Environmental Product Declaration | Hot Rolled Steel

Ternium

EPD®

THE INTERNATIONAL EPD® SYSTEM

LATIN AMERICA EPD®

Hot Rolled Steel

Included A36 and A50 grades

In accordance with ISO 14025:2006 and 15804: 2012+A2:2019 /AC:2021

Programme:	The International EPD® System EPD registered through the fully aligned regional programme / hub: Latin American Hub, www.epd-latinamerica.com info@environdec.com
Programme operator:	EPD® Latin America EPD International AB Regional Hub: Latin American Hub of the International EPD® System
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ECO PLATFORM EPD VERIFIED

Content

This EPD was prepared in conformity with the international standard ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 Sustainability of Construction Works; for Hot Rolling Steel.

The EPD owner has the sole ownership, liability, and responsibility for the EPD. The EPD of construction products may not be comparable if they do not comply with the Product Category Rules (PCR) "Construction Product" and the EN 15804:2012+A2:2019/AC:2021 Sustainability of Construction Works – Environmental Product Declarations - Core rules for Central Product Classification: UN CPC 4121 Flat-rolled products of steel, not further worked than hot-rolled.

For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterization factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804:2012+A2:2019/AC:2021 and ISO 14025:2006

1. Ternium Mexico

Ternium is a leading company in Latin America that manufactures and processes a broad range of steel products using the most advanced technology. The company provides customers that operate in such diverse and essential steel consuming industries, such as construction, automotive and energy, as well as manufacturers of heavy and agricultural machinery, household appliances and packaging, among others.

Ternium and its subsidiaries have 17 productive centers in Argentina, Brazil, Colombia, Guatemala, Mexico, and the United States. It is also part of the controlling group of Usiminas, a leading steelmaker of the Brazilian market.

Ternium supplies with high quality steel all the main regional markets and it also promotes the development of its customers from the metallurgical industry. The company's distinctive position is a result of its highly integrated production procedure. Its facilities feature the whole manufacturing process of steelmaking, from the mining of iron ore to the production of high value-added products. With a yearly achievable production capacity of 12.3 million tons, Ternium's shares are listed and traded on the New York Stock Exchange.

2. General information

Product:	Hot Rolled Steel - including A36 and A50
Declaration owner:	Ternium México S.A. de C.V. Avenida Universidad 992 Colonia Cuauhtémoc, C.P. 66450 San Nicolás de Los Garza. Nuevo León, México. mx.ternium.com Contact person: Lucia Betanzos: lbetanzo@ternium.com.mx Víctor Bernal: vbernalh@ternium.com.mx
Description of the construction product:	The Hot Rolled Steel is a product manufactured in the Ternium´s steel shop and rolling mills through a thermomechanical process that involves the deformation of the steel in the form of slabs at high temperatures, until reaching the dimensions and mechanical properties required.
Declared Unit:	1000 kg of hot rolled steel.
Construction product identification:	Central Product Classification: CPC 4121 Flat-rolled products of steel, not further worked than hot-rolled.
Main product components:	100% Hot Rolled Steel including Grade 36 and Grade 50 Steel. Flat-rolled products of steel, not further worked than hot-rolled
Life cycle stages not considered:	The modules: A4, A5, B1, B2, B3, B4, B5, B6, B7.
Statement content:	This environmental product declaration is based on information modules that do not cover aspects of construction stage and use. It contains detailed information on the stage of input materials used for the generation of raw material and central process, modules A1, A2, A3, approximations of scenarios C1, C2, C3, C4 and D based on national statistics. • Definition of the product. •Content declaration. • Declared unit. • System boundary. • Environmental performance. • Evidence and verifications.
Comparability of EPD of construction products:	a. EPD of construction products may not be comparable if they do not comply with EN 15804:2012+A2:2019/AC:2021 b. Environmental product declarations within the same product category from different programs may not be comparable.
For more information consult:	mx.ternium.com
Site for which this EPD is representative:	Manufacturing Plants Industrial Center: Ave. Guerrero Nte. 151 Colonia Cuauhtémoc, San Nicolás de los Garza (66450) Nuevo León (+52) 81 8865-2828 Industrial Center: Ave. Churubusco 1000 Colonia Santa Fe Monterrey (64540) Nuevo León (+52) 81 83295000 Industrial Center: Carretera Pesquería-Los Ramones Km 15, Santa María La Floreña, Pesquería (66601) Nuevo León (+52) 81 88652828
Intended Public:	B2B (Business to Business)

2. General information

Accountabilities for PCR, LCA and independent, third-party verification

Product Category Rules (PCR)

CEN standard EN 15804:2012+A2:2019/AC:2021 serve as the core Product Category Rules (PCR)

Product category rules (PCR): 2019:14 Construction products. Version 1.3.4 published April 30th, 2024

PCR review was conducted by: The Technical Committee of the International EPD System. See www.environdec.com for a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact.

LIFE CYCLE ASSESSMENT (LCA)

LCA accountability: Nathalia Duarte, Mireya González, Center for Life Cycle Assessment and Sustainable Design – CADIS.

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: Ruben Carnerero, IK Ingeniería SL.

Approved by: The International EPD System

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

☑ Yes

☐ No

3. The Product

The Hot Rolled Steel is a product manufactured in the Ternium´s steel shop and rolling mills through a thermomechanical process that involves the deformation of the steel in the form of slabs at high temperatures, until reaching the dimensions and mechanical properties required.

The Hot Rolled Steel is a structural product that has no processes subsequent to hot rolling and its final presentation is in the form of rolls, straps or sheets.

Uses in the construction sector:	Bending Cutting Forming Welding
Finishing:	Non pickled steel: Product with no processes subsequent to hot rolling. Pickled steel: Hot Rolled Steel processed in a series of acid baths to remove surface oxides (not included in this EPD)
Production ranges:	Thickness: 1.5 to 19.05 mm Width: 791.0 up to 1930 mm
Coil weight:	up to 39000 kilograms
Available shapes:	Coil Sheets Straps Pickled and non-pickled
Application:	Mainly construction

3. The Product

Also, Hot Rolled Steel manufactured by Ternium Mexico can be used in automotive industry, heavy-duty transport, heavy-duty machinery, high-pressure pipes and vessels, among other sectors.

Products

Commercial

Generic grade	CS	1006	1008	1010	1020	1035	1045
	•	•	•	•	•	•	•

Die-cutting

Generic grade	DQ	DDQ
	•	•

High Resistance Low-alloy

	HLSA (designation by yield strength in Mpa)					
Generic grade	300LA	340LA	380LA	420LA	490LA	550LA
	•	•	•	•	•	•

Structural

	SS (Designation by yield strength in kpsi)			
Generic grade	SS36	SS50	SS55	SS60
	•	•	•	•

High Resistance Low-alloy

	HLSA (designation by yield strength in Mpa)			
Generic grade	400	440	540	590
	•	•	•	•

Steel pipelines

	API (PSL1&PSL2)				
Generic grade	J55	X42	X52	X65	X70
	•	•	•	•	•

High Resistance Low-alloy

	Ferrite-bainite		Dual phase
Generic grade	540FB	590FB	DP590
	•	•	•

High pressure vessels

Generic grade	HSLA 50
	•

Anti-slip

Generic grade	CS
	•

Notes:
-Products presented in tables above have application in the construction sector, as well as in other sectors, depending on the final application required by each client.
-The environmental indicators presented in this EPD include all grades of steel presented in the tables. However, section 3.1 provides information on grades A36, A50, A55 and A60 since these are the most representative for the construction sector.
-The tables refer to generic products; these can be subject to various national standards. (NOM, NMX, etc.), international (ASTM, EN, JIS, etc.), owners of customer specification and/ or Ternium specification.

-The aforementioned products are general references and represent only a part of Ternium's capabilities, in the case of more specific products, please consult the sales area.
-The products depending on their final application or at the customer's request can be delivered with a "Skin Pass" process after the hot rolling process.
-Very high strength and / or advanced products require an approval process, please consult the sales area for the specific Procedure.
-Consult the sales area for the dimensional combination available for each steel grade.
-Ternium reserves the right to modify the aforementioned information without prior notice.

3. The Product

3.1 Technical specifications

Table 1. Dimensions

Property	Grade A36		Grade A 50		Grade A 55		Grade A 60	
	Min	Max	Min	Max	Min	Max	Min	Max
Thickness (mm)	1.5	19.05	1.5	19.05	1.5	19.05	1.5	19.05
Width (mm)	791.0	1930	791.0	1930	791.0	1930	791.0	1930
Weight (Ton)		30.0		39.0		39.0		39.0

3.2 Mechanical properties

Table 2. Technical specification*

Property		Grade A36		Grade A 50		Grade A 55		Grade A 60	
		ksi	MPa	ksi	MPa	ksi	MPa	ksi	MPa
Yield Strength	Min	36	250	50	340	55	380	60	420
	Max	-	-	-	-	-	-	-	-
Tensile Strength	Min	58	400	60	420	65	450	70	480
	Max	80	550	-	-	-	-	-	-
Elongation 50 mm (%).	Min	23		20		18		16	
	Max	-		-		-		-	

*ASTM E8M Standard method for tensile testing on metallic materials.

4. Content declaration

The total raw materials that make up the product were not declared, only the materials with a more representative percentage that make up the hot rolled steel.

For reasons of confidentiality, a more detailed description of the composition of the Hot Rolled Steel is not made.

Table 3. Typical content in Hot Rolled Steel manufactured by Ternium Mexico

Homogeneous Material or Chemical Substance	Chemical Substances	Weight (%)	Material Weight Post Consumer (%)	CAS Number	Function of Chemical Substance	Health class[1]
Iron pellet	Not applicable	25%	0%	Not applicable	Iron content in steel	Not listed
Steel scrap*	Not applicable	≥4.74%	>=4%	Not applicable	Iron content in steel	Not listed
Lime	Not applicable	≥0.86%	0%	Not applicable	Steel alloy	Not listed
Coal	Not applicable	≥0.05%	0%	Not applicable	Carbon content steel	Not listed
Aluminium	Aluminium	≥0.03%	0%	7429-90-5	Steel alloy	Not listed
Graphite	Not applicable	≥0.02%	0%	Not applicable	Steel alloy	Not listed
Ferroalloy	Ferro-manganese	≥0.05%	0%	12604-53-4	Steel alloy	Not listed
Driect reduced iron	Not applicable	≥0.97%	0%	Not applicable	Iron content in steel	Not listed
Steel low alloyed	Not applicable	≥68.47%	>=30%	Not applicable	Iron content in steel	Not listed

*Steel scrap can reach 30% according with the steel grade specification

[1] European Chemical Agency (ECHA):

a) Candidate List: https://echa.europa.eu/es/candidate-list-table?p_p_id=disslists_WAR_disslistsportlet&p_p_lifecycle=1&p_p_state=normal&p_p_mode=view&p_p_col_id=column-1&p_p_col_pos=2&p_p_col_count=3&_disslists_WAR_disslistsportlet_javax.portlet.action=searchDissLists

b) Authorisation list https://echa.europa.eu/es/authorisation-list?p_p_id=disslists_WAR_disslistsportlet&p_p_lifecycle=1&p_p_state=normal&p_p_mode=view&p_p_col_id=column-1&p_p_col_pos=1&p_p_col_count=2&_disslists_WAR_disslistsportlet_javax.portlet.action=searchDissLists

c) Restriction list https://echa.europa.eu/es/substances-restricted-under-reach?p_p_id=disslists_WAR_disslistsportlet&p_p_lifecycle=1&p_p_state=normal&p_p_mode=view&p_p_col_id=column-1&p_p_col_pos=1&p_p_col_count=2&_disslists_WAR_disslistsportlet_javax.portlet.action=searchDissLists

5. Distribution Packaging

Packaging: The product is sent to the customers in no packaging, only the casting number distinction and steel band for handling.

6. Biogenic Carbon Content information

The Hot Rolled Steel doesn't have biogenic carbon content. Biogenic carbon from packaging and products was excluded from the system, since by mass it represents less than 5% ("2019:14 Construction products, Version 1.3.4").

7. LCA Rules

Environmental potential impacts were calculated in accordance with EN 15804:2012+A2:2019/AC:2021 sustainability of construction works and PCR 2019:14 Construction products Version 1.3.4. CPC 4121: Flat-rolled products of steel not further worked than hot-rolled. This EPD is in accordance with ISO 14025:2006.

Environmental potential impacts were calculated through Life Cycle Assessment (LCA) methodology conformity to ISO 14040:2006 and ISO 14044:2006. An external third-party verification process of the EPD was conducted according to General Programme Instructions from the International EPD® System Version 4.0. Verification includes a documental review and a validation of both the underlying LCA study and documents describing additional environmental information that justify data provided in the EPD.

7.1 Declared unit

1000 kg of Hot Rolled Steel manufactured in 2022 by Ternium Mexico.

7.2 System boundary

The potential environmental impacts were calculated through Life Cycle Assessment (LCA) methodology of Hot Rolled Steel to ISO 14040:2006 and ISO 14044:2006. This study went through a critical review process in accordance with ISO / TS 14071: 2014.

According to EN 15804:2012+A2:2019/AC:2021 section 5.2 the following type of EPD is "cradle to gate" with modules C1-C4 and module D (A1-A3 +C+D). This EPD is based on information upstream processes and core processes, modules A1 to A3, and approximations of scenarios C1, C2, C3, C4, and D based on construction sector statistics in Mexico (see table 4).

Does not include A4-A5 Construction stage and B Usage stage.

Table 4. System boundary Hot Rolled Steel

Life cycle stage	Information about the modules contained in the stages	EPD			
		Cradle-to-gate with modules C1-C4 and module D	Cradle-to-gate with modules C1-C4, module D and optional modules	From cradle to grave and module D	EPD construction services: Cradle to door with modules A1-A5 and optional modules
A1-A3 products stage	A1) Raw material procurement	Mandatory	Mandatory	Mandatory	Mandatory
	A2) Transport				
	A3) Manufacture				
A4-A5 Construction stage	A4) Transport	-	Optional for goods Required for services	Mandatory	Mandatory
	A5) Construction / installation				
B Usage stage	B1) Use	-	Optional	Mandatory	Mandatory
	B2) Maintenance				
	B3) Reparation				
	B4) Replacement				
	B5) Remodeling				
	B6) Operational energy use				
	B7) Operational water use				
C End of life stage	C1) Deconstruction, demolition	Mandatory	Mandatory	Mandatory	Optional
	C2) Transport				
	C3) Waste processing				
	C4) Final disposition				
D Benefits and charges beyond the system limit	D) Reuse, recycling or energy recovery potential.	Mandatory	Mandatory	Mandatory	-
Declared unit	Inclusion of reference usefullife	Optional	Mandatory	Mandatory	-

7. LCA Rules

Table 5. Description of the modules included in this EPD.

	Product stage			Cons-truction process phase		Usage stage						End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction facility	Use	Maintenance	Repair	Restoration	Operational energy use	Operational use of water	Demolition/ Deconstruction	Transport	Waste processing	Disposal	Reuse Recovery Recycling potential
Module	A1	A2	A3	A4	A5	B1	B2	B4	B5	B6	B7	C1	C2	C3	C4	D
Declared modules	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	MX	MX	MX	ND	ND	ND	ND	ND	ND	ND	ND	MX	MX	MX	MX	MX
Specific data used	>90%			-	-	-	-	-	-	-	-	-	-	-	-	-
Product variaton	0%			-	-	-	-	-	-	-	-	-	-	-	-	-
Site variaton	0%			-	-	-	-	-	-	-	-	-	-	-	-	-

X = Declared module; ND = No declared module; MX= México

7.3 Description of information modules

Table 6. Description of information modules included in this EPD.

A1) RAW MATERIALS SUPPLY

- Pre-processing of steel scrap.
- Production of raw materials: ferroalloys, lime, carbon, graphite electrodes.
- Production of packaging materials for raw materials.
- Generation and distribution of the electricity consumed in manufacturing.
- Generation and distribution of the natural gas consumed in manufacturing.
- Production of steel slab by external supplier.

A2) TRANSPORTATION

- Transportation of steel scrap.
- Transportation of iron pellet.
- Transportation of other raw materials.
- Transportation of ancillary materials.
- Internal transportation requirements.
- Transport of steel slab from external supplier facilities.

A3) MANUFACTURING

- Fresh water consumption.
- Production and consumption of ancillary materials: oxygen, nitrogen, textiles for cleaning and maintenance, lubricating oils and grease.
- Waste generation and waste management processes.
- Emissions to air.
- Transport of waste to treatment and final disposal sites.

C) END OF LIFE

- Deconstruction.
- Transport final destination.
- What can be recycled.
- What goes to landfill what is wasted and not recycled.

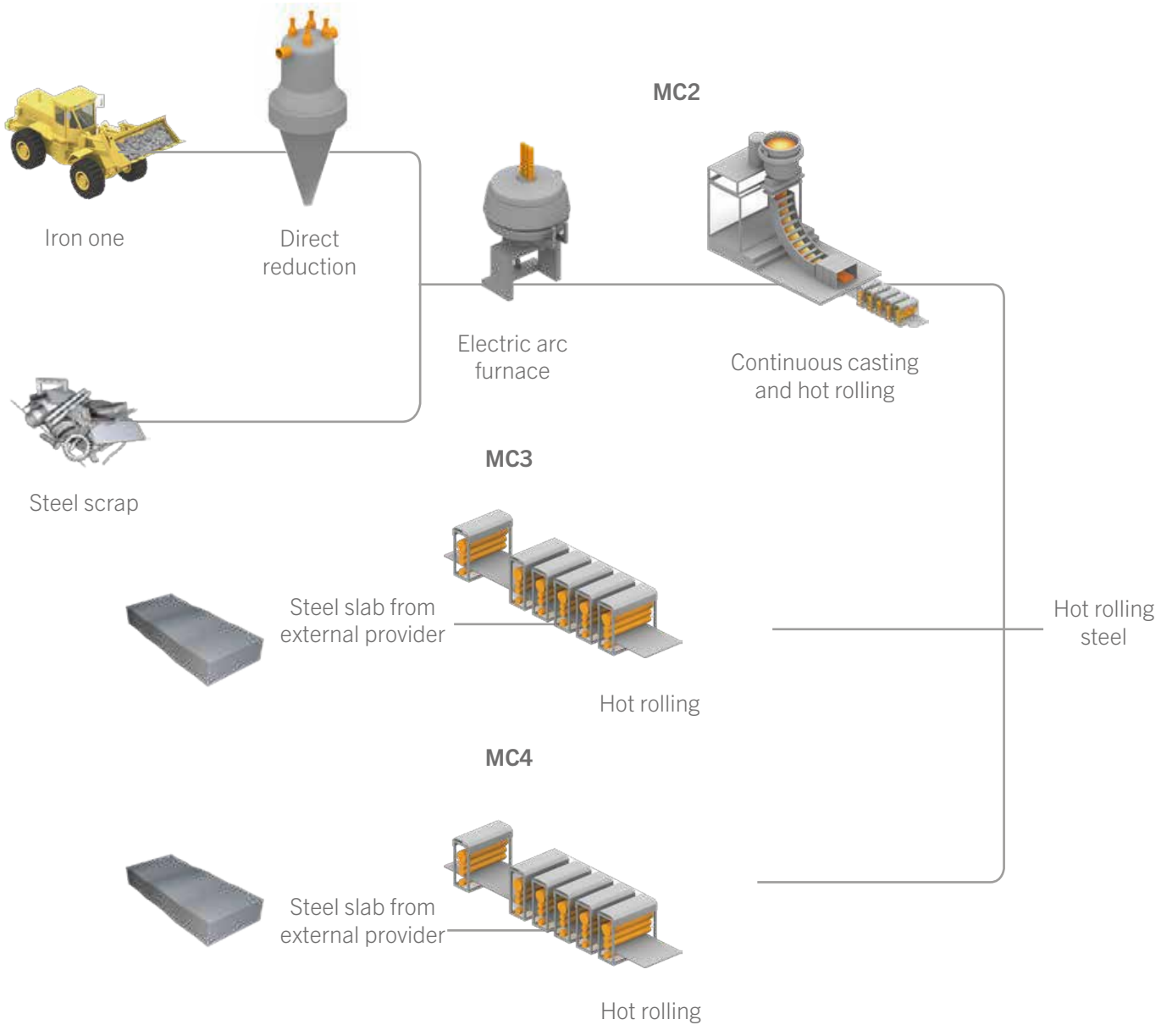
D) BENEFITS AND CHARGES BEYOND THE SYSTEM LIMIT

- The avoided loads, benefits of stopping the production of mineral for steel.

7. LCA Rules

7.4 Description of the manufacturing process

Ternium Mexico manufactures Hot Rolled Steel in three hot rolling mills, one (MC2) is in the Guerrero plant, located in the municipality of San Nicolás de los Garza, other mill (MC3) in the Churubusco plant, located in the municipality of Monterrey, and the last one (MC4) at the Pesquería plant, located in the municipality of Pesquería, all of them are in the state of Nuevo León. MC3 and MC4 mills use slab purchased to an independent supplier and the MC2 mill has an integrated process that starts from the direct reduction of the iron pellet, through the production of steel in the electric arc furnace, the continuous casting, and the hot rolling mill. The manufacturing process is depicted in Figure 1.



7. LCA Rules

7.5 Assumptions

The assumptions related to the hot rolled steel manufacturing process are presented below.

- There is no significant difference in the production process of A36 and A50 grades of hot rolled steel sheet and the rest of the hot rolled steel sheet specifications produced by Ternium, therefore the assumption is made that the potential environmental impacts are identical for all types of hot rolled steel sheet.
- The same data as those reported in 2016 were used for the manufacture of sponge iron by Ternium in the Puebla plant, under the assumption that there were no significant process differences with respect to 2022. The sponge iron from said plant represented 7% of the total raw materials used in the Guerrero plant in 2022. It is important to mention that the data set was modified to represent the electricity provided by the CFE to the Puebla plant, in order to represent the situation of the year 2022.
- When spent oil and grease residues were reported, oil and grease entries were added to complement the material balances.
- When the generation of contaminated industrial waste was reported, entries of tow and rags were added to complement the material balance, under the assumption that 50% by weight are tow and 50% are rags from reused clothing scraps (recycling).
- The assumption is made that tow and rags leave the system in the form of contaminated industrial waste or impregnated textiles and that they have the capacity to absorb 55% of their weight.
- It is assumed that the rags and tow used for cleaning, as well as the grease for maintenance, are available in the same municipality at a distance of 34 km.
- According to the Latin American Steel Association (ALACERO, 2022), in Mexico, 98% of the steel generated during the demolition of construction buildings is recycled, and only 2% reaches the landfill.
- On the other hand, according to Javeriana University (Pontificia Universidad Javeriana, Faculty of Engineering, 2014) the fuel consumption involved during the demolition of buildings corresponds to 960 liters for the use of a backhoe, 1,590 liters for the use of a backhoe loader, 432 liters for the use of a mobile crusher. In this same process, the emissions of particulate matter associated with the demolition were obtained from Ecoinvent 3.9 “Waste concrete, not reinforced {CH}| treatment of, recycling | Cut-off, U”.
- For the transport of waste, an average distance in the State was assumed, corresponding to 250.71 km and one truck (capacity greater than 32 tons).

7.6 Cut-off-criteria

- All flows of fuel, energy, materials and supplies necessary to produce the hot rolled steel have been considered; materials that could be used in preventive or corrective maintenance of machinery and equipment were disregarded, as well as the use of uniforms and personal protective equipment or other auxiliary materials, leaving out textile impregnated with oils or plastics and the final disposal of these as hazardous waste.

7.7 Allocation

In this study, the first preferred allocation procedure was applied, mentioned in the PCR (PCR, 2023), which constitutes the partition of the inputs and outputs of the system, reflecting the physical relationships between the product and each by-product. The partition of inputs and outputs was based on a mass relationship, considering the quantity produced per year of each product or byproduct at the unit process level.

This procedure constitutes a conservative approach, because the products represent the largest proportion when analyzing the outputs (based on the mass produced) in each unit process evaluated. This procedure was used in the same way for material flows as for energy flows throughout the evaluated modules.

7. LCA Rules

Also, the performances of each plant and process involved in the manufacture of the Hot Rolled Steel Sheet were used in the assignment of the input and output flows of the LCI, the performances are found in Table 7.

Table 7. Performance for the manufacture of hot rolled sheet.

Plant	Production area or line	% production allocation
Guerrero	MC2	30.35%
Churubusco	MC3	23.80%
Pesquería	MC4	45.85%

7.8 Time representativeness

Direct data obtained from Ternium Mexico is representative for 2022.

8. Environmental performance

SimaPro 9.5 and Ecoinvent 3.9.1 was used for Life Cycle Impact Assessment.

8.1 Potential environmental impact

The results of the LCI for the basic categories of one thousand kilograms of Hot Rolled Steel sheet are presented in Figure 2. Table 8 presents the LCI with the reference substance corresponding to each impact category and the percentage contribution.

All information modules are reported and valued separately. However, the present EPD presents itself the total impact across all stage.

Electricity impact

The electricity generation data in Mexico comes from the Ecoinvent 3.9 database and information from the National Center for Energy Control (CENACE), which is a decentralized public body whose purpose is to manage the Operational Control of the National Electric System in México. With both references a dataset was created, named "Electricity, high voltage, 2023 {MX}| market for electricity, high voltage | Cut-off, U", this dataset represents the most recent electricity Mexican grid by type of technology. But adjusts was required in order to reflect that Ternium México in year 2022 also use Electricity from Independent Producers and this one has at least for GWP lower emission factors.

Mexican electricity grid

Type of technology	Total
Deep geothermal	1%
Hard coal	4%
Hydro, run-of-river	6%
Natural gas, combined cycle power plant	59%
Natural gas, conventional power plant	9%
Nuclear, boiling water reactor	3%
Wind, 1-3MW turbine, onshore	5%
Photovoltaic, 570kWp open ground installation, multi-Si	5%
Ethanol production from sweet sorghum	<0%
Oil	2%
Natural gas, burned in gas turbine, for compressor station	6%
TOTAL	**100%**

8. Environmental performance

As part of the requirements of the PCR, the climate impact as kg CO2 eq/kWh of the electricity used in the manufacturing process of the Hot rolled steel, is reported in the next table. This impact was calculated using the GWP-GHG indicator.

Electricity Global warming potential (GWP-GHG) per kWh

	Unit	Quantity
1 kWh Electricity, high voltage, 2023 {MX}| market for electricity, high voltage | Cut-off, U	kg CO_2 eq.	0.483
1 kWh Electricity, low voltage {MX}| electricity production, photovoltaic, 570kWp open ground installation, multi-Si | Cut-off, U	kg CO_2 eq.	3.19E-08
1 kWh Electricity, high voltage {MX}| electricity production, natural gas, combined cycle power plant | Cut-off, U Adapted Techgen	kg CO_2 eq.	0.397
1kWh Electricity, high voltage {MX}| electricity production, natural gas, combined cycle power plant | Cut-off, U Adapted IBERDROLA	kg CO_2 eq.	0.3932

Global warming potential (GWP-GHG) of Scrap use

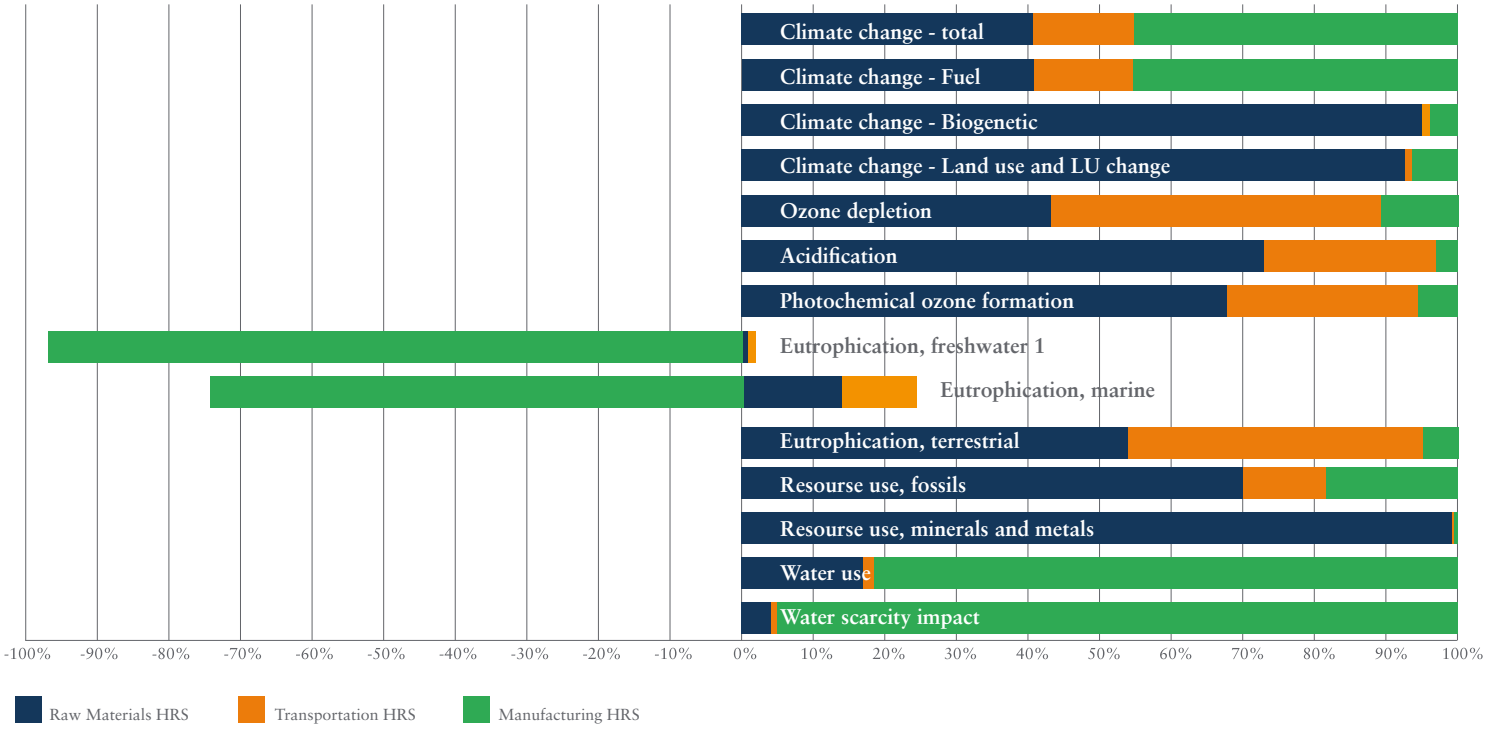
Another specific topic in accordance with the new requirements of the PCR is the report of the climate impact of the scrap inputs per 1000 kg of hot rolled steel. This impact was calculated using the GWP-GHG indicator.

Scrap use, Global warming potential

	Unit	Electricity
Global warming potential (GWP-GHG) of scrap use	kg CO_2 eq.	0.02186

Module A1, obtaining raw materials, has significant contributions greater than 40% in most of the impact categories evaluated (10/14), except for those related to water consumption and scarcity, and in Eutrophication of marine and fresh water. Module A2, transportation, has a significant contribution in the categories of ozone layer depletion, marine eutrophication, and terrestrial eutrophication, Module A3, manufacturing, in addition to the main contribution to water consumption and scarcity, has a significant impact contribution in the categories of climate change and a positive impact in freshwater and marine water eutrophication.

Figure 2. A1-A3 Basic impact categories results.



8. Environmental performance

The results of stages A1-A3 are presented in Table 8.

Table 8. A1-A3 Basic impact categories results

Basic impact categories	Unit	A1) Raw materials	A2) Transport	A3) Manufacture	A1-A3
Climate change- total[1]	kg CO2 eq	3.15E+02	1.11E+02	3.50E+02	7.77E+02
	%	40.56%	14.35%	45.09%	100.00%
Climate change- Fuel	kg CO2 eq	3.14E+02	1.11E+02	3.50E+02	7.76E+02
	%	40.48%	14.37%	45.16%	100.00%
Climate change- Biogenic	kg CO2 eq	6.61E-01	6.21E-03	2.47E-02	6.92E-01
	%	95.53%	0.90%	3.57%	100.00%
Climate change - Land use and LU change	kg CO2 eq	4.31E-01	3.83E-03	2.59E-02	4.60E-01
	%	93.5%	0.8%	5.6%	100.0%
Ozone depletion	kg CFC11 eq	1.58E-05	1.70E-05	3.74E-06	3.65E-05
	%	43.31%	46.46%	10.23%	100.00%
Acidification	mol H+ eq	5.85E+00	1.93E+00	1.83E-01	7.97E+00
	%	73.43%	24.27%	2.30%	100.00%
Resource use, minerals and metals	kg NMVOC eq	4.28E+00	1.69E+00	3.22E-01	6.29E+00
	%	67.99%	26.90%	5.12%	100.00%
Eutrophication, freshwater	kg P eq	3.10E-03	1.23E-04	-5.06E-01	-5.03E-01
	%	0.62%	0.02%	-100.64%	-100.00%
Eutrophication, marine	kg N eq	7.17E-01	5.61E-01	-4.05E+00	-2.77E+00
	%	25.87%	20.23%	-146.10%	-100.00%
Eutrophication, terrestrial	mol N eq	8.01E+00	6.17E+00	6.53E-01	1.48E+01
	%	53.99%	41.61%	4.40%	100.00%
Resource use, fossils	MJ	8.42E+03	1.40E+03	2.13E+03	1.19E+04
	%	70.45%	11.69%	17.86%	100.00%
Resource use, minerals and metals	kg Sb eq	1.01E-03	3.07E-06	1.43E-06	1.02E-03
	%	99.56%	0.30%	0.14%	100.00%
Water use	m3 depriv.	1.53E+01	1.27E+00	7.56E+01	9.22E+01
	%	16.65%	1.38%	81.97%	100.00%
Water scarcity impact	m3 H2O eq	9.48E-01	1.35E-01	2.43E+01	2.54E+01
	%	3.73%	0.53%	95.74%	100.00%

* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

1 This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO2 is set to zero.

* A disclaimer discouraging the use of the results of modules A1-A3 without considering the results of module C. The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

8. Environmental performance

The results of stages C1-C4 are presented next as well as stage D.

Table 9. C1-C4, D impact categories results.

Impact categories	Unit	C1) Deconstruction	C2) Waste transport	C3) Waste treatment	C4) Waste disposal	D) Benefits and charges beyond the system boundary, recycling scenario
Climate change- total	kg CO2 eq	2.68E+00	1.91E+01	0.00E+00	6.69E+00	2.14E+01
Climate change- Fuel	kg CO2 eq	2.68E+00	1.91E+01	0.00E+00	6.68E+00	2.14E+01
Climate change- Biogenic	kg CO2 eq	1.76E-04	1.23E-03	0.00E+00	6.28E-03	1.50E-03
Climate change - Land use and LU change	kg CO2 eq	1.10E-04	7.52E-04	0.00E+00	1.92E-03	8.38E-04
Ozone depletion	kg CFC11 eq	4.23E-08	2.89E-07	0.00E+00	2.26E-08	3.28E-07
Acidification	mol H+ eq	2.57E-02	3.09E-02	0.00E+00	2.02E-02	5.56E-02
Photochemical ozone formation	kg NMVOC eq	3.86E-02	4.42E-02	0.00E+00	1.86E-02	8.11E-02
Eutrophication, freshwater	kg P eq	2.29E-06	4.58E-05	0.00E+00	8.03E-05	5.64E-05
Eutrophication, marine	kg N eq	1.20E-02	7.18E-03	0.00E+00	5.97E-03	1.89E-02
Eutrophication, terrestrial	mol N eq	1.31E-01	7.18E-02	0.00E+00	6.76E-02	1.99E-01
Resource use, fossils	MJ	3.53E+01	2.64E+02	0.00E+00	3.24E+01	2.94E+02
Resource use, minerals and metals	kg Sb eq	1.13E-07	1.17E-06	0.00E+00	1.05E-05	1.24E-06
Water use	m3 depriv.	4.52E-02	3.66E-01	0.00E+00	3.15E-01	4.45E-01

The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

8. Environmental performance

8.2. Use of resources

Parameters describing resource use were evaluated with the Cumulated Energy Demand method version 1.09 (Frischknecht et al. 2007) adjusted with option B of Anex 3 from PCR; the indicator of use of net fresh water that was evaluated with Recipe 2016 Midpoint (H) version 1.00 (Huijbregts et al. 2017). The detailed description of the use of resources is provided in Table 10.

Table 10. Use of resources parameters.

Use of resources parameters	Unit	A1-A3	C1	C2	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	1.43E+02	6.87E-02	3.89E-01	0.00E+00	1.31E+00	1.31E+00
Use of renewable primary energy resources used as raw materials	MJ	1.34E+02	0.00E+00	0.00E+00	-1.32E+02	0.00E+00	0.00E+00
Total use of renewable primary energy resources	MJ	2.78E+02	6.87E-02	3.89E-01	-1.32E+02	1.31E+00	0.00E+00
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	6.78E+03	3.75E+01	2.80E+02	0.00E+00	3.44E+01	3.13E+02
Use of non-renewable primary energy resources used as raw materials	MJ	6.36E+03	0.00E+00	0.00E+00	-6.23E+03	0.00E+00	0.00E+00
Total use of non-renewable primary energy re-sources	MJ	1.31E+04	3.75E+01	2.80E+02	-6.23E+03	3.13E+02	3.13E+02
Use of secondary material; RSF = Use of renewable secondary fuels	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water	m^3	7.25E-01	1.75E-03	1.45E-02	0.00E+00	9.41E-03	1.69E-02

8. Environmental performance

8.3. Other indicators describing waste categories

Environmental indicators describing waste generation were obtained from LCI except for background information which has been calculated using EDIP 2003 method (Hauschild and Potting, 2005). Environmental parameters describing waste generation are provided in table 11 and 12.
All information modules are reported separately. However, the total impact across all stages is also presented.

Table 11. A1-A3 Other indicators describing waste categories

Output parameter	Unit	A1) Raw materials supply	A2) Transportation	A3) Manufacturing	Total A1-A3
Hazardous waste	kg	6.31E-02	7.94E-03	5.19E-01	5.90E-01
Non hazardous waste	kg	2.88E+01	1.59E-01	6.67E-01	2.97E+01
Radioactive waste*	kg	1.59E-03	5.34E-05	8.22E-04	2.47E-03
Components for reuse	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	5.00E-02	0.00E+00	1.41E-07	5.00E-02
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported electricity	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported heat	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00

* No radioactive waste is produced during Ternium Mexico operation.

Table 12. C1-C4, D Other indicators describing waste categories

Output parameter	Unit	C1) Deconstruction	C2) Waste transport	C3) Waste treatment	C4) Waste disposal	D) Benefits and charges beyond the system boundary, recycling scenario
Hazardous waste	kg	2.36E-04	1.78E-03	0.00E+00	9.53E-05	3.53E-01
Non hazardous waste	kg	2.62E-03	6.73E-02	0.00E+00	4.00E+01	7.20E-02
Radioactive waste*	kg	1.72E-06	9.24E-06	0.00E+00	1.55E-05	1.98E-05
Components for reuse	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	9.80E-01	2.00E-02	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported electricity	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported heat	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

* No radioactive waste is produced during Ternium Mexico operation.

8.4. Global Warming Potential (GWP-GHG)

Table 13 shows the results of the Global warming potential of 1000 kg of Hot rolled steel evaluated with IPCC GWP100 method.

Table 13. Global warming potential (GWP-GHG) of Hot rolled steel

Impact category	Unit	A1-A3	C1) Deconstruction	C2) Waste transport	C3) Waste treatment	C4) Waste disposal	D) Benefits and charges beyond the system boundary
Global Warming Potential	kg CO_2 eq	7.77E+02	2.68E+00	1.91E+01	0.00E+00	6.69E+00	2.14E+01

* This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO2 is set to zero.

9. Differences versus previous versions

The previous version of this EPD was published in 2018 in accordance with PCR 2012:01 construction products and construction services, Version 2.3 V2.2 2012:01.

During 2023 the EPD was updated following EN 15804:2012+A2:2019/AC:2021 standard and PCR Construction products 2019:2014 V 1.3.4.

10. Verification and registration

CEN STANDARD EN 15804 SERVED AS THE CORE PCR	
Programme:	EPD® International EPD® System www.environdec.com EPD® LATIN AMERICA EPD registered through the fully aligned regional programme/hub: EPD Latin America www.epd-americalatina.com
Programme operator:	EPD International AB Box 210 60 SE-100 31 Stockholm, Sweden E-mail: info@environdec.com EPD Latin America Chile: Alonso de Ercilla 2996, Ñuñoa, Santiago Chile. Mexico: Bosques De Bohemia 2 No. 9, Bosques del Lago. Cuautitlan Izcalli, Estado de México, México.
EPD registration number:	EPD-IES-0001425:001
Date of publication (issue):	2019-07-01
Date of validity:	2029-08-05
Date of revision:	2024-08-05 (Version 001)
Reference year of data:	2022
Geographical scope:	Mexico
Product group classification:	CPC 4121 Flat-rolled products of steel, not further worked than hot-rolled
PCR:	PCR 2019:14 construction products, Version 1.3.4 (15804:2012+A2:2019/AC:2021)
PCR review was conducted by:	Martin Erlandsson, IVL Swedish Environmental Research Institute, martin.erlandsson@ivl.se
Independent verification of the declaration data, according to ISO 14025:2006.	EPD process certification (Internal) ☐ EPD verification (External) ☑
External third-party verifier and critical reviewer of the LCA:	Rubén Carnerero Approved EPD verifier r.carnerero@ik-ingenieria.com
Accredited or approved by:	The International EPD® System
Procedure for follow-up of data during EPD validity involves third-party verifier:	Yes ☐ No ☑

11. Ternium's Certifications

Environment
The Environmental Management System of the Ternium Plants that participate in the manufacture are certified under standard ISO 14001:2015

Quality
To ensure the quality of the steel products that are produced in Ternium plants, the different manufacturing processes are certified with the ISO 9001:2015 quality standard, in its latest version. Additionally, the chemical and physical test labs are certified with ISO 17025:2017 standard, as well in its latest version.

Safety
To ensure the care of the physical integrity and occupational health of all the personnel, of the Ternium Plants that participate in the manufacture the Safety Management System is certified with the ISO 45001:2018.

Energy
The process equipment for the manufacture of Hot Rolling Steel Coils in Guerrero and Pesquería Plants are certified for Energy Efficiency under the standard ISO 50001:2018

Sustainability
Towards sustainability and environmental protection Ternium manufactures 100% recyclable products, with the highest quality and minimizing environmental impact. Recycling is an important part of the company's production process, as well as ensuring a long-term healthy link with the communities neighboring the production centers.

Ternium is deeply committed to sustainable development, so its actions are guided by an Environmental and Energy Policy that involves employees, shareholders, suppliers, customers, and communities. The company has a Management System that foresees procedures, reviews and specific records for the proper operation, maintenance and control of facilities, as well as for the handling of substances.

Active Participation
Ternium reports, since 2005, CO_2 emissions to the World Steel Association. This garnered the recognition of the "Climate Action Member" program. Additionally, Ternium subscribed to the report on sustainability indicators and reports on energy consumption and personnel training. In addition Ternium also garnered for 6 consecutive years the recognition of Sustainability Champion by the World Steel Association.

In addition, the company is part of different groups that are concerned about environmental issues, mainly the World Business Council for Sustainable Development (National Chapters), the Latin American Steel Association (Alacero), World Steel Association and various work committees in several industrial associations. In Mexico, it participates through the commissions related to environmental issues and energy saving of the National Chamber of Iron and Steel (CANACERO), the Mining Chamber of Mexico (CAMIMEX) and the Environmental Protection Institute of Nuevo León (IPA-NL).

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LCA study: Análisis de ciclo de vida de lámina rolada en caliente fabricada por Ternium México (Reporte 2024)

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