Furnishing Knowledge®

VERIFIED by SCS GLOBAL SERVICES
ENVIRONMENTAL PRODUCT DECLARATION
BASED ON LCA

KI

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KI is a contract furniture company that manufactures innovative furniture and movable wall systems for educational, university, business and government market.

Product:

Strive Cantilever Arm Task Chair

Upholstered Seat and Back (SPDCAUB)

Functional Unit

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

EPD Number and Period of Validity

SCS-EPD-03927

Beginning Date: March 21, 2016 – End Date: March 20, 2021

Product Category Rule

BIFMA PCR for Seating: UNCPC 3811, Version 3

Program Operator:

SCS Global Services

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SCSglobal SERVICES

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Disclaimers: *This Environmental Product Declaration (EPD) conforms toto ISO 14025, 14040, and ISO 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.*

PCR Review Chairperson	Tom Gloria, PhD, Industrial Ecology Consultants t.gloria@industrial-ecology.com
Approved: March 21, 2016 Valid until: March 20, 2021	
Independent verification of the declaration and data, according to ISO 14025:2006	☐ internal ☑ external
Third party verifier	Tom Gloria, PhD, Industrial Ecology Consultants

PRODUCT SPECIFICATIONS

KI's Strive® chair is available in a variety of styles and accessories to fit your needs including stools, stackable/nesting frames, writing tables and task chairs. It features a flexible back and contoured seat to encourage movement, greater comfort, and enhanced circulation.

Strive's simple, yet elegant style delivers an able task chair solution for corporate interiors, education spaces and healthcare areas. Blending with a wide variety of architectural styles, Strive® offers a consistent design language through an extended seating collection that includes 4-leg, sled-base and caster base stack chairs, high-density stack chairs, café stools, nesting chairs, task chairs, task stools, tandem seating, and fixed seating.

For more information on the product, please visit http://www.ki.com/products/name/strive-task-chair

KEY ENVIRONMENTAL PARAMETERS

Table 1. *Key Environmental Parameters, over the life cycle of the Strive® chairs.*

Parameter	Strive Cantilever Arm Task Chair
Global Warming Potential, 100 year time horizon	100 kg CO_2 eq
Primary Energy Demand	1,600 MJ
Percentage of Recycled Content	55%

MATERIAL RESOURCES

The following tables provide a description of the materials in the Strive® Task chairs. Table 2 provides this information by type of material and Table 3 describes the material content through classification of material resources based on their recyclability and renewability characteristics.

Table 2. *Description of the material content for each Strive® Task Chair.*

Material Type	Strive Cantilever Arm Task Chair	
	Weight (kg)	Percent of Product
Steel	5.9	44%
Plastic	5.6	42%
Nylon	1.7	12%
Coatings/Other	0.26	1.9%
Aluminum	$4.1x10^{-2}$	0.30%
Zinc	$1.3x10^{-2}$	0.09%
TOTAL	**13**	**100%**

Table 3. *Classification of the material resources for each Strive® Task Chair.*

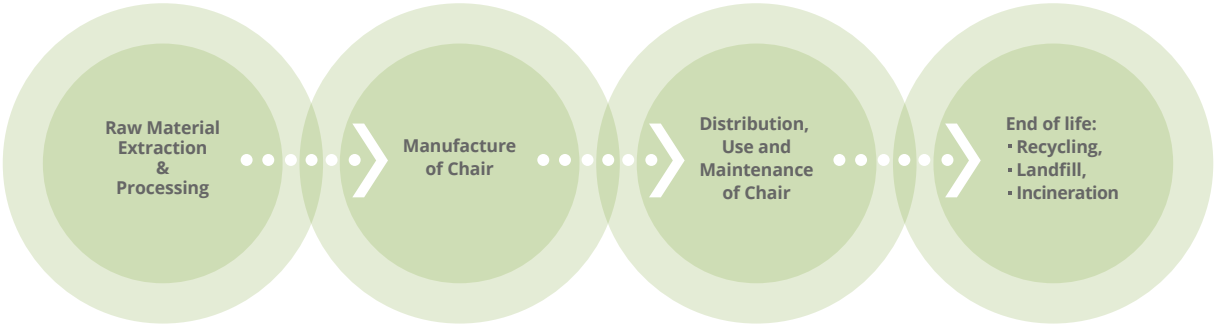
Material Type	Strive Cantilever Arm Task Chair	
	Weight (kg)	Percent of Product
Virgin Renewable Resources	-	-
Recycled Resources	7.3	55%
Virgin Non-renewable Resources	6.1	45%

ADDITIONAL ENVIRONMENTAL INFORMATION

- The Strive® seating products included in this EPD are 3rd party certified level® 1.
- Strive® Task Chairs support a healthy indoor environment through emissions testing. Strive® chairs are certified Indoor Advantage™ Gold, qualify for LEED low-emitting materials credits, comply with ANSI/BIFMA X7.1/M7.1, and meet CA 01350 air emissions requirements.
- Strive® seating is manufactured in Green Bay, Wisconsin, at an ISO 9001 facility.

LIFE CYCLE ASSESSMENT OVERVIEW

A Life Cycle Assessment (LCA) was conducted to evaluate the environmental performance of the Strive® Task Chair. LCA is an assessment of the environmental and human health potential impacts of a product over its entire life cycle, from raw material extraction through manufacturing, use, and end-of-life.



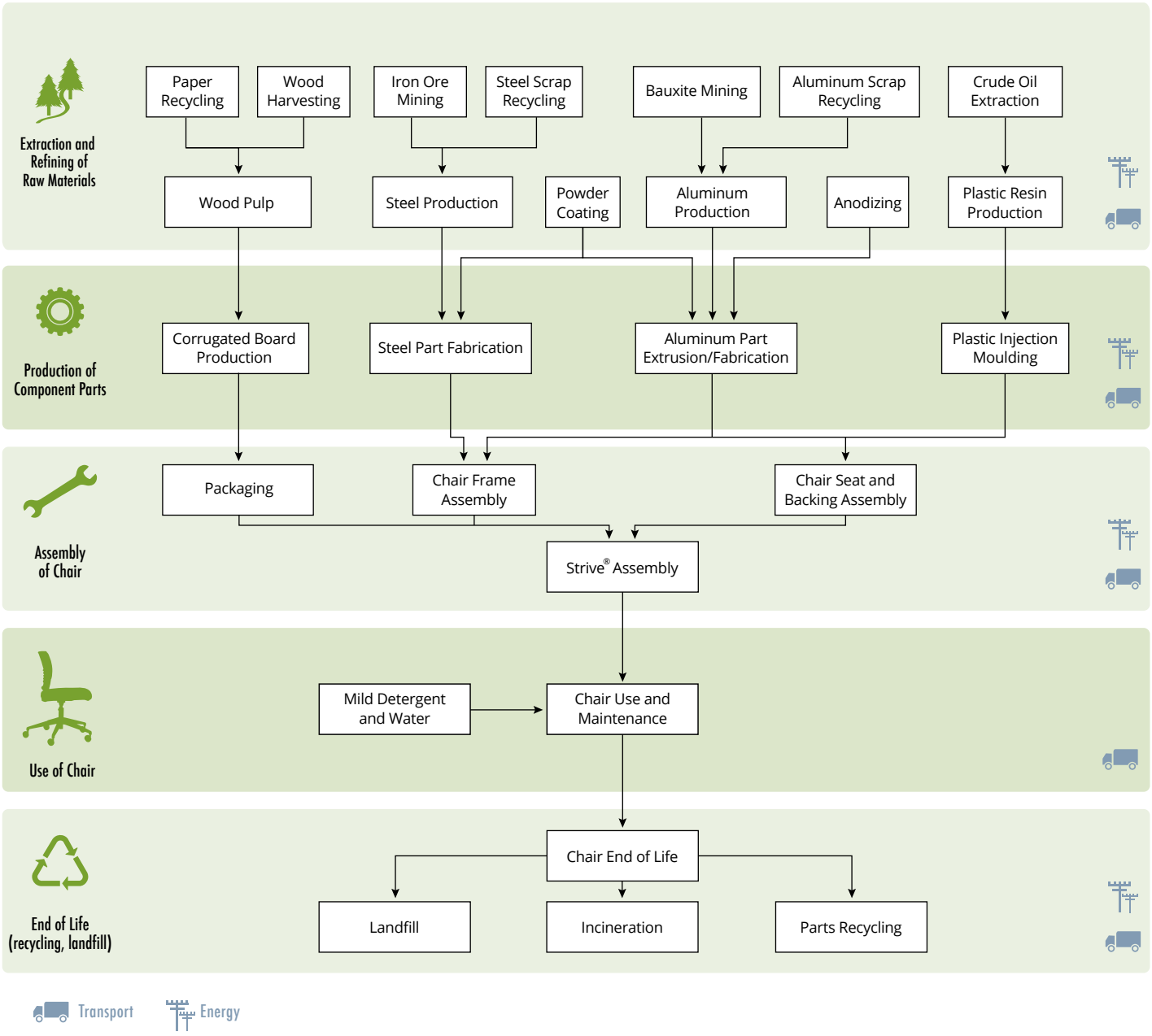
Raw Material Extraction and Processing: This phase of the chair's life cycle includes extraction and refining of raw materials such as mining of iron ore for steel production; crude oil refining and extraction into fossil-based resins. This phase also includes the transport, processing and/or forming the raw materials (e.g., steel, plastics) into parts for Strive® seating. Plastics are injection modeled in forms while raw steel is extruded or formed into other parts. Also included are reprocessing of recycled materials such as steel scrap for reuse in the chair.

Manufacture of Chair: Strive® chairs are assembled in Green Bay, Wisconsin at an ISO 9001 facility. The finished chair is inspected and then packaged for distribution.

Distribution, Use, and Maintenance of Chair: Based on ANSI/BIFMA x5.1 performance testing, Strive® Task Chairs are expected to provide seating for 10 years under normal use conditions. The performance test is a minimum performance test and does not preclude that the chair may last for a longer period of time. For the LCA, it was assumed that the chair is cleaned monthly with a mild detergent for the 10 year period.

End-of-Life: For end-of-life, it is assumed that a portion of the used chair will go to a landfill or is incinerated, while the remainder will be disassembled so that the recycled parts can be used as raw material to manufacture new products. These assumptions about end-of-life are based on US EPA statistics for the disposal of durable goods and requirements from the Product Category Rule.

The diagram below is a representation of the most significant contributions to the life cycle of the KI Strive® Task Chair. This includes resource extraction, raw material processing, component manufacturing, transportation, assembly of chair, use and maintenance, and end-of-life.



LIFE CYCLE INVENTORY AND ENVIRONMENTAL PARAMETERS

The resource use and emissions from each step of the product life cycle are summed to obtain the life cycle inventory results. Table 4 summarizes the aggregated inventory flows by life cycle stage, including water and energy consumption, and waste generation.

Table 4. *Aggregated inventory flows, by life cycle stage, for the Strive® Task Chair.*

Parameter	Units	Total	Raw Material Extraction and Processing	Manufacture of Chair	Distribution, Use, and Maintenance	End-of-life
Energy Consumption						
Primary Energy Demand	MJ	1,600	1,000	490	68	4.6
Fossil Fuel Energy	MJ	1,500	90	480	66	4.5
Renewable Energy	MJ	94	84	7.6	2.0	8.0×10^{-2}
Miscellaneous Fuels	MJ	3.8×10^{-3}	2.1×10^{-4}	3.6×10^{-3}	-	-
Water Consumption						
Water Use	kg	1,100	80	980	1.2	6.5
Waste Generation						
Incineration with energy recovery	kg	1.5×10^{-3}	5.4×10^{-5}	1.5×10^{-3}	-	-
Incineration without energy recovery	kg	13	1.5×10^{-3}	9.0	-	4.4
Landfill	kg	55	0.17	46	-	8.8
Hazardous waste	kg	9.0	2.4×10^{-3}	9.0	3.7×10^{-5}	6.6×10^{-7}
Recycling	kg	2.2	-	-	-	2.2

LIFE CYCLE IMPACT ASSESSMENT

Life cycle impact assessment is the process of converting the life cycle inventory results into a representation of environmental and human health impacts. For example, emissions of carbon dioxide, methane, and nitrous oxide (inventory data) together contribute to climate change (impact assessment). The impact assessment for the EPD is conducted in accordance with the requirements of the Product Category Rule (PCR). Impact category indicators were estimated using TRACI v2.1 characterization method, including Global Warming Potential (100 year time horizon), Acidification Potential, Eutrophication Potential, Ozone Depletion Potential, and Photochemical Oxidation Creation Potential (Smog).

Table 5. *Life Cycle Impact Assessment results for one Strive® Task Chair.*

Impact Category	Units	Total	Raw Material Extraction and Processing	Manufacture of Chair	Distribution, Use, and Maintenance	End-of-life
Global Warming Potential, 100 years	kg CO_2 eq	104	54	41	4.3	3.9
Acidification Potential	kg SO_2 eq	0.51	0.29	0.20	$1.9x10^{-2}$	$2.0x10^{-3}$
Eutrophication Potential	kg N eq	0.41	0.19	0.14	$5.7x10^{-3}$	$6.9x10^{-2}$
Photochemical Ozone Creation Potential (Smog)	kg O_3 eq	7.1	3.4	3.1	0.44	$5.5x10^{-2}$
Ozone Depletion Potential	kg CFC-11 eq	$5.4x10^{-6}$	$2.6x10^{-6}$	$2.1x10^{-6}$	$7.4x10^{-7}$	$4.4x10^{-8}$

SUPPORTING TECHNICAL INFORMATION

System Boundaries

The product system under study includes the production of all product components, as well as transportation to point of use, use and maintenance, and end-of-life. The system boundaries include all unit processes contributing measurably to category indicator results for those category indicators specified in the PCR.

Cut-off Criteria

No data gaps were allowed which were expected to significantly affect the outcome of the indicator results. No single flow that represents more than 1% of the total mass or energy flows was excluded.

Data Sources

Unit processes were developed within SimaPro 8.2 software, drawing from data from multiple sources. Primary data were provided by KI and some suppliers of chair materials. Sources of secondary data include the Ecoinvent LCI database. Detailed descriptions of unit processes can be found in the accompanying documentation.

Data Sources

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Table 6. *LCI datasets and associated databases used to model material production and processing.*

Material Dataset		Processing Dataset	Publication Date
Strive Cantilever Arm Task Chair			
Aluminum (virgin)	Aluminium, primary, ingot {GLO}| market for | Alloc Rec[1]	Metal working, average for metal product manufacturing {GLO}| market for | Alloc Rec[1]	2014; 2014
Aluminum (pre-consumer recycled)	Aluminium scrap, new {GLO}| aluminium scrap, new, Recycled Content cut-off | Alloc Rec[1]	Metal working, average for metal product manufacturing {GLO}| market for | Alloc Rec[1]	2014; 2014
Aluminum (post-consumer recycled)	Aluminium scrap, post-consumer {GLO}| aluminium scrap, post-consumer, Recycled Content cut-off | Alloc Rec[1]	Metal working, average for metal product manufacturing {GLO}| market for | Alloc Rec[1]	2014; 2014
Steel (BOF)	Steel, low-alloyed {GLO}| market for | Alloc Rec[1]	Metal working, average for steel product manufacturing {GLO}| market for | Alloc Rec[1]	2014; 2014
Steel (EAF)	Steel, low-alloyed, electric {GLO}| market for | Alloc Rec[1]	Metal working, average for steel product manufacturing {GLO}| market for | Alloc Rec[1]	2012; 2014
Zinc Alloy (Zamac3)	Zinc {GLO} | market for | Alloc Rec[1]; Aluminium, primary, ingot {GLO} | market for | Alloc Rec[1]	Metal working, average for steel product manufacturing {GLO}| market for | Alloc Rec[1]	2014; 2014
HDPE	Polyethylene, high density, granulate {GLO}| market for | Alloc Rec[1]	Injection moulding {GLO}| market for | Alloc Rec[1]	2014; 2014
LDPE	Polyethylene, low density, granulate {GLO}| market for | Alloc Rec[1]	Extrusion, plastic film {GLO}| market for | Alloc Rec[1]	2014; 2014
Nylon 6	Nylon 6 {GLO}| market for | Alloc Rec[1]	Injection moulding {GLO}| market for | Alloc Rec[1]	2014; 2014
Nylon 6,6	Nylon 6-6 {GLO}| market for | Alloc Rec[1]	Injection moulding {GLO}| market for | Alloc Rec[1]	2014; 2014
Glass reinforced nylon 6	Nylon 6, glass-filled {GLO}| market for | Alloc Rec[1]	Extrusion, plastic film {GLO}| market for | Alloc Rec[1]	2014; 2014
Polypropylene	Polypropylene, granulate {GLO}| market for | Alloc Rec[1]	Injection moulding {GLO}| market for | Alloc Rec1; Extrusion, plastic pipes {GLO}| market for | Alloc Rec[1]	2014

Table 6 (Continued). *LCI datasets and associated databases used to model material production and processing.*

Material Dataset		Processing Dataset	Publication Date
Strive Cantilever Arm Task Chair			
Glass-filled Polypropylene	Polypropylene, granulate {GLO}| market for | Alloc Rec[1]	Injection moulding {GLO}| market for | Alloc Rec[1]; Extrusion, plastic pipes {GLO}| market for | Alloc Rec[1]	2014
Reprocessed/ Regrind Polypropylene	Polypropylene, granulate, regrind {GLO}| market for | Alloc Rec[1]	Injection moulding {GLO}| market for | Alloc Rec[1]	2014
Rubber	Synthetic rubber {GLO}| market for | Alloc Rec[1]	Injection moulding {GLO}| market for | Alloc Rec[1]	2014
Recycled Polyurethane foam	Polyurethane, reprocessed foam {GLO} | market for | Alloc Rec[1]	Injection moulding {GLO}| market for | Alloc Rec[1]	2014
Polyester fabric	100% Recycled PET fabric[2]	Included with material datasets	2010
Laminated Wood Composite	Laminated veneer lumber, at plant, MROE, US[2]	Included with material datasets	2008
Powder coat	Coating powder {GLO}| market for | Alloc Rec[1]	Included with material	2014
Packaging			
Cardboard	Corrugated board, recycling fibre, single wall, at plant/RER[2]; Corrugated board, fresh fibre, single wall, at plant/RER[2]	Included with material dataset	2007; 2007
Paper	Kraft paper, unbleached {GLO}| market for | Alloc Rec[1]	included with material dataset	2014
Transportation			
Truck	Transport, freight, lorry 16-32 metric ton, EURO4 {GLO}| market for | Alloc Rec[1]	NA	2014
Rail	Transport, freight train {US}| market for | Alloc Rec[1]	NA	2014
Ship	Transport, freight, sea, transoceanic ship {GLO}| market for | Alloc Rec[1]	NA	2014

1) Ecoinvent v3.1 Life Cycle Database

2) Ecoinvent v2.2 Life Cycle Database

NA: not applicable

Data Quality

Table 7. *Data Quality assessment of Life Cycle Inventory.*

Data Quality Parameter	Data Quality Discussion
Time-Related Coverage: Age of data and the minimum length of time over which data 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 10 years old (2003 or typically more recent). 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 2013 annual production.
Geographical Coverage: Geographical area from which data for unit processes is collected	The data used in the analysis provide the best possible representation available with current data. Actual processes for upstream operations are primarily North American. Surrogate data used in the assessment are representative of North American or European operations. Data representative of European operations are considered sufficiently similar to actual processes. Data representing product disposal are based on US 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. In some cases, specific information regarding metal and plastic component manufacturing was not available. Representative fabrication datasets, specific to the type of metal, are used to represent the actual processes. Similarly, representative plastic injection molding datasets are used to represent production of plastic components.
Precision: 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: Percentage of flow that is measured or estimated	The LCA model included all known mass and energy flows for production of the chair. 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. In total, these missing data represent less than 5% of the mass or energy flows.
Representativeness: 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: 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 data where available. Different portions of the product life cycle are equally considered; however, it must be noted that final disposition of the product is based on assumptions of current average practices in the United States.
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 with access to the primary data used. 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 KI Green Bay facility 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 datasets, the Ecoinvent LCI data are used.
Uncertainty of the information: Uncertainty related to data, models, and assumptions	Uncertainty related to the chair materials and packaging is low. Actual supplier data for upstream operations was sought but not available for all suppliers and in some cases relied upon 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.

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