An Industry Average EPD for Canadian Pre-fabricated Wood I-Joists

According to ISO 14025:2006 and ISO 21930:2017

CANADIAN WOOD COUNCIL
CONSEIL CANADIEN DU BOIS

ASTM International Certified Environmental Product Declaration

This is a Canadian industry wide (average) business-to-business Type III environmental product declaration (EPD) for pre-fabricated wood I-joists. This declaration has been prepared in accordance with ISO 21930 (1), ISO 14025 (2), ISO 14040 (3), ISO 14044 (4), the governing product category rules (5), and ASTM General Program Instructions for Type III EPDs (6). The intent of this document is to transparently disclose comprehensive environmental information related to the potential impacts associated with the cradle-to-gate life cycle stages of wood I-joists manufactured in Canada.

EPD Summary

Program operator	ASTM International 100 Barr Harbor Drive PO Box C700 West Conshohocken, PA 19428-2959 USA www.astm.org
General program instructions and version	ASTM Program Operator Rules 4/29/2020
Declaration owner	Canadian Wood Council 99 Bank Street, Suite 420 Ottawa, ON K1P 6B9 Canada www.cwc.ca
Declaration number	EPD 856
Declared product	Pre-fabricated wood I-joists produced in Canada
Declared unit	1 linear metre of wood I-joist
Reference PCR and version	UL Environment Part B Structural and Architectural Wood Products EPD Requirements v1.1 2020 (5)
Description of product's intended application and use	Building construction (residential and commercial)
Markets of applicability	Construction sector, North America
Date of issue	February 4, 2025
Period of validity	Five years
EPD type	Industry average
EPD scope	Cradle to gate

Year of reported manufacturer primary data	2022
LCA software	SimaPro v9.5.0.2 (7)
LCA databases	USLCI (8), ecoinvent 3.9 (9)
LCIA methodology	TRACI 2.1 (10), CML Baseline v3.02
Sub-category PCR review was conducted by:	Thomas P. Gloria, Ph.D. Industrial Ecology Consultants
The LCA was conducted in accordance with ISO 14044 and the reference PCR by:	Athena Sustainable Materials Institute 280 Albert St, Suite 404 Ottawa, ON K1P 5G8 Canada info@athenasmi.org www.athenasmi.org
LCA report	Athena Sustainable Materials Institute (2024). An Industry-average Cradle-to-gate LCA of Canadian Wood I-Joists. National Research Council Canada (11).
The LCA was independently verified in accordance with ISO 14044 and the reference PCR by:	Adam Robertson, M.A.Sc., P.Eng. Sustainatree Consulting adam@sustainatree.ca
This declaration was independently verified in accordance with ISO 14025 (external)	Tim Brooke ASTM International 100 Barr Harbor Drive, PO Box C700 West Conshohocken, PA 19428-2959 USA www.astm.org
Limitations	Environmental declarations from different programs (ISO 14025) might not be comparable. Comparison of the environmental performance using EPD information shall consider all relevant information modules over the full life cycle of the products within the building. Comparisons using this EPD are only allowable when the same functional requirements between products are ensured and the requirements of ISO 21930:2017 section 5.5 are met. Different LCA software and background LCI datasets may lead to different results across EPDs.

1. PRODUCT IDENTIFICATION

1.1. PRODUCT DEFINITION

Pre-fabricated I-joists are composite wood structural members comprising a top and bottom flange (softwood lumber or laminated veneer lumber) and a web (oriented strandboard or plywood). The components are attached using an adhesive. The cross-sectional “I” shape of these structural wood products provides a higher strength to weight ratio than traditional solid sawn lumber. The uniform stiffness, strength, and light weight of pre-fabricated I-joists allow for use in longer span applications for both residential and commercial construction. Wood I-joist are dimensionally stable as they are manufactured with a moisture content between 6 and 12%.

Pre-fabricated wood I-joists are available in a variety of standard depths and in lengths of up to 20 m (66 ft). The most common dimensions are those that directly replace 2x10 and 2x12 structural lumber. I-joists are widely used in floor and roof framing for residential and some commercial building construction. All cross sectional sizes of engineered wood I-joists manufactured in Canada are covered under this EPD.

The product covered in this EPD falls under the following United Nations Standard Products and Services Code (UNSPSC) and Construction Specification Institute (CSI) MasterFormat Codes:

- UNSPSC: Structural products/ Wood joists/ 301036 07
- CSI /CSC: Wood I-joist/Prefabricated wood I-joist / Engineered Wood Products 06 11 13
- CSI /CSC: Wood I-joist/Prefabricated wood I-joist / Wood I-joists 06 17 13

1.2. FLOW DIAGRAM

Figure 1 provides a flow diagram for I-joist production (also see section 3.1 for more detail on the processes).

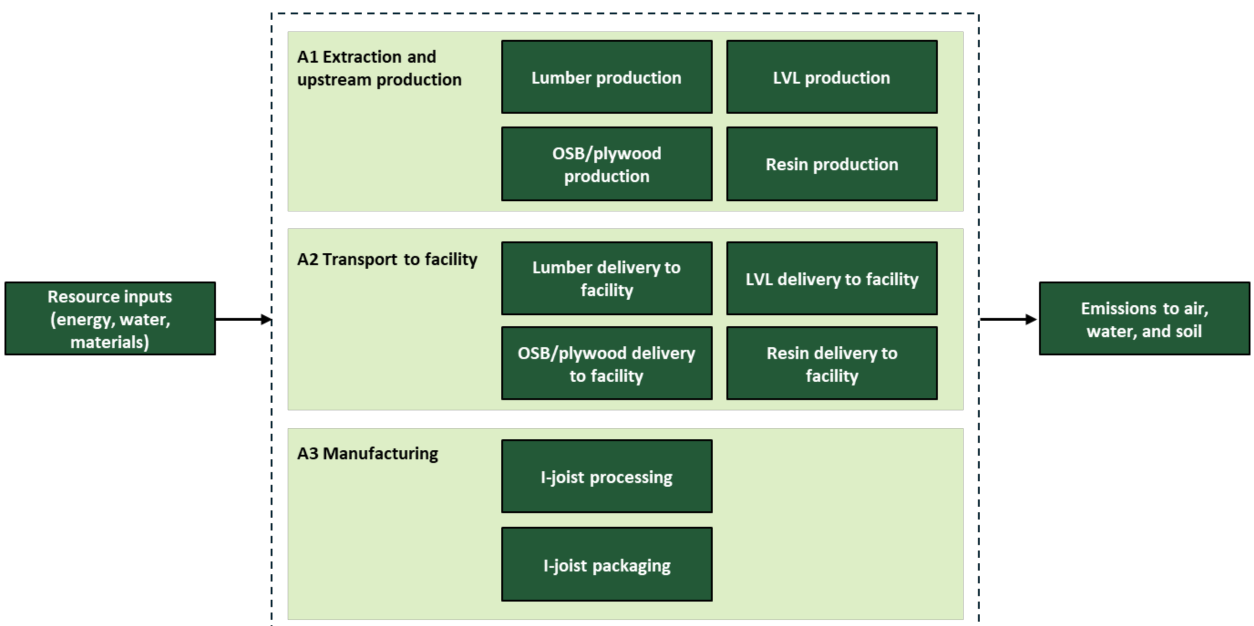

Figure 1: Cradle-to-gate flow diagram for I-joists

1.3. PRODUCT AVERAGE

Foreground gate-to-gate LCI data were collected for I-joist production from a sample of facilities with good representation of the Canadian industry-average technology mix and provincial/regional geographic representation. Each facility's specific input and output flow data were weighted based on their contribution to the total annual production to calculate the weighted-average profile.

The study sample included 11 manufacturing sites which represents about 49% of all I-joists produced in Canada. A summary of the plant sample representativeness is shown in Table 1.

Table 1: Plant Sample –Participation Statistics

Number of plants in study	11
Sample production (m)	40,115,066
Total production in Canada (m)*	82,300,000
Sample as a % of production	48.7%

*Source: Confidential correspondence with APA – Engineered Wood Association.

1.4. APPLICATION

Wood I-joists are used for floor and roof framing in the construction and renovation of residential and commercial buildings.

1.5. MATERIAL COMPOSITION

Wood I-joists consist of flanges, a web, and adhesives (resins). The flanges are either solid sawn softwood lumber or laminated veener lumber (LVL). The web is oriented strand board (OSB) or softwood plywood. Note that in the study sample, OSB was the only reported web material used.

2. METHODOLOGICAL FRAMEWORK

2.1. DECLARED UNIT

The declared unit is defined as the quantity of a construction product for use as a reference unit in an EPD based on LCA for the expression of environmental information in information modules (1). Per the PCR, the declared unit for I-joists is one linear metre of product.

2.2. SYSTEM BOUNDARY

The boundary is "cradle-to-gate" or the Product stage, which includes extraction of raw materials (cradle) through the manufacture of wood I-joists ready for shipment (gate). Downstream activity stages − Construction, Use, End-of-life, and optional supplementary information beyond the system boundary − are excluded from the system boundary (see Figure 2).

Per ISO 21930, section 7.1.7.2.1, the system boundary with nature includes those technical processes that provide the material and energy inputs into the system and the subsequent manufacturing and transport processes up to the factory gate, as well as the processing of any waste arising from those processes.

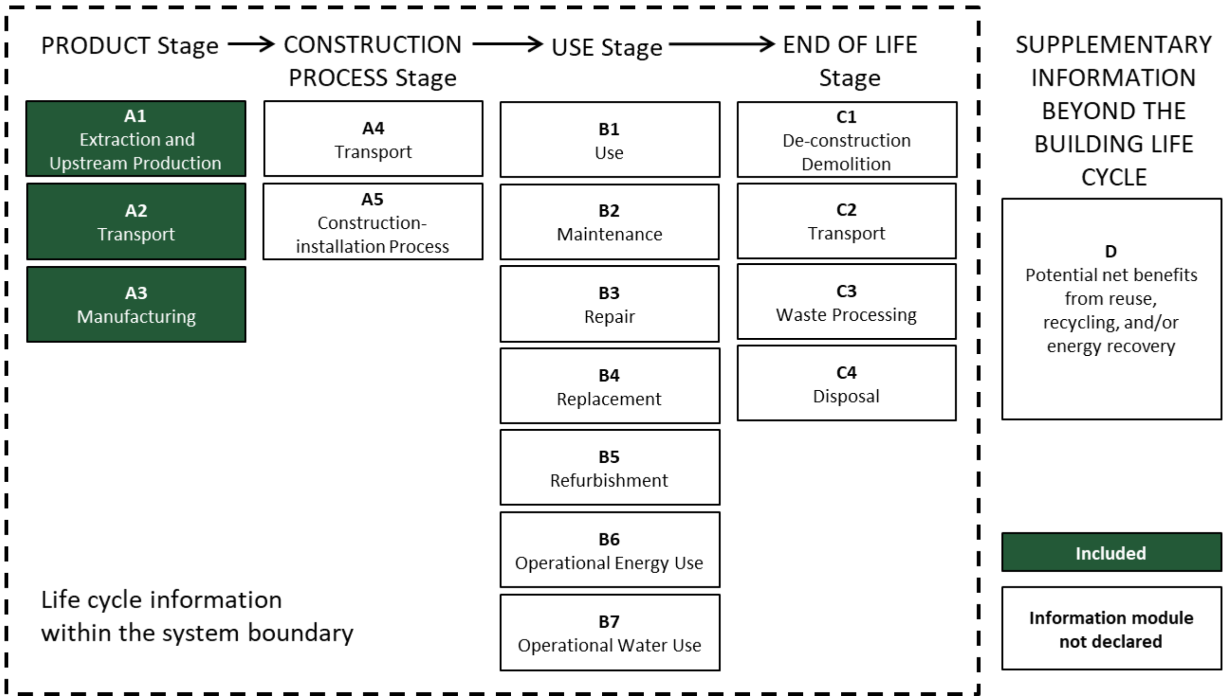

Figure 2: System boundary

2.3. ALLOCATION

Allocation is the method used to assign environmental loads when several products, co-products, or functions share the same process. Loads were allocated by mass. Note that the I-joist production system generates no coproducts. Hence, all flows are allocated to the primary product.

2.4. CUT-OFF RULES

The cut-off criteria as per the PCR were followed. Per ISO 21930, section 7.1.8, all input/output data required were collected and included in the LCI modelling. No substances with hazardous and toxic properties that pose a concern for human health and/or the environment were identified in the framework of this LCA. Any plant-specific data gaps for the reference year 2022, e.g., input hydraulic fluids, lubricants, oils, or packaging materials, were filled in with plant generic data from previous years or industry-average data.

2.5. DATA SOURCES

Data collection was based on an initial survey of facility operations for members of the Forest Products Association of Canada (FPAC) and the Canadian Wood Council (CWC). The LCI data collection was done with the expressed intent of attaining an acceptable representation of the Canadian industry-average technology mix and provincial/regional geographic representation.

Foreground gate-to-gate LCI data were collected for pre-fabricated wood I-joist production for the reference year 2022. Data collection was based on customized, web-based LCI surveys which covered the following primary data for each facility for the 2022 reference year:

- I-joist production
- Production energy
- Plant consumables
- Waste produced
- Air emissions (water emissions data was unavailable and was drawn from previous studies)

The LCA study drew on appropriate LCI datasets provided by:

- FPAC/CWC and its members for foreground gate-to-gate I-joist production (11);
- FPInnovations for 2021/22 harvesting and road building/maintenance LCI data for four provinces (11);
- FPAC/CWC and its members for lumber, plywood, OSB, and resin production (11) (with plywood data used as a proxy for LVL); and
- North American and global LCI databases such as the U.S. National Renewable Energy Laboratory LCI database (8), and ecoinvent 3.9, allocation, cut-off database (9). Both are included in the LCA software SimaPro.

Data calculation procedures follow ISO 14044 and the PCR. The same calculation procedures are applied throughout this LCA study. Per ISO 21930, section 7.2.2, when transforming the inputs and outputs of combustible material into inputs and outputs of energy, the net calorific value (lower heating value) of fuels is applied according to scientifically based and accepted values specific to the combustible material.

2.6. DATA QUALITY

Per the PCR and ISO 21930, appropriate activity and LCI foreground and background data shall be used to model the I-joist production systems. Overall data quality is assessed based on its representativeness (technology coverage, geographic coverage, time coverage), completeness, consistency, reproducibility, transparency and uncertainty – see Table 2.

Table 2: Data Quality Requirements and Assessments

Data Quality Requirements	Description
Technology Coverage	Foreground data represents the prevailing regional technology in use in Canada.
Geographic Coverage	The geographic region considered is Canada. The geographic coverage of all LCI databases and datasets is provided in the LCA report.
Time Coverage	Activity data are representative as of 2022. • Forest harvesting and road building/maintenance: primary data collected from 17 sites in four provinces. • In-bound/ out-bound transportation data: primary data collected from 11 facilities: reference year 2022 (12 months). • Generic data: the most appropriate LCI datasets were used as found in the US LCI Database, ecoinvent v.3.9 database for US, Canada and global.
Completeness	All relevant, specific processes, including inputs (raw materials, energy and ancillary materials) and outputs (emissions and production volume) were considered and modeled to provide industry average profiles. In some instances, some minor data were missing (e.g., consumables such as lubricants) and were backfilled with data from previous industry studies. These data are not expected to unduly impact the results of this study. The relevant background materials and processes were taken from the US LCI Database, ecoinvent v.3.9 LCI database adjusted for the appropriate regional system boundary and modeled in SimaPro v.9.5.
Consistency	To ensure consistency, the LCI modeling of the production weighted input and output LCI data for I-joists used the same LCI modeling structure across the selected FPAC/CWC member facilities, which consisted of input raw, secondary, ancillary and packaging materials, energy flows, water resource inputs, product outputs, co-products, by-products, emissions to air, water and soil, and solid and liquid waste disposal. Crosschecks concerning the plausibility of mass and energy flows were continuously conducted. The LCA team conducted mass and energy balances at the facility level and selected process levels to maintain a high level of consistency.
Reproducibility	Internal reproducibility is possible since the data and the models are stored and available. A high level of transparency is provided throughout the LCA report as the weighted-average LCI profile is presented for the declared product as well as major upstream inputs. Key foreground (manufacturer specific) and background (generic) LCI data sources are summarized in the LCA report. External reproducibility is also possible as a high level of transparency is provided in the LCA report.
Transparency	Activity and LCI datasets are transparently disclosed in the LCA report, including data sources.
Uncertainty	A sensitivity check was conducted to assess the reliability of the LCA results and conclusions by determining how they are affected by uncertainties in the data or assumptions on calculation of LCIA and energy indicator results. The sensitivity check includes the results of the sensitivity analysis.

2.7. BIOGENIC CARBON

Wood is a biobased material and thus contains biogenic carbon. The accounting of biogenic carbon in this LCA follows the requirements set out in ISO 21930:2017 section 7.2.7 and 7.2.12. Per ISO 21930, biogenic carbon enters the product system (a removal) as primary or secondary material. The carbon removal is considered a negative emission. The biogenic carbon leaves the system (an emission) as product, coproducts, and directly to the atmosphere when combusted. These mass flows of biogenic carbon from and to nature are listed in the LCI and expressed in kg CO_2.

In the LCIA, the LCI flow of biogenic carbon removal is characterized with a factor of -1 kg CO_2 eq./ kg CO_2 of biogenic carbon in the calculation of the GWP[1]. Likewise, the LCI flow of biogenic carbon emission is characterized with a factor of +1 kg CO_2 eq./kg CO_2 of biogenic carbon in the calculation of the GWP. Emissions other than CO_2 associated with biomass combustion (e.g., methane or nitrogen oxides) are characterized by their specific radiative forcing factors in the calculation of the GWP.

The PCR (5) specifies TRACI as the default LCIA method for GWP. The TRACI method does not account for the removals or emissions of biogenic CO_2. Therefore, the component of the global warming potential related to biogenic carbon was calculated separately. This study reports the GWP indicator both with and without the biogenic CO_2 component for maximum transparency.

The GWP results in this EPD conservatively assume there is no long-term biogenic carbon storage. This is discussed further in section 5.

3. TECHNICAL INFORMATION AND SCENARIOS

3.1. MANUFACTURING

The cradle-to-gate EPD includes the three Production modules: A1 Extraction and upstream production, A2 Transport, and A3 Manufacturing.

Upstream raw material production (Raw Materials A1): This process includes upstream production of the wood components (lumber, LVL, OSB, and plywood) and resins. Wood production begins in the forest with harvesting, processing and road building/maintenance activities. Activities include harvesting of trees by chainsaw, harvester, or feller buncher as per a management regime (logging). The tree is turned into logs by removing the limbs (delimbing) and cutting it into logs of optimal length (bucking). The logs are moved from the stump to the landing by ground vehicles, cable systems or flown to the landing by helicopter. Some logs are not bucked until they are transferred to the landing or mill site. This EPD does not include any potential impacts associated with nursery operations (which include fertilizer, irrigation, energy for greenhouses if applicable etc.), as well as planting, fertilization, thinning and other management operations, as these impacts are estimated to fall below the 1% cut-off criteria.

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[1] ISO 21930 requires a demonstration of forest sustainability to characterize carbon removals with a factor of -1 kg CO_2e/kg CO_2. ISO 21930 Section 7.2.1 Note 2 states the following regarding demonstrating forest sustainability: "Other evidences such as national reporting under the United Nations Framework Convention on Climate Change (UNFCCC) can be used to identify forests with stable or increasing forest carbon stocks." Canada's UNFCCC annual report Table 6-1 provides annual NET GHG Flux Estimates for different land use categories in 2021 (see link https://publications.gc.ca/collections/collection_2023/eccc/En81-4-2021-1-eng.pdf). This reporting indicates stable forest carbon stocks and thus the source forests meet the conditions for characterization of removals with a factor of -1 kg CO_2e/kg CO_2.

Transportation of materials to the I-joist plant (Transport A2): Materials are commonly transported by truck. See Table 3 for the transportation scenario data by region.

Table 3: Material Input Transportation Scenarios

Inputs	Units	Amount
Lumber transport	tkm	0.460
LVL transport	tkm	0.412
OSB/plywood transport	tkm	0.800
Resin transport	tkm	0.026

Wood I-joist production (Manufacturing A3): Wood I-joist manufacturing includes the assembly of the various constituent materials into a finished wood composite I-joist. During processing, raw materials go through routing and shaping, where they are cut and formed to the desired dimensions, followed by assembly, where the shaped parts are joined to create the I-joist structure. This is followed by sawing and curing to finalize the form and ensure adhesives or bindings are fully set. Once the I-joist is complete, it moves to the packaging stage, where it is prepared for transport to ensure protection during storage and shipping.

3.2. PACKAGING

Packaging consists of steel strapping and plastic (polypropylene) wrap. Packaging is included in the A3 module.

4. ENVIRONMENTAL INDICATORS DERIVED FROM LCA

See Table 4 for a list of impact category and inventory indicators reported, and the methods used. See Table 5 for the results. It should be noted that life cycle impact assessment (LCIA) results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

Table 4: Impact category and inventory indicators reported

Impact category and inventory indicators	Short name	Unit	Source of the method
Environmental impacts			
Global warming potential (including fossil and biogenic components)	GWP	kg CO_2 eq.	TRACI v2.1, July 2012 /with IPCC 2013, AR5 (10)
Ozone depletion potential	ODP	kg CFC-11 eq.	TRACI v2.1, July 2012/WMO:2003 (10)
Acidification potential	AP	kg SO_2 eq.	TRACI v2.1, July 2012 (10)
Eutrophication potential	EP	kg N eq.	TRACI v2.1, July 2012 (10)
Photochemical oxidant creation potential	POCP	kg O_3 eq.	TRACI v2.1, July 2012 (10)
Use of primary resources			
Renewable primary resources used as an energy carrier (fuel)	RPR_E	MJ, LHV	CED V1.10 LHV
Renewable primary resources with energy content used as material	RPR_M	MJ, LHV	ACLCA ISO 21930 Guidance, 6.2 (12)
Non-renewable primary resources used as an energy carrier (fuel)	$NRPR_E$	MJ, LHV	CED V1.10 LHV
Non-renewable primary resources with energy content used as material	$NRPR_M$	MJ, LHV	ACLCA ISO 21930 Guidance, 6.4 (12)
Use of secondary resources			
Secondary materials	SM	kg	ACLCA ISO 21930 Guidance, 6.5 (12)
Renewable secondary fuels	RSF	MJ, LHV	ACLCA ISO 21930 Guidance, 6.6 (12)
Non-renewable secondary fuels	NRSF	MJ, LHV	ACLCA ISO 21930 Guidance, 6.7 (12)
Recovered energy	RE	MJ, LHV	ACLCA ISO 21930 Guidance, 6.8 (12)
Abiotic depletion potential for fossil resources and elements			
Abiotic depletion potential, fossil	ADPf	MJ, LHV	CML-baseline, V3.09
Abiotic depletion potential, elements	ADPe	kg Sb eq.	CML-baseline, V3.09
Consumption of freshwater resources			
Consumption (or net use) of freshwater	FW	m^3	ACLCA ISO 21930 Guidance, 9 (12)
Waste and output flows			
Hazardous waste disposed	HWD	kg	ACLCA ISO 21930 Guidance, 10.1 (12)
Non-hazardous waste disposed	NHWD	kg	ACLCA ISO 21930 Guidance, 10.2 (12)
High-level radioactive waste, to final repository	HLRW	m^3	ACLCA ISO 21930 Guidance, 10.3 (12)
Intermediate- and low-level radioactive waste, to final repository	ILLRW	m^3	ACLCA ISO 21930 Guidance, 10.4 (12)
Components for reuse	CRU	kg	ACLCA ISO 21930 Guidance, 10.5 (12)
Materials for recycling	MR	kg	ACLCA ISO 21930 Guidance, 10.6 (12)
Materials for energy recovery	MER	kg	ACLCA ISO 21930 Guidance, 10.7 (12)
Recovered energy exported from the product system	EE	MJ, LHV	ACLCA ISO 21930 Guidance, 10.8 (12)

Table 5: LCA Results for 1 linear metre of wood I-joists produced in Canada

Impact category and inventory indicators	Unit	A1-A3	A1	A2	A3
Environmental impacts					
GWP Total	kg CO_2 eq.	2.08E+00	-7.14E+00	1.62E-01	9.07E+00
GWP Fossil	kg CO_2 eq.	2.08E+00	1.68E+00	1.62E-01	2.47E-01
GWP Biogenic	kg CO_2 eq.	0.00E+00	-8.82E+00	0.00E+00	8.82E+00
ODP	kg CFC-11 eq.	4.28E-08	3.26E-08	6.85E-12	1.01E-08
AP	kg SO_2 eq.	2.10E-02	1.69E-02	2.14E-03	2.04E-03
EP	kg N eq.	2.06E-03	1.83E-03	1.29E-04	1.04E-04
POCP	kg O_3 eq.	2.83E-01	2.19E-01	5.50E-02	8.46E-03
Use of primary resources					
RPR_E	MJ, LHV	3.00E+01	2.93E+01	0.00E+00	6.75E-01
RPR_M	MJ, LHV	9.15E+01	9.15E+01	0.00E+00	0.00E+00
$NRPR_E$	MJ, LHV	4.45E+01	3.68E+01	2.47E+00	5.17E+00
$NRPR_M$	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of secondary resources					
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RE	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Abiotic depletion potential					
ADPf	MJ, LHV	3.91E+01	3.29E+01	2.33E+00	3.82E+00
ADPe	kg Sb eq.	1.20E-06	7.22E-07	0.00E+00	4.81E-07
Consumption of freshwater resources					
FW	m^3	3.17E-03	3.07E-03	0.00E+00	1.01E-04
Waste and output flows					
HWD	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NHWD	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HLRW	m^3	7.09E-09	3.38E-09	0.00E+00	3.72E-09
ILLRW	m^3	5.49E-09	2.85E-09	0.00E+00	2.64E-09
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MR	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00

5. ADDITIONAL INFORMATION

Additional inventory parameters related to biogenic carbon removals and emissions are given in Table 6. The carbon dioxide flows are presented unallocated to consider co-products leaving the product system in information module A3. Even though the system boundary of this study included only the information modules A1-A3, in accordance with ISO 21930, emissions from packaging are reported in A5 and emissions from the main product in C3/C4.

Table 6: Biogenic carbon inventory parameters

Additional Inventory Parameters		Unit	Total	A1	A2	A3	A5	C3/C4
Biogenic Carbon Removal from Product	BCRP	kg CO_2 eq.	-8.82E+00	-8.82E+00				
Biogenic Carbon Emission from Product	BCEP	kg CO_2 eq.	8.82E+00			2.30E-01		8.59E+00
Biogenic Carbon Removal from Packaging	BCRK	kg CO_2 eq.	0.00E+00			0.00E+00		
Biogenic Carbon Emission from Packaging	BCEK	kg CO_2 eq.	0.00E+00				0.00E+00	
Biogenic Carbon Emission from Combustion of Waste from Ren. Sources	BCEW	kg CO_2 eq.	0.00E+00			0.00E+00		

Abbreviations used in Table 11:

BCRP	Biogenic carbon removal from product	AB	Alberta
BCEP	Biogenic carbon emission from product	BC	British Columbia
BCRK	Biogenic carbon removal from packaging	ON	Ontario
BCEK	Biogenic carbon emission from packaging	QC	Quebec
BCEW	Biogenic carbon emission from combustion of waste from renewal sources used in production	NB	New Brunswick
		ATL	Atlantic Canada

The net value for each region across the five biogenic carbon parameters reported in Table 6 is zero. This is conservative, as it does not account for permanent carbon sequestration in wood that has been landfilled at end of life.

Permanent carbon sequestration is calculated here per the method in Appendix A of the PCR (5). It is conservatively assumed that 100% of wood goes to landfill at end of life.

- Mass of wood in one linear metre of I-joist: 4.66 kg (from the LCI in the LCA report)
- Proportion of oven dry wood that is carbon: 50% (commonly used average for softwoods)

- Mass of carbon in 1 linear metre of I-joist: 4.66 kg x .50 = 2.33 kg carbon
- Conversion factor, carbon to carbon dioxide equivalent (CO_2e): 3.67 kg CO_2e/1 kg carbon
- Sequestered CO_2e in 1 linear metre of I-joist: 2.33 kg carbon x 3.67 = 8.55 kg CO_2e
- Landfill methane emissions factor from the PCR: 0.00353 kg CH_4 per kg of oven dry wood
- Landfill methane emissions for 1 linear metre of I-joist: 0.00353 kg x 4.66 kg = 0.02 kg CH_4
- Convert landfill methane emissions to CO_2e: 0.02 kg CH_4 x 25 (per the PCR) = 0.50 kg CO_2e
- Landfill CO_2 emissions factor from the PCR: 0.206 kg CO_2 per kg of oven dry wood
- Landfill CO_2 emissions for 1 linear metre I-joist: 0.206 x 4.66 kg = 0.96 kg CO_2
- Total landfill emissions for 1 linear metre I-joist: 0.50 kg CO_2e + 0.96 kg CO_2 = 1.46 kg CO_2e
- Net permanent sequestered carbon per linear metre I-joist: 8.55 kg CO_2e (original) – 1.46 kg CO_2e (landfill emissions) = 7.09 kg CO_2e

6. INTERPRETATION

For best interpretation and appropriate use of LCA results, it is important to state the inherent limitations and assumptions of the LCA technique. LCA addresses “potential environmental impacts” and does not predict absolute or precise environmental impacts due to (a) the relative expression of potential environmental impacts to a reference unit, (b) the integration of environmental data over space and time, (c) the inherent uncertainty in modeling of environmental impacts, and (d) the fact that some possible environmental impacts are clearly future impacts (3).

Limitations include the fact that this study does not report all the environmental impacts caused by, for example, emissions that might impact human and/or ecosystem health. In order to assess the local impacts of product manufacturing on human health, land use and local ecology, additional analysis is required.

LCIA results are only relative expressions of potentials and do not predict actual impacts, the exceeding of thresholds, safety margins or risks.

This regional industry-average EPD for wood I-joists is not a comparative assertion; it does not imply superiority or equivalence of wood I-joists relative to a competing product. Only LCAs or EPDs prepared from cradle-to-grave life cycle results and based on the same function, reference service life (RSL), quantified by the same functional unit, and meeting all the conditions for comparability listed in ISO 14025:2006 and ISO 21930:2017 can be used to compare between products.

While this EPD does not address landscape level forest management impacts, potential impacts may be addressed through requirements put forth in regional regulatory frameworks, ASTM 7612-15 guidance, and ISO 21930 Section 7.2.11 including notes therein. These documents, combined with this EPD, may provide a more complete picture of environmental and social performance of wood products.

While this EPD does not address all forest management activities that influence forest carbon, wildlife habitat, endangered species, and soil and water quality, these potential impacts may be addressed through other mechanisms such as regulatory frameworks and/or forest certification systems which, combined with this EPD, will give a more complete picture of environmental and social performance of wood products.

EPDs can complement but cannot replace tools and certifications that are designed to address environmental impacts and/or set performance thresholds, e.g., Type 1 certifications, health assessments and declarations.

EPDs regularly rely on estimations of impacts; the level of accuracy in estimation of effect differs for any particular product line and reported impact when averaging data. Variability was estimated in this EPD by calculating various statistics for dominant inputs and then completing a sensitivity analysis based on +/- one standard deviation for these key contributing inputs.

7. REFERENCES

1. ISO 21930:2017 Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products and services.
2. ISO 14025: 2006 Environmental labeling and declarations - Type III environmental declarations - Principles and procedures.
3. ISO 14040/Amd1:2020 Environmental Management – Life Cycle Assessment – Principles and Framework, International Organization for Standardization, 2006.
4. ISO 14044/Amd1:2017/Amd2:2020 Environmental Management – Life Cycle Assessment – Requirements and guidelines, International Organization for Standardization, 2006.
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