Environmental Product Declaration

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019 for:

Gerdau Column Mesh

CSG (Rio de Janeiro)

From

GERDAU ACOS LONGOS S.A.

Programme:	The International EPD® System EPD registered through the fully aligned regional programme: Hub EPD Brasil. More information at www.environdec.com
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Contents

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General information

Programme information

Programme:	The International EPD® System. More information at www.environdec.com
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Accountabilities for PCR, LCA and independent, third-party verification
Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product Category Rules (PCR): *PCR 2019:14 version 1.11 (Construction Products) and UN CPC Code 4126 - Bars, rods, angles, shapes and sections, cold processed or further worked, of iron or steel; angles, shapes and sections, hot-rolled, hot-drawn or extruded, of alloy steel; steel wire*
PCR review was conducted by: *Claudia A. Peña from ADDERE Research & Technology. Mobile: +56 9 9359 9210. E-mail: cpena@addere.cl*
Life Cycle Assessment (LCA)
LCA accountability: *Carolina Alves, Thays Sampaio, Peter Shonfield, Augusto Mello; ERM Brasil Ltda.*
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: *Claudia A. Peña; ADDERE Research & Technology* Approved by: The International EPD® System

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.

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Company information: Gerdau Corporation and Operations in Brazil

Owner of the EPD
GERDAU ACOS LONGOS S.A.

Contact
Av. das Nações Unidas, 8.501 - 6º andar – *São Paulo Municipality, São Paulo State, Brazil*
Naiara Lopes <naiara.lopes@gerdau.com.br>

Description of the organization
With a history spanning 122 years, Gerdau is Brazil's largest and one of the leading producers of long steel in the Americas and of special steel in the world. In Brazil, Gerdau produces flat steel and iron ore for its own use. Gerdau also has a new business division, Gerdau Next, which fosters entrepreneurship in segments adjacent to the steel industry. Guided by its purpose of empowering people who build the future, Gerdau has operations in nine countries and over 30 000 direct and indirect employees. Gerdau is the largest recycling company in Latin America and uses scrap as an important input, with 71% of the steel it produces made from scrap. Every year, Gerdau transforms 11 million tonnes of scrap into a variety of steel products. Gerdau also is the world's largest charcoal producer, with over 250 hectares of planted forests in the state of Minas Gerais. As a result of its sustainable production matrix, Gerdau currently has one of the industry's lowest average greenhouse gas emissions (CO_2e). Gerdau's shares are listed on the São Paulo (B3), New York (NYSE) and Madrid (Latibex) stock exchanges.

Faced with an increasingly growing scenario for sustainable / green buildings and the requirements in relation to the products used in these types of constructions, Gerdau felt the need to start the certification of its products, in order to become competitive in this market in relation to its competitors. To achieve this goal, a Life Cycle Assessment (LCA) from cradle-to-gate was performed to support the preparation of EPD.

Product-related or management system-related certifications
All the products in this study follow the specifications of the ABNT NBR 7480 standards - Steel bars and wires for concrete reinforcement - that provides definitions regarding bar and wire diameters, tolerances, geometric configurations (ribs), mechanical properties, identification and test methods; and also the specifications of ABNT NBR 6118: Design of concrete structures - Procedure. Gerdau Column Mesh has compulsory certification by INMETRO. Furthermore, the producing plants have ISO 14001 – Environmental Management Systems and ISO 9001 - Quality Management System certification that certifies the ability to provide products and services that meet the requirements of customers, statutory, and applicable regulations, in order to increase customer satisfaction.

Name and location of production site(s)

- Gerdau Cosigua – Production of column mesh
  Location: Avenida João XXIII, 6777, parte Santa Cruz - *Rio de Janeiro Municipality, Rio de Janeiro State, Brazil*

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Product information: Gerdau Column Mesh

Product name
Gerdau Column Mesh.

Product identification
Gerdau column meshes fully meet the requirements of the reference standard ABNT NBR 7480 standards - Steel bars and wires for concrete reinforcement.

Product description
Column meshes are produced with Reinforcing Steel Bar Gerdau GG 50 and Gerdau CA-60, joined by solder points. It has a uniform spacing of 20 cm between the transversal wires.

Reinforcing Steel Bar Gerdau GG 50 is rolled from continuous cast billets and Reinforcing Steel Bar Gerdau CA-60 reinforcing bar is rolled from wire machine. Both are used in a wide range of construction projects as the framework for reinforced concrete. The Gerdau GG 50 is the Gerdau brand for rebar produced in the CA50 category and the Gerdau CA-60 for the CA60 category. It is the union of the product description with the name Gerdau (GG - Gerdau Group), and “50” and “60” are the specification of how much tensile stress the product must withstand without plastic deformation (500 MPa or 50 kgf / mm² and 600 MPa or 60 kgf / mm², respectively). Moreover, the categories CA50 and CA60 are described in a standard. CA - Reinforced Concrete.

Table 1: Technical specification for GG 50 rebar produced by Gerdau

Nominal Diameter (ND) (mm)	Nominal Mass (kg/m)	Linear Mass Tolerance (%)	Characteristic Flow Resistance (fy) (MPa)	Resistance Limit (MPa)	Elongation at 10 Ø	Pin Diameter for Folding at 180º (mm)
8.0	0.395	+/- 6	500	1.10 x fy	8%	3 x DN
10.0	0.617	+/- 6	500	1.10 x fy	8%	3 x DN

Table 2: Technical specification for CA-60 rebar produced by Gerdau

Nominal Diameter (ND) (mm)	Nominal Mass (kg/m)	Linear Mass Tolerance (%)	Characteristic Flow Resistance (fy) (MPa)	Resistance Limit (MPa)	Elongation at 10 Ø	Pin Diameter for Folding at 180º (mm)
4.2	0.109	± 6%	600	1.05 x fy	5%	5 x DN

Table 3: Composition for Column Mesh produced by Gerdau

Chemical composition	Quantity (%)
Iron	< 99
Manganese	< 1.3
Copper	< 0.35
Carbon	< 0.31
Others	< 0.92

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Table 4: Technical Specification of Column Mesh produced by Gerdau

Type	Longitudinal Rebar Diameter - GG 50 (mm)	Transversal Wire Diameter - CA-60 (mm)	Width (mm)	Length (m)	Number of Longitudinal Bars	Number of Transversal Wires	Transversal Spacing between wires (mm)
7 x 14	8	4.2	440	6	4	28	200
	10						
7 x 17	8		500				
	10						
7 x 20	8		560				
	10						
7 x 27	8		700				
	10						
9 x 14	8		480				
	10						
10 x 20	10		620				

Other types of meshes with dimensions, steel type, diameters, fringes and/or spacing than those mentioned in the Table above may be produced at the customer's request, upon prior consultation.

Content declaration

Table 5: Dangerous subtances from the candidate list of SVHC for Authorisation

Dangerous substances from the candidate list of SVHC for Authorisation	EC No.	CAS No.	Weight-% per functional or declared unit
Not applicable			

The structural steel does not require packaging, and none was considered in the present study.

No dangerous substances from the candidate list of SVHC for authorization are present in the composition of column meshes.

Column meshes are used in reinforced concrete structures, such as buildings, bridges, viaducts, and other civil works to provide additional mechanical strength.

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Figure 1: Column meshes produced by Gerdau

UN CPC code

4126 - Bars, rods, angles, shapes and sections, coldprocessed or further worked, of iron or steel; angles, shapes and sections, hot-rolled, hot-drawn or extruded, of alloy steel; steel wire.

Geographical scope

Brazil

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LCA information: Life Cycle Impact Assessment

Declared unit
The declared unit of this study for rebar is 1 metric ton of Column Mesh produced in Gerdau facility up to the gate.

Reference service life
Not applicable.

Time representativeness
Primary data for the core process was gathered for one year of operation (2019).

Database(s) and LCA software used
All primary data used was based on the manufacturer's specific data inventory. For consistency, the background life cycle inventory data from secondary sources used in this LCA were obtained from the databases contained within the Gabi 10.6.1.35 software; either Gabi from Sphera 2020.1, Ecoinvent 3.7.1 and World Steel inventories 2021 (WSA 2021) were used. Brazil specific data were preferably considered whenever available.

Description of system boundaries
This study is a cradle-to-gate (A1-A3) with modules C1-C4 and module D, carried out based on EN15804+A2 and the relevant PCR 2019:14 version 1.11 (Construction Products), which addresses the environmental aspects and potential environmental impacts from raw material acquisition to the point at which it leaves the gate of the CSG facility (A3). The LCA also included the end-of-life stage, from the building de-construction/ demolition to the final disposal of the product of interest, and the potential benefits and loads beyond the system boundary, mandatory according to the PCR.

The life cycle stages descriptions are shown below in Figure 2. Modules declared, geographical scope, share of specific data (in GWP-GHG indicator) and data variation are presented in Table 6**Erro! Fonte de referência não encontrada.** (note that 'X' denotes inclusion in the LCA).

Adopted premises to fill data gaps

The following premises were considered in the study in order to fill data gaps:

- When specific transport distances from external suppliers to the factory were not available, a weighted average distance was used.
- When consumption data could not be directly measured in the plant, the input quantities were estimated based on the technical lists.
- At the manufacturing process in which disaggregated data was not available, physical allocation was performed to calculate the specific input values based on the production volumes and the total consumptions of the plant.

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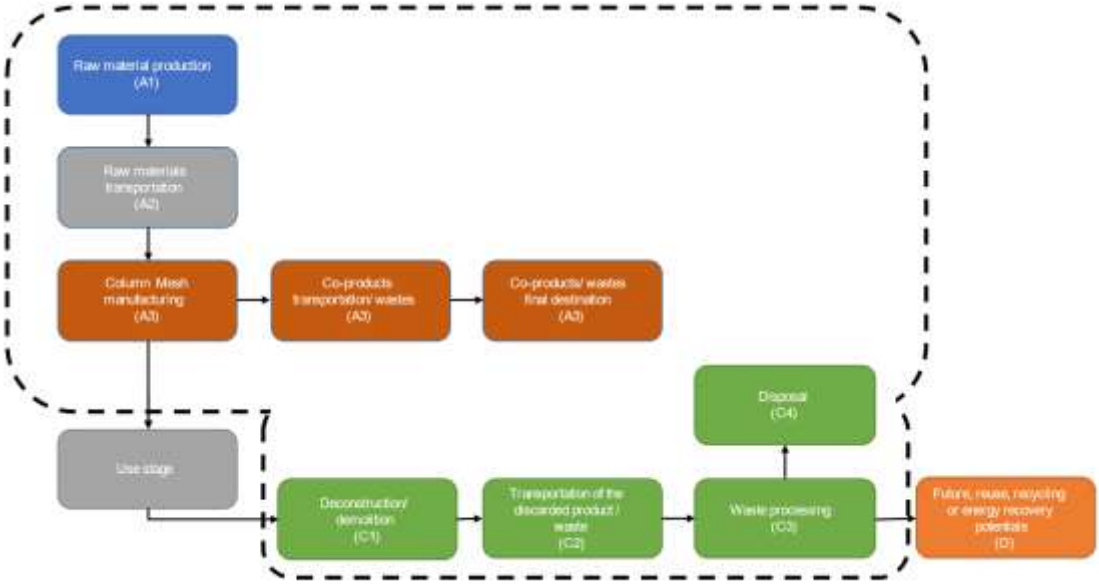

Figure 2: System boundary of the life cycle assessment for Gerdau Column Meshes

The life cycle stages included within the system boundaries are:

- A1 – Primary raw material and alloys used for the manufacture of column mesh;
- A2 – Includes the transportation of all raw materials and auxiliaries from suppliers to the Gerdau manufacturing facilities;
- A3 – Scrap beneficiation, Melt Shop, Rolling Mill and transportation of all co-products/ wastes from Gerdau to the final destination and waste disposal;
- C1 – Manual dismantling of metal parts. Thus, no environmental impact was attributed to the non-destructive removal of building waste in this module;
- C2 – Accounts for part of the waste processing, e.g., to a recycling site and transportation of waste e.g. to final sorting yard or disposal;
- C3 – It includes collection of waste fractions from the deconstruction and waste processing of material flows intended for reuse, recycling and energy recovery;
- C4 – Refers to waste disposal including physical pre-treatment and management of the disposal site; and
- D – Contains potential benefits and loads from the recycling of rebar considered in module C3 (95%).

The electricity mix considered for this LCA was based on the GaBi dataset for Brazil, which is representative of the Brazilian energy matrix for the reference year.

Table 6: Description of the system boundary according to the PCR

	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	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	BR	BR	BR	-	-	-	-	-	-	-	-	-	BR	BR	BR	BR	BR
Specific data used	>90%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	Not relevant			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	Not relevant			-	-	-	-	-	-	-	-	-	-	-	-	-	-

This EPD refers to the environmental impact results specific to the column meshes produced at Cosigua facility per declared unit.[1] The scenarios included are currently in use and are representative for one of the most probable alternatives.

[1] The characterisation model and factors used in this study are in accordance with EN15804 for assessing the environmental impacts of construction products.

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Environmental performance indicators[2]

Mandatory impact category indicators according to EN 15804

Table 7: Core environmental impact indicators

Results per declared unit										
Indicator	**Unit**	**A1**	**A2**	**A3**	**Tot.A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-fossil	kg CO_2 eq.	1.33E+03	1.62E+01	2.27E+01	1.37E+03	0.00E+00	2.36E+00	1.22E+00	2.44E+00	-7.60E+02
GWP-biogenic	kg CO_2 eq.	2.25E+02	-2.28E-01	-6.93E-01	2.24E+02	0.00E+00	-3.31E-02	3.62E-03	-2.50E-02	-4.33E-01
GWP-luluc	kg CO_2 eq.	-1.93E+01	1.34E+00	4.33E-02	-1.79E+01	0.00E+00	1.95E-01	1.88E-02	2.44E-03	-1.66E-02
GWP-total	kg CO_2 eq.	1.54E+03	1.73E+01	2.20E+01	1.58E+03	0.00E+00	2.52E+00	1.24E+00	2.42E+00	-7.60E+02
ODP	kg CFC 11 eq.	1.17E-05	3.85E-16	2.99E-08	1.17E-05	0.00E+00	5.53E-17	1.81E-08	5.77E-15	-1.81E-12
AP	mol H^+ eq.	5.02E+00	5.45E-02	4.27E-02	5.12E+00	0.00E+00	7.61E-03	8.21E-03	7.78E-03	-1.35E+00
EP-freshwater	kg PO_4^{3-} eq.	2.03E-01	3.10E-04	2.40E-05	2.03E-01	0.00E+00	4.49E-05	2.96E-05	5.71E-06	-5.07E-04
EP-freshwater	kg P eq.	6.60E-02	1.01E-04	7.82E-06	6.61E-02	0.00E+00	1.46E-05	9.65E-06	1.86E-06	-1.65E-04
EP-marine	kg N eq.	1.14E+00	2.62E-02	1.91E-02	1.19E+00	0.00E+00	3.64E-03	1.63E-03	1.93E-03	-2.61E-01
EP-terrestrial	mol N eq.	1.20E+01	2.75E-01	2.09E-01	1.25E+01	0.00E+00	3.81E-02	1.53E-02	2.12E-02	-2.64E+00
POCP	kg NMVOC eq.	4.72E+00	4.93E-02	5.18E-02	4.82E+00	0.00E+00	6.62E-03	4.12E-03	6.08E-03	-1.17E+00
ADP-minerals&metals	kg Sb eq.	1.07E-03	7.89E-07	6.92E-07	1.07E-03	0.00E+00	1.15E-07	1.99E-07	1.68E-07	-1.89E-03
ADP-fossil	MJ	1.32E+04	2.18E+02	2.58E+02	1.37E+04	0.00E+00	3.17E+01	1.14E+01	3.56E+01	-7.43E+03
WDP	m^3	9.58E+02	4.37E-02	7.10E-01	9.59E+02	0.00E+00	6.26E-03	3.36E-01	-2.89E-02	-2.07E+03
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources*; ADP-fossil = Abiotic depletion for fossil resources potential*; WDP = Water (user) deprivation potential, deprivation-weighted water consumption* *: The results of these environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator									

[2] The estimated impact results are only relative statements which do not indicate the end points of the impact categories, exceeding threshold values, safety margins or risks

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Additional mandatory and voluntary impact category indicators

Table 8: GWP additional indicator

Results per declared unit										
Indicator	**Unit**	**A1**	**A2**	**A3**	**Tot.A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-GHG[3]	kg CO_2 eq.	1.41E+03	1.58E+01	2.15E+01	1.45E+03	0.00E+00	2.30E+00	1.20E+00	2.29E+00	-7.25E+02
Additional voluntary indicators e.g. the voluntary indicators from EN 15804 or the global indicators according to ISO 21930:2017										

Resource use indicators

Table 9: Indicators describing resource use

Results per declared unit										
Indicator	**Unit**	**A1**	**A2**	**A3**	**Tot.A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	1.28E+04	1.40E+01	8.54E-01	1.28E+04	0.00E+00	2.02E+00	1.85E+01	2.57E+00	4.68E+02
PERM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	1.28E+04	1.40E+01	8.54E-01	1.29E+04	0.00E+00	2.02E+00	1.85E+01	2.57E+00	4.68E+02
PENRE	MJ	1.33E+04	2.18E+02	2.58E+02	1.37E+04	0.00E+00	3.17E+01	1.14E+01	3.56E+01	-7.44E+03
PENRM	MJ.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	1.33E+04	2.18E+02	2.58E+02	1.37E+04	0.00E+00	3.17E+01	1.14E+01	3.56E+01	-7.44E+03
SM	kg	4.37E+02	0.00E+00	3.34E+00	4.40E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.47E+02
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	3.50E+01	1.31E-02	3.16E-01	3.53E+01	0.00E+00	1.88E-03	7.99E-02	3.67E-04	-4.83E+01
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water									

[3] The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus almost equal to the GWP indicator originally defined in EN 15804:2012+A1:2013.

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Waste indicators

Table 10: Environmental information describing waste categories

Results per declared unit										
Indicator	**Unit**	**A1**	**A2**	**A3**	**Tot.A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	1.81E-06	1.87E-09	1.90E-08	1.83E-06	0.00E+00	2.69E-10	8.37E-09	6.30E-09	1.63E-06
Non-hazardous waste disposed	kg	4.06E+01	2.06E-02	9.17E+00	4.98E+01	0.00E+00	2.98E-03	7.65E-03	5.01E+01	9.48E+01
Radioactive waste disposed	kg	1.25E-01	3.58E-05	3.88E-05	1.25E-01	0.00E+00	5.08E-06	4.55E-04	4.05E-04	8.06E-04

Output flow indicators

Table 11: Indicators describing resource use

Results per declared unit										
Indicator	**Unit**	**A1**	**A2**	**A3**	**Tot.A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for recycling	kg	1.79E+02	0.00E+00	4.35E+01	2.22E+02	0.00E+00	0.00E+00	9.50E+02	0.00E+00	0.00E+00
Materials for energy recovery	kg	2.92E+02	0.00E+00	0.00E+00	2.92E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Information on biogenic carbon content

Table 12: Information describing the biogenic carbon content at the factory gate

Results per declared unit		
BIOGENIC CARBON CONTENT	**Unit**	**QUANTITY**
Biogenic carbon content in product	kg C	Around 0.07%
Biogenic carbon content in packaging	kg C	-

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO_2.

Structural steel does not use packaging, and none is modelled in the present study (the final product is labeled and grouped using wire bundles).

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Other environmental performance indicators

Table 13: Additional environmental impact indicators

Results per declared unit										
Indicator	**Unit**	**A1**	**A2**	**A3**	**Tot.A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
PM	Disease incidences	6.50E-05	3.17E-07	2.85E-07	6.56E-05	0.00E+00	4.14E-08	1.13E-07	8.43E-08	-2.57E-05
IR	kBq U235 eq.	1.88E+01	3.35E-03	1.30E-02	1.88E+01	0.00E+00	4.79E-04	3.38E-02	5.81E-02	1.40E+01
ETF-fw	CTUe	1.82E+04	4.42E+02	2.48E+01	1.87E+04	0.00E+00	6.42E+01	4.83E+00	1.05E+01	-4.80E+02
HTP-c	CTUh	1.87E-04	6.96E-09	1.26E-04	3.13E-04	0.00E+00	1.01E-09	7.83E-10	1.21E-09	-4.12E-07
HTP-nc	CTUh	1.78E-05	2.19E-07	3.82E-08	1.81E-05	0.00E+00	3.16E-08	9.80E-09	1.23E-07	-9.24E-06
SQP	Pt	3.50E+04	1.34E+02	5.11E+00	3.52E+04	0.00E+00	1.95E+01	9.62E+00	2.62E+00	1.11E+02
Acronyms	PM = Particulate matter emissions; IR = Ionizing radiation, human health; ETF-fw = Eco-toxicity (freshwater); HTP-c = Human toxicity, cancer effects; HTP-c = Human toxicity, non-cancer effects, SQP = Soil quality potential/ Land use related impacts									

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Additional environmental information

The environment is a frequent topic at meetings of our Board of Directors and strategic committees. Our Sustainability Policy and Environmental Stewardship System reinforce our commitment to creating value for our stakeholders, and break down into measures to promote energy efficiency, reduce GHG emissions, water management, and reuse and recycle waste. They reinforce the company's commitment to creating value for its stakeholders, and are in line with global best practices and regulatory guidelines. These guidelines are cascaded to all company operations, and describe the procedures and responsibilities to be followed.

Gerdau is committed to being part of the solution to achieve a low-carbon economy, and has developed a medium and long term strategy to this end. For more information please check our commitment https://www2.gerdau.com.br/wp-content/uploads/2022/03/Gerdau_ING.pdf

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References

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