Steel Recycling Institute
680 Andersen Drive
Pittsburgh, PA 15220 USA

A complete list of manufacturers represented by this EPD
can be found here: www.recycle-steel.org/epd-companies

Product

Industry-wide Cold-Formed Steel Studs and Track manufactured in U.S. and Canada.

Declared Unit

One metric ton of cold-formed steel studs and/or track. Results are also presented for one short ton of cold-formed steel studs and/or track.

EPD Number and Period of Validity

SCS-EPD-03838

Beginning Date: January 19, 2016 – End Date: January 18, 2021

Product Category Rule

North American Product Category Rule for Designated Steel Construction Products. May 2015.

Program Operator:

SCS Global Services

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PCR review, was conducted by	Thomas P. Gloria, Ph.D., Industrial Ecology Consultants t.gloria@industrial-ecology.com
Approved Date: January 19, 2016 - End Date: January 18, 2021	
Independent verification of the declaration and data, according to ISO 14025:2006 and ISO 21930:2007	☐ internal ☑ external
Third party verifier	Tom Gloria, PhD, Industrial Ecology Consultants

PRODUCT SCOPE

This EPD represents cold-formed steel (CFS) studs and track made from hot-dip galvanized steel, produced and manufactured in U.S. and Canada. The steel in the studs and track is produced at a mix of steel mill types in the U.S. and Canada, which use both the BOF (basic oxygen furnace) and EAF (electric arc furnace) route for steelmaking. The dimensions of the CFS studs and track in the study are described in Table 1 and Table 2.

Table 1. *Dimensions of CFS studs.*

Dimensions of Cold-Formed Steel Studs included in the scope	
Web Depth	1 5/8 to14 inches (41.3 to 356 mm)
Flange Width	1 1/4 to 3 1/2 inches (31.8 to 88.9 mm)
Design Thickness	0.0188 to 0.1242 inches (0.478 to 3.155 mm)

Table 2. *Dimensions of CFS track.*

Dimensions of Cold-Formed Steel Track included in the scope	
Web Depth	1 5/8 to 14 inches (41.3 to 356 mm)
Flange Width	1 1/4 to 3 inches (31.8 to 76.2 mm)
Design Thickness	0.0188 to 0.1242 inches (0.478 to 3.155 mm)

The CFS studs and track can be used in a large number of building designs and applications, ranging from commercial to residential applications, in buildings of many different sizes, designs, and locations. While the functions of these product systems are for construction, the large number of applications means that a single functional unit cannot be clearly defined. Accordingly, a declared unit is used, in lieu of a functional unit, as described in Table 3.

Table 3. *Declared unit for CFS Studs and Track and the approximate density.*

Parameter	Value, SI Units	Value, US Customary Units
Declared Unit	1 metric ton	1 short ton
Density	7,769 to 7,849 kg/m^3	485 to 490 lb/ft^3

MATERIAL CONTENT

The approximate content of the cold-formed steel studs and track are shown below in Table 4.

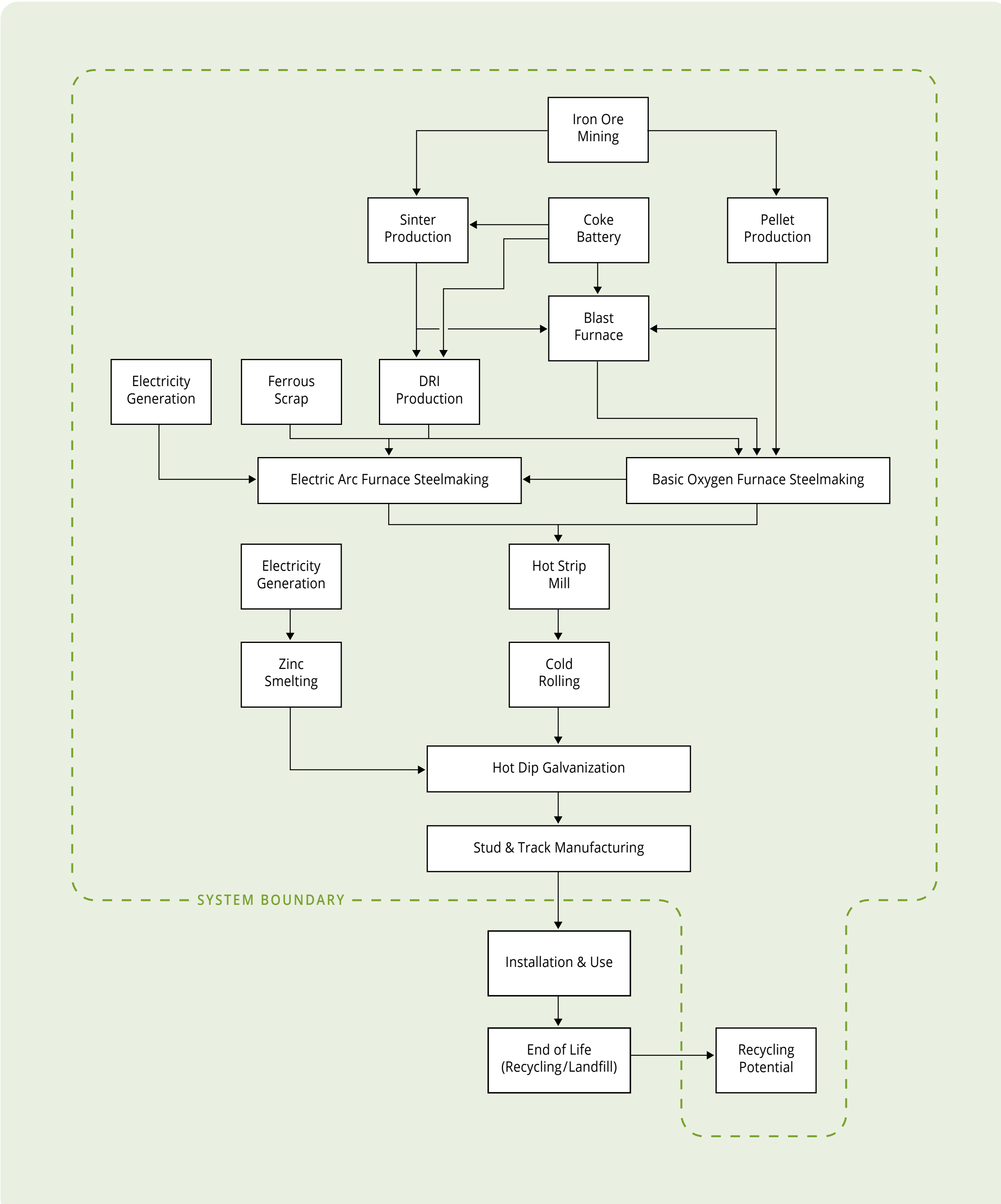
Table 4. *Material composition of CFS studs and track.*

Material	Percentage of Total Mass of Product
Steel	91.9 to 99.3%
Zinc Coating	0.7 to 8.1%

CFS studs and track used inside the building envelope do not include materials or substances which have any potential route of exposure to humans or flora/fauna in the environment.

PRODUCT LIFE CYCLE FLOW DIAGRAM

The diagram below is a representation of the most significant contributions to the production of cold-formed steel studs and track. This includes resource extraction, steelmaking, transport to manufacturer, and product manufacture.



LIFE CYCLE ASSESSMENT STAGES AND REPORTED INFORMATION

The following life cycle stages are included: raw material extraction and steel production, transport to manufacturer, manufacture of stud/track, and benefits and loads beyond the system boundary (reported in Module D). The EPD does not cover life cycle stages for product use, building operation, and product disposal. Since the EPD is cradle-to-gate, the RSL (reference service life) of the product is not specified.

Module D represents the potential avoided production of primary steel as a result of the net steel scrap produced across the product life cycle. The Module D calculation accounts for all steel scrap material flows entering or recovered from the product system, including steel recovered at end-of-life, as well as the steel scrap generated during stud and track manufacture. To calculate the potential avoided burden, a World Steel Association inventory dataset representing steel scrap was used. These data were calculated in accordance with the methodology described in Appendix 10 of the World Steel Association LCA Methodology Report. The steel scrap dataset uses current industry-average data to represent processes which will occur at the end of the service life of the studs and track.

The potential avoided burden per ton of product for a specific inventory flow, AB_{FLOW}, was assessed using the following equation:

$$AB_{FLOW} = (RR - S) \times Scrap_{FLOW}$$

AB_{FLOW} = *The potential avoided burden credit (or burden) for a specific inventory flow per ton of steel product (CFS stud/track)*

RR = *0.95 (the recovery rate per ton of steel product)*

S = *0.45 (the amount of scrap used in the steelmaking process per ton of steel product)*

$Scrap_{FLOW}$ = *The inventory flow per ton of steel scrap (from the World Steel Association steel scrap dataset).*

The Module D calculation takes into account all steel scrap material flows undergoing recovery processes during any part of the product system. This includes the amount of steel recovered at end-of-life, as well as the steel scrap generated during stud and track manufacture.

LIFE CYCLE IMPACT ASSESSMENT

Results are reported according to the LCIA methodologies of Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI version 2.1) or CML-IA version 4.1 as required by the PCR. All considerations of scoping and inventory are the same. There are impact categories which are not addressed by this EPD, including impacts to biomes, habitat disruption, and human health.

Table 6. *Results for the declared unit of CFS studs and track.*

				PRODUCT STAGE			CREDITS AND BURDENS BEYOND THE SYSTEM BOUNDARY
				Raw Material Extraction / Processing	Transport to the Manufacturer	Manufacturing	Reuse, Recovery, Recycling Potential
Impact Category	Category Indicator	Indicator Description	Unit	A1	A2	A3	D
Global warming [a]	Global Warming Potential	Global Warming Potential (GWP)	ton CO_2 eq/ ton [d]	2.2	$3.6x10^{-2}$	$4.4x10^{-2}$	-0.76
Ozone Depletion [a]	Ozone Depletion Potential	Depletion potential of the stratospheric ozone layer (ODP)	ton CFC-11 eq/ ton [d]	Negligible [f]	Negligible [f]	Negligible [f]	Negligible [f]
Acidification of land and water [a]	Acid Emissions	Acidification Potential of soil and water (AP)	ton SO_2 eq/ ton [d]	$1.0x10^{-2}$	$3.4x10^{-4}$	$2.8x10^{-4}$	$-1.7x10^{-3}$
Eutrophication (freshwater) [a]	Phosphorus and nitrogen emissions	Eutrophication potential (EP)	ton N eq/ ton [d]	$4.7x10^{-4}$	$1.9x10^{-5}$	$1.3x10^{-4}$	$-9.0x10^{-5}$
Photochemical Ozone Creation [a]	Max. Pot. for Ozone Formation	Formation potential of tropospheric ozone (POCP)	ton O_3 eq/ ton [d]	0.18	$1.0x10^{-2}$	$2.1x10^{-3}$	$-1.8x10^{-2}$
Depletion of abiotic resources (elements) [b,c]	Aggregated Depletion of Extracted Resources	Abiotic depletion potential (ADP-elements) for non-fossil resources	ton Sb eq/ ton [d]	$5.4x10^{-5}$	Negligible	$7.6x10^{-8}$	$2.1x10^{-9}$
Depletion of abiotic resources (fossil) [b]	Fossil fuel consumption	Abiotic depletion potential (ADP-fossil fuels) for fossil resources	BTU/short ton (MJ/metric ton) [e]	$3.0x10^{7}$ (29,000)	$5.1x10^{5}$ (490)	$5.8x10^{5}$ (560)	$-9.3x10^{6}$ (-8,900)

[a] Calculated using TRACI v2.1. [b] Calculated using CML-IA v4.1. [c] This indicator is based on assumptions regarding current reserves estimates. Users should use caution when interpreting results because there is insufficient information on which indicator is best for assessing the depletion of abiotic resources. [d] Results shown represent both short ton per short ton of steel product, and metric ton per metric ton of steel product (these values are equivalent). [e] Results shown represent US Customary (BTU per short ton of steel product) and SI (MJ per metric ton of steel product) units. SI units are shown using parenthesis. [f] Results for this indicator are negligible.

Table 7. *Results for resource use, wastes, and output flows for one ton of CFS stud and track.*

		PRODUCT STAGE			CREDITS AND BURDENS BEYOND THE SYSTEM BOUNDARY
		Raw Material Extraction / Processing	Transport to the Manufacturer	Manufacturing	Reuse, Recovery, Recycling Potential
Impact Category	**Unit**	**A1**	**A2**	**A3**	**D**
Use of renewable primary energy excluding renewable primary energy resources used as raw materials.	BTU/ short ton (MJ/metric ton) [a]	950,000 (1,100)	None	19,000 (22)	None
Use of renewable primary energy resources used as raw materials	-	None	None	None	None
Total use of renewable primary energy resources	BTU/ short ton (MJ/metric ton) [a]	950,000 (1,100)	None	19,000 (22)	None
Use of nonrenewable primary energy excluding nonrenewable primary energy resources used as raw materials	BTU/ short ton (MJ/metric ton) [a]	$2.4x10^7$ (28,000)	380,000 (440)	630,000 (730)	$-5.5x10^6$ (-6,400)
Use of nonrenewable primary energy resources used as raw materials		Negligible	Negligible	Negligible	Negligible
Total use of nonrenewable primary energy resources (primary energy and primary energy resources used as raw materials)	BTU/ short ton (MJ/metric ton) [a]	$2.4x10^7$ (28,000)	380,000 (440)	630,000 (730)	$-5.5x10^6$ (-6,400)
Use of secondary materials	ton/ton [b]	0.45	None	None	N/A
Use of renewable secondary fuels	-	Negligible	Negligible	Negligible	Negligible
Use of nonrenewable secondary fuels	-	Negligible	Negligible	Negligible	Negligible
Net use of fresh water	Gallons/short ton (m^3/metric ton) [a]	Not available [c]	2.9 ($1.2x10^{-2}$)	260 (1.1)	None
Nonhazardous waste disposed	ton/ton [b]	$3.3x10^{-3}$	None	$1.4x10^{-3}$	None
Hazardous waste disposed	ton/ton [b]	$2.3x10^{-2}$	None	None	None
Radioactive Waste disposed	ton/ton [b]	$5.6x10^{-4}$	Negligible	Negligible	Negligible
Components for re-use	ton/ton [b]	Negligible	Negligible	Negligible	N/A
Materials for recycling	ton/ton [b]	Data not available [d]	None	0.03	N/A
Materials for energy recovery		Negligible	Negligible	Negligible	Negligible
Exported energy		Negligible	Negligible	Negligible	Negligible

[a] Results shown represent US Customary units per short ton of steel, and SI units per metric ton of steel. SI units are shown using parenthesis.
[b] Results shown represent both short ton per short ton of steel, and metric ton per metric ton of steel (these values are equivalent).
[c] Due to data quality issues, water use is not reported. This will be a focus area in future data collection efforts.
[d] The dataset on which this module is based does not provide this information. See Section 4.1.

Disclaimer

This Environmental Product Declaration (EPD) conforms to ISO 14025, 14040, ISO 14044, and ISO 21930.

Scope of Results Reported: The PCR requires the reporting of a limited set of LCA metrics; therefore, there may be relevant environmental impacts beyond those disclosed by this EPD. The EPD does not indicate that any environmental or social performance benchmarks are met nor thresholds exceeded.

Accuracy of Results: This EPD has been developed in accordance with the PCR applicable for the identified product following the principles, requirements and guidelines of the ISO 14040, ISO 14044, ISO 14025 and ISO 21930 standards. The results in this EPD are estimations of potential impacts. The accuracy of results in different EPDs may vary as a result of value choices, background data assumptions and quality of data collected.

Comparability: EPDs are not comparative assertions and are either not comparable or have limited comparability when they cover different life cycle stages, are based on different product category rules or are missing relevant environmental impacts. Such comparisons can be inaccurate, and could lead to the erroneous selection of materials or products which are higher-impact, at least in some impact categories. Any comparison of EPDs shall be subject to the requirements of ISO 21930. For comparison of EPDs which report different module scopes, such that one EPD includes Module D and the other does not, the comparison shall only be made on the basis of Modules A1, A2, and A3. Additionally, when Module D is included in the EPDs being compared, all EPDs must use the same methodology for calculation of Module D values.

Interpreting the Results in Module D: The values in Module D include a recognition of the benefits or impacts related to steel recycling which occur at the end of the product's service life. The rate of steel recycling and related processes will evolve over time. The results included in Module D attempt to capture future benefits, or impacts, but are based on a methodology that uses current industry-average data reflecting current processes.

Hot-Dip Galvanized LCI Data: The majority of impacts of cold formed steel stud and track can be attributed to the production of hot-dip galvanized steel. The industry average emissions for the production of HDG steel have been provided by the Steel Recycling Institute/World Steel Association and have not been subject to critical review. However, this critical review is not a requirement of the relevant ISO standards. The data collection process and methodology for global steel LCI data have been critically reviewed by a panel of experts.

SUPPORTING TECHNICAL INFORMATION

Data Sources:

The life cycle inventory (LCI) analysis was conducted using SimaPro v8.0 software, using a mix of primary and secondary data sources, shown in Table 8. These inventory data sources were used to create results for each inventory flow relative to the declared unit of one metric ton.

Table 8. *Data sources used for the LCA.*

Module	Scope	Technology Source	Data Source	Region	Year
A1	Extraction through production of HDG steel	Extraction through production of HDG steel	World Steel Association	U.S. & Canada	2006 to 2010
A2	Transportation to stud/track manufacturer	Diesel combination truck	USLCI database and AISC [a]	North America	2008
A3	Stud/track manufacturing	Manufacture of steel studs/track	Steel Framing Alliance	North America	2014
D	Credit or burden at end-of-life	Value of scrap	World Steel Association	Global	2005-2008
	Other Processes [b]		ecoinvent and USLCI databases	Varies	Varies

[a] Transport distances from correspondence with AISC.

[b] This includes inputs to Modules A2 and A3.

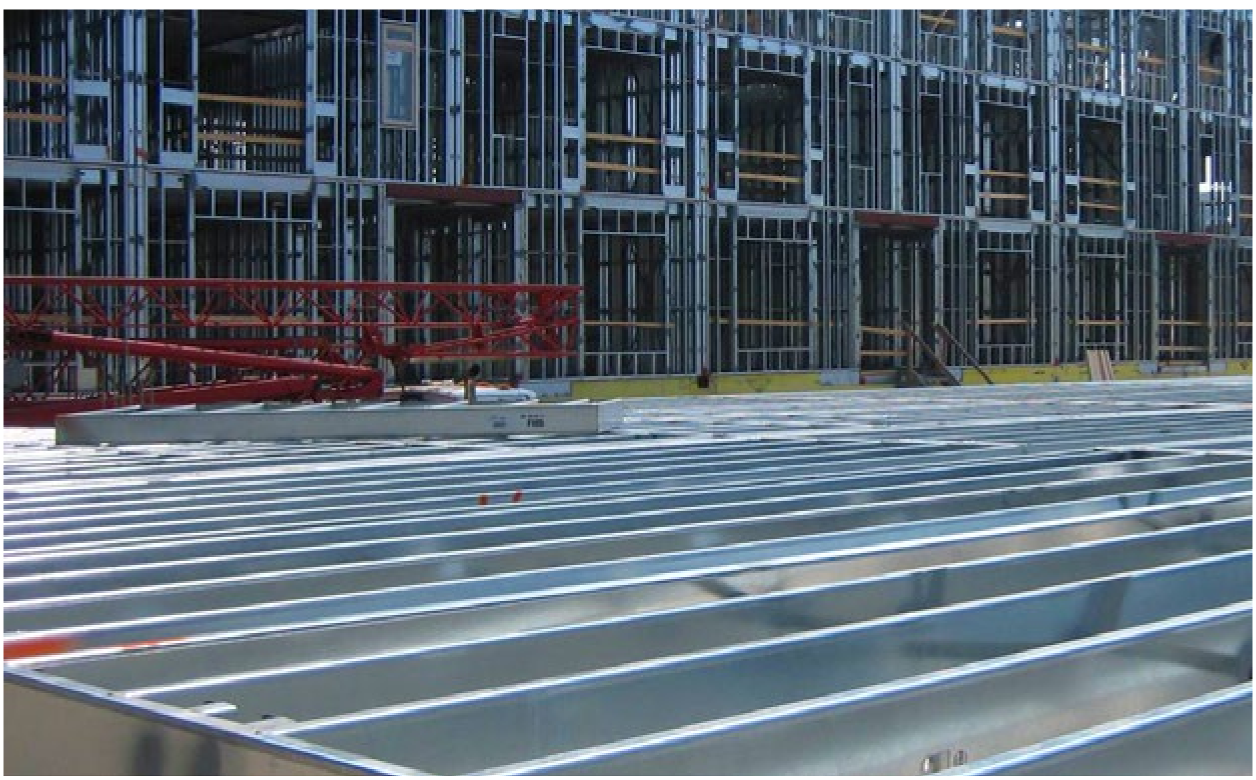


Table 9. *Data quality assessment of Life Cycle Inventory.*

Data Quality Parameter	Data Quality Discussion
Time-Related Coverage: Age of data and the minimum length of time over which data should be collected	For Modules A1-A3, the data used are the most current available. The data representing HDG steel production (Module A1) is from within the last 8 years, although the generic data used may be as old as 15 years old. For Module A3, data is from 2012. Module D represents avoided steel production occurring many decades into the future, using current data on recycling rates, steel production, electricity grid mix, and emissions controls. Module D therefore has poorer time-related coverage than the other modules, a limitation which should be considered in the interpretation of results.
Geographical Coverage: Geographical area from which data for unit processes should be collected to satisfy the goal of the study	The data sources used for Modules A1 to A3 are from North America, and so provide good geographical coverage. Module D uses global data to represent avoided steel production. Although the location of the avoided steel production is unknown, it is most likely occurring mainly in North America. Module D therefore has poorer geographical coverage than the other modules, which is related both to a lack of knowledge of the geographical boundaries of Module D impacts, and lack of regional specificity in the data.
Technology Coverage: Specific technology or technology mix	For Module A1, the technological coverage is considered good, as the data is based on primary data from a representative mix of the U.S. and Canadian EAF and BOF steel mills. For Modules A2 and A3, technology coverage is good. For Module D, technology coverage is based on current practices, consistent with the guidance of EN 15804. Module D attempts to capture benefits or impacts associated with recycling which occurs years in the future, and these processes may evolve over time.
Precision: Measure of the variability of the data values for each data expressed	None of the datasets used to assess results for any module include statistical information regarding the confidence in results, so it is not possible quantitatively to evaluate the precision in results, which is affected by sampling variability and measurement error.
Completeness: Percentage of flow that is measured or estimated	All datasets included are considered to have a high degree of completeness, except for the lack of data on net water use for Module A1. As this module is expected to account for a larger degree of net water use than the other modules, this is a clear study limitation.
Representativeness: Qualitative assessment of the degree to which the data set reflects the true population of interest.	The representativeness of Modules A1 to A3 is good overall. Module D has poor representativeness, due to a lack of time-related and geographical coverage.
Consistency: Qualitative assessment of whether the study methodology is applied uniformly to the various components of the analysis.	For all Modules, assumptions and methodology are largely consistent. The approach of system expansion is used, in lieu of allocation, as much as possible.
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.	Provided the practitioner had access to the same data sources described in the report, the results would be reproducible.
Sources of the data: Data quality assessment examples include (but not limited to) USLCI and ILCD.	The sources of the data provided by the World Steel Association used to model Module A1 are presented as aggregated values, with no detail on the contribution of individual flows or unit processes. The same applies to the aggregated data used to model Module D.
Uncertainty of the information: E.g. data, models, and assumptions	It is not possible to assess the uncertainty of Modules A1 and D, due to the World Steel data being provided in an aggregated manner. For the other modules, the uncertainty is likely to be low, although there is some additional uncertainty associated with the generic data used to model results for Modules A2. As it uses current data and assumptions to model processes occurring far in the future, Module D has higher uncertainty than the other modules.

Allocation:

The LCA followed the allocation guidelines of ISO 14044 and the PCR. Co-products from hot-dip galvanized steelmaking were allocated using system expansion, as described in the World Steel Association LCA Methodology Report (2011). Net steel scrap, accounting for scrap input to the product system and scrap generated from product manufacturers and at end-of-life, is modeled as a potential avoided burden and is reported as Module D.

REFERENCES

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