`

KEILHAUER

VERIFIED by SCS Global Services
ENVIRONMENTAL PRODUCT DECLARATION
BASED ON LCA

Declaration Owner
Keilhauer
1450 Birchmount Rd
Toronto, ON, M1P 2E3
1.800.724.5665 | www.keilhauer.com

Product
Foryu Seating

(UNCPC Class 3811, Subclass 38119 - Other seats)

Functional Unit
One unit of seating to seat one individual, maintained for a 10 year period

EPD Number and Period of Validity
SCS-EPD-10244
Valid August 26, 2024 through August 25, 2029

Product Category Rule
Product Category Rule (PCR) Environmental Product Declarations (EPD), BIFMA PCR for Seating: UNCPC 3811, Version 3, Extended 12 months per PCRext 2023-111, valid through September 30, 2024.

Program Operator
SCS Global Services
2000 Powell Street, Ste. 600, Emeryville, CA 94608
+1.510.452.8000 | www.SCSglobalServices.com

SCSglobal SERVICES

Declaration Owner:	Keilhauer
Address:	1450 Birchmount Rd., Toronto, ON, M1P 2E3
Product:	Foryu Seating
Declaration Number:	SCS-EPD-10244
Declaration Validity Period:	Valid August 26, 2024 through August 25, 2029
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 v2.1 software and the Ecoinvent v3.10 database
Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071	☐ internal ☒ external
LCA Reviewer:	Lindita Bushi, Ph.D., Athena Sustainable Materials Institute
Product Category Rule:	Product Category Rule (PCR) Environmental Product Declarations (EPD), BIFMA PCR for Office Furniture Seating products: UNCPC 3814. August 5, 2015. NSF Version 3, Extended 12 months per PCRext 2023-111, valid through September 30, 2024
PCR Review conducted by:	
Independent verification of the declaration and data, according to ISO 14025 and the PCR	☐ internal ☒ external
EPD Verifier:	Lindita Bushi, Ph.D., Athena Sustainable Materials Institute
Declaration Contents:	

Disclaimers: *This EPD conforms to ISO 14025, 14040, and 14044.*

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.*

TABLE OF CONTENTS

ABOUT KEILHAUER

Keilhauer thoughtfully manufactures seating and tables for all the different ways people work. Keilhauer products are made to support engaging communications in offices, lobbies, lunchrooms and more. Working with world-renowned designers, Keilhauer is internationally recognized for award-winning design, built with a craftsmanship that is held to the highest environmental standards.

PRODUCT DESCRIPTION

Foryu is an ergonomic office chair that is designed to provide custom comfort and support to anyone who takes a seat, made possible through a fully integrated, self-weighted mechanism that automatically adjusts to and flexes with the user's unique weight and size.

MATERIAL COMPOSITION

Table 1. *Material composition of the Foryu seating. Results are shown per unit of seating and as a perfect of total.*

Material Type	Material Resource	Amount (kg/unit of seating)	Amount (%)
PET fabric	Non-renewable	0.22	2.1%
Plastic	Non-renewable	7.59	72%
Steel	Non-renewable	2.14	20%
PUR Foam	Non-renewable	0.60	5.7%
TOTAL		**10.6**	**100%**

KEY ENVIRONMENTAL PARAMETERS

Table 2. *Summary of key environmental parameters.*

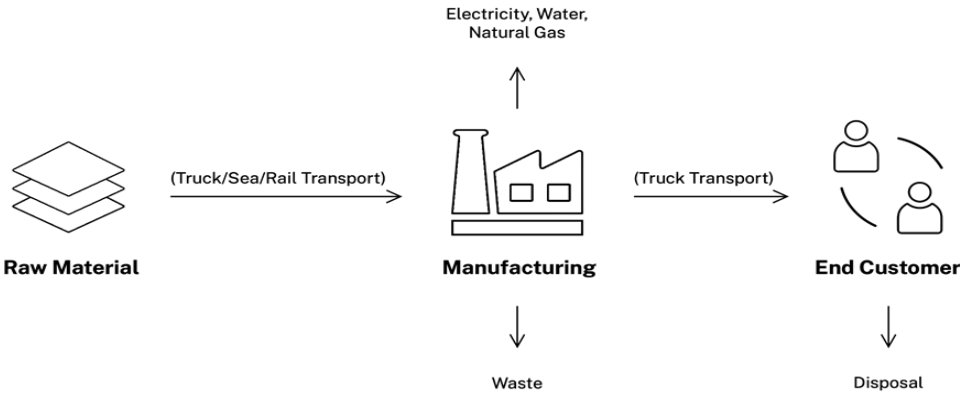
Parameter	Value	Unit
Global Warming Potential	192	kg CO_2e
Primary Energy Demand	2,600	MJ
Recycled Content	0.0	%

LIFE CYCLE ASSESSMENT STAGES

The system boundary is cradle-to-grave and includes resource extraction and processing, product manufacture and assembly, distribution/transport, use and maintenance, and end-of-life. The seating products are assessed based on a 5 year service lifetime requiring two (2) complete product lifecycles over the 10 year time horizon of the assessment. The diagram below illustrates the life cycle stages included in this EPD.

PRODUCT LIFE CYCLE FLOW DIAGRAM

The diagram below is a representation of the most significant contributions to the life cycle of *Foryu* seating products. This includes resource extraction, raw material processing, component manufacturing, transportation, assembly of chair, use and maintenance, and end-of-life.



LIFE CYCLE INVENTORY

The resource use and emissions from each step of the product life cycle are summed to obtain the life cycle inventory results. Table 3 shows inventory categories for energy and water consumption.

Table 3. *Inventory categories for energy and water consumption. Results are shown for one unit of seating to seat one individual over a 10 year time period.*

Parameter	Units	Total (per 1 unit of seating)
Primary Energy Demand	MJ	2,600
Non-Renewable Energy, Fossil Fuels	MJ	2,120
Non-Renewable Energy, Nuclear	MJ	134
Renewable Energy	MJ	341
Freshwater Consumption	kg	8,540

LIFE CYCLE IMPACT ASSESSMENT

Impact category indicators are calculated using TRACI 2.1 characterization methods, including acidification potential, eutrophication potential, smog potential, ozone depletion potential, and global warming potential, in accordance with the BIFMA PCR. Note, biogenic carbon uptake and biomass CO_2 emissions are not included.

Table 4. *Life cycle impact assessment results for the Foryu seating products. Results are shown for one unit of seating to seat one individual over a 10 year period.*

Impact Category	Units	Raw Material Extraction & Processing	Production (Manufacturing & Assembly)	Distribution, Use & Maintenance	End-of-Life	Total
Global Warming Potential, 100 year time horizon	kg CO_2 eq	139	30.5	13.1	9.69	192
Acidification Potential	kg SO_2 eq	0.542	0.183	$8.57x10^{-2}$	$7.84x10^{-3}$	0.819
Ozone Depletion Potential	kg CFC-11 eq	$7.19x10^{-6}$	$2.32x10^{-7}$	$1.97x10^{-7}$	$2.83x10^{-8}$	$7.65x10^{-6}$
Smog Formation Potential	kg O_3 eq	7.98	3.40	1.87	0.229	13.5
Eutrophication Potential	kg N eq	0.260	0.523	$3.42x10^{-2}$	0.579	1.40

ADDITIONAL ENVIRONMENTAL INFORMATION

Foryu is certified by Carbonfund.org to be carbon neutral through their Carbonfree® product certification.

Keilhauer has reduced emissions at every stage of our processes – from design and the materials we use to production, distribution, and end-of-life. Throughout the life cycle of the chair, there is inevitable carbon that can't be eliminated.

Keilhauer completely offsets this carbon with investments in third-party verified carbon offset projects through Carbonfund.org. The below projects are currently or have previously been supported by Keilhauer.

1. **The US Truck Stop Electrification Project**

   Foryu seating, along with all Keilhauer products, are transported via truck to reach the final customer. Keilhauer is supporting this project to specifically address the carbon emissions of our product transportation.

2. **The Minnesota Forestry Improvement Project**

   Many of Keilhauer's products contain wood components and it is important to us to consistently measure and manage our natural resource use. Supporting this project means contributing to the management and improvement of Minnesota woodlands.

3. **The Aqua Clara Water Filtration Program**

   Keilhauer believes clean water is a basic human right that every person should have access to. This water filtration program provides Kenyan communities with access to safe drinking water while generating employment opportunities and reducing deforestation.

4. **The Francis Beidler Forestry Project**

   The Francis Beidler project is a 5,548 acre protected property located in the South Carolina lowlands. This property is home to a pristine ecosystem of thousand-year-old old growth trees which aid in emission reductions through enhanced sequestration relative to baseline forest management techniques and provides essential habitat for key plant and animal species. Keilhauer is proud to support the management and upkeep of old growth forests.

For more carbon neutral information regarding *Foryu* seating, please visit https://www.keilhauer.com/.

SUPPORTING TECHNICAL INFORMATION

Unit processes are developed with OpenLCA 2.1 software, drawing upon data from multiple sources. Primary data were provided by Keilhauer for their manufacturing processes. The primary sources of secondary LCI data are from the Ecoinvent 3.10 database and published literature.

Table 5. *Data sources used for the LCA study.*

Component	Dataset	Data Source	Publication Date
PRODUCT			
Steel	steel production, converter, low-alloyed | steel, low-alloyed | Cutoff, S/RoW	EI v3.10	2023
	metal working, average for steel product manufacturing | metal working, average for steel product manufacturing | Cutoff, S/RoW	EI v3.10	2023
Plastic	nylon 6 production | nylon 6 | Cutoff, S/RoW; glass fibre production | glass fibre | Cutoff, S/RoW	EI v3.10	2023
	polypropylene production, granulate | polypropylene, granulate | Cutoff, S/RoW	EI v3.10	2023
	injection moulding | injection moulding | Cutoff, S/RoW	EI v3.10	2023
PUR Foam	market for polyurethane, flexible foam | polyurethane, flexible foam | Cutoff, S/RoW	EI v3.10	2023
Polyester Fabric	polyester fibre production, finished | fibre, polyester | Cutoff, S/RoW	EI v3.10	2023
PACKAGING			
Cardboard	containerboard production, linerboard, kraftliner | containerboard, linerboard | Cutoff, S/RoW	EI v3.10	2023
Plastic film	packaging film production, low density polyethylene | packaging film, low density polyethylene | Cutoff, S/RoW	EI v3.10	2023
Paper	kraft paper production | kraft paper | Cutoff, S/RoW	EI v3.10	2023
Adhesive	polyurethane adhesive production | polyurethane adhesive | Cutoff, S/GLO	EI v3.10	2023
TRANSPORT			
Diesel truck	transport, freight, lorry 16-32 metric ton, EURO4 | transport, freight, lorry 16-32 metric ton, EURO4 | Cutoff, S/RoW	EI v3.10	2023
Ocean freighter	transport, freight, sea, container ship | transport, freight, sea, container ship | Cutoff, S/GLO	EI v3.10	2023
RESOURCES			
Grid electricity	market for electricity, medium voltage | electricity, medium voltage | Cutoff, S/PL	EI v3.10	2023
Heat - natural gas	heat production, natural gas, at industrial furnace >100kW | heat, district or industrial, natural gas | Cutoff, S/RoW	EI v3.10	2023
Heat - diesel	diesel, burned in building machine | diesel, burned in building machine | Cutoff, S/GLO	EI v3.10	2023
Heat – fuel oil	heat production, light fuel oil, at industrial furnace 1MW | heat, district or industrial, other than natural gas | Cutoff, S/RoW	EI v3.10	2023
Heat - propane	heat production, propane, at industrial furnace >100kW | heat, district or industrial, other than natural gas | Cutoff, S/RoW	EI v3.10	2023
Heat - wood	heat production, wood chips from industry, at furnace 50kW | heat, central or small-scale, other than natural gas | Cutoff, S/RoW	EI v3.10	2023
Water	tap water production, conventional treatment | tap water | Cutoff, S/RoW	EI v3.10	2023
WASTE DESPOSAL			
Incineration	treatment of municipal solid waste, incineration | municipal solid waste | Cutoff, S/RoW	EI v3.10	2023
	treatment of waste plastic, mixture, municipal incineration | waste plastic, mixture | Cutoff, S/RoW	EI v3.10	2023
	treatment of scrap steel, municipal incineration | scrap steel | Cutoff, S/RoW	EI v3.10	2023
Landfill	treatment of municipal solid waste, sanitary landfill | municipal solid waste | Cutoff, S/RoW	EI v3.10	2023
	treatment of waste plastic, mixture, sanitary landfill | waste plastic, mixture | Cutoff, S/RoW	EI v3.10	2023
	treatment of scrap steel, inert material landfill | scrap steel | Cutoff, S/RoW	EI v3.10	2023
Wastewater	treatment of wastewater, average, wastewater treatment | wastewater, average | Cutoff, S/RoW	EI v3.10	2023
Heat – fuel oil	heat production, light fuel oil, at industrial furnace 1MW | heat, district or industrial, other than natural gas | Cutoff, S/RoW	EI v3.10	2023

Data Quality

Data Quality Parameter	Data Quality Discussion
Time-Related Coverage: Age of data and the minimum length of time over which data is collected	The most recent available data are used, based on other considerations such as data quality and similarity to the actual operations. Typically, these data are less than 5 years old. 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 2022.
Geographical Coverage: Geographical area from which data for unit processes is collected to satisfy the goal of the study	The data used in the analysis provide the best possible representation available with current data. Electricity use for product manufacture is modeled using representative data for Poland. 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: 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: Measure of the variability of the data values for each data expressed	Precision of results are not quantified due to a lack of data. Data collected for operations were typically averaged for one or more years and over multiple operations, which is expected to reduce the variability of results.
Completeness: Percentage of flow that is measured or estimated	The LCA model included all known mass and energy flows for production of the 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: Qualitative assessment of the degree to which the data set reflects the true population of interest	Data used in the assessment represent typical or average processes as currently reported from multiple data sources and are therefore generally representative of the range of actual processes and technologies for production of these materials. Considerable deviation may exist among actual processes on a site-specific basis; however, such a determination would require detailed data collection throughout the supply chain back to resource extraction.
Consistency: Qualitative assessment of whether the study methodology is applied uniformly to the various components of the analysis	The consistency of the assessment is considered to be high. Data sources of similar quality and age are used; with a bias towards Ecoinvent v3.10 data where available. Different portions of the product life cycle are equally considered.
Reproducibility: Qualitative assessment of the extent to which information about the methodology and data values would allow an independent practitioner to reproduce the results reported in the study	Based on the description of data and assumptions used, this assessment would be reproducible by other practitioners. All assumptions, models, and data sources are documented.
Sources of the Data: Description of all primary and secondary data sources	Data representing energy use at the manufacturing facilities represent an annual average and are considered of high quality due to the length of time over which these data are collected, as compared to a snapshot that may not accurately reflect fluctuations in production. For secondary LCI data, Ecoinvent v3.10 LCI data are used.
Uncertainty of the Information: 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.

Allocation

Electricity and resource use at the production facility in Poland (e.g., water and energy) was allocated to the product based on processing machine runtime for the product as a fraction of the total annual facility machine operating time for 2022. Electricity use at the manufacturing facility was modeled using country-specific inventory datasets from the Ecoinvent LCI database. Neither green power nor carbon offsets are used in the modeling inventory for product manufacture. Additionally, no on-site renewable energy from solar cells or other renewable energy sources is applicable for this project.

Impacts from transportation were allocated based on the mass of material and distance transported.

System Boundaries

The system boundaries of the life cycle assessment for the *Foryu* seating products are cradle-to-grave. A description of the system boundaries for this study are as follows:

- **Raw Material Extraction and Processing** – This stage includes extraction of virgin materials and reclamation of non-virgin feedstock. This includes the extraction of all raw materials, including the transport to the manufacturing site. Resource use and emissions associated with both the extraction of the raw materials used in the workstation, as well as those associated with the processing of raw materials and workstation component manufacturing are included. Impacts associated with the transport of the processed raw materials to manufacturing facilities (upstream transport) are also included in this stage.
- **Production** – This stage includes all the relevant manufacturing processes and flows, excluding production of capital goods, infrastructure, production of manufacturing equipment, and personnel-related activities. This stage includes the impacts from energy use and emissions associated with the processes occurring at the manufacturing facility. Energy use at the facility is excluded unless used directly for the manufacturing process. This stage also includes the production and disposal (including transport) of the product packaging materials.
- **Distribution, Use, and Maintenance** – This stage includes the delivery of the seating product to the point of use (downstream transportation) and the use, cleaning and maintenance of the workstation for a period of 10 years. Also included are the impacts from extraction, manufacture and transport of all sundry material for maintenance and cleaning.
- **End of life stage** – The end-of-life stage includes transport of the seating product to material reclamation or waste treatment facilities. Emissions from disposal of seating product components in a landfill or from incineration are included.

Cut-off criteria

According to the PCR, cumulative omitted mass or energy flows within the product boundary shall not exceed 5%. In the present study, except as noted, all known materials and processes were included in the life cycle inventory.

REFERENCES

1. Life Cycle Assessment of Keilhauer Foryu Seating. SCS Global Services Report. Prepared for Keilhauer. August 2024.
2. ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and Procedures.
3. ISO 14040: 2006/AMD 1:2020 Environmental Management – Life cycle assessment – Principles and Framework
4. ISO 14044: 2006/AMD 1:2017/ AMD 2:2020 Environmental Management – Life cycle assessment – Requirements and Guidelines.
5. SCS Type III Environmental Declaration Program: Program Operator Manual. V12.0 December 2023. SCS Global Services.
6. Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI). Dr. Bare, J., https://www.epa.gov/chemical-research/tool-reduction-and-assessment-chemicals-and-other-environmental-impacts-trac.i
7. Ecoinvent Centre (2023) ecoinvent data from v3.10. Swiss Center for Life Cycle Inventories, Dübendorf, 2023, http://www.ecoinvent.org .
8. US EPA. Advancing Sustainable Materials Management:2018 Fact Sheet Assessing Trends in Materials Generation and Management in the United States. November 2020. https://www.epa.gov/sites/production/files/2020-11/documents/2018_ff_fact_sheet.pdf..
9. Product Category Rule (PCR) Environmental Product Declarations (EPD), BIFMA PCR for Office Furniture Seating products: UNCPC 3814. August 5, 2015. NSF Version 3, Extended 12 months per PCRext 2023-111, valid through September 30, 2024.

For more information contact:

KEILHAUER

Keilhauer
1450 Birchmount Rd
Toronto, ON, M1P 2E3
1.800.724.5665 | www.keilhauer.com

SCS Global Services
2000 Powell Street, Ste. 600, Emeryville, CA 94608 USA
Main +1.510.452.8000 | fax +1.510.452.8001