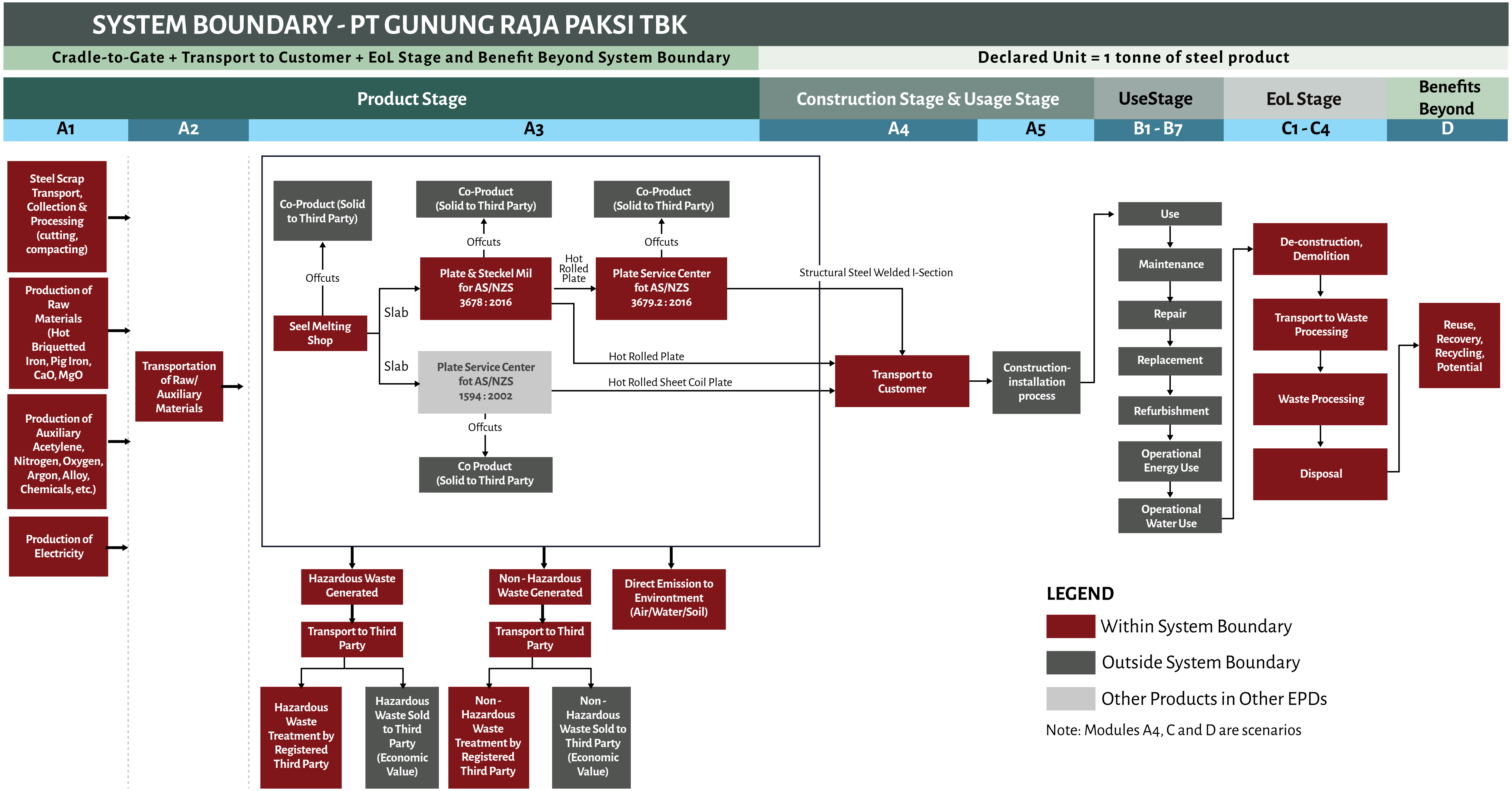
The system boundary was chosen based on the goal and scope of the study and in accordance with EN 15804:2012+A2:2019, i.e. "cradle-to-gate" plus transport to customer, end of life stages and benefits and loads beyond the system boundary (module A1-A4, C1-C4, D). Modules A5 and B1-B7 have not been included 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)**
    a. Steel Melting Shop (SMS): Electric Arc Furnace, Ladle Furnace, Tundish, Continuous Casting Machine, Cutting, Marking, Scarfing
    b. 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
    c. Plate Service Center (PSC): Plate Cutting, Beveling, Surface Cleaning, Tack Welding, Welding, Repair, Straightening, Heat Correction, Final Inspection & Marking, Storage
    d. Clarifier (vessel)
    e. Dust collector & blower
    f. Waste treatment (slag, skull, scrap, welding wire, electrode, grinding disc, etc.)
    g. Hazardous waste generated and waste treatment by the registered third party
    h. Non-hazardous waste generated that is sold to the third parties
    i. Direct emissions to the environment

3. **Downstream (A4, C1-C4, D)**
    a. Transport to the building/construction site
    b. Deconstruction & Demolition
    c. Transport to waste processing facility
    d. Waste processing of the scrap steel
    e. Disposal
    f. Reuse/Recovery/Recycling at the end of life of the products

System diagram



More information

Relevant websites for more information regarding the process in manufacturing:
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_2 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., 0.4m3/m3 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

	Product stage			Con-struction 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

Structural Steel Welded I-section AS/NZS 3679.2:2016 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 3679.2:2016 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 3679.2 : 2016 Gr. 300 and 300 L15**	**AS/NZS 3679.2 : 2016 Gr. 350 and 350 L15**	**AS/NZS 3679.2 :2016 Gr. 400 and 400 L15**
Iron (Fe)	97-99	97-99	97-99
Carbon (C)	0.16 - 0.20	0.17 - 0.20	0.12 - 0.20
Silica (Si)	0.20 - 0.30	0.20 - 0.30	0.20 - 0.30
Manganese (Mn)	0.80 – 1.20	1.20 – 1.40	1.25 - 1.35
Phosphorus (P)	0.015	0.015	0.015
Sulphur (S)	0.01	0.01	0.01
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
Potential Environmental Impact Indicators, in accordance with EN 15804:2012+A2:2019			
Global Warming Potential - total	GWP-total	kg CO_2 eq.	IPCC 2013
Global Warming Potential - fossil fuels	GWP-fossil	kg CO_2 eq.	IPCC 2013
Global Warming Potential - biogenic	GWP-biogenic	kg CO_2 eq.	IPCC 2013
Global Warming Potential - land use and land-use change	GWP-luluc	kg CO_2 eq.	IPCC 2013
Depletion potential of the stratospheric ozone layer	ODP	kg CFC_{11} eq.	WMO 2014
Acidification potential	AP	mol H^+ 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^3 world eq. deprived	AWARE

Impact Category	Abbreviation	Unit	Characterization Method
Additional Environmental Impact Indicators, in accordance with EN 15804:2012+A2:2019			
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®)
Environmental Impact indicators, in accordance with EN 15804:2012+A1:2013			
Global Warming Potential	GWP	kg CO_2 eq.	IPCC 2007 (AR4)
Ozone depletion potential	ODP	kg CFC_{11} eq.	WMO 2003
Acidification potential	AP	kg SO_2 eq.	CML 2002b
Eutrophication potential	EP	kg PO_4^{3-} eq.	CML 2002b
Photochemical ozone creation potential	POCP	kg C_2H_4 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
Climate Impact, in accordance with PCR 2019-14 Construction products v1.11			
Climate Impact	GWP-GHG	kg CO_2 eq.	IPCC 2013 (AR5)
Resource Use Parameters			
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
Resource Use Parameters			
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^3	N/A
Waste Categories and Output Flows			
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 1,645.21 kWh per tonne output to 1,146.67 kWh per tonne output, decrease around 30%.

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 m3/m3 in the previous version. These factors have now been adjusted to the watershed level in the region, which stands at 0.4 m^3/m^3, differing from the average in Indonesia of 23.6 m^3/m^3.

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_2 eq.	2.81E+03	2.30E+03	-5.13E+02	-18.2%
GWP-fossil	kg CO_2 eq.	2.80E+03	2.29E+03	-5.11E+02	-18.2%
GWP-biogenic	kg CO_2 eq.	6.89E+00	5.93E+00	-9.59E-01	-13.9%
GWP-luluc	kg CO_2 eq.	2.65E+00	2.08E+00	-5.65E-01	-21.4%
ODP	kg CFC_{11} eq.	1.35E-04	1.31E-04	-3.64E-06	-2.7%
AP	mol H^+ eq.	1.46E+01	1.21E+01	-2.55E+00	-17.5%
EP-freshwater	kg P eq.	4.45E-01	3.36E-01	-1.09E-01	-24.4%
EP-marine	kg N eq.	3.24E+00	2.73E+00	-5.07E-01	-15.7%
EP-terrestrial	mol N eq.	3.53E+01	2.98E+01	-5.52E+00	-15.6%
POCP	kg NMVOC eq.	1.01E+01	8.68E+00	-1.38E+00	-13.7%
ADP-minerals & metals	kg Sb eq.	4.78E-03	4.20E-03	-5.82E-04	-12.2%
ADP-fossil	MJ, net calorific value	3.36E+04	2.88E+04	-4.79E+03	-14.3%
WDP	m^3 world eq. deprived	2.72E+03	4.91E+01	-2.68E+03	-98.2%

Potential environmental impact – mandatory indicators according to EN 15804:2012+A2:2019

Results for 1 tonne of Structural Steel Welded I-section (AS/NZS 3679.2:2016)								
Impact Category	Unit	Total A1-A3	A4	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq.	2.30E+03	8.58E+01	5.37E+01	5.57E+00	1.35E+01	8.10E-01	6.91E+01
GWP-fossil	kg CO_2 eq.	2.29E+03	8.58E+01	5.37E+01	5.57E+00	1.35E+01	8.09E-01	6.87E+01
GWP-biogenic	kg CO_2 eq.	5.93E+00	4.02E-02	1.94E-02	1.97E-03	2.98E-02	1.03E-03	3.56E-01
GWP-luluc	kg CO_2 eq.	2.08E+00	9.21E-04	7.88E-04	6.90E-05	5.06E-04	1.31E-05	1.77E-02

Results for 1 tonne of Structural Steel Welded I-section (AS/NZS 3679.2:2016)								
Impact Category	Unit	Total A1-A3	A4	C1	C2	C3	C4	D
ODP	kg CFC_{11} eq.	1.31E-04	1.83E-05	1.21E-05	1.26E-06	2.01E-06	1.78E-07	1.92E-06
AP	mol H^+ eq.	1.21E+01	2.42E+00	5.81E-01	1.97E-02	1.14E-01	4.57E-03	2.34E-01
EP-freshwater	kg P eq.	3.36E-01	9.28E-05	4.21E-05	1.31E-05	8.38E-04	2.23E-06	2.97E-03
EP-marine	kg N eq.	2.73E+00	6.07E-01	2.60E-01	6.20E-03	4.49E-02	1.75E-03	3.50E-02
EP-terrestrial	mol N eq.	2.98E+01	6.74E+00	2.86E+00	6.84E-02	4.94E-01	1.92E-02	4.45E-01
POCP	kg NMVOC eq.	8.68E+00	1.72E+00	7.81E-01	1.86E-02	1.35E-01	5.31E-03	3.24E-01
ADP-minerals & metals	kg Sb eq.	4.20E-03	7.99E-06	2.40E-05	1.69E-06	4.89E-06	2.74E-07	1.36E-03
ADP-fossil	MJ, net calorific value	2.88E+04	1.13E+03	7.45E+02	7.82E+01	1.71E+02	1.12E+01	5.63E+02
WDP	m^3 world eq. deprived	4.91E+01	-1.20E-01	1.45E-01	2.59E-02	3.29E-01	3.74E-03	1.51E+01

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

Results for 1 tonne of Structural Steel Welded I-section (AS/NZS 3679.2:2016)								
Impact Category	Unit	Total A1-A3	A4	C1	C2	C3	C4	D
PM	Disease incidence	1.77E-04	3.12E-06	1.56E-05	3.55E-07	2.52E-06	1.04E-07	5.52E-06
IRP	kBq U235 eq.	2.35E+01	4.91E+00	3.25E+00	3.36E-01	5.28E-01	4.79E-02	4.48E-01
ETP-fw	CTUe	1.72E+04	4.01E+02	2.52E+02	3.52E+01	6.68E+01	5.23E+00	4.19E+03
HTP-c	CTUh	2.79E-06	1.45E-08	3.24E-09	4.67E-10	1.14E-09	6.76E-11	4.96E-07
HTP-nc	CTUh	5.09E-05	4.41E-07	2.61E-07	5.25E-08	8.03E-08	7.78E-09	-7.84E-06
SQP	dimensionless	7.42E+02	3.68E+00	2.10E+00	3.76E-01	1.85E+00	4.16E+00	1.39E+02

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

Results for 1 tonne of Structural Steel Welded I-section (AS/NZS 3679.2:2016)								
Impact Category	Unit	Total A1-A3	A4	C1	C2	C3	C4	D
GWP	kg CO_2 eq.	2.25E+03	8.52E+01	5.31E+01	5.53E+00	1.34E+01	7.99E-01	6.24E+01
ODP	kg CFC_{11} eq.	1.10E-04	1.45E-05	9.57E-06	9.93E-07	1.59E-06	1.41E-07	2.60E-06
AP	kg SO_2 eq.	9.80E+00	1.93E+00	4.13E-01	1.51E-02	8.33E-02	3.38E-03	1.92E-01
EP	kg PO_4^{3-} eq.	2.05E+00	2.12E-01	9.14E-02	2.59E-03	1.84E-02	6.58E-04	2.47E-02
POCP	kg C_2H_4 eq.	8.77E-01	8.15E-02	4.89E-02	1.30E-03	8.55E-03	3.79E-04	1.15E-01
ADPE	kg Sb eq.	4.20E-03	8.00E-06	2.40E-05	1.69E-06	4.90E-06	2.74E-07	1.36E-03
ADPF	MJ	3.81E+04	1.10E+03	7.28E+02	7.72E+01	1.91E+02	1.11E+01	8.33E+02

Climate impact (GWP-GHG) – according to PCR

Results for 1 tonne of Structural Steel Welded I-section (AS/NZS 3679.2:2016)								
Impact Category	Unit	Total A1-A3	A4	C1	C2	C3	C4	D
GWP-GHG	kg CO_2 eq.	2.27E+03	8.53E+01	5.32E+01	5.54E+00	1.34E+01	8.01E-01	6.46E+01

Resource use

Results for 1 tonne of Structural Steel Welded I-section (AS/NZS 3679.2:2016)								
Parameter	Unit	Total A1-A3	A4	C1	C2	C3	C4	D
PERE	MJ	7.26E+02	1.47E+00	1.12E+00	9.50E-02	2.43E+01	2.22E-02	6.72E+01
PERM	MJ	0	0	0	0	0	0	0
PERT	MJ	7.26E+02	1.47E+00	1.12E+00	9.50E-02	2.43E+01	2.22E-02	6.72E+01
PENRE	MJ	3.18E+04	1.20E+03	7.91E+02	8.30E+01	1.84E+02	1.19E+01	5.85E+02
PENRM	MJ	0	0	0	0	0	0	0
PENRT	MJ	3.18E+04	1.20E+03	7.91E+02	8.30E+01	1.84E+02	1.19E+01	5.85E+02
SM	kg	9.51E+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^3	1.08E+02	2.25E-01	1.97E-01	2.17E-02	3.44E-01	3.15E-03	5.95E-01

Waste production and output flows

Waste production

Results for 1 tonne of Structural Steel Welded I-section (AS/NZS 3679.2:2016)								
Parameter	Unit	Total A1-A3	A4	C1	C2	C3	C4	D
HWD	kg	3.62E+01	0	3.22E-01	0	5.14E-02	0	-2.09E +00
NHWD	kg	9.66E+01	0	0	0	0	100	-3.72E-01
RWD	kg	1.45E-04	0	0	0	0	0	0

Output flows

Results for 1 tonne of Structural Steel Welded I-section (AS/NZS 3679.2:2016)								
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

- 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 rehe ating 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 3679.2:2016. The results show insignificant changes (with overall 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

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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Southeast Asia EPD

Environmental Product Declaration

SHAPING TOMORROW

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