



Environmental Product Declaration

CCA Red Pine Pole

Date of Issue:
Oct 18, 2024

System Boundary
Cradle-to-Grave

In Accordance With
ISO 14025 and ISO 21930:2017
Sustainable Minds Part B: Utility Poles



STORED CARBON

Emissions from carbon stored, sequestered, and released by organic matter.

-736 kg CO₂-Eq



GLOBAL WARMING

Total greenhouse gas emissions from cradle to grave.

596 kg CO₂-Eq

OTHER IMPACT INDICATORS



ACID RAIN

Acidification Potential: A measure of airborne emissions that enter the atmosphere and transform into acids.

5.7 kg SO₂-Eq



ALGAE BLOOM

Eutrophication Potential: A measure of chemicals from fertilizers and detergents leaching into aquatic ecosystems.

0.7 kg N-Eq



SMOG

Maximum Incremental Reactivity: Amount of harmful low-level ozone created from VOCs entering the air.

107.2 kg O₃-Eq



OZONE THINNING

Ozone Depletion Potential: The amount of ozone thinning caused by human-made chemicals entering the stratosphere.

1.7E-05 kg CFC-11-Eq



DUST & AEROSOL EMISSIONS

Particulate Matter: Emissions from fossil fuel combustion, wood combustion, and dust particles from roads and fields.

0.45 kg PM_{2.5}-Eq

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General Information

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Product Name:	Red Pine CCA-Treated Utility Pole
Functional Unit:	1 utility pole
Declaration Number:	SmartEPD-2024-042-0191-01
Date of Issue:	October 18, 2024
Expiration:	October 18, 2029
Last updated:	October 18, 2024
EPD Scope:	Cradle to grave A1 – A3, A4, A5, B1 - B7, C1 - C4
Market(s) of Applicability:	North America

Reference Standards

Standard(s):	ISO 14025 and ISO 21930:2017
Core PCR:	Sustainable Minds Part A Version 2023 Date of issue: August 01, 2023
Sub-category PCR:	Sustainable Minds Part B: Utility poles v.1 Date of issue: February 07, 2024 Valid until: February 06, 2029
Sub-category PCR review panel:	Contact Smart EPD for more information.
General Program Instructions:	Smart EPD General Program Instructions v.1.0, November 2022

Verification Information

ACLCA PCR Guidance Version:	1.0
ACLCA PCR Conformance Level:	Transparency
LCA Author/Creator:	Alexander Cooper alex@pathwaysai.co Alexander Munge CHM Analytics
EPD Program Operator:	Smart EPD info@smartepd.com www.smartepd.com 585 Grove St., Ste. 145 PMB 966, Herndon, VA 20170, USA

Verification:	Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071 :	External
	 Kamalakanta Sahoo  kksahoo80@gmail.com	
	Independent external verification of EPD, according to ISO 14025 and reference PCR(s) :	External
	 Kamalakanta Sahoo  kksahoo80@gmail.com	

Limitations, Liability, and Ownership

Environmental declarations from different programs (ISO 14025) may not be comparable. Comparison of the environmental performance of products using EPD information shall be based on the product's use and impacts at the building level, and therefore EPDs may not be used for comparability purposes when not considering the whole building life cycle. EPD comparability is only possible when all stages of a life cycle have been considered. However, variations and deviations are possible. Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared. The EPD owner has sole ownership, liability, and responsibility for the EPD.

Organization Information

North American manufacturer of pressure treated wood products
Further information can be found at: <https://www.stella-jones.com/en>

Product Description

Utility Poles from CCA (Chromated Copper Arsenate) treated red pine wood, produced by Stella-Jones at the following 7 Canadian facilities: Riviere Rouge, Gatineau, Prince George, Neepawa, Truro, Guelph
Further information can be found at: <https://www.stella-jones.com/en/products/utility-poles>

Product Information

Functional Unit:	1 utility pole
Mass:	797 kg
Reference Service Life:	60 Years
Product Specificity:	 Product Average  Product Specific
Supply Chain Specific Data:	26 %
Variation in GWP Result (Facilities):	-52% to +48%

Plants

- 

Riviere Rouge
2549 Chemin Francisco, Rivière-Rouge, QC, Canada
- 

Prince George
7177 Pacific Street, Prince George, BC, Canada
- 

Gatineau
426 Chemin de Montréal Est, Gatineau, QC, Canada
- 

Guelph
7818 Wellington Road 22, Guelph, ON, Canada
- 

Truro
278 Park Street, Truro, NS, Canada
- 

Kirkland Lake
100 Highway 672, Dobie, ON, Canada
- 

Neepawa
MB-16, Neepawa, MB, Canada

Product Specifications

Product SKU(s):

Product Classification Codes:

Stella-Jones Red Pine CCA-Treated Utility Pole

EC3 - Wood

Material Composition

Material/Component Category	Origin	% Mass
Red Pine Wood - Direct	Several Suppliers	98.9
CCA	Arxada, Westchester	1.1

Biogenic Carbon Content	kg C per utility pole
Biogenic carbon content in product	372
Biogenic carbon content in accompanying packaging	None

Hazardous Materials
CCA Sludge

EPD Data Specificity

Primary Data Year:	2023
Manufacturing Specificity:	✗ Industry Average ✗ Manufacturer Average ✓ Facility Specific

Averaging:
The EPD results are based on an average of the results from each of the 7 facilities covered by the LCA.

Software and LCI Data Sources

LCA Software:	📁 SimaPro v. 9.6
LCI Foreground Database(s):	📁 Ecoinvent v. 3.10 📍 Canadian Provinces when available, Global when needed 📄 Cut-Off by Classification
LCI Background Database(s):	📁 Ecoinvent v. 3.10 📍 Canadian Provinces when available, Global when needed 📄 Cut-Off by Classification 📁 US LCI v. FY21.Q3.01 📍 US 📄 Follows ISO 14044 three-step hierarchy for co-product

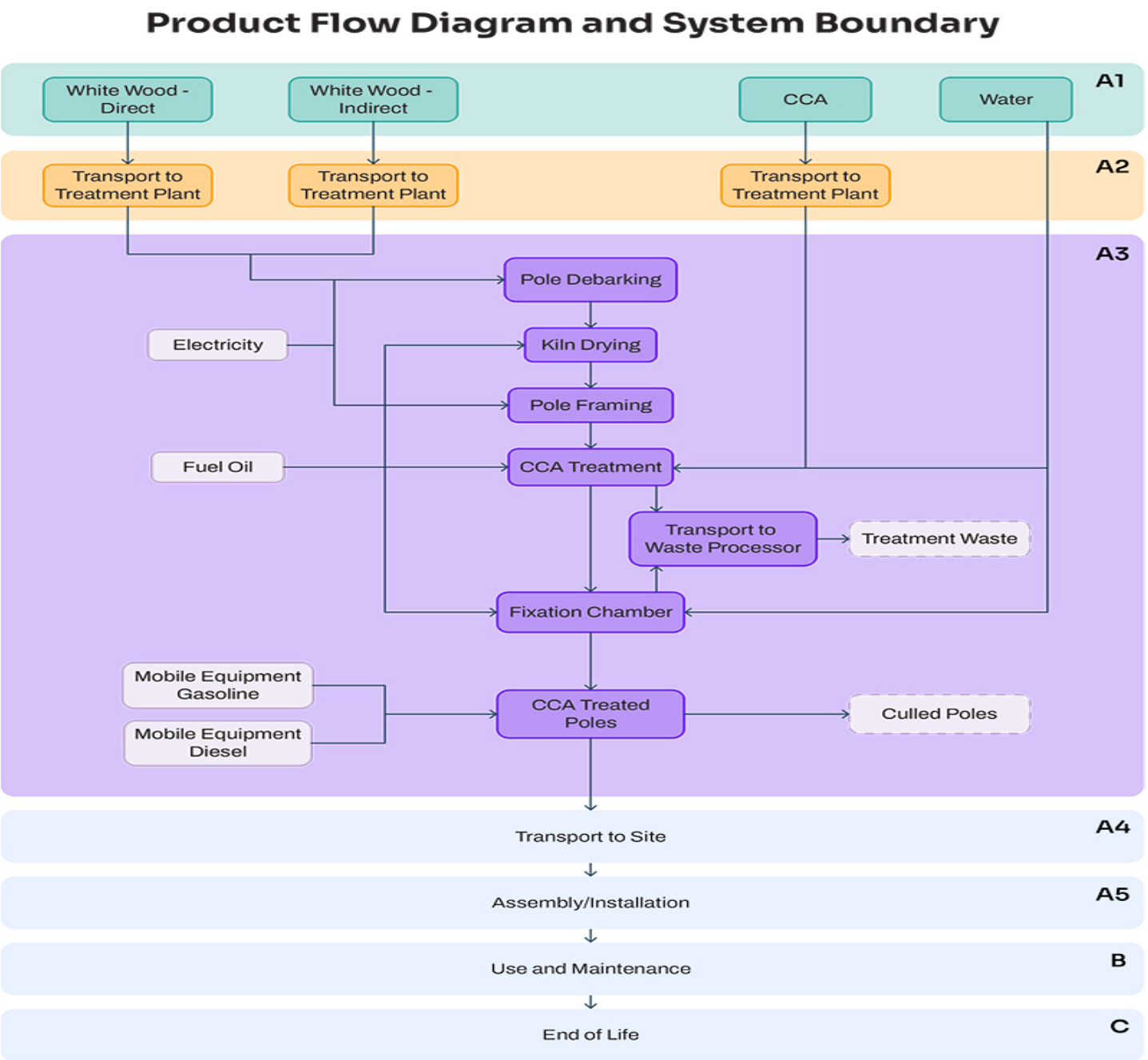
Renewable Electricity

Renewable electricity is used:	Yes
Electricity Source:	Offsite
Renewable type:	Wind, Solar, Hydro, Bioenergy
Grid type used to model remaining electricity:	Province-level consumption mix
Commitment pledged for entire EPD validity period:	No

System Boundary

Production	A1	Raw material supply	✓
	A2	Transport	✓
	A3	Manufacturing	✓
Construction	A4	Transport to site	✓
	A5	Assembly / Install	✓
Use	B1	Use	✓
	B2	Maintenance	✓
	B3	Repair	✓
	B4	Replacement	✓
	B5	Refurbishment	✓
	B6	Operational Energy Use	✓
	B7	Operational Water Use	✓
End of Life	C1	Deconstruction	✓
	C2	Transport	✓
	C3	Waste Processing	✓
	C4	Disposal	✓
Benefits & Loads Beyond System Boundary	D	Recycling, Reuse Recovery Potential	ND

Product Flow Diagram



Life Cycle Module Descriptions

Stella-Jones purchases red pine wood from suppliers in North America and debarks the logs at their facilities. The bark waste from the debarking process is sent to a company for re-use.

The log is then either air dried in stacks or kiln-dried before being framed which is the process of preparing utility poles for crossarm attachment in the field. The pole is then moved to the treatment cylinder (autoclave) where the wood is pressure treated with CCA preservative, before being processed in the fixation chamber. When the pole has been treated, it is sent for quality inspection and, if approved, sent to customer for installation and use, eventually reaching end-of-life after service life and ultimately disposed of.

The system boundary to nature is set to include those processes that provide the material and energy inputs into the system and the following manufacturing, and transport processes up to the factory gate as well as the processing of any waste arising from those processes.

All infrastructure/capital goods are included as a standard through datasets used in ecoinvent for all generic data.

All activities for the production of the utility pole are included, with the exception of plastic waste and oil filter waste as described in chapter 3.2.5 cut-off criteria. Modules B3, B5, B6 and B7 are considered to have zero activity in accordance with Sustainable Minds Part B PCR (Sustainable Minds, 2023).

The life cycle stages were modelled in accordance with Sustainable Minds Part B PCR for Utility Poles. Please refer to the Part B PCR for further life cycle stage requirements and descriptions.

LCA Discussion

Allocation Procedure

Allocation procedure used per Sustainable Minds Part A requirements (Section 8.2-8.5: Allocations, Co-Product Allocation, Allocation of Multi-Input Processes, Allocation Procedure for Reuse, Recycling, and Recovery).

Cut-off Procedure

Cut-Off procedure used per Sustainable Minds Part A requirements (Section 7.4: Criteria for the Exclusion of Inputs and Outputs (Cut-Off rules)).

Data Quality Discussion

Data Quality guidelines used per Sustainable Minds Part A requirements (Section 7.6: Data / Background data quality requirements)

Results

Environmental Impact Assessment Results

IPCC AR5 GWP 100, IPCC AR6 GWP 100, TRACI 2.1, AWARE
per 1 utility pole.

LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

40 year estimated service life

Impact Category	Method	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
GWP-total	IPCC AR5 GWP 100	kg CO2 eq	195	105	49.3	ND	107	ND	ND	ND	ND	ND	15	1.67	ND	0.395
GWP-total	IPCC AR6 GWP 100	kg CO2 eq	194	105	48.9	ND	107	ND	ND	ND	ND	ND	14.8	1.67	ND	0.384
GWP-total	TRACI 2.1	kg CO2 eq	151	104	45.9	ND	101	ND	ND	ND	ND	ND	14	1.66	ND	36.7
ODP	TRACI 2.1	kg CFC 11 eq	0.00000289	3.99e-9	0.00000357	ND	0.00000658	ND	ND	ND	ND	ND	0.00000107	6.39e-11	ND	ND
AP	TRACI 2.1	kg SO2 eq	2.19	1.34	0.188	ND	0.645	ND	ND	ND	ND	ND	0.0581	0.0197	ND	0.00000797
EP	TRACI 2.1	kg N eq	0.394	0.0804	0.0155	ND	0.0443	ND	ND	ND	ND	ND	0.00475	0.00118	ND	0.0000026
POCP	TRACI 2.1	kg O3 eq	37.8	34.2	2.42	ND	6.21	ND	ND	ND	ND	ND	0.783	0.499	ND	0.00000233
HTP-c	TRACI 2.1	CTUh	0.00000903	0.00000156	1.67e-7	ND	0.00000859	ND	ND	ND	ND	ND	5.07e-8	2.49e-8	ND	2.62e-10
HTP-nc	TRACI 2.1	CTUh	0.00011	0.000015	0.00000182	ND	0.0000268	ND	ND	ND	ND	ND	5.5e-7	2.4e-7	ND	7.82e-8
PM	TRACI 2.1	kg PM2.5 eq	0.21	0.0388	0.0228	ND	0.0758	ND	ND	ND	ND	ND	0.00711	0.000601	ND	0.0000661
WDP	AWARE	m3	0.859	ND	0.0149	ND	0.0382	ND	ND	ND	ND	ND	0.0045	ND	ND	ND

Abbreviations:

GWP = Global Warming Potential, 100 years (may also be denoted as GWP-total, GWP-fossil (fossil fuels), GWP-biogenic (biogenic sources), GWP-luluc (land use and land use change)), ODP = Ozone Depletion Potential, AP = Acidification Potential, EP = Eutrophication Potential, SFP = Smog Formation Potential, POCP = Photochemical oxidant creation potential, ADP-Fossil = Abiotic depletion potential for fossil resources, ADP-Minerals&Metals = Abiotic depletion potential for non-fossil resources, WDP = Water deprivation potential, PM = Particulate Matter Emissions, IRP = Ionizing radiation, human health, ETP-fw = Eco-toxicity (freshwater), HTP-c = Human toxicity (cancer), HTP-nc = Human toxicity (non-cancer), SQP = Soil quality index.

per 1 utility pole.

80 year estimated service life

Impact Category	Method	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
GWP-total	IPCC AR5 GWP 100	kg CO2 eq	195	105	49.3	ND	107	ND	122	ND	ND	ND	15	1.67	ND	0.395
GWP-total	IPCC AR6 GWP 100	kg CO2 eq	194	105	48.9	ND	107	ND	121	ND	ND	ND	14.8	1.67	ND	0.384
GWP-total	TRACI 2.1	kg CO2 eq	151	104	45.9	ND	101	ND	118	ND	ND	ND	14	1.66	ND	36.7
ODP	TRACI 2.1	kg CFC 11 eq	0.00000289	3.99e-9	0.00000357	ND	0.00000658	ND	0.00000251	ND	ND	ND	0.00000107	6.39e-11	ND	ND
AP	TRACI 2.1	kg SO2 eq	2.19	1.34	0.188	ND	0.645	ND	1.26	ND	ND	ND	0.0581	0.0197	ND	0.00000797
EP	TRACI 2.1	kg N eq	0.394	0.0804	0.0155	ND	0.0443	ND	0.165	ND	ND	ND	0.00475	0.00118	ND	0.0000026
POCP	TRACI 2.1	kg O3 eq	37.8	34.2	2.42	ND	6.21	ND	25.3	ND	ND	ND	0.783	0.499	ND	0.00000233
HTP-c	TRACI 2.1	CTUh	0.00000903	0.00000156	1.67e-7	ND	0.00000859	ND	0.00000361	ND	ND	ND	5.07e-8	2.49e-8	ND	2.62e-10
HTP-nc	TRACI 2.1	CTUh	0.00011	0.000015	0.00000182	ND	0.0000268	ND	0.0000427	ND	ND	ND	5.5e-7	2.4e-7	ND	7.82e-8
PM	TRACI 2.1	kg PM2.5 eq	0.21	0.0388	0.0228	ND	0.0758	ND	0.093	ND	ND	ND	0.00711	0.000601	ND	0.0000661
WDP	AWARE	m3	0.859	ND	0.0149	ND	0.0382	ND	0.293	ND	ND	ND	0.0045	ND	ND	ND

Abbreviations:

GWP = Global Warming Potential, 100 years (may also be denoted as GWP-total, GWP-fossil (fossil fuels), GWP-biogenic (biogenic sources), GWP-luluc (land use and land use change)), ODP = Ozone Depletion Potential, AP = Acidification Potential, EP = Eutrophication Potential, SFP = Smog Formation Potential, POCP = Photochemical oxidant creation potential, ADP-Fossil = Abiotic depletion potential for fossil resources, ADP-Minerals&Metals = Abiotic depletion potential for non-fossil resources, WDP = Water deprivation potential, PM = Particular Matter Emissions, IRP = Ionizing radiation, human health, ETP-fw = Eco-toxicity (freshwater), HTP-c = Human toxicity (cancer), HTP-nc = Human toxicity (non-cancer), SQP = Soil quality index.

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 or EN 15804. EPDs are not comparative assertions and are either not comparable or have limited comparability when they have different system boundaries. 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.

Resource Use Indicators

per 1 utility pole.

40 year estimated service life

Indicator	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
PERE	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PERM	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PERT	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENRE	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENRM	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENRT	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RPRE	MJ	4030	ND	6.38	ND	9.73	ND	ND	ND	ND	ND	1.93	ND	ND	ND
RPRM	MJ	3260	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RPRT	MJ	7290	ND	6.38	ND	9.73	ND	ND	ND	ND	ND	1.93	ND	ND	ND
NRPRE	MJ	2660	1490	2430	ND	1500	ND	ND	ND	ND	ND	729	23.9	ND	ND
NRPRM	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NRPRT	MJ	2660	1490	2430	ND	1500	ND	ND	ND	ND	ND	729	23.9	ND	ND
ADP-fossil	MJ	2510	1480	2420	ND	1490	ND	ND	ND	ND	ND	1480	2420	ND	1490
SM	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RSF	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NRSF	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FW	m3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Abbreviations:

RPRE or PERE = Renewable primary resources used as energy carrier (fuel), RPRM or PERM = Renewable primary resources with energy content used as material, RPRT or PERT = Total use of renewable primary resources with energy content, NRPRE or PENRE = Non-renewable primary resources used as an energy carrier (fuel), NRPRM or PENRM = Non-renewable primary resources with energy content used as material, NRPRT or PENRT = Total non-renewable primary resources with energy content, SM: Secondary materials, RSF = Renewable secondary fuels, NRSF = Non-renewable secondary fuels, RE = Recovered energy, ADPF = Abiotic depletion potential, FW = Use of net freshwater resources, VOCs = Volatile Organic Compounds.

per 1 utility pole.

80 year estimated service life

Indicator	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
PERE	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PERM	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PERT	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENRE	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENRM	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENRT	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RPRE	MJ	4030	ND	6.38	ND	9.73	ND	1340	ND	ND	ND	1.93	ND	ND	ND
RPRM	MJ	3260	ND	ND	ND	ND	ND	1090	ND	ND	ND	ND	ND	ND	ND
RPRT	MJ	7290	ND	6.38	ND	9.73	ND	2430	ND	ND	ND	1.93	ND	ND	ND
NRPRE	MJ	2660	1490	2430	ND	1500	ND	2440	ND	ND	ND	729	23.9	ND	ND
NRPRM	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NRPRT	MJ	2660	1490	2430	ND	1500	ND	2440	ND	ND	ND	729	23.9	ND	ND
ADP-fossil	MJ	2510	1480	2420	ND	1490	ND	3930	ND	ND	ND	1480	2420	ND	1490
SM	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RSF	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NRSF	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FW	m3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Abbreviations:

RPRE or PERE = Renewable primary resources used as energy carrier (fuel), RPRM or PERM = Renewable primary resources with energy content used as material, RPRT or PERT = Total use of renewable primary resources with energy content, NRPRE or PENRE = Non-renewable primary resources used as an energy carrier (fuel), NRPRM or PENRM = Non-renewable primary resources with energy content used as material, NRPRRT or PENRT = Total non-renewable primary resources with energy content, SM: Secondary materials, RSF = Renewable secondary fuels, NRSF = Non-renewable secondary fuels, RE = Recovered energy, ADPF = Abiotic depletion potential, FW = Use of net freshwater resources, VOCs = Volatile Organic Compounds.

Waste and Output Flow Indicators
per 1 utility pole.

40 year estimated service life

Indicator	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
HWD	kg	ND	ND	ND	4.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NHWD	kg	ND	ND	ND	4.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RWD	kg	ND	ND	ND	4.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HLRW	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ILLRW	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CRU	kg	40.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MFR	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MER	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MNER	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EEE	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EET	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Abbreviations:
HWD = Hazardous waste disposed, NHWD = Non-hazardous waste disposed, RWD = Radioactive waste disposed, HLRW = High-level radioactive waste, ILLRW = Intermediate- and low-level radioactive waste, CRU = Components for re-use, MFR or MR = Materials for recycling, MER = Materials for energy recovery, MNER = Materials for incineration, no energy recovery, EE or EEE = Recovered energy exported from the product system, EET = Exported thermal energy.



per 1 utility pole.
80 year estimated service life

Indicator	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
HWD	kg	ND	ND	ND	4.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NHWD	kg	ND	ND	ND	4.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RWD	kg	ND	ND	ND	4.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HLRW	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ILLRW	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CRU	kg	40.3	ND	ND	ND	ND	ND	13.4	ND	ND	ND	ND	ND	ND	ND
MFR	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MER	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MNER	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EEE	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EET	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Abbreviations:
HWD = Hazardous waste disposed, NHWD = Non-hazardous waste disposed, RWD = Radioactive waste disposed, HLRW = High-level radioactive waste, ILLRW = Intermediate- and low-level radioactive waste, CRU = Components for re-use, MFR or MR = Materials for recycling, MER = Materials for energy recovery, MNER = Materials for incineration, no energy recovery, EE or EEE = Recovered energy exported from the product system, EET = Exported thermal energy.

Carbon Emissions and Removals

per 1 utility pole.

40 year estimated service life

Indicator	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
BCRP	kg CO2	-729	-0.081	-0.108	ND	-0.286	ND	ND	ND	ND	ND	-0.0328	-0.0013	ND	ND
BCEP	kg CO2	147	0.081	0.119	39.8	0.311	ND	ND	ND	ND	ND	0.0362	0.0013	ND	0.484
BCRK	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BCEK	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BCEW	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CCE	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CCR	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CWNR	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Abbreviations:
BCRP = Biogenic Carbon Removal from Product, BCEP = Biogenic Carbon Emission from Product, BCRK = Biogenic Carbon Removal from Packaging, BCEK = Biogenic Carbon Emission from Packaging, BCEW = Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes, CCE = Calcination Carbon Emissions, CCR = Carbonation Carbon Removals, CWNR = Carbon Emissions from Combustion of Waste from Non-Renewable Sources used in Production Processes, GWP-luc = Carbon Emissions from Land-use Change.

per 1 utility pole.

80 year estimated service life

Indicator	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
BCRP	kg CO2	-729	-0.081	-0.108	ND	-0.286	ND	-243	ND	ND	ND	-0.0328	-0.0013	ND	ND
BCEP	kg CO2	147	0.081	0.119	39.8	0.311	ND	49.1	ND	ND	ND	0.0362	0.0013	ND	0.484
BCRK	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BCEK	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BCEW	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CCE	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CCR	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CWNR	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Abbreviations:
BCRP = Biogenic Carbon Removal from Product, BCEP = Biogenic Carbon Emission from Product, BCRK = Biogenic Carbon Removal from Packaging, BCEK = Biogenic Carbon Emission from Packaging, BCEW = Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes, CCE = Calcination Carbon Emissions, CCR = Carbonation Carbon Removals, CWNR = Carbon Emissions from Combustion of Waste from Non-Renewable Sources used in Production Processes, GWP-luc = Carbon Emissions from Land-use Change.

Scenarios

Transport to the building/construction site (A4)

A4 Module

Fuel Type:	Diesel fuel
Liters of Fuel:	32 l/100km
Vehicle Type:	Truck
Transport Distance:	1370 km
Capacity Utilization:	28.5 %
Gross density of products transported:	978 kg/m ³
Weight of products transported:	787 kg
Volume of products transported:	0.8 m ³
Capacity utilization volume factor:	=1
Assumptions for scenario development:	The transportation to site is modeled according to the guidelines in Part B PCR for utility poles from Sustainable Minds (Sustainable Minds, 2023). The input data is therefore 1 290 km from manufacturing site to customer, an additional 80 km from customer site to final installation, and 80 km return trip without weight. The dataset used to model the transportation is Transport, combination truck, long-haul, diesel powered, Northeast/tkm/RNA from USLCI. Since the dataset has an output of kgkm, the return trip without weight was modeled with 1 kg to ensure that there are emissions associated with the return trip. 1 kg was chosen arbitrarily, however, it only represents 0.01% of the total input value and therefore it can be considered negligible. Capacity utilization is assumed to be 28.5% based on an average load factor of 57% when freight trucks are loaded, and 0% for the return trip. These values are based on a report, Maximizing Truck Load Factor, from the American Council for an Energy-Efficient Economy (2021).

Installation in to the building/construction site (A5)

A5 Module

Net Fresh Water Consumption Specified by Water Source and Fate:	0.015 m ³
Other Energy Carriers:	2436 MJ
Waste Materials at the Construction Site Before Waste Processing:	0 kg
Assumptions for scenario development:	The installation of the utility pole on site is based on the guidelines in Part B PCR for utility poles from Sustainable Minds (Sustainable Minds, 2023), which states that the assumption of using a digger derrick with 33.5 liters of diesel fuel consumption shall be used for installation of one pole.

Reference Service Life

B1 Module

RSL:	60 Years
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Declared Product Properties:

The reference service life for the utility pole is set to 60 years. The reference service life was determined based on the default reference service life for wooden utility poles defined in chapter 7.1.4 of the NSF/ASTM 1104-23 PCR for North American Pressure-Treated Wood Products (UN CPC 313), which states the default RSL shall be 60 years. This approach, referencing the NSF/ASTM 1104-23 PCR, is based on the Part B PCR for Utility Poles, which states that treated wood poles should also refer to the NSF PCR (section 7.1.4) for guidance in selecting an RSL.

A variety of factors can have significant influence on the actual service life of a utility pole – such as pole material and geographic installation location (and associated climate-specific decay rates, corrosion, UV light exposure, frequency and magnitude of natural disasters, actual in service forces applied to the pole, and other factors), and the rigor of installation, inspection, and maintenance programs. Organizations should incorporate their own expected service life considerations, including planned expansion that could replace poles prior to their end of life for line upgrades or rights of way, as they interpret the underlying assumptions and resulting conclusions of this EPD. The default ESLs in this EPD are 40 years and 80 years. However, customers should understand that the ESL can be conceptualized to be a period of time for which a pole will be needed in a particular location. Therefore, customers can approximate custom impacts for other ESLs with this understanding.

Indoor Environment:

The activities modelled for module B1 is leachate from the wood preservative CCA over the course of the utility pole service life, in accordance with Part B PCR for utility poles from Sustainable Minds (Sustainable Minds, 2023). The input values can be seen below:

Copper leachate to water 40 years: 0.81 g
Copper leachate to water 80 years: 1.62 g
Copper leachate to soil 40 years: 2.44 kg
Copper leachate to soil 80 years: 4.88 kg

Chromium leachate to water 40 years: 0.60 g
Chromium leachate to water 80 years: 1.12 g
Chromium leachate to soil 40 years: 0.88 kg
Chromium leachate to soil 80 years: 1.75 kg

Arsenic leachate to water 40 years: 0.33 g
Arsenic leachate to water 80 years: 0.66 g
Arsenic leachate to soil 40 years: 0.72 kg
Arsenic leachate to soil 80 years: 1.44 kg

Use Conditions:

Continuous outdoor use

Maintenance:

Ground line treatment and wood preservative for external treatment represents the activities used for maintenance of the utility pole. Ground line treatment assumed to be the same activity as installation in module A5, and the wood preservative is assumed to be 2 kg preservative consumption over service life for 40 years, and 4 kg for 80 years.

Maintenance (B2)

B2 Module

Maintenance Cycle:	1 Cycles/RSL
Net Fresh Water Consumption Specified by Water Source and Fate:	0.038 m3
Energy Input:	418 kWh
Waste Materials from Maintenance:	0.13 kg
Maintenance Process Information:	Ground line treatment (assumed once during service life of 40 years, and twice for service life of 80 years) and application of external wood preservative (2kg used over service life for 40 years, and 4 kg for 80 years) included in this stage.

Repair (B3)

B3 Module

Repair Process Information:	Repair (B3): Uncommon, zero activity assumed. Replacement (B4): No specific activity was modeled for module B4, instead, the end results of modules A1-A5 and C1-C4 are multiplied by a factor of 0.33 to obtain the results of replacing one utility pole (for an estimated service life of 80 years, in correlation to the reference service life of 60 years, thereby $60/80 = 0.33$), in accordance with Part B PCR for utility poles (Sustainable Minds, 2023). Refurbishment (B5): Not expected to occur, zero activity assumed. Operation energy use (B6) and operational water use (B7): Zero activity assumed.
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Replacement (B4)
B4 Module

Reference Service Life:	60 Years
Replacement Cycle:	0.33 (ESL/RSL)-1
Energy Input:	1354 kWh
Net Fresh Water Consumption Specified by Water Source and Fate:	0.293 m3
Further assumptions for scenario development:	No specific activity was modelled for module B4, instead, the end results of modules A1-A5 and C1-C4 are multiplied by a factor of 0.33 to obtain the results of replacing one utility pole (for an estimated service life of 80 years, in correlation to the reference service life of 60 years, thereby $60/80 = 0.33$), in accordance with Part B PCR for utility poles (Sustainable Minds, 2023).

End of Life
C1 - C4 Modules

Collection Process	
Collected Separately:	596 kg
Recovery	
Landfill:	596 kg
Disposal	
Product or Material for Final Disposal:	596 kg
Removals of Biogenic Carbon:	183 kg CO2

Assumptions for scenario development:

Deconstruction/demolition (C1): Same dataset used as in module A5 except the diesel consumption is adjusted to 20.1 liters in accordance with Part B PCR for utility poles (Sustainable Minds, 2023).

Transportation to disposal (C2): Distance (32.2km) based on guideline from Part B PCR for utility poles for module C2 (Sustainable Minds, 2023).

Waste processing (C3): No waste pre-processing was modeled as it is assumed that the utility pole is sent to landfill without pre-processing. This assumption is based on the product disposal assumptions defined in Sustainable Minds Part B PCR for utility poles (Sustainable Minds, 2023), as well as landfilling being the most common method to date to dispose of utility poles in North America according to the North American Wood Pole Council (Khademibami & Shmulsky, 2022).

Waste disposal (C4): The final disposal of the utility poles was modeled based on the product disposal assumptions according to Sustainable Minds Part B PCR for utility poles, where all non-metal poles is assumed to be sent to landfill (Sustainable Minds, 2023). Since there is no pre-treatment of the utility poles, and no part of the wood is assumed to be recycled (as it has been treated with wood preservative), the utility pole in its entirety is assumed to go to landfilling, represented by the dataset Waste wood, untreated {GLO} treatment of waste wood, untreated, open dump, hyperarid infiltration class (- 250 mm) J Cut-off, U. The dataset was compared to four other datasets for open dump waste wood, in which the hyperarid infiltration class showed the highest impact. To maintain a conservative approach, this dataset was therefore chosen.

In accordance with Part B PCR for utility poles (Sustainable Minds, 2023), the landfill modelling for biogenic carbon shall be based on the UL's PCR for Structural and Architectural Wood products (UL, 2020). The values used as input is therefore 3.53 kg CH4 per metric ton dry wood and 206 kg CO2 per metric ton dry wood. Since the utility pole weighs approximately 596 kg (removing the average CCA input makes the wood weigh approximately 588 kg) , the input values are therefore 2.1 kg biogenic CH4 and 121.1 kg biogenic CO2 per utility pole.

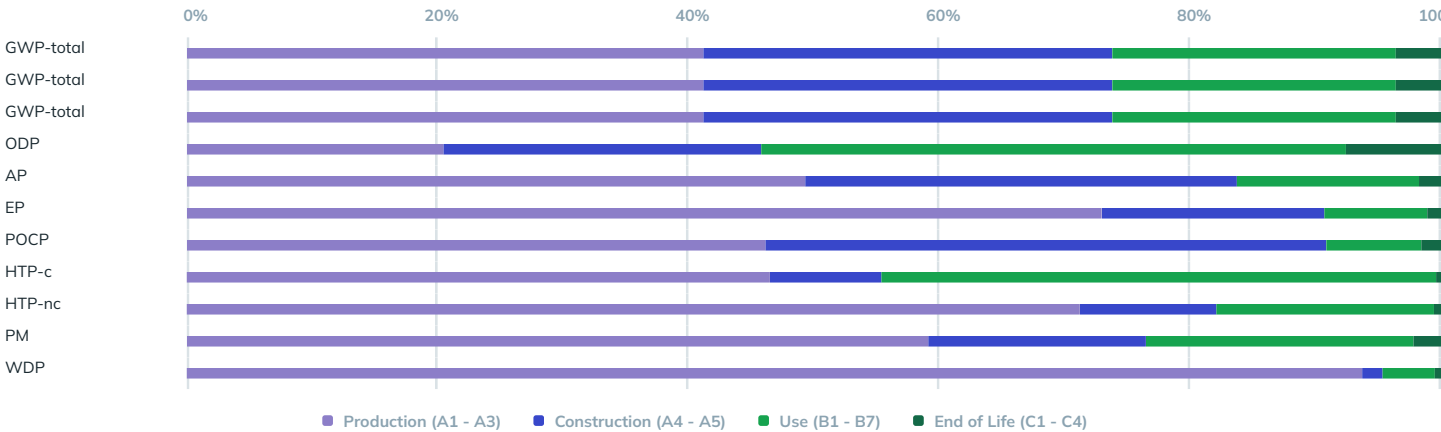
Interpretation

This chapter aims to interpret the results to easier understand which impacts are the most relevant, where they appear and how accurate the results are. The mandatory LCIA results are presented graphically and described. Only the global warming indicator is analyzed in a sensitivity analysis to keep the number of pages to a reasonable amount. The global warming indicator is chosen as it is identified as the impact category that is most relevant for customer to understand and communicate.

Each module contributes in varying degrees based on the impact category. For the global warming indicator, one of the largest contributors to fossil CO2 emissions is the transportation from supplier to manufacturing facility, accounting for approximately 18% of the total amount. The maintenance of the wooden utility pole, as well as the replacement represent approximately 15% and 19% respectively of the total CO2 emissions. The remaining modules have a similar share in impact based on the global warming indicator.

The share of impact ozone depletion impact category differentiates from the global warming impact category, where the maintenance of the utility pole represents a significant majority together with the impact from the installation process. These processes were modelled based on the Part B PCR for wooden utility poles by Sustainable Minds.

For acidification and eutrophication, the main contributor is the copper oxide used for production of CCA preservative, accounting for around 24% of the total impact. The impact from transportation to production facility represents approximately 43% of the total smog impact.



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