Environmental Product Declaration

Spacesaver | High-Density Mobile Storage Systems

VERIFIED by SCS Global Services
ENVIRONMENTAL PRODUCT DECLARATION
BASED ON LCA

Declaration Owner
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Products
High-Density Mobile Storage Systems

Functional Unit
The functional unit is one complete storage unit of 8.16 m^3 storage capacity, serving the function of storage for a 10-year period.

EPD Number and Period of Validity
SCS-EPD-10165
EPD Valid May 22, 2024 through May 21, 2029
Version Date: May 29, 2024

Product Category Rule
Product Category Rule for Environmental Product Declarations.
BIFMA PCR for Storage: UNCPC 3812,

Program Operator
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Program Operator:	SCS Global Services
Declaration URL Link:	https://www.scsglobalservices.com/certified-green-products-guide
Product:	High-Density Mobile Storage Systems
LCA Practitioner:	Gerard Mansell, PhD., SCS Global Services
LCA Software:	OpenLCA v2.0 & ecoinvent v3.10
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 for Environmental Product Declarations: BIFMA PCR for Storage: UNCPC 3812. NSF International National Center for Sustainability Standards. 2013. Extended through September 30, 2027
PCR Review conducted by:	Thomas Gloria Ph.D., Industrial Ecology Consultants
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:	About Spacesaver ..... 2 Product Description ..... 2 Key Environmental Parameters ..... 2 Product Material Composition ..... 3 Life Cycle Assessment Overview ..... 4 Product Life Cycle Flow Diagram ..... 5 Life Cycle Inventory and Environmental Parameters ..... 6 Life Cycle Impact Assessment ..... 6 Supporting Technical Information ..... 8 References 11

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.*

About Spacesaver

Spacesaver provides a full range of storage products that add versatility and flexibility to any space. We design and manufacture high-density mobile storage systems, library shelving, museum storage cabinets, evidence lockers, athletic equipment storage, weapon racks, healthcare supply storage, and more. Founded in Fort Atkinson, Wisconsin, in 1972, Spacesaver now employs approximately 400 people in its 300,000-square-foot custom manufacturing facility and office building. In partnership with our nation-wide distribution network, we serve vertical markets that include schools and libraries, museums, public safety, healthcare, indoor agriculture, offices, manufacturing facilities, and more.

Beyond our standard product lines, we frequently work with designers, architects, and clients to create custom solutions for unique spaces and applications. Our in-house teams of engineers, project managers, and manufacturers work with our nationwide network of local distributors to provide clients with reliable, well-designed storage solutions that optimize space, streamline workflows, and integrate seamlessly into any space.

Product Description

High-Density Mobile Storage Systems

Spacesaver Standard High-Density Mobile Storage (HDMS) Systems can deliver up to three times the storage capacity of conventional shelving in the same amount of floor space. By mounting storage cabinets or shelving on wheeled carriages that travel on rails, wasted space created by fixed aisles can be eliminated, freeing up valuable floor space for other, more productive use. The versatility of Spacesaver High-Density Mobile Systems makes it possible to mount almost any type of storage housing on our mobile carriages, including your existing shelving and cabinets. Standard HDMS was designed to increase operational efficiency by creating a movable aisle that can compact storage space, allow access to more goods and materials, and create extra space for the things that have a direct impact on organizations, regardless of the industry.

Table 1. *The High-Density Mobile Storage Systems storage product information.*

Product Line	Dimensions (W x D x H)	Storage volume (m^3)	Product weight (kg)	Packaging weight (kg)	Reference flow (kg)
High-Density Mobile Storage Systems	216" x 24" x 96"	8.16	272	19	291

Key Environmental Parameters

Table 2. Average k*ey environmental parameters, over the life cycle of the Spacesaver storage products per functional unit.*

Parameter	Value
Global Warming Potential (IPPC AR6)	1,140 kg CO_2e
Primary Energy Demand	14,800 MJ
Recycled content	32.0%

Product Material Composition

The following tables provide a description of the materials in the *High-Density Mobile Storage Systems* storage products. Table 3 provides this information by type of material and percent of total mass for the product. Product packaging materials are summarized in Table 4.

Table 3. *Material content for the **High-Density Mobile Storage Systems** storage products in kg per functional unit and percent of total mass*

Component	Pre-consumer Recycled content (%)	Post-consumer Recycled content (%)	kg	Percent
Steel	19.8	31.0	237	87%
Other metals	0	0	0.127	0.047%
Powder coat	0	0	4.15	1.5%
Plastics/Rubber	0	0	5.46	2%
Other	0	0	25.4	9.3%
Total Product			**272**	**100%**

Table 4. *Material content for the packaging of the **High-Density Mobile Storage Systems** storage products in kg per functional unit and percent of total mass.*

Component	Pre-consumer Recycled content (%)	Post-consumer Recycled content (%)	kg	Percent
Corrugate	0	0	3.16	16%
Plastics	0	0	0.128	0.67%
Wood	0	0	15.9	83%
Total Packaging			**19.2**	**100%**

Life Cycle Assessment Overview

A Life Cycle Assessment (LCA) was conducted to evaluate the environmental performance of the Spacesaver storage products in accordance with ISO 14044 standard. LCA accounts for the potential environmental impacts of a product over its entire life cycle, from raw material extraction through manufacturing, use, and end-of-life.

System Boundary

The scope of the EPD is cradle-to-grave, including raw material extraction and processing, transportation, product manufacture, product delivery, installation and use, and product disposal. The life cycle phases included in the EPD scope are described below and illustrated in Figure 1.

- ***Production stage (A1-A3)*** – 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 products, as well as those associated with the processing of raw materials and product component manufacturing are included. This stage also 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 Spacesaver manufacturing facility in Wisconsin. Energy use at the manufacturing facilities is excluded unless used directly for the manufacturing process. Impacts associated with the transport of the processed raw materials to manufacturing facilities (upstream transport) as well as the production of the product packaging materials are also included in this stage.
- ***Construction stage (A4-A5)*** – This stage includes the delivery of the storage units and their packaging to the point of use (downstream transportation) and installation of the storage unit.
- ***Use stage (B1-B7)*** – This stage includes the impacts associated with the use and maintenance of the storage products. Impacts from maintenance are assumed negligible while no impacts are associated with the use of the products.
- ***End-of-Life stage (C1-C4)*** – The end-of-life stage includes the transport of the storage units and their packaging to waste treatment and material reclamation facilities and associated emissions.

Processes excluded from the study include:

- Production of capital goods, infrastructure, manufacturing equipment, etc.
- Personnel-related activities.

Product Life Cycle Flow Diagram

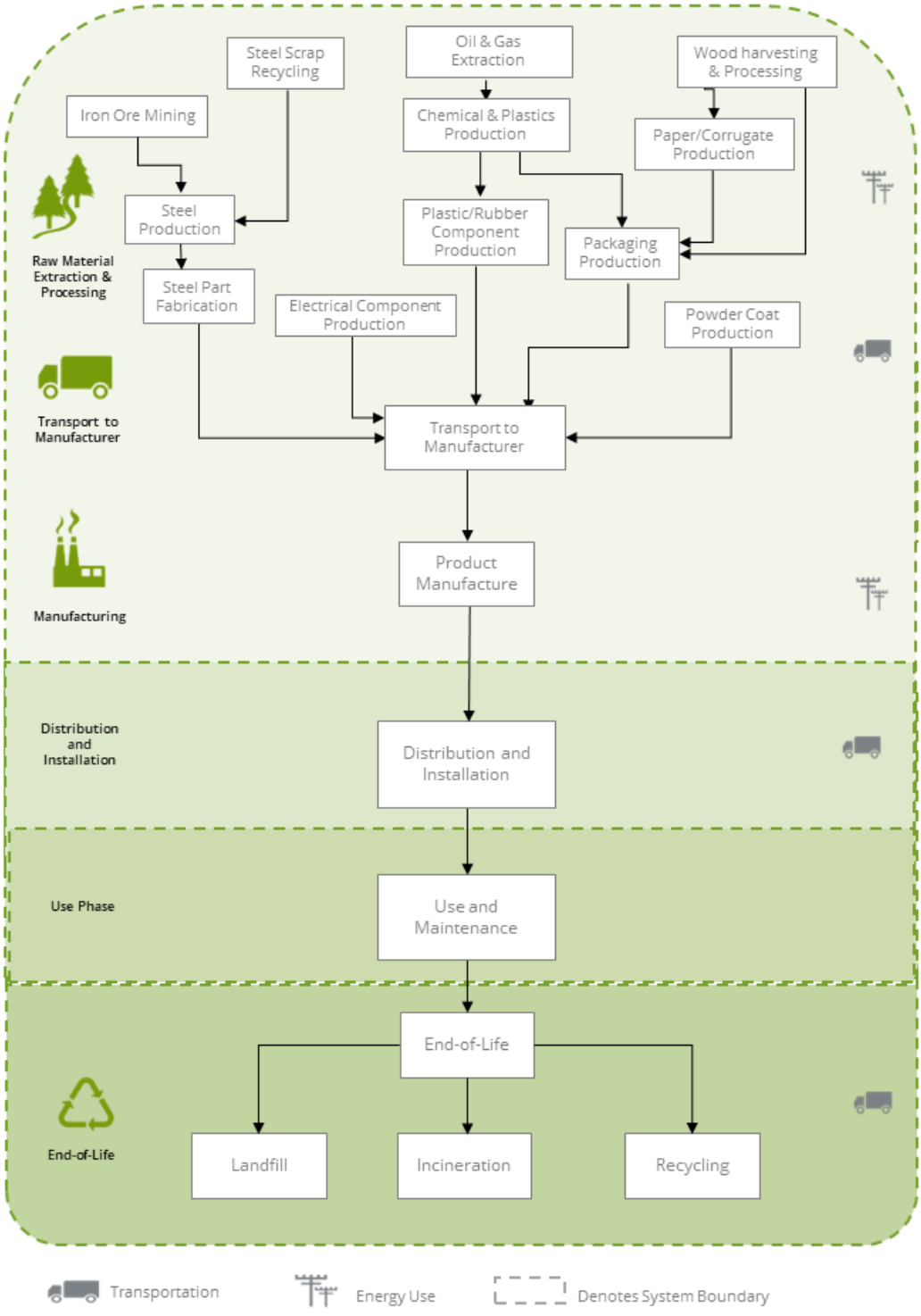

Figure 1. *Flow diagram representing the major unit operations in the life cycle of the Spacesaver storage products.*

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 5 presents the life cycle inventory flows by life cycle stage for the Spacesaver storage products as specified in the PCR. The LCIA and inventory flow results were calculated using the OpenLCA model and summarized for the functional unit from cradle-to-grave. Where necessary, the lower heating value is used for energy flow calculations.

Table 5. *Resource use for the **High-Density Mobile Storage Systems** storage products per functional unit. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.*

Parameter	Production Stage	Construction Stage	Use Stage	End-of-Life Stage	Total
Primary Energy Demand (MJ)	13,400	1,100	0.00	203	14,800
	91%	7.5%	0%	1.4%	100%
Use of renewable primary energy (MJ)	1,450	13.9	0.00	1.20	1,460
	99%	0.95%	0%	0.082%	100%
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)	12,000	1,090	0.00	202	13,300
	90%	8.2%	0%	1.5%	100%
Use of nonrenewable primary energy resources used as raw materials (MJ)	0.00	0.00	0.00	0.00	0.00
	0%	0%	0%	0%	0%
Recovered energy (MJ)	0.00	0.00	0.00	0.00	0.00
	0%	0%	0%	0%	0%
Use of fresh water (kg)	34,500	831	0.00	99.2	35,500
	97%	2.3%	0%	0.28%	100%

Life Cycle Impact Assessment

The LCA conforms to ISO 14040/44 and the PCR. Results of the Life Cycle Assessment are presented below using the impact indicators specified by the PCR. 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 6. *Life Cycle Impact Assessment results for the **High-Density Mobile Storage Systems** storage products per functional unit. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.*

Parameter	Production Stage	Construction Stage	Use Stage	End-of-Life Stage	Total
Global Warming Potential (kg CO_2 eq)	1,040	77.0	0.00	23.3	1,140
	91%	6.8%	0%	2.1%	100%
Acidification Potential (kg SO_2 eq)	4.21	0.303	0.00	7.57×10^{-2}	4.59
	92%	6.6%	0%	1.6%	100%
Eutrophication Potential (kg N eq)	3.70	7.19×10^{-2}	0.00	0.182	3.95
	94%	1.8%	0%	4.6%	100%
Smog Formation Potential (kg O_3 eq)	55.6	7.65	0.00	2.21	65.5
	85%	12%	0%	3.4%	100%
Ozone Depletion Potential (kg CFC-11 eq)	2.24×10^{-5}	1.34×10^{-6}	0.00	2.63×10^{-7}	2.40×10^{-5}
	93%	5.6%	0%	1.1%	100%

The contributions to total indicator impacts are dominated by the Production stage followed by the Construction stage and End-of-Life. Within the Production stage, raw material extraction and processing accounts for approximately 50%-60% of overall life cradle-to-grave impacts while product manufacturing, including packaging, accounts for roughly 20%-35% of the total estimated impacts, depending on the specific product and impact category. The Construction stage impacts are primarily from transport processes (product distribution) and contribute ~9% to total estimated impacts. With the exception of the Eutrophication Potential indicator, End-of-life stage impacts are minimal.

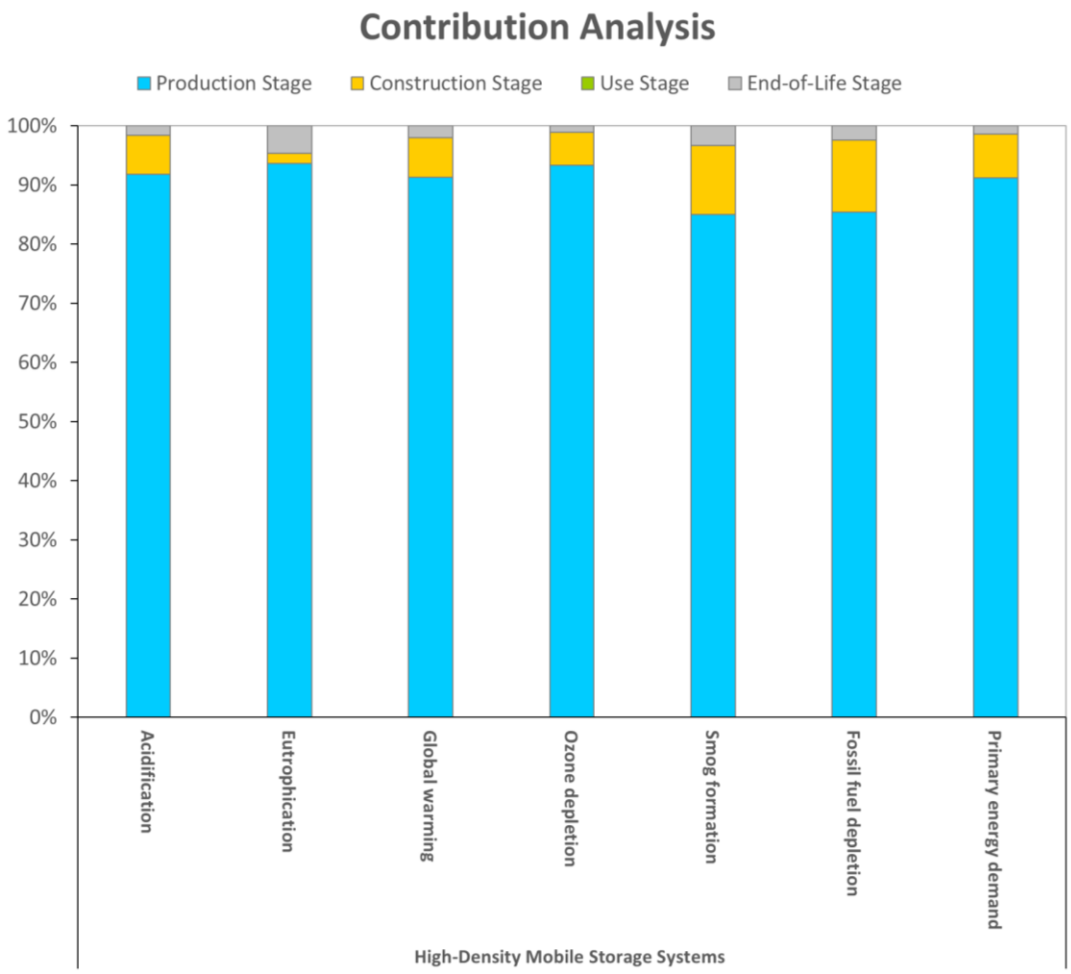

Figure 2. *Contribution analysis graph representing percent contribution to each impact category indicator by life cycle phase.*

Supporting Technical Information

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.

Period under review

The period of review is calendar year 2022.

Allocation

Manufacturing resource use was allocated to the products based on mass. Impacts from transportation were attributed to the products 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.

Estimates and Assumptions

- The Fort Atkinson, Wisconsin facility is located in the RFCW eGRID EPA NERC sub-region. An Ecoinvent inventory dataset was modified to reflect the eGRID energy mix for RFCW to estimate resource use and emissions from electricity use at the Ft. Atkinson, Wisconsin facility.
- Electricity and resource use at the production facility were allocated to the products based on product mass as a fraction of the total facility production in calendar year 2022 provided by the manufacturer.
- Primary data for upstream component fabrication were not available. Representative LCI datasets from the ecoinvent database were used to model processing for most material components.
- The 10 year expected lifetime of the product was modeled based on ANSI/BIFMA test methods.
- For end-of-life, disposal of the product and product packaging is modeled based on 2018 statistics for municipal solid waste generation and disposal in the United States, from the US Environmental Protection Agency. These data provide recycling rate estimates for household and municipal waste, durable and non-durable goods, as well as for packaging and containers.
- For final disposal of the product and packaging materials at end-of-life, all materials are assumed to be transported 20 miles by diesel truck to either a landfill, incineration facility, or material reclamation facility (for recycling). Datasets representing disposal in a landfill and waste incineration are from Ecoinvent.
- Modeling of recycled materials follows the recycled content method (also known as 100-0 method or cut-off method) whereby only the burdens of reprocessing the waste material are allocated to the system from the use of the recycled material.

It should 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 resource use and waste flows 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.

Background Data

Primary data were provided by Spacesaver for their Ft. Atkinson, Wisconsin manufacturing facility. The sources of secondary LCI data are the Ecoinvent database.

Table 7. *Data sources for the Spacesaver storage product system.*

Component	Dataset	Data Source	Publication Date
PRODUCT			
Steel			
Recycled steel	Steel, sheet rolled (19.8/31%)- LCI[1]; Steel, extruded – LCI[1]	SCS	2023
Sheet steel, Extruded steel, Stainless steel	steel production, converter, low-alloyed | steel, low-alloyed | Cutoff, S/RoW; steel production, chromium steel 18/8, hot rolled | steel, chromium steel 18/8, hot rolled | Cutoff, S/RoW	EI v3.10	2023
Metal working	metal working, average for steel product manufacturing | metal working, average for steel product manufacturing | Cutoff, S/RoW sheet rolling, steel | sheet rolling, steel | Cutoff, S/RoW	EI v3.10	2023
Non-ferrous metals			
Bronze, Zinc	bronze production | bronze | Cutoff, S/RoW Zn alloy production | Zn alloy | Cutoff, S/RNA	EI v3.10	2023
Powder coat			
Powder coat	coating powder production | coating powder | Cutoff, S/RoW	EI v3.10	2023
Plastics			
PVC	polyvinylchloride production, bulk polymerisation | polyvinylchloride, bulk polymerised | Cutoff, S/RoW	EI v3.10	2023
Nylon	nylon 6-6 production | nylon 6-6 | Cutoff, S/RoW	EI v3.10	2023
PE	polyethylene production, high density, granulate | polyethylene, high density, granulate | Cutoff, S/RoW polyethylene production, low density, granulate | polyethylene, low density, granulate | Cutoff, S/RoW	EI v3.10	2023
Rubber			
Rubber	synthetic rubber production | synthetic rubber | Cutoff, S/RoW	EI v3.10	2023
Other			
Adhesives	polyurethane adhesive production | polyurethane adhesive | Cutoff, S/GLO	EI v3.10	2023
Cables	market for cable, unspecified | cable, unspecified | Cutoff, S/GLO	EI v3.10	2023
Wire, Electronics	copper production, cathode, solvent extraction and electrowinning process | copper, cathode | Cutoff, S/GLO; wire drawing, copper | wire drawing, copper | Cutoff, S/RoW; printed wiring board production, surface mounted, unspecified, Pb free | printed wiring board, surface mounted, unspecified, Pb free | Cutoff, S/GLO	EI v3.10	2023
Paper/Tape	kraft paper production | kraft paper | Cutoff, S/RoW; ethylene vinyl acetate copolymer production | ethylene vinyl acetate copolymer | Cutoff, S/RoW;	EI v3.10	2023
PACKAGING	**PACKAGING**		
Corrugated	containerboard production, linerboard, kraftliner | containerboard, linerboard | Cutoff, S/RoW	EI v3.10	2023
Plastics	polypropylene production, granulate | polypropylene, granulate | Cutoff, S/RoW; polyethylene production, low density, granulate | polyethylene, low density, granulate | Cutoff, S/RoW; packaging film production, low density polyethylene | packaging film, low density polyethylene | Cutoff, S/RoW	EI v3.10	2023
Wood	EUR-flat pallet production | EUR-flat pallet | Cutoff, S/RoW; sawnwood production, softwood, dried (u=10%), planed | sawnwood, softwood, dried (u=10%), planed | Cutoff, S/RoW	EI v3.10	2023
RESOURCES	**RESOURCES**		
Grid electricity	market for electricity, medium voltage | electricity, medium voltage | Cutoff, U - RFCW/US-RFC	EI v3.10; eGRID	2023; 2018
Natural gas	market for heat, central or small-scale, natural gas | heat, central or small-scale, natural gas | Cutoff, S/RoW	EI v3.10	2023
TRANSPORTATION	**TRANSPORTATION**		
Road transport	transport, freight, lorry 16-32 metric ton, EURO4 | transport, freight, lorry 16-32 metric ton, EURO4 | Cutoff, S/RoW	EI v3.10	2023

[1] Datasets modified for specified recycled content. Based on EI v3.10 process dataset "steel production, converter, low-alloyed | steel, low-alloyed | Cutoff, S/RoW"

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.

Table 8. *Data quality assessment for the Spacesaver storage product system.*

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 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: 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 storage 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 facility 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 v3.10 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.

References

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