



**Declaration Owner**

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**Product**
*Wildwood Cladding*

*UNSPSC Code 30151800*

**Declared Unit**
The functional unit is one square meter of Composite Cladding System.

**EPD Number and Period of Validity**
SCS-EPD-08200
EPD Valid August 30, 2022 through August 29, 2027
Version: October 3, 2022

**Product Category Rule**

PCR Guidance for Building-Related Products and Services. Part A: Life Cycle Assessment Calculation Rules and Report Requirements. UL Environment. UL 10010. Version 3.2. 2018.

PCR Guidance for Building-Related Products and Services. Part B: Cladding Product Systems EPD Requirements, UL 10010–25. April 2021.

**Program Operator**
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|---|---|
| Declaration Owner: | Fiber Composites, LLC (Fiberon) |
| Address: | 181 Random Drive, New London, NC 28127 |
| Declaration Number: | SCS-EPD-08200 |
| Declaration Validity Period: | EPD Valid August 30, 2022 through August 29, 2027 |
| Version Date: | October 3, 2022 |
| Program Operator: | SCS Global Services |
| Declaration URL Link: | https://www.scsglobalservices.com/certified-green-products-guide |
| LCA Practitioner: | Gerard Mansell, Ph.D., SCS Global Services |
| LCA Software and LCI database: | OpenLCA 1.10 software and the Ecoinvent v3.8 database |
| Product RSL: | n/a |
| Markets of Applicability: | Global |
| EPD Type: | Product-Specific |
| EPD Scope: | Cradle-to-Gate with options |
| LCIA Method and Version: | 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. Version 3.2. UL Environment. December 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 for Building-Related Products and Services. Part B: Cladding Product Systems EPD Requirements, UL 10010–25. April 2021 |
| Part B PCR Review conducted by: | Jack Geibig (chair), Ecoform; Thomas Gloria, Industrial Ecology Consultants; Thaddeus Owen |
| 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 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. About Fiberon

If a project's worth building, it's worth protecting.

Give your structure the warm look of wood, with an eco-friendly product warrantied for 50 years.

Fiberon® Wildwood composite cladding offers a striking appearance, with authentic grain patterns, multi-tonal streaking, and rich hues inspired by natural wood. It also strengthens rainscreens, with an unprecedented durability that requires virtually no maintenance. Finally, Wildwood is sustainably created with up to 94% recycled wood and plastic—and backed by dedicated project support from specification to installation.

# 2. Product

### 2.1 Product Description

The product systems assessed include Fiber Composite's Fiberon® Wildwood Cladding products manufactured at the company's production facility in Meridian, ID.

| Product Name | Product Description |
|---|---|
| **Wildwood Cladding - 6"**<br>.75 in. x 6 in.<br>(19 mm x 152 mm)<br>Lengths: 12 ft., 16 ft. and 20 ft.<br>(3.66 m, 4.88 m and 6.1 m)<br><br>**Wildwood Cladding - 7 1/4"**<br>.75 in. x 7.25 in. x 12 ft.<br>(19 mm x 184 mm x 3.66 m)<br><br>**Wildwood Cladding - 11 1/4"**<br>.75 in. x 11.25 in. x 12 ft.<br>(19 mm x 283 mm x 3.66 m) | An ideal alternative.<br>Fiberon Wildwood cladding offers a range of exceptional benefits not found with wood, fiber cement, or other materials.<br>Rainscreen systems are an effective, eco-friendly way to manage moisture in the building envelope. A key element is durable cladding that deflects water and adds aesthetic appeal.<br>Fiberon Wildwood cladding is the answer. Available in eight striking, multi-tonal colors that emulate natural hardwoods, Fiberon Wildwood cladding delivers a range of benefits not found with wood, fiber-cement, or other common materials. A solid wood-composite core prevents splintering, cracking, insect infestation, and decay. The four-sided, patented PermaTech® cap layer delivers exceptional stain and fade resistance. Fiberon Wildwood composites are easy to install and never needs painting, staining, or refinishing, so long-term costs of ownership are significantly lower, too.<br>Fiberon® Wildwood cladding is manufactured using a co-extrusion process, combining wood fiber and polyethylene (PE) into the board core, and a polyethylene (PE) capstock. Both the core and capstock are inclusive of additives for color, weathering resistance and specific performance characteristics. |

### 2.2 Application

The Fiberon Wildwood Cladding products provide the primary function of exterior cladding.

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### 2.3 Technical Data

Technical specifications of the products included in the LCA scope, as well as product performance testing results are summarized below and available on the manufacturer's website (https://www.fiberoncladding.com/product/wildwood-cladding/).

| Property | Test Method | Result |
|---|---|---|
| Weight per Lineal Foot (12-in. width) | n/a | 3.9 lb/ft (5.80 kg/m) |
| Weight per Lineal Foot (8-in. width) | n/a | 2.6 lb/ft (3.87 kg/m) |
| Weight per Lineal Foot (6-in. width) | n/a | 2.2 lb/ft (3.27 kg/m) |
| Flexural Modulus MOE | ASTM 6109 | 800,000 PSI (5515.81 MPa) |
| Flexural Strength MOR | ASTM 6109 | 4700 PSI (32.41 MPa) |
| Coefficient of Thermal Expansion | ASTM D6341 | 1.47 x 10 -5 in/in/F |
| Decay Resistance (Brown & White Rot) | AWPA E10-12 | Pass |
| Termites | AWPA E1-09 | Pass |
| Termites (Formosan Subterranean) | (ASTM D3345) | Pass |
| Screw Head Pull-Through | ASTM E330 | 695 lbf (3,096 N) |
| Flame Spread | ASTM E-84 | FSI 65 (Class B) |
| Smoke Development Index | ASTM E-84 | 400 |
| Uniform Load (11-1/4 in. tested) | ASTM E330 | 441 psf (3.04 MPa) |
| Flexural (Baseline) | ASTM D7032 | 294 psf (2.03 MPa) |
| Temperature Effect (Hot) | ASTM D7032 | 175 psf (1.21 MPa) |
| Temperature Effect (Cold) | ASTM D7032 | 496 psf (3.42 MPa) |
| Moisture Effect | ASTM D7032 | 288 psf (1.99 MPa) |
| Freeze-Thaw | ASTM D7032 | 284 psf (1.96 MPa) |
| UV Exposure | ASTM D7032 | 337 psf (2.32 MPa) |

### 2.4 Base Materials

The primary materials include virgin and recycled polyethylene, recycled wood and various additives and pigments. The recycled wood components are locally sourced and consist of sawdust, wood shavings and other wood waste material destined for disposal in a landfill or incinerator. Consistent with the cut-off approach for recycled materials, no upstream burdens are associated with the recycled wood components, including land use changes.

**Table 1.** *Material content for the Fiberon product in kg per square meter and percent of total mass.*

| Material | Wildwood Cladding – 1 x 6 | Wildwood Cladding – 1 x 8 | Wildwood Cladding – 1 x 12 |
|---|---|---|---|
| Polyethylene | 3.94 | 4.78 | 7.35 |
| | 38% | 38% | 38% |
| Wood | 5.24 | 6.36 | 9.78 |
| | 50% | 50% | 51% |
| Other | 1.23 | 1.45 | 2.16 |
| | 12% | 12% | 11% |
| Product Total | 10.4 | 12.6 | 19.3 |
| | 100% | 100% | 100% |

### 2.5 Manufacture

Fiberon composite Wildwood cladding system products are manufactured at the company's production facility in Meridian, Idaho. Resource use at the production facility is allocated to the product based on mass.

The PE (Polyethylene) cladding products are manufactured using co-extrusion processes. In co-extrusion manufacturing, multiple extruders are used to produce different layers of the finished product. Fiberon cladding products have a central

core that provides physical stability while an outer shell or cap provides visual aesthetics. Raw materials are mixed and blended for both the core and cap layers. The core layer materials are added to the main (core) extruder where heat and shear is used to soften the materials. This allows the blended material to be formed into the desired board shape. This is achieved by forcing the material through dies (in line molds) as it exits the extruder. While the core material is passing through the dies, secondary extruders will add the capping material through portals in the dies to form the outer shell or cap. Once the layered material or cladding board exit the dies, it is cooled with chilled water to set its final shape and dimensions. Finishing operation such as embossing to provide wood grain texture, cutting the board to desire length and final packaging are completed prior to shipment to consumers.

Electricity use at the manufacturer's facility is modeled based on the regional electricity supply mix using the USEPA eGRID emissions database. Electricity and resources used at the manufacturing facility are allocated to the products based on annual production data for 2019.

### 2.6 Environment and Health during Manufacture

No environmental or health impacts are expected during the manufacture of the products.

### 2.7 Packaging

The Fiberon products are packaged for shipment using plastic wrap and corrugated cardboard.

**Table 2.** *Material content for the Fiberon product packaging, per square meter.*

| Material | Wildwood Cladding – 1 x 6 | Wildwood Cladding – 1 x 8 | Wildwood Cladding – 1 x 12 |
|---|---|---|---|
| Plastic | $6.09x10^{-2}$ | $6.09x10^{-2}$ | $6.09x10^{-2}$ |
| | 10% | 10% | 10% |
| Corrugated | 0.543 | 0.543 | 0.543 |
| | 90% | 90% | 90% |
| **Packaging Total** | **0.604** | **0.604** | **0.604** |
| | **100%** | **100%** | **100%** |

### 2.8 Condition of Use

No special conditions of use are noted.

### 2.9 Environment and Health during use

No environmental or health impacts are expected due to normal use of cladding products.

### 2.10 Reference Service Life

The EPD scope is cradle-to-gate with options – the Reference Service Life (RSL) is not relevant.

### 2.11 Extraordinary Effects

No environmental or health impacts are expected due to extraordinary effects including fire and/or water damage and unforeseeable mechanical destruction.

### 2.12 Further Information

Further information on the products can be found on the manufacturers' website at https://www.fiberoncladding.com/product/wildwood-cladding/.

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# 3. LCA: Calculation Rules

### 3.1 Declared Unit

The declared unit used in the study is defined as 1 $m^2$ of cladding product. The reference flows and declared unit for each product are summarized in Table 3.

**Table 3.** *Declared unit and reference flows for the Fiberon products.*

| Product Name | Dimensions | Declared Unit | Reference flow ($kg/m^2$) |
|---|---|---|---|
| Wildwood Cladding – 1 x 6 | Nominal: 1" x 6"<br>Actual: 0.75" x 6"<br>Length(s):12 ft; 16 ft; 20 ft | 1 $m^2$ of cladding system with a thickness of 19.1 mm | 10.4 |
| Wildwood Cladding – 1 x 8 | Nominal: 1" x 8"<br>Actual: 0.75" x 7.75"<br>Length:12 ft | 1 $m^2$ of cladding system with a thickness of 19.1 mm | 12.6 |
| Wildwood Cladding – 1 x 12 | Nominal: 1" x 12"<br>Actual: 0.75" x 11.75"<br>Length:12 ft | 1 $m^2$ of cladding system with a thickness of 19.1 mm | 19.3 |

### 3.2 System Boundary

The scope of the EPD is "cradle-to-gate with options", including raw material extraction, processing of raw materials, material transport, product manufacture, including packaging, and end-of-life. The life cycle phases included in the EPD scope are described in Table 4 and illustrated in Figure 1.

**Table 4.** *The modules and unit processes included in the scope for the Fiberon products.*

| Module | Module description from the PCR | 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 | Extraction and processing of raw materials for the composite cladding system components. |
| A2 | Transport (to the manufacturer) | Transport of component materials to the manufacturing facilities |
| A3 | Manufacturing, including ancillary material production | Manufacturing of products and packaging (incl. upstream unit processes) |
| 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 | Demolition of the product is accomplished using hand tools with no associated emissions and negligible impacts |
| C2 | Transport (to waste processing) | Transport of the product to waste treatment at end-of-life |
| C3 | Waste processing for reuse, recovery and/or recycling | The products are disposed of by landfilling or incineration which require no waste processing |
| C4 | Disposal | Disposal of the product in a municipal landfill or incineration |
| D | Reuse-recovery-recycling potential | Module Not Declared |

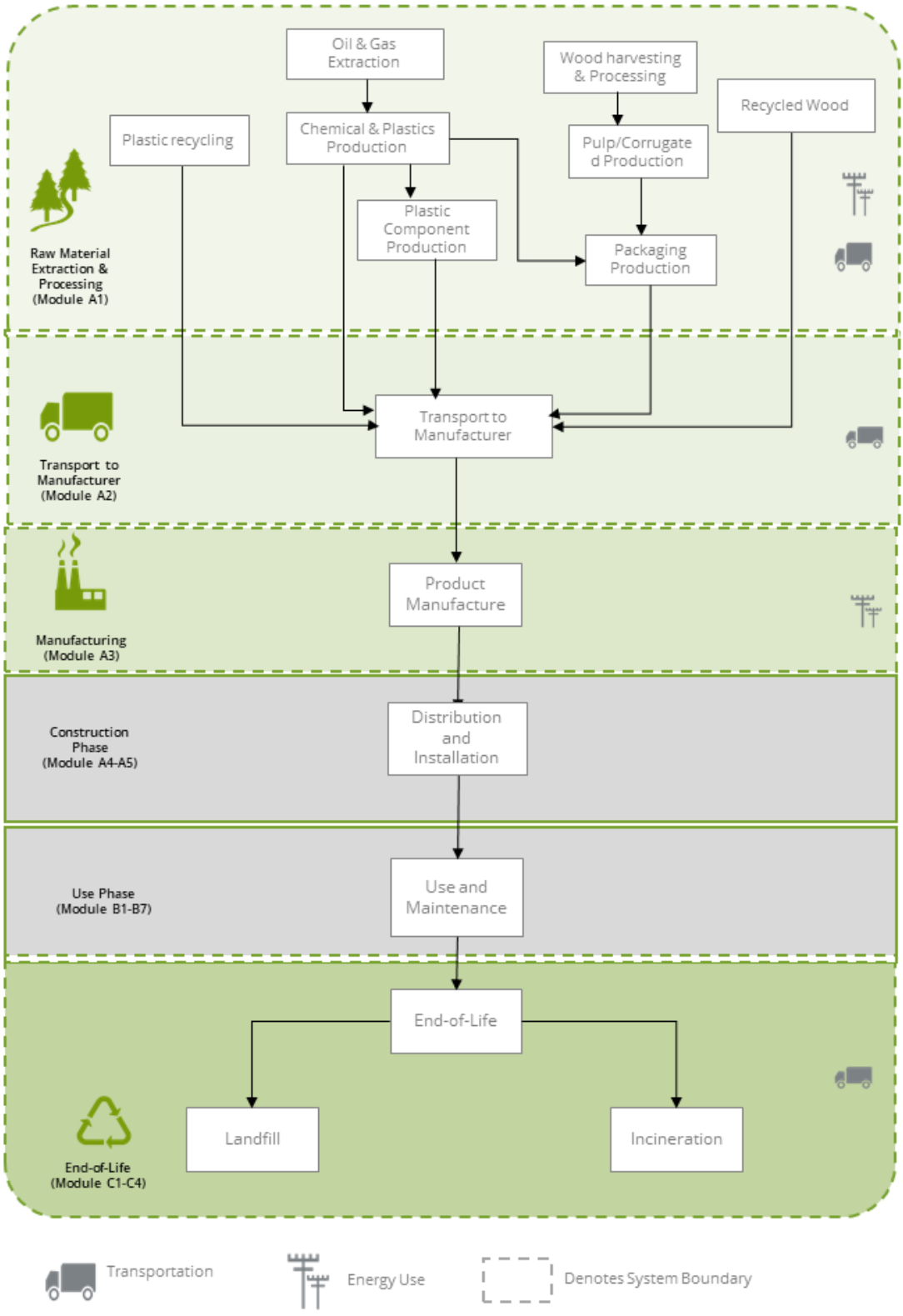



**Figure 1.** *Flow diagram representing the major unit operations in the life cycle of the Wildwood cladding products.*

### 3.3 Estimates and Assumptions

- Fiberon's manufacturing facility is located in Meridian, Idaho. Ecoinvent inventory datasets for the appropriate eGRID energy grid mix were used to model resource use and emissions from electricity use at the manufacturing facility.
- Electricity and resource use at the manufacturing facility was allocated to the composite cladding products based on product mass utilizing production data for calendar year 2019 provided by the manufacturer.
- Primary data for upstream component fabrication were not available. Representative data from the Ecoinvent LCI databases were utilized as appropriate.
- Specific data to estimate the disposition of the product at end-of-life were unavailable. The study assumes no recycling of the product occurs at end-of-life. Assumptions regarding landfilling and incineration rates for the product materials are based on regional statistics regarding municipal solid waste generation.

It should also be noted that LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

The PCR allows for the results for several inventory flows related to construction products to be reported as "other parameters". These are aggregated inventory flows, and do not characterize any potential impact; results should be interpreted taking into account this limitation.

The following limitations are also noted:

- 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.

### 3.4 Cut-off criteria

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.

### 3.5 Background Data

Primary data were provided by Fiberon for their manufacturing facility. The sources of secondary LCI data are the Ecoinvent database.

**Table 5.** *Data sources for the Fiberon product system.*

| Component | Dataset | Data Source | Publication Date |
|---|---|---|---|
| **PRODUCT** | | | |
| Polyethylene | | | |
| Recycled PE | Recycled PE | Primary data | 2021 |
| Wood | | | |
| Recycled Wood Trim/Wood Chips | n/a | n/a | n/a |
| Other | | | |
| Additives & Colorants | aluminium hydroxide production \| aluminium hydroxide \| Cutoff, S - RNA | EI v3.8 | 2021 |
| | Polyethylene grafted with maleic anhydride | EI v3.8 | 2021 |
| | Ethylene-methacrylic acid copolymer | EI v3.8 | 2021 |
| | polydimethylsiloxane production \| polydimethylsiloxane \| Cutoff, S/GLO | EI v3.8 | 2021 |
| | limestone production, crushed, washed \| limestone, crushed, washed \| Cutoff, S/RoW | EI v3.8 | 2021 |
| | zinc oxide production \| zinc oxide \| Cutoff, S/RoW | EI v3.8 | 2021 |
| | chemical production, organic \| chemical, organic \| Cutoff, S/GLO | EI v3.8 | 2021 |
| **PACKAGING** | | | |
| Cardboard | containerboard production, linerboard, testliner \| containerboard, linerboard \| Cutoff, S/RoW | EI v3.8 | 2021 |
| Packaging Film | packaging film production, low density polyethylene \| packaging film, low density polyethylene \| Cutoff, S/RoW | EI v3.8 | 2021 |
| **TRANSPORT** | | | |
| Road transport | market for transport, freight, lorry 16-32 metric ton, EURO4 \| transport, freight, lorry 16-32 metric ton, EURO4 \| Cutoff, S/RoW | EI v3.8 | 2021 |
| **RESOURCES** | | | |
| Grid electricity | Electricity, medium voltage, per kWh - NWPP/NWPP | EI v3.8; eGRID | 2021; 2018 |
| | Electricity, medium voltage, per kWh - SRVC/SRVC | EI v3.8; eGRID | 2021; 2018 |
| Heat – natural gas | market group for heat, district or industrial, natural gas \| heat, district or industrial, natural gas \| Cutoff, S/GLO | EI v3.8 | 2021 |
| Heat – propane | heat production, propane, at industrial furnace >100kW \| heat, district or industrial, other than natural gas \| Cutoff, S/RoW | EI v3.8 | 2021 |

### 3.6 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.

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**Table 6.** *Data quality assessment for the Fiberon product system.*

| Data Quality Parameter | Data Quality Discussion |
|---|---|
| **Time-Related Coverage**<br>Age of data and the minimum length of time over which data should be 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 5 years old (typically 2016). All of the data used represented an average of at least one year's worth of data collection, and up to three years in some cases. Manufacturer-supplied data (primary data) are based on annual production for 2019. |
| **Geographical Coverage**<br>Geographical area from which data for unit processes should be collected to satisfy the goal of the study | The data used in the analysis provide the best possible representation available with current data. Electricity use for product manufacture is modeled using representative data for the US. Surrogate data used in the assessment are representative of global or European operations. Data representative of European operations are considered sufficiently similar to actual processes. Data representing product disposal are based on regional statistics. |
| **Technology Coverage**<br>Specific technology or technology mix | For the most part, data are representative of the actual technologies used for processing, transportation, and manufacturing operations. Representative fabrication datasets, specific to the type of material, are used to represent the actual processes, as appropriate. |
| **Precision**<br>Measure of the variability of the data values for each data expressed (e.g., variance) | 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**<br>Percentage of flow that is measured or estimated | The LCA model included all known mass and energy flows for production of the cladding system products. 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**<br>Qualitative assessment of the degree to which the data set reflects the true population of interest (i.e., geographical coverage, time period, and technology coverage) | 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**<br>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 v3.8 data where available. Different portions of the product life cycle are equally considered. |
| **Reproducibility**<br>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**<br>Description of all primary and secondary data sources | Energy use data at Fiberon's manufacturing facilities represents 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. For secondary LCI data, Ecoinvent v3.8 LCI data are used. |
| **Uncertainty of the Information**<br>Uncertainty related to data, models, and assumptions | Uncertainty related to materials in the products and packaging is low. Actual supplier data for upstream operations were not available 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. |

### 3.7 Period under review

The period of review is calendar year 2019.

### 3.8 Allocation

Manufacturing resource use was allocated to the products based on mass. Impacts from transportation were allocated based on the mass of material and distance transported.

The product system includes some recycled materials, which were allocated using the recycled content allocation method (also known as the 100-0 cut-off method). Using the recycled content allocation approach, system inputs with recycled content do not receive any burden from the previous life cycle other than reprocessing of the waste material. At end-of-life, materials which are recycled leave the system boundaries with no additional burden.

### 3.9 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

### 4.1 Product End-of-Life

The disposal stage includes removal of the products; transport of the products to waste treatment facilities; waste processing; and associated emissions as the product degrades in a landfill or is burned in an incinerator. For the composite Wildwood cladding system products, it is assumed no emissions are generated during demolition while no waste processing is required for incineration or landfill disposal.

No specific data are available regarding the recycling rate of materials in the product at end-of-life. Although some component materials of the product are recyclable, the form of the final product makes separation and recovery of these materials impractical. Therefore, the products are assumed to be landfilled or incinerated at end-of-life. Based on regional statistics for municipal solid waste disposal, 80% of the product materials are assumed landfilled and 20% incinerated.

Transportation of waste materials at end-of-life assumes a 100 km average distance to disposal, consistent with PCR guidance.

**Table 7.** *End-of-life disposal scenario parameters for the Fiberon products.*

| Parameter | | Wildwood Cladding – 1 x 6 | Wildwood Cladding – 1 x 8 | Wildwood Cladding – 1 x 12 |
|---|---|---|---|---|
| Assumptions for scenario development | | 80% Landfill<br>20% Incineration | 80% Landfill<br>20% Incineration | 80% Landfill<br>20% Incineration |
| Collection process | | | | |
| Collected with mixed construction waste (kg) | | 10.4 | 12.6 | 19.3 |
| Recovery | | n/a | n/a | n/a |
| Disposal | Recycled (kg) | 0.0 | 0.0 | 0.0 |
| | Landfill (kg) | 8.3 | 10.1 | 15.4 |
| | Incineration (kg) | 2.1 | 2.5 | 3.9 |
| Removals of biogenic carbon (kg $CO_2$ eq) | | 9.6 | 11.7 | 17.9 |

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# 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.

**Table 8.** *Life cycle phases included in the product system boundary.*

| Product | | | Construction Process | | Use | | | | | | | End-of-life | | | | Benefits and loads beyond the system boundary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A1 | A2 | A3 | A4 | A5 | B1 | B2 | 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 | X | X | X | X | MND |

X = Included in system boundary | MND = Module not declared

The following environmental impact category indicator 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:

| Impact Category | Unit |
|---|---|
| Global Warming Potential (GWP 100) | kg $CO_2$ eq |
| Ozone Depletion Potential (ODP) | kg CFC 11 eq |
| Acidification Potential (AP) | kg $SO_2$ eq |
| Eutrophication Potential (EP) | kg N eq |
| Smog Formation Potential (POCP) | kg $O_3$ eq |
| Fossil Fuel Depletion Potential (FFD) | MJ Surplus, LHV |

These six 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 | $m^3$ | | |

Life cycle impact assessment results for the Wildwood cladding system products are presented below. Note that Modules C1 and C3 are not associated with any impact as the products are expected to be manually deconstructed. Additionally, Modules A4, A5, B1-B7 and D are not declared. In the interest of space and table readability, these modules are not included in the results presented below.



**Table 9.** *TRACI Life Cycle Impact Assessment (LCIA) results for the **Wildwood Cladding – 1 x 6** products. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.*

| Impact Category | Unit | Raw Materials | Transport | Manufacturing | Transport to Disposal | Disposal |
|---|---|---|---|---|---|---|
| Global warming | kg $CO_2$ eq | 6.91 | 4.19 | 3.59 | 1.32 | 3.79 |
| | % | 35% | 21% | 18% | 6.7% | 19% |
| Acidification | kg $SO_2$ eq | $3.40x10^{-2}$ | $1.91x10^{-2}$ | $1.39x10^{-2}$ | $7.60x10^{-3}$ | $2.03x10^{-3}$ |
| | % | 44% | 25% | 18% | 9.9% | 2.6% |
| Eutrophication | kg N eq | $1.89x10^{-2}$ | $4.58x10^{-3}$ | $1.83x10^{-2}$ | $9.67x10^{-4}$ | $8.42x10^{-2}$ |
| | % | 15% | 3.6% | 14% | 0.76% | 66% |
| Smog | kg $O_3$ eq | 0.431 | 0.459 | 0.158 | 0.215 | $4.80x10^{-2}$ |
| | % | 33% | 35% | 12% | 16% | 3.7% |
| Ozone depletion | kg CFC-11 eq | $2.44x10^{-3}$ | $9.72x10^{-7}$ | $1.60x10^{-7}$ | $3.04x10^{-7}$ | $6.09x10^{-8}$ |
| | % | 100% | 0.04% | 0.0066% | 0.012% | 0.0025% |
| Fossil fuel depletion | MJ surplus | 14.0 | 8.89 | 4.79 | 2.72 | 0.559 |
| | % | 45% | 29% | 15% | 8.8% | 1.8% |

**Table 10.** *Resource use and waste flows for the **Wildwood Cladding – 1 x 6** products. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits*

| Parameter | Unit | Raw Materials | Transport | Manufacturing | Transport to Disposal | Disposal |
|---|---|---|---|---|---|---|
| ***Energy Use*** | | | | | | |
| Use of renewable primary energy | MJ | 7.02 | 0.711 | 15.5 | $6.90x10^{-2}$ | 0.105 |
| | % | 30% | 3% | 66% | 0.29% | 0.45% |
| Use of renewable primary energy resources used as raw materials | MJ | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 0% | 0% | 0% | 0% | 0% |
| Use of nonrenewable primary energy | MJ | INA | INA | INA | INA | INA |
| Use of nonrenewable primary energy resources used as raw materials | MJ | INA | INA | INA | INA | INA |
| Use of secondary materials | kg | 9.17 | 0.00 | 0.00 | 0.00 | 0.00 |
| | % | 100% | 0% | 0% | 0% | 0% |
| Renewable secondary fuel use | MJ | Neg. | Neg. | Neg. | Neg. | Neg. |
| Nonrenewable secondary fuel use | MJ | Neg. | Neg. | Neg. | Neg. | Neg. |
| Recovered energy | MJ | Neg. | Neg. | Neg. | Neg. | Neg. |
| Use of net fresh water | $m^3$ | 0.421 | $4.35x10^{-2}$ | $2.85x10^{-2}$ | $5.70x10^{-3}$ | $2.14x10^{-2}$ |
| | % | 81% | 8.4% | 5.5% | 1.1% | 4.1% |
| ***Waste Flows*** | | | | | | |
| Nonhazardous waste disposed | kg | 3.07 | 3.20 | 1.53 | $9.20x10^{-2}$ | 8.64 |
| | % | 19% | 19% | 9.2% | 0.56% | 52% |
| Hazardous waste disposed | kg | $7.44x10^{-5}$ | $1.66x10^{-4}$ | $3.59x10^{-5}$ | $4.92x10^{-5}$ | $1.03x10^{-5}$ |
| | % | 22% | 50% | 11% | 15% | 3% |
| High-level radioactive waste | kg | $6.46x10^{-5}$ | $3.19x10^{-6}$ | $9.82x10^{-6}$ | $2.86x10^{-7}$ | $4.45x10^{-7}$ |
| | % | 82% | 4.1% | 13% | 0.36% | 0.57% |
| Intermediate and low-level radioactive waste | kg | $4.64x10^{-4}$ | $4.09x10^{-4}$ | $6.03x10^{-5}$ | $1.28x10^{-4}$ | $2.30x10^{-5}$ |
| | % | 43% | 38% | 5.6% | 12% | 2.1% |
| Materials for recycling | kg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Components for re-use | kg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Materials for energy recovery | kg | Neg. | Neg. | Neg. | Neg. | Neg. |
| Exported energy | MJ | Neg. | Neg. | Neg. | Neg. | Neg. |

INA = Indicator not assessed | Neg. = Negligible

**Table 11.** *TRACI Life Cycle Impact Assessment (LCIA) results for the **Wildwood Cladding – 1 x 8** products. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.*

| Impact Category | Unit | Raw Materials | Transport | Manufacturing | Transport to Disposal | Disposal |
|---|---|---|---|---|---|---|
| Global warming | kg $CO_2$ eq | 8.22 | 5.07 | 4.24 | 1.60 | 4.52 |
| | % | 35% | 21% | 18% | 6.7% | 19% |
| Acidification | kg $SO_2$ eq | $4.04x10^{-2}$ | $2.31x10^{-2}$ | $1.64x10^{-2}$ | $9.19x10^{-3}$ | $2.35x10^{-3}$ |
| | % | 44% | 25% | 18% | 10% | 2.6% |
| Eutrophication | kg N eq | $2.24x10^{-2}$ | $5.54x10^{-3}$ | $2.17x10^{-2}$ | $1.17x10^{-3}$ | 0.101 |
| | % | 15% | 3.6% | 14% | 0.77% | 67% |
| Smog | kg $O_3$ eq | 0.513 | 0.555 | 0.186 | 0.261 | $5.53x10^{-2}$ |
| | % | 33% | 35% | 12% | 17% | 3.5% |
| Ozone depletion | kg CFC-11 eq | $2.92x10^{-3}$ | $1.18x10^{-6}$ | $1.86x10^{-7}$ | $3.68x10^{-7}$ | $6.99x10^{-8}$ |
| | % | 100% | 0.04% | 0.0063% | 0.013% | 0.0024% |
| Fossil fuel depletion | MJ surplus | 16.6 | 10.7 | 5.54 | 3.29 | 0.641 |
| | % | 45% | 29% | 15% | 8.9% | 1.7% |

**Table 12.** *Resource use and waste flows for the **Wildwood Cladding – 1 x 8** products. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits*

| Parameter | Unit | Raw Materials | Transport | Manufacturing | Transport to Disposal | Disposal |
|---|---|---|---|---|---|---|
| ***Energy Use*** | | | | | | |
| Use of renewable primary energy | MJ | 8.38 | 0.860 | 18.6 | $8.35x10^{-2}$ | 0.125 |
| | % | 30% | 3.1% | 66% | 0.3% | 0.45% |
| Use of renewable primary energy resources used as raw materials | MJ | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 0% | 0% | 0% | 0% | 0% |
| Use of nonrenewable primary energy | MJ | INA | INA | INA | INA | INA |
| Use of nonrenewable primary energy resources used as raw materials | MJ | INA | INA | INA | INA | INA |
| Use of secondary materials | kg | 11.1 | 0.00 | 0.00 | 0.00 | 0.00 |
| | % | 100% | 0% | 0% | 0% | 0% |
| Renewable secondary fuel use | MJ | Neg. | Neg. | Neg. | Neg. | Neg. |
| Nonrenewable secondary fuel use | MJ | Neg. | Neg. | Neg. | Neg. | Neg. |
| Recovered energy | MJ | Neg. | Neg. | Neg. | Neg. | Neg. |
| Use of net fresh water | $m^3$ | 0.502 | $5.26x10^{-2}$ | $2.93x10^{-2}$ | $6.90x10^{-3}$ | $2.59x10^{-2}$ |
| | % | 81% | 8.5% | 4.8% | 1.1% | 4.2% |
| ***Waste Flows*** | | | | | | |
| Nonhazardous waste disposed | kg | 3.67 | 3.87 | 1.85 | 0.111 | 10.4 |
| | % | 18% | 19% | 9.3% | 0.56% | 52% |
| Hazardous waste disposed | kg | $8.85x10^{-5}$ | $2.01x10^{-4}$ | $4.20x10^{-5}$ | $5.95x10^{-5}$ | $1.18x10^{-5}$ |
| | % | 22% | 50% | 10% | 15% | 2.9% |
| High-level radioactive waste | kg | $7.79x10^{-5}$ | $3.86x10^{-6}$ | $1.17x10^{-5}$ | $3.46x10^{-7}$ | $5.33x10^{-7}$ |
| | % | 83% | 4.1% | 12% | 0.37% | 0.56% |
| Intermediate and low-level radioactive waste | kg | $5.55x10^{-4}$ | $4.94x10^{-4}$ | $7.10x10^{-5}$ | $1.55x10^{-4}$ | $2.62x10^{-5}$ |
| | % | 43% | 38% | 5.5% | 12% | 2% |
| Materials for recycling | kg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Components for re-use | kg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Materials for energy recovery | kg | Neg. | Neg. | Neg. | Neg. | Neg. |
| Exported energy | MJ | Neg. | Neg. | Neg. | Neg. | Neg. |

INA = Indicator not assessed | Neg. = Negligible

**Table 13.** *TRACI Life Cycle Impact Assessment (LCIA) results for the **Wildwood Cladding – 1 x 12** products. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.*

| Impact Category | Unit | Raw Materials | Transport | Manufacturing | Transport to Disposal | Disposal |
|---|---|---|---|---|---|---|
| Global warming | kg $CO_2$ eq | 12.4 | 7.75 | 6.21 | 2.44 | 6.77 |
| | % | 35% | 22% | 17% | 6.9% | 19% |
| Acidification | kg $SO_2$ eq | $6.06x10^{-2}$ | $3.53x10^{-2}$ | $2.42x10^{-2}$ | $1.41x10^{-2}$ | $3.34x10^{-3}$ |
| | % | 44% | 26% | 18% | 10% | 2.4% |
| Eutrophication | kg N eq | $3.35x10^{-2}$ | $8.46x10^{-3}$ | $3.18x10^{-2}$ | $1.79x10^{-3}$ | 0.154 |
| | % | 15% | 3.7% | 14% | 0.78% | 67% |
| Smog | kg $O_3$ eq | 0.774 | 0.848 | 0.271 | 0.399 | $7.76x10^{-2}$ |
| | % | 33% | 36% | 11% | 17% | 3.3% |
| Ozone depletion | kg CFC-11 eq | $4.51x10^{-3}$ | $1.80x10^{-6}$ | $2.63x10^{-7}$ | $5.64x10^{-7}$ | $9.74x10^{-8}$ |
| | % | 100% | 0.04% | 0.0058% | 0.012% | 0.0022% |
| Fossil fuel depletion | MJ surplus | 24.7 | 16.4 | 7.81 | 5.04 | 0.895 |
| | % | 45% | 30% | 14% | 9.2% | 1.6% |

**Table 14.** *Resource use and waste flows for the **Wildwood Cladding – 1 x 12** products. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits*

| Parameter | Unit | Raw Materials | Transport | Manufacturing | Transport to Disposal | Disposal |
|---|---|---|---|---|---|---|
| ***Energy Use*** | | | | | | |
| Use of renewable primary energy | MJ | 12.7 | 1.31 | 28.0 | 0.128 | 0.189 |
| | % | 30% | 3.1% | 66% | 0.3% | 0.45% |
| Use of renewable primary energy resources used as raw materials | MJ | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 0% | 0% | 0% | 0% | 0% |
| Use of nonrenewable primary energy | MJ | INA | INA | INA | INA | INA |
| Use of nonrenewable primary energy resources used as raw materials | MJ | INA | INA | INA | INA | INA |
| Use of secondary materials | kg | 17.1 | 0.00 | 0.00 | 0.00 | 0.00 |
| | % | 100% | 0% | 0% | 0% | 0% |
| Renewable secondary fuel use | MJ | Neg. | Neg. | Neg. | Neg. | Neg. |
| Nonrenewable secondary fuel use | MJ | Neg. | Neg. | Neg. | Neg. | Neg. |
| Recovered energy | MJ | Neg. | Neg. | Neg. | Neg. | Neg. |
| Use of net fresh water | $m^3$ | 0.757 | $8.03x10^{-2}$ | $3.19x10^{-2}$ | $1.06x10^{-2}$ | $3.95x10^{-2}$ |
| | % | 82% | 8.7% | 3.5% | 1.1% | 4.3% |
| ***Waste Flows*** | | | | | | |
| Nonhazardous waste disposed | kg | 5.57 | 5.91 | 2.78 | 0.170 | 15.9 |
| | % | 18% | 20% | 9.2% | 0.56% | 52% |
| Hazardous waste disposed | kg | $1.33x10^{-4}$ | $3.08x10^{-4}$ | $6.07x10^{-5}$ | $9.11x10^{-5}$ | $1.64x10^{-5}$ |
| | % | 22% | 51% | 10% | 15% | 2.7% |
| High-level radioactive waste | kg | $1.19x10^{-4}$ | $5.89x10^{-6}$ | $1.73x10^{-5}$ | $5.29x10^{-7}$ | $8.01x10^{-7}$ |
| | % | 83% | 4.1% | 12% | 0.37% | 0.56% |
| Intermediate and low-level radioactive waste | kg | $8.37x10^{-4}$ | $7.55x10^{-4}$ | $1.04x10^{-4}$ | $2.37x10^{-4}$ | $3.61x10^{-5}$ |
| | % | 43% | 38% | 5.3% | 12% | 1.8% |
| Materials for recycling | kg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Components for re-use | kg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Materials for energy recovery | kg | Neg. | Neg. | Neg. | Neg. | Neg. |
| Exported energy | MJ | Neg. | Neg. | Neg. | Neg. | Neg. |

INA = Indicator not assessed | Neg. = Negligible

# 6. LCA: Interpretation

The interpretation phase conforms to ISO 14044 with further guidance from the ILCD General Guide for Life Cycle Assessment. The interpretation included the use of evaluation and sensitivity checks to steer the iterative process during the assessment, and a final evaluation including completeness, sensitivity, and consistency checks, at the end of the study.

With the exception of the Eutrophication Potential indicator, which is dominated by the disposal phase, the contributions to total impact indicators are dominated by the raw material extraction and upstream transport phase. The product manufacturing phase is generally the next highest contributor followed by product disposal.

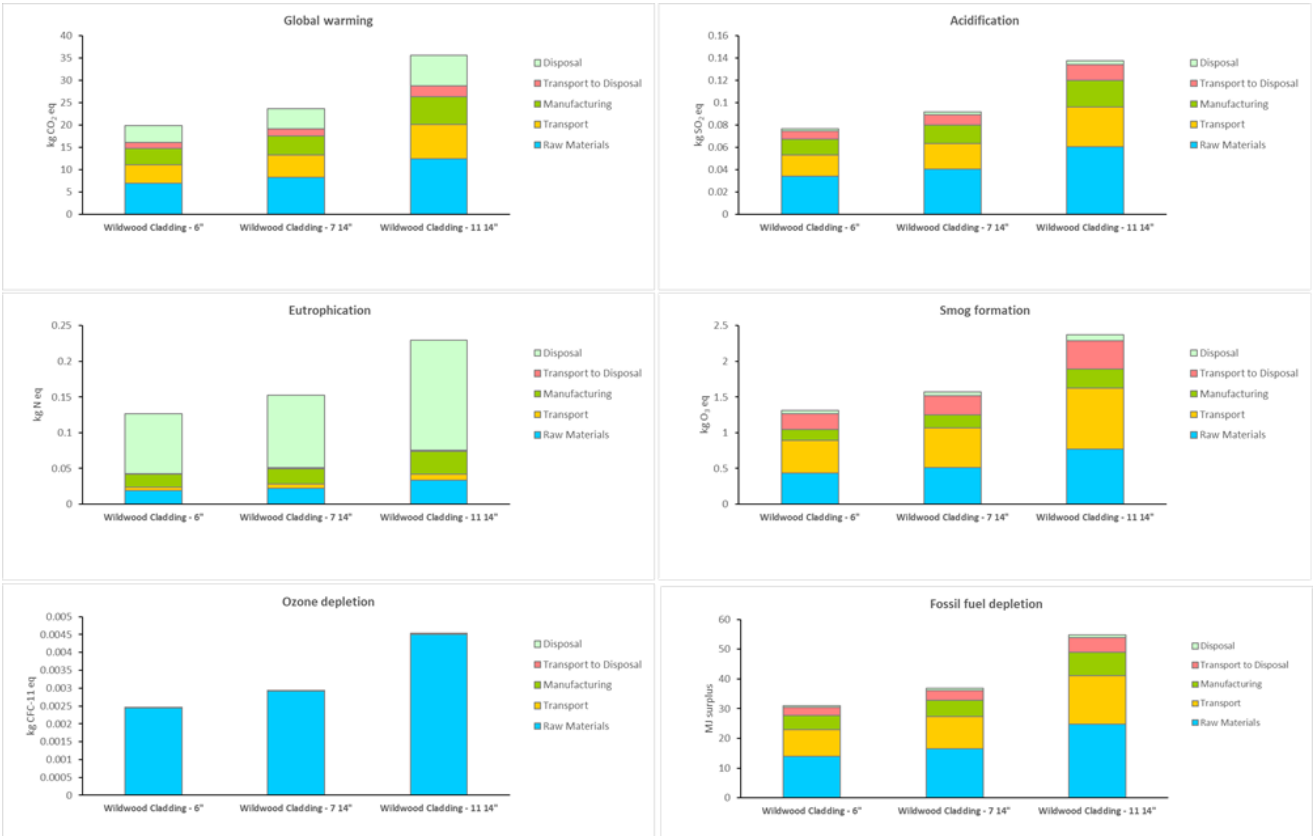



**Figure 2.** *Contribution analysis for the Fiberon products – TRACI 2.1.*

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