EVRAZ

VERIFIED by SCS GLOBAL SERVICES
ENVIRONMENTAL PRODUCT DECLARATION
BASED ON LCA

Declaration Owner

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Product:

Hot Rolled Steel Plate

Declared Unit

The declared unit is one ton of steel plate
produced at the Portland, OR rolling mill from steel slab
produced at the EVRAZ Regina mill in Saskatchewan, Canada

EPD Number and Period of Validity

SCS-EPD-07593
EPD Valid January 20, 2022 through January 19, 2027
Version: February 10, 2022

Product Category Rule

PCR Guidance for Version 3.2. UL Environment. Dec. 2018

PCR Guidance for Building-Related Products and Services. Part B: Designated Steel Construction Product EPD Requirements. UL 10010-34 Version 2.0. August 2020.

Program Operator

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SCSglobal SERVICES

Declaration owner:	EVRAZ North America
Address:	14400 N Rivergate Blvd. Portland, Or 97203
Declaration Number:	SCS-EPD-07593
Declaration Validity Period:	EPD Valid January 20, 2022 through January 19, 2027
Version Date:	February 10, 2022
Program Operator:	SCS Global Services
Declaration URL Link:	https://www.scsglobalservices.com/certified-green-products-guide
LCA Practitioner:	Tess Garvey, Ph.D., SCS Global Services
LCA Software and LCI database:	OpenLCA 1.10 software and the Ecoinvent v3.7.1 database
Product's Intended Application:	Steel plate is used in various products
Product RSL:	n/a
Markets of Applicability:	Global
EPD Type:	Product-Specific
EPD Scope:	Cradle-to-Gate
LCIA Method and Version:	CML-IA and TRACI 2.1
Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071	☐ internal ☒ external
LCA Reviewer:	Thomas Gloria, Ph.D., Industrial Ecology Consultants
Part A Product Category Rule:	PCR Guidance for Building-Related Products and Services Part A: Life Cycle Assessment Calculation Rules and Report Requirements. UL 10010 Version 3.2.Dec. 2018
Part A PCR Review conducted by:	Lindita Bushi, PhD (Chair); Hugues Imbeault-Tétreault, ing., M.Sc.A.; Jack Geibig
Part B Product Category Rule:	PCR Guidance for Building-Related Products and Services. Part B: Designated Steel Construction Product EPD Requirements. UL 10010-34 Version 2.0. August 2020.
Part B PCR Review conducted by:	Thomas Gloria, PhD; Brandie Sebastian, James Littlefield
Independent verification of the declaration and data, according to ISO 14025 and the PCR	☐ internal ☒ external
EPD Verifier:	Thomas Gloria, Ph.D., Industrial Ecology Consultants
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Disclaimers: *This EPD conforms to ISO 14025, 14040, 14044, and ISO 21930.*

Scope of Results Reported: *The PCR requirements limit the scope of the LCA metrics such that the results exclude environmental and social performance benchmarks and thresholds, and exclude impacts from the depletion of natural resources, land use ecological impacts, ocean impacts related to greenhouse gas emissions, risks from hazardous wastes and impacts linked to hazardous chemical emissions.*

Accuracy of Results: *Due to PCR constraints, this EPD provides estimations of potential impacts that are inherently limited in terms of accuracy.*

Comparability: *The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.*

In accordance with ISO 21930:2017, EPDs are comparable only if they comply with the core PCR, use the same sub-category PCR where applicable, include all relevant information modules and are based on equivalent scenarios with respect to the context of construction works.

1. EVRAZ North America

EVRAZ North America is proudly based in the United States and a wholly owned subsidiary of EVRAZ plc, which serves as one of the largest vertically integrated steel and mining businesses in the world. As a leading North American producer of engineered steel products for rail, energy and industrial end markets, we deliver a broad selection of specialty steel solutions to meet our customers' demands in the United States and Canada. Headquartered in Chicago, Illinois, EVRAZ North America employs more than 1,400 people in the United States and 1,800 in Canada. We have the facilities and equipment to meet our customers' needs, backed by outstanding team members who are committed to continuously improving safety, quality and customer service.

EVRAZ North America has six production sites located in the United States (Portland, Oregon; Pueblo, Colorado) and Canada (Regina, Saskatchewan; Calgary, Camrose and Red Deer, Alberta). We are the largest North American producer by volume in the rail and large diameter pipe markets. We also hold leading positions in the West Coast plate as well as the Western Canada oil country tubular goods and small diameter pipe markets.

Our diverse range of manufacturing capabilities allows us to produce a wide array of specialty steel products: plate, coiled plate, welded and seamless pipe for oil and gas applications, rail and wire rod and bar. We take a dynamic approach to manufacturing, using the geographic accessibility and production flexibility of our facilities to respond quickly to changes in the market for maximum efficiency and cost savings. Our Product Technology Centers in Pueblo and Portland and our Research and Development complex in Regina enhance our ability to develop high strength steel products for the most demanding applications. We have a long legacy of leadership in the communities where we operate and continue to explore growth opportunities to expand our operations in the United States as well as Canada.

2. Products

2.1 PRODUCT DESCRIPTION

EVRAZ Regina and Portland collectively produce over 500 grades and specifications of steel plate. EVRAZ hot-rolled plate, strip mill plate and heat-treated plate spans a wide variety of grades and sizes. EVRAZ produces as-rolled carbon, high-strength-low-alloy and alloy grades, plus heat-treated carbon and alloy grades. Their ability to turn and roll product to width before they finish the length allows them great flexibility in producing customers' specific dimensions. Steel plate is in railcars, barges, ocean-going vessels, industrial equipment, tanks and pressure vessels, large diameter pipe for oil and natural gas transmission, wind towers, bridges, armored vehicles and many other applications.

EVRAZ steel plate can be manufactured into various end products, where the CSI/UNSPSC codes will depend upon the final product. The EVRAZ Portland mill steel plate grades include ASTM A36, ASTM A572, ASTM A514, ASTM A516, ASTM A656, ASTM A709, ABS Grades A, B, D, AH32, AH36, DH32 and DH36.

EVRAZ produces steel plate with an average density of 7,850 kg/m^3.

2.2 PRODUCT FLOW DIAGRAM

A flow diagram illustrating the production processes and life cycle phases included in the scope of the EPD is provided below.

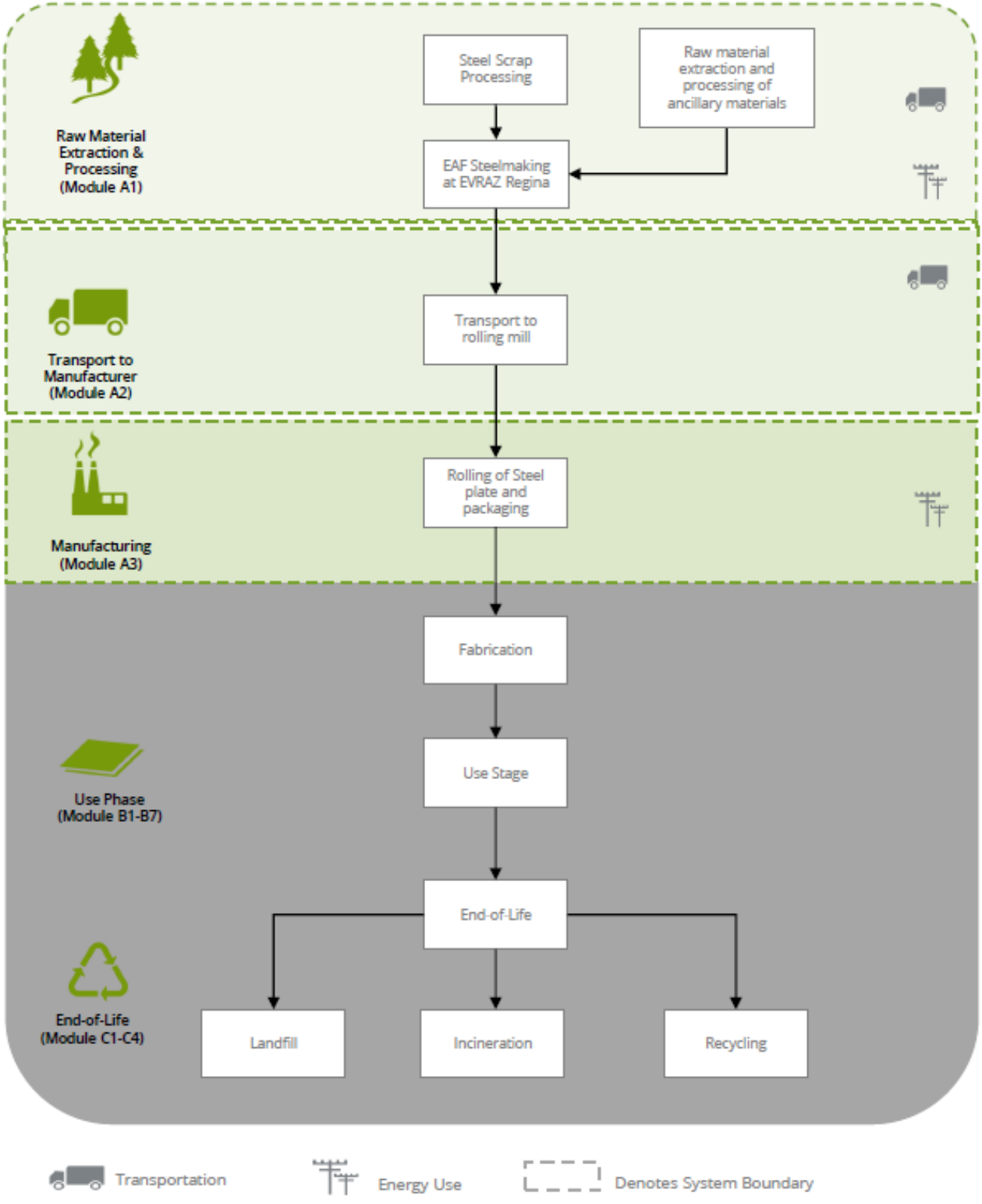

Figure 1. *Flow Diagram for the life cycle of the EVRAZ steel plate.*

2.4 DECLARATION OF METHODOLOGICAL FRAMEWORK

The scope of the EPD is cradle-to-gate, including raw material extraction and processing, transportation, steel manufacture and hot rolling. The life cycle phases included in the product system boundary are shown below.

Table 1. *Life cycle phases included in the EVRAZ steel plate product system boundary.*

Product			Construction Process		Use							End-of-life				Benefits and loads beyond the system boundary
A1	A2	A3	A4	A5	B1	B1	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw material extraction and processing	Transport to manufacturer	Manufacturing	Transport	Construction - installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal	Reuse, recovery and/or recycling potential
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

X = Module Included | MND = Module Not Declared

Cut-off and allocation procedures are described below and conform to the PCR and ISO standards.

2.5 TECHNICAL DATA

Technical specifications for the steel plate in this study include ASTM A36, ASTM A572, ASTM A514, ASTM A516, ASTM A656, ASTM A709, ABS Grades A, B, D, AH32, AH36, DH32 and DH36.

2.6 INTENDED APPLICATION

The intended application of the steel plate is for manufacture of railcars, barges, ocean-going vessels, industrial equipment, tanks and pressure vessels, large diameter pipe for oil and natural gas transmission, wind towers, bridges, armored vehicles and many other applications.

2.7 MATERIAL COMPOSITION

The steel coil modeled in this study contains 100% recycled steel scrap with an alloy content lower than 5%. In general, the steel products will contain 95-99% recycled iron, including < 2% Manganese, ≤ 1% Carbon, <1% Silicon, ≤ 0.5% Chromium, ≤0.5% Copper, ≤0.2% Nickel, and other alloying elements, each less than 0.1% of the total.

Steel construction products under normal conditions do not present inhalation, ingestion, or contact health hazards. These products are used inside the building envelope, or other structures, and do not include materials or substances which have potential route of exposure to humans or flora/fauna in the environment.

2.8 PROPERTIES OF DECLARED PRODUCT AS DELIVERED

The steel plate is produced in over 500 grades and specifications of steel plate, depending upon the customer's requirements.

2.9 MANUFACTURING

The steel plate in this study is manufactured at the Portland, OR mill from steel slab manufactured at the EVRAZ Regina mill in Regina, SK.

2.10 PACKAGING

Steel plate is packaged using lumber and heavy tarps.

2.11 FURTHER INFORMATION

Further information on the product can be found on the manufacturers' website at www.evrazna.com

3. LCA: Calculation Rules

3.1 DECLARED UNIT

The declared unit used in the study is defined as one (1) metric ton of steel plate, consistent with the PCR.

Table 2. *The modules and unit processes included in the scope for the EVRAZ steel plate.*

Module	Module Description	Unit Processes Included in Scope
A1	Extraction and processing of raw materials; any reuse of products or materials from previous product systems; processing of secondary materials; generation of electricity from primary energy resources; energy, or other, recovery processes from secondary fuels	Raw material extraction and processing, including all activities necessary for the reprocessing steel scrap, including but not limited to the recovery or extraction and processing of feedstock materials. EAF Steelmaking at the EVRAZ Regina EAF mill.
A2	Transport (to the manufacturer)	Transportation from Regina to the EVRAZ rolling mill and facility in Portland, OR
A3	Manufacturing, including ancillary material production	Manufacture of steel plate, including hot rolling of the final product at the processor
A4	Transport (to the building site)	Module Not Declared
A5	Construction-installation process	Module Not Declared
B1	Product use	Module Not Declared
B2	Product maintenance	Module Not Declared
B3	Product repair	Module Not Declared
B4	Product replacement	Module Not Declared
B5	Product refurbishment	Module Not Declared
B6	Operational energy use by technical building systems	Module Not Declared
B7	Operational water uses by technical building systems	Module Not Declared
C1	Deconstruction, demolition	Module Not Declared
C2	Transport (to waste processing)	Module Not Declared
C3	Waste processing for reuse, recovery and/or recycling	Module Not Declared
C4	Disposal	Module Not Declared
D	Reuse-recovery-recycling potential	Module Not Declared

3.4 UNITS

All data and results are presented using SI units.

3.5 ESTIMATES AND ASSUMPTIONS

- Representative inventory data were used to reflect the energy mix for electricity use. Supply mixes were modeled based on WECC NERC region, in which the rolling mill is located.
- The production of steel was modeled using primary data from the Regina steel mill. The datasets utilized for steel production are provided in Section 4.4
- Impacts of the system were allocated to co-products (EAF slag, baghouse and millscale) based on mass.
- Impacts were modeled for processing EAF baghouse dust based on the energy required to recycle zinc from EAF dust, based on Narita et al. 1999 [6].
- Representative inventory data for raw materials and ancillary materials were modeled with unit process data taken from Ecoinvent.
- Disposal of manufacturing waste is modeled for solid and hazardous waste generation and disposal in the United States, as specified in the PCR. Specifically, 80% of non-hazardous wastes are disposed in landfill and 20% incinerated. Transportation for end-of-life scenarios was modeled using the EPA WARM model assumption of 20 miles (~32 km), from the point of product use to a landfill, material recovery center, or waste incinerator. Ecoinvent datasets are used to model the impacts associated with incineration and landfilling, which does not include energy recovery from landfill gas.

The PCR requires the results for several inventory flows related to construction products to be reported including energy and resource use and waste and outflows. These are aggregated inventory flows, and do not characterize any potential impact; results should be interpreted considering this limitation.

3.6 CUT-OFF RULES

According to the PCR, processes contributing greater than 1% of the total environmental impact indicator for each impact are included in the inventory. No data gaps were allowed which were expected to significantly affect the outcome of the indicator results. No known flows are deliberately excluded from this EPD.

3.7 DATA SOURCES

Primary data were provided by EVRAZ for their manufacturing facilities in Regina and Portland. The sources of secondary LCI data are the Ecoinvent database.

Table 3. *Data sources for the EVRAZ steel plate.*

Flow	Dataset	Data Source	Publication Date
Raw Materials			
Pig iron	market for pig iron | pig iron | Cutoff, U - RoW	Ecoinvent 3.7.1	2020
Charge chrome	chromium production | chromium | Cutoff, U - RoW	Ecoinvent 3.7.1	2020
Ferrochrome	market for ferrochromium, high carbon, 55% Cr | ferrochromium, high carbon, 55% Cr | Cutoff, U - GLO	Ecoinvent 3.7.1	2020
Ferrocolumbium	market for ferromanganese, high-coal, 74.5% Mn | ferromanganese, high-coal, 74.5% Mn | Cutoff, U - GLO	Ecoinvent 3.7.1	2020
Manganese	market for manganese | manganese | Cutoff, U - GLO	Ecoinvent 3.7.1	2020
Silicomanganese	market for ferrosilicon | ferrosilicon | Cutoff, U – GLO market for manganese | manganese | Cutoff, U - GLO	Ecoinvent 3.7.1	2020
Ferromolybdenum	market for ferromanganese, high-coal, 74.5% Mn | ferromanganese, high-coal, 74.5% Mn | Cutoff, U - GLO	Ecoinvent 3.7.1	2020
Moly Oxide	market for molybdenum trioxide | molybdenum trioxide | Cutoff, U - GLO	Ecoinvent 3.7.1	2020
Ferrosilicon	market for ferrosilicon | ferrosilicon | Cutoff, U - GLO	Ecoinvent 3.7.1	2020
Ferrotitanium	titanium production, primary | titanium, primary | Cutoff, U - GLO	Ecoinvent 3.7.1	2020
CaSi Wire	calcium carbide production, technical grade | calcium carbide, technical grade | Cutoff, U - RoW	Ecoinvent 3.7.1	2020
Aluminum	market for aluminium, cast alloy | aluminium, cast alloy | Cutoff, U - GLO	Ecoinvent 3.7.1	2020
Nickel	market for nickel, class 1 | nickel, class 1 | Cutoff, U - GLO	Ecoinvent 3.7.1	2020
Graphite	anode production, graphite, for lithium-ion battery | anode, graphite, for lithium-ion battery | Cutoff, U - RoW	Ecoinvent 3.7.1	2020
Charge Carbon	market for hard coal briquettes | hard coal briquettes | Cutoff, U - RoW	Ecoinvent 3.7.1	2020
Petcoke	petroleum coke production, petroleum refinery operation | petroleum coke | Cutoff, U - RoW	Ecoinvent 3.7.1	2020
Tundish	magnesium oxide production | magnesium oxide | Cutoff, U - RoW	Ecoinvent 3.7.1	2020
Lime/dololime	dolomite production | dolomite | Cutoff, U - RoW	Ecoinvent 3.7.1	2020
Electrodes	anode production, graphite, for lithium-ion battery | anode, graphite, for lithium-ion battery | Cutoff, U - RoW	Ecoinvent 3.7.1	2020
Electricity/Heat			
Electricity	electricity voltage transformation from high to medium voltage | electricity, medium voltage | Cutoff, U - CA-SK electricity voltage transformation from high to medium voltage | electricity, medium voltage | Cutoff- US-WECC	Ecoinvent 3.7.1 Ecoinvent 3.7.1 eGRID 2019	2020 2020
Propane	natural gas production | propane | Cutoff, U - RoW	Ecoinvent 3.7.1	2020
Natural gas	market group for natural gas, high pressure | natural gas, high pressure | Cutoff, U - CA	Ecoinvent 3.7.1	2020
Acetylene	acetylene production | acetylene | Cutoff, U - RoW	Ecoinvent 3.7.1	2020
Oxygen	Oxygen, liquid, at plant	US LCI	2012
Diesel	market for diesel | diesel | Cutoff, U - RoW	Ecoinvent 3.7.1	2020
Gasoline	market for petroleum | petroleum | Cutoff, U - GLO	Ecoinvent 3.7.1	2020
Biodiesel	soybean oil refinery operation | soybean oil, refined | Cutoff, U – US	Ecoinvent 3.7.1	2020
Transportation			
Rail	market for transport, freight train | transport, freight train | Cutoff, U – RoW	Ecoinvent 3.7.1	2020
Road	market for transport, freight, lorry 16-32 metric ton, EURO4 | transport, freight, lorry 16-32 metric ton, EURO4 | Cutoff, U - RoW	Ecoinvent 3.7.1	2020
Ocean	transport, freight, sea, container ship | transport, freight, sea, container ship | Cutoff, U - GLO	Ecoinvent 3.7.1	2020

3.8 DATA QUALITY

The data quality assessment addressed the following parameters: time-related coverage, geographical coverage, technological coverage, precision, completeness, representativeness, consistency, reproducibility, sources of data, and uncertainty.

Table 4. *Data quality assessment for the EVRAZ steel plate product system.*

Data Quality Parameter	Data Quality Discussion
Time-Related Coverage: Age of data and the minimum length of time over which data is collected	The most recent available data are used, based on other considerations such as data quality and similarity to the actual operations. Typically, these data are less than 10 years old (typically 2015 or more recent). All of the data used represented an average of at least one year's worth of data collection. Manufacturer-supplied data (primary data) are based on annual production for 2018 and 2019 for the Portland rolling mill. Manufacturer-supplied data (primary data) are based on annual production for 2019 for the Regina steel mill.
Geographical Coverage: Geographical area from which data for unit processes is collected to satisfy the goal of the study	The data used in the analysis provide the best possible representation available with current data. Actual processes for upstream operations are primarily North American. Surrogate data used in the assessment are representative of North American operations. Data representative of European operations are considered sufficiently similar to actual processes. Data representing product disposal are based on regional statistics.
Technology Coverage: Specific technology or technology mix	For the most part, data are representative of the actual technologies used for processing, transportation, and manufacturing operations.
Precision: Measure of the variability of the data values for each data expressed	Precision of results are not quantified due to a lack of data. Data collected for operations were typically averaged for one or more years and over multiple operations, which is expected to reduce the variability of results.
Completeness: Percentage of flow that is measured or estimated	The LCA model included all known mass and energy flows for production of plate and coil. In some instances, surrogate data used to represent upstream and downstream operations may be missing some data which is propagated in the model. No known processes or activities contributing to more than 1% of the total environmental impact for each indicator are excluded.
Representativeness: Qualitative assessment of the degree to which the data set reflects the true population of interest	Data used in the assessment represent typical or average processes as currently reported from multiple data sources and are therefore generally representative of the range of actual processes and technologies for production of these materials. Considerable deviation may exist among actual processes on a site-specific basis; however, such a determination would require detailed data collection throughout the supply chain back to resource extraction.
Consistency: Qualitative assessment of whether the study methodology is applied uniformly to the various components of the analysis	The consistency of the assessment is considered to be high. Data sources of similar quality and age are used with a bias towards Ecoinvent v3.7.1 data where available. Different portions of the product life cycle are equally considered; however, it must be noted that final disposition of the product is based on assumptions of current average practices in Europe and the United States.
Reproducibility: Qualitative assessment of the extent to which information about the methodology and data values would allow an independent practitioner to reproduce the results reported in the study	Based on the description of data and assumptions used, this assessment would be reproducible by other practitioners. All assumptions, models, and data sources are documented.
Sources of the Data: Description of all primary and secondary data sources	Data representing energy use at the EVRAZ manufacturing facility represent an annual average and are considered of high quality due to the length of time over which these data are collected, as compared to a snapshot that may not accurately reflect fluctuations in production. The Ecoinvent database is used for secondary LCI datasets.
Uncertainty of the Information: Uncertainty related to data, models, and assumptions	Uncertainty related to materials in the steel products is low. Actual supplier data for upstream operations was not available for all suppliers and the study relied upon the use of existing representative datasets. These datasets contained relatively recent data (<10 years) but lacked geographical representativeness. Uncertainty related to the impact assessment methods used in the study are high. The impact assessment method required by the PCR includes impact potentials, which lack characterization of providing and receiving environments or tipping points.

3.9 PERIOD UNDER REVIEW

The period of review for the steel plate produced at the Portland mill is from January 01, 2018 through December 31, 2019. The data from the Regina steel mill represents January 01, 2019 through December 31, 2019.

3.10 ALLOCATION

This study follows the allocation guidelines of ISO 14044 and allocation rules specified in the PCR and minimized the use of allocation wherever possible.

With respect to the steel scrap, the 100-0 recycled content approach is used in which the recycled material bears only the burden of any processing from waste material.

Mass allocation was deemed the most accurate and reproducible way of calculating the energy and material requirements for the manufacture of the steel and steel products. Primary data for resource use (e.g., electricity, natural gas, water), waste/co-products, and emissions released, are allocated on a mass-basis as a fraction of total annual production.

The transportation from primary producer of material components (e.g., alloys, fluxes) to steel mill and between Regina and Portland is based on primary data provided by EVRAZ, including modes, distances, and amount of steel transported. Transportation was allocated on the basis of the mass and distance the material was transported.

3.11 COMPARABILITY

The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.

4. LCA: Scenarios and Additional Technical Information

Manufacturing

Electric arc furnace (EAF) steelmaking occurs at the Regina, SK facility. Electricity is modeled using ecoinvent v3.7.1 for Saskatchewan. Rolling occurs at the Portland, OR facility, and electricity for this facility is modeled using ecoinvent v3.7.1 specific to the WECC NERC region, in which the facility is located.

Transportation of waste materials at manufacturing assumes a 20 mile (~32 km) average distance to disposal, consistent with assumptions used in the US EPA WARM model. Assumed disposal rates for nonhazardous wastes are based on US EPA SMM rates of 20% incineration and 80% landfilled. Hazardous wastes are disposed by landfilling. Recycling of EAF dust is discussed in section 3.5 and based on actual modes of transport and distances, provided by the manufacturer.

5. LCA: Results

Results of the Life Cycle Assessment are presented below. It is noted that LCA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

The following environmental impact category indicators are reported using characterization factors based on the U.S. EPA's Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts – TRACI 2.1 and CML-IA.

CMLI-A Impact Category	Unit	TRACI 2.1 Impact Category	Unit
Global Warming Potential **(GWP)**	kg CO_2 eq	Global Warming Potential **(GWP)**	kg CO_2 eq
Depletion potential of the stratospheric ozone layer **(ODP)**	kg CFC 11 eq	Ozone Depletion Potential **(ODP)**	kg CFC 11 eq
Acidification Potential of soil and water **(AP)**	kg SO_2 eq	Acidification Potential **(AP)**	kg SO_2 eq
Eutrophication Potential **(EP)**	kg PO_4^{3-} eq	Eutrophication Potential **(EP)**	kg N eq
Photochemical Oxidant Creation Potential **(POCP)**	kg C_2H_4 eq	Smog Formation Potential **(SFP)**	kg O_3 eq
Abiotic depletion potential **(ADP-elements)** for non-fossil resources	kg Sb eq	Fossil Fuel Depletion Potential **(FFD)**	MJ Surplus, LHV
Abiotic depletion potential **(ADP-fossil fuels)** for fossil resources	MJ, LHV	-	-

These impact categories are globally deemed mature enough to be included in Type III environmental declarations. Other categories are being developed and defined and LCA should continue making advances in their development. However, the EPD users shall not use additional measures for comparative purposes.

The following inventory parameters, specified by the PCR, are also reported.

Resources	Unit	Waste and Outflows	Unit
RPR_E: Renewable primary resources used as energy carrier (fuel)	MJ, LHV	**HWD:** Hazardous waste disposed	kg
RPR_M: Renewable primary resources with energy content used as material	MJ, LHV	**NHWD:** Non-hazardous waste disposed	kg
$NRPR_E$: Non-renewable primary resources used as an energy carrier (fuel)	MJ, LHV	**HLRW:** High-level radioactive waste, conditioned, to final repository	kg
$NRPR_M$: Non-renewable primary resources with energy content used as material	MJ, LHV	**ILLRW:** Intermediate- and low-level radioactive waste, conditioned, to final repository	kg
SM: Secondary materials	MJ, LHV	**CRU:** Components for re-use	kg
RSF: Renewable secondary fuels	MJ, LHV	**MR:** Materials for recycling	kg
NRSF: Non-renewable secondary fuels	MJ, LHV	**MER:** Materials for energy recovery	kg
RE: Recovered energy	MJ, LHV	**EE:** Recovered energy exported from the product system	MJ, LHV
FW: Use of net freshwater resources	m^3	-	-

Table 5. *Life Cycle Impact Assessment (LCIA) results for EVRAZ steel plate. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.*

Impact Category	Life cycle stage			
	A1	A2	A3	Total (A1-A3)
CML-IA				
GWP (kg CO_2 eq)	873	112	466	1,450
	60.2%	7.7%	32.1%	100%
AP (kg SO_2 eq)	3.73	0.864	0.772	5.36
	69.5%	16.1%	14.4%	100%
EP (kg $(PO_4)^{3-}$ eq)	2.83	0.224	0.551	3.61
	78.5%	6.2%	15.3%	100%
POCP (kg C_2H_4 eq)	0.172	0.0238	0.0603	0.256
	67.2%	9.3%	23.6%	100%
ODP (kg CFC-11 eq)	$5.59x10^{-5}$	$1.58x10^{-5}$	$3.08x10^{-5}$	$1.02x10^{-4}$
	54.5%	15.4%	30.0%	100%
ADPE (kg Sb eq)	$7.91x10^{-5}$	$2.04x10^{-6}$	$1.03x10^{-6}$	$8.22x10^{-5}$
	96.3%	2.5%	1.2%	100%
ADPF (MJ)	10,100	1,430	5,410	17,000
	59.6%	8.4%	31.9%	100%
TRACI 2.1				
GWP (kg CO_2 eq)	868	111	458	1,440
	60.4%	7.73%	31.9%	100%
AP (kg SO_2 eq)	3.74	1.10	0.902	5.74
	65.2%	19.1%	15.7%	100%
EP (kg N eq)	6.20	0.194	1.05	7.44
	83.3%	2.61%	14.1%	100%
SFP (kg O_3 eq)	49.0	32.7	19.7	101
	48.3%	32.3%	19.4%	100%
ODP (kg CFC-11 eq)	$7.17x10^{-5}$	$2.11x10^{-5}$	$3.90x10^{-5}$	$1.32x10^{-4}$
	54.4%	16.0%	29.6%	100%
FFD (MJ eq)	1,040	193	788	2,020
	51.5%	9.5%	39.0%	100%

Comparisons cannot be made between product-specific or industry average EPDs at the design stage of a project, before a building has been specified. Comparisons may be made between product-specific or industry average EPDs at the time of product purchase when product performance and specifications have been established and serve as a functional unit for comparison. Environmental impact results shall be converted to a functional unit basis before any comparison is attempted.

Any comparison of EPDs shall be subject to the requirements of ISO 21930. EPDs are not comparative assertions and are either not comparable or have limited comparability when they have different system boundaries, are based on different product category rules or are missing relevant environmental impacts. Such comparison can be inaccurate and could lead to erroneous selection of materials or products which are higher-impact, at least in some impact categories.

Table 6. *Resource use and waste flows for EVRAZ steel plate. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.*

Parameter	Life cycle stage			
	A1	A2	A3	Total (A1-A3)
Resources				
RPR_E (MJ)	784	36.4	1,890	2,710
	29.0%	1.34%	69.7%	100%
RPR_M (MJ)	0.00	0.00	29.1	29.1
	0.00%	0.00%	100%	100%
$NRPR_E$ (MJ)	6,580	1,370	1,830	9,780
$NRPR_M$ (MJ)	350	0.0	0.0	350
SM (MT)	1.15	0.00	0.00	1.15
	100%	0.00%	0.00%	100%
RSF/NRSF (MJ)	0.00	0.00	0.00	0.00
RE (MJ)	0.00	0.00	0.00	0.00
FW (m^3)	34.4	1.02	0.371	35.8
	96.1%	2.86%	1.04%	100%
Wastes				
HWD (kg)	0.0385	$3.85x10^{-3}$	$6.00x10^{-3}$	0.0483
	79.6%	7.96%	12.4%	100%
NHWD (kg)	95.0	17.4	16.5	129
	73.7%	13.52%	12.8%	100%
HLRW (kg)	$3.52x10^{-3}$	$1.63x10^{-4}$	$9.32x10^{=5}$	$3.78x10^{-3}$
	93.2%	4.32%	2.47%	100%
ILLRW (kg)	0.0114	$8.97x10^{-3}$	$1.87x10^{-3}$	0.0222
	51.2%	40.4%	8.42%	100%
CRU (kg)	0.00	0.00	0.00	0.00
MR (kg)	0.0741	0.00	$2.99x10^{-4}$	0.0744
	99.6%	0.00%	0.40%	100%
MER (kg)	0.00	0.00	0.00	0.00
EE (MJ)	Neg.	Neg.	Neg.	Neg.

Neg = negligible

The PCR requires the calculation of carbon emissions and removals, all of which are negligible due to the fact that no biogenic carbon is included in the product and any packaging is negligible.

Steel Plate Global Warming Potential

Table 7 below provides the TRACI 2.1 100 year GWP for one metric ton of steel plate, prior to downstream fabrication into a final product.

Table 7. *100-year Global Warming Potential, based on TRACI 2.1, for one metric ton of steel plate manufactured with steel slab from the Regina steel mill.*

Steel Plate ($MT\ CO_2$ eq./ MT steel plate)
1.44

6. LCA: Interpretation

The contributions to total impact indicator results are dominated by the product manufacturing phase (A3), followed by the raw material extraction and processing stage (A1) for many indicators.

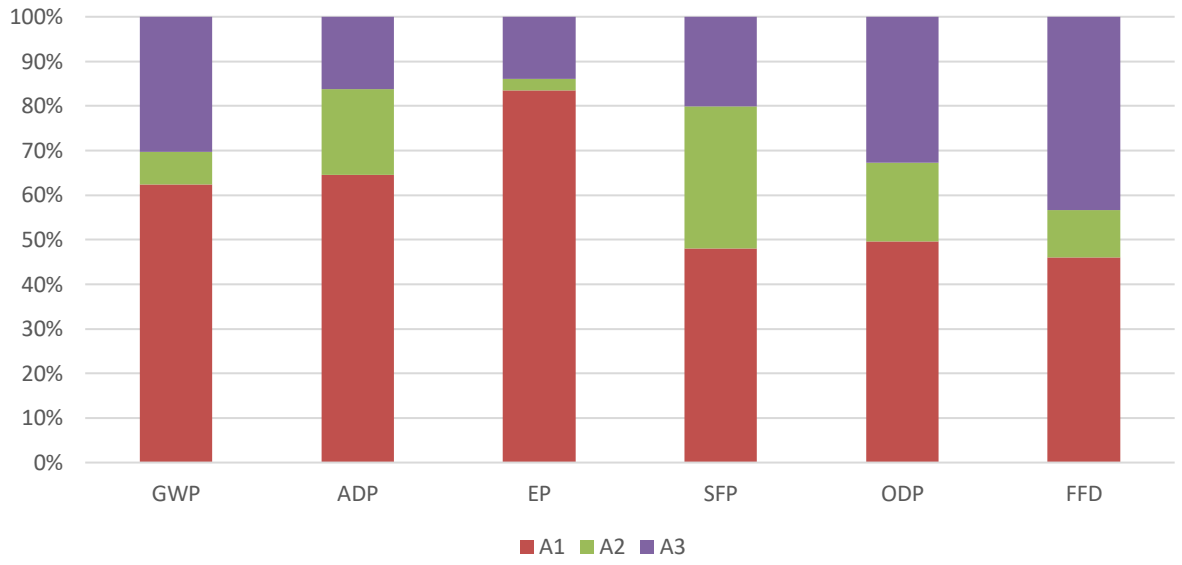

Figure 2. *Contribution analysis for the EVRAZ steel plate.*

Limitations

Primary data of material components (i.e., alloys, refractory materials) could not be modeled with actual process information so ecoinvent datasets were used to represent the alloy materials.

This facility also produces hot rolled steel coil, and facility energy use and waste data could not be disaggregated between the two products.

7. Additional Environmental Information

The EVRAZ Portland rolling mill was the first plate mill in North America to be ISO 9002-certified. With the unique capability of producing both discrete plate and coil in both custom and standard sizes, it offers our customers excellent quality in a full range of sizes and specifications.

EVRAZ Recycling is the largest metal scrap recycler in western Canada with 13 facilities across the prairies. We also have three facilities in the U.S. - one in North Dakota and two in Colorado. We buy, process and sell a wide range of ferrous and non-ferrous materials, and offer a variety of metal recycling and other services including auto wrecking yards that provide a great selection of low cost parts on a self-serve basis.

8. References

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