

The Vitra logo consists of the word "vitra." in a bold, lowercase, sans-serif font.**Declaration Owner**

Vitra AG

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Product

Kado office storage

Functional Unit

One complete storage unit maintained for a 10 year period. The reference flow for the modeling system is one complete storage unit. Results are also reported on the basis of 0.15 m³.

EPD Number and Period of Validity

SCS-EPD-05023

EPD Valid June 15, 2018 through June 14, 2023

Product Category Rule

Product Category Rules in Accordance with ISO 14025. Product Group: UN CPC 3812 & 3814. Other Furniture used in Offices and Other Furniture N.E.C.. Version 1.2. International EPD System. 2018.

Program Operator

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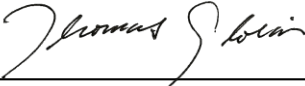
The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty 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.

Disclaimers: This EPD conforms to 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, was conducted by	The Technical Committee of the International EPD® System. Chair: Massimo Marino Contact via info@environdec.com.
Approved Date: June 15, 2018 – End Date: June 14, 2023	
Independent verification of the declaration and data, according to ISO 14025:2006	<input type="checkbox"/> internal <input checked="" type="checkbox"/> external
Third party verifier	 <hr/> Tom Gloria, Ph.D., Industrial Ecology Consultants

ABOUT VITRA

Vitra is a Swiss family-owned company. It not only makes furniture and creates retail environments, but also has its own Campus with buildings by leading international architects. Creating innovative products and concepts with great designers is Vitra's essence. They are developed in Switzerland and installed worldwide by architects, companies and private users to build inspirational spaces for living, working and shopping as well as public areas. With its classics, Vitra represents groundbreaking 20th century design. Today, in combining technical and conceptual expertise with the creativity of contemporary designers, Vitra seeks to continue pushing the boundaries of the design discipline. A family business for eighty years, Vitra believes in lasting relationships with customers, employees and designers, durable products, sustainable growth and the power of good design. The Vitra Campus with buildings by some of the world's leading architects and the Vitra Design Museum with its exhibitions on design and architecture, design archives and a comprehensive furniture collection are all part of Vitra. They inspire visitors, inform the design process and create an atmosphere in which innovation flourishes.

PRODUCT DESCRIPTION

The multifaceted elements of the Kado structural system offer a spotlight for merchandise: they provide the setting for a wide variety of display options and also lend structure to store interiors. Kado comes either with sturdy square tubes (Kado 25) or in a slimline version (Kado 15).

Final assembly of Vitra Kado office storage occurs in an ISO 9001 and ISO 14001 certified facility.

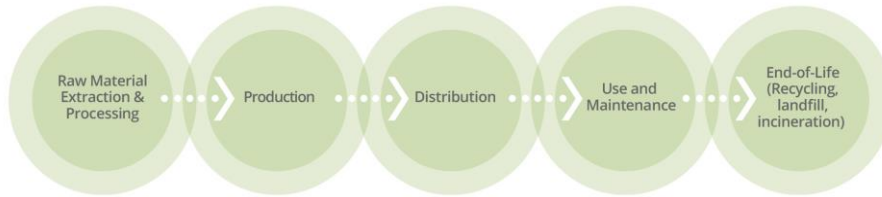
MATERIAL COMPOSITION

Table 1. Material composition of Kado. Results are shown per functional unit and as a percent of total.

Material	Amount (kg/functional unit)	Amount (%)
PRODUCT		
Particle Board	130	67%
Steel (45% recycled)	48	25%
Zamak (30% recycled)	14	7.2%
Polyamides	0.88	0.46%
Product Total	190	100%
PACKAGING		
Wood	11	86%
Cardboard	0.80	6.3%
Packaging film	0.60	4.7%
Packaging foam	0.35	2.7%
Packaging Total	13	100%

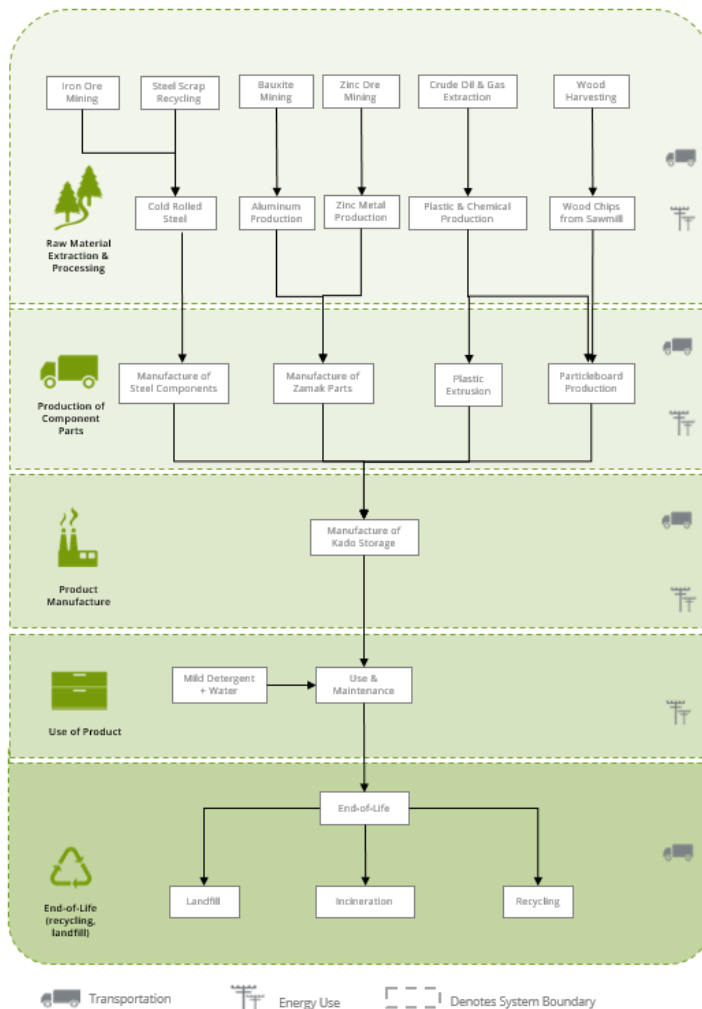
LIFE CYCLE ASSESSMENT STAGES

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 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 Kado. This includes resource extraction, raw material processing, component manufacturing, transportation, assembly of chair, use and maintenance, and end-of-life.



LIFE CYCLE IMPACT ASSESSMENT

Impact category indicators are calculated using the CML-IA and TRACI 2.1 characterization methods. CML-IA impact category indicators include global warming potential (100 years), acidification potential, eutrophication potential, Photochemical Ozone Creation potential, ozone depletion potential, fossil fuel abiotic resource depletion, human toxicity, and ecotoxicity, in accordance with the PCR. In addition, an estimate of the impacts from land use is reported (based on ReCiPe methodology). The global warming potential indicators do not include biogenic carbon uptake or biomass CO₂ emissions, which are reported separately for the product system in the table below.

Table 2. Life cycle impact assessment results for the Kado office storage. Results are shown for one unit of storage maintained over a 15 year period.

Impact category	Unit	Total	Raw Material Extraction & Processing (Upstream Module)	Production (Core Module)	Distribution, Use & End-of-Life (Downstream Module)
LCIA Results - TRACI					
Global warming Potential	kg CO ₂ eq	820	340	450	40
	%	100%	41%	54%	4.9%
Acidification Potential	kg SO ₂ eq	3.0	2.1	0.55	0.28
	%	100%	72%	19%	9.5%
Eutrophication Potential	kg N eq	3.2	2.0	0.64	0.58
	%	100%	61%	20%	18%
Smog Potential	kg O ₃ eq	35	23	6.7	5.6
	%	100%	65%	19%	16%
Ozone depletion Potential	kg CFC-11 eq	8.6x10 ⁻⁵	2.4x10 ⁻⁵	5.8x10 ⁻⁵	4.9x10 ⁻⁶
	%	100%	28%	67%	5.7%
LCIA Results - CML					
Global warming (GWP100a)	kg CO ₂ eq	850	340	460	42
	%	100%	40%	55%	5.0%
Acidification potential	kg SO ₂ eq	2.9	2.1	0.53	0.26
	%	100%	73%	18%	8.7%
Eutrophication potential	kg PO ₄ ³⁻ eq	1.5	0.94	0.28	0.24
	%	100%	64%	19%	16%
Photochemical oxidation	kg C ₂ H ₄ eq	0.20	0.14	4.6x10 ⁻²	1.1x10 ⁻²
	%	100%	72%	23%	5.6%
Ozone layer depletion (ODP)	kg CFC-11 eq	8.6x10 ⁻⁵	2.4x10 ⁻⁵	5.8x10 ⁻⁵	4.9x10 ⁻⁶
	%	100%	28%	67%	5.7%
Abiotic depletion potential (elements)	kg Sb eq	6.5x10 ⁻²	6.5x10 ⁻²	5.0x10 ⁻⁵	5.9x10 ⁻⁵
	%	100%	100%	0.08%	0.09%
Abiotic depletion (fossil fuels)	MJ	10,000	4,200	5,900	430
	%	100%	40%	56%	4.1%
Biogenic Carbon					
Biogenic carbon emission	kg CO ₂ eq	140	53	6.0	78
	%	100%	39%	4.3%	57%
Carbon uptake	kg CO ₂ eq	160	160	0.60	0.97
	%	100%	99%	0.37%	0.60%
LCIA Results - Other					
Ecotoxicity	CTUe	30,000	8,900	7,400	14,000
	%	100%	29%	24%	46%
Human toxicity, cancer	CTUh	3.1x10 ⁻⁷	2.9x10 ⁻⁷	1.2x10 ⁻⁹	2.4x10 ⁻⁸
	%	100%	92%	0.38%	7.5%
Human toxicity, non-cancer	CTUh	1.6x10 ⁻⁹	1.3x10 ⁻⁹	9.2x10 ⁻¹¹	1.6x10 ⁻¹⁰
	%	100%	84%	5.8%	9.8%
Land occupation	species.yr	3.8x10 ⁻⁶	3.6x10 ⁻⁶	9.8x10 ⁻⁸	5.5x10 ⁻⁸
	%	100%	96%	2.6%	1.5%

Resource Use

The PCR requires that several parameters be reported in the EPD, including resource use, waste categories and output flows, and other environmental information. The results for these parameters per declared unit presented below

Table 3. Life cycle impact assessment results for the Kado office storage. Results are shown for one unit of storage maintained over a 15 year period.

Impact category	Unit	Total	Raw Material Extraction & Processing (Upstream Module)	Production (Core Module)	Distribution, Use & End-of-Life (Downstream Module)
Resources					
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ eq. %	3,000 100%	2,100 69%	910 30%	19 0.64%
Use of renewable primary energy resources used as raw materials	MJ	2,800	2,600	220	0.0
	%	100%	92%	7.8%	0.00%
Total use of renewable primary energy resources	MJ eq.	5,800	4,600	1,100	21
	%	100%	80%	19%	0.36%
Use of nonrenewable primary energy excluding nonrenewable primary energy resources used as raw materials	MJ eq.	INA	INA	INA	INA
Use of nonrenewable primary energy resources used as raw materials	MJ eq.	INA	INA	INA	INA
Total use of nonrenewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ eq.	11,000	4,600	6,000	470
	%	100%	41%	54%	4.3%
Use of secondary materials	kg	71	71	0	0
	%	100%	100%	0.0%	0.0%
Use of renewable secondary fuels	MJ eq.	Negligible	Negligible	Negligible	Negligible
Use of nonrenewable secondary fuels	MJ eq.	Negligible	Negligible	Negligible	Negligible
Net use of fresh water	m ³	26	20	5.0	0.85
	%	100%	77%	19%	3.3%
Use of renewable material resources	kg	130	130	0	0
	%	100%	100%	0%	0%
Wastes					
Hazardous waste disposed	kg	270	70	110	87
	%	100%	72%	12%	17%
Radioactive Waste disposed	kg	4.4x10 ⁻²	3.7x10 ⁻²	5.9x10 ⁻³	3.4x10 ⁻⁴
	%	100%	26%	42%	32%
Nonhazardous waste disposed	kg	1.8x10 ⁻²	1.3x10 ⁻²	2.1x10 ⁻³	3.0x10 ⁻³
	%	100%	86%	13%	0.77%
Components for re-use	kg	0	0	0	0
Materials for recycling	kg	Negligible	Negligible	Negligible	Negligible
Materials for energy recovery	kg	Negligible	Negligible	Negligible	Negligible
Exported energy	MJ	Negligible	Negligible	Negligible	Negligible

INA = Indicator Not Assessed

SUPPORTING TECHNICAL INFORMATION

Unit processes are developed with SimaPro 8.3 software, drawing upon data from multiple sources. Primary data were provided by Vitra for their manufacturing processes. The primary sources of secondary LCI data are from Ecoinvent Database.

Table 4. Data sources used for the LCA study.

Component	Material Description	Material Dataset	Data Source	Publication Date
Product Materials				
Polyamides	Plastic	Nylon 6 {GLO} market for	Injection moulding {GLO} market for	EI v3.3; 2016
Particle Board	Wood	Particle board, for indoor use {RER} market for	Included in dataset	EI v3.3; 2016
Steel (45% recycled)	Steel	Steel, low-alloyed {GLO} market for	Metal working, average for steel product manufacturing {GLO} market for	EI v3.3; 2016
Zamak (30% recycled)	Zinc	Zinc {GLO} market for; Aluminium, primary, ingot {IAI Area, EU27 & EFTA} market for; Copper {RER} production, primary; Magnesium {GLO} market for	Metal working, average for metal product manufacturing {GLO} market for	EI v3.3; 2016
Manufacturing				
Electricity	Regional electricity grid mix	Electricity, medium voltage, hydro {DE} market for	n/a	EI v3.3; 2016
Heat	Natural gas	Natural gas, high pressure {DE} market for	n/a	EI v3.3; 2016
Combustion	Light fuel oil	Light fuel oil {Europe without Switzerland} market for	n/a	EI v3.3; 2016
Packaging				
Packaging	Packaging foam	Polyurethane, flexible foam {RER} production	Negligible	EI v3.3; 2016
Packaging	Packaging film	Packaging film, low density polyethylene {RER} production	Included in dataset	EI v3.3; 2016
Packaging	Cardboard	Corrugated board box {RER} production	Included in dataset	EI v3.3; 2016
Packaging	Wood	Sawnwood, board, softwood, raw, dried (u=20%) {GLO} market for	Included in dataset	EI v3.3; 2016
Transportation				
Road transport	Diesel Truck	Transport, freight, lorry 16-32 metric ton, EURO4 {GLO} market for	n/a	EI v3.3; 2016

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 10 years old (typically 2016). All of the secondary 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 2017 and engineering estimates.
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 hydroelectricity. Surrogate data used in the assessment are representative of European or global operations. Data representative of global operations are considered sufficiently similar to actual processes. Data representing product disposal are based on European and 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. Representative datasets 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. Secondary data for operations are 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. 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	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 v3.3 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. 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 Vitra's Weil am Rhein facility represent an annual average and are considered of medium to high quality due to the length of time over which these data are collected for the existing production processes. For secondary LCI datasets, Ecoinvent v3.3 LCI data are used.
Uncertainty of the Information: Uncertainty related to data, models, and assumptions	Uncertainty related to materials in the storage products and packaging is low. Actual supplier data for upstream operations was 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

Resource use at the Weil am Rhein, Germany facility (e.g., water and energy) was allocated to the product based on the product mass as a fraction of the total facility production volume.

The storage product includes recycled materials, which are 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.

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

System Boundaries

The system boundary of the life cycle assessment for Vitra Kado was cradle-to-grave. A description of the system boundaries for this study is as follows:

- **Upstream - 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 products and packaging, as well as those associated with the processing of raw materials and product component manufacturing, are included. Impacts associated with the transport of the processed raw materials to the manufacturing facility (upstream transport) are also included in this stage.
- **Core - Production stage** – 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 Weil am Rhein, Germany facility.
- **Downstream**
 - *Distribution, Storage and Use stage* – This stage includes the delivery of the products to the point of use (downstream transportation), storage and maintenance of the furniture product for a period of 15 years.
 - *Disposal stage* – The end-of-life stage includes transport of the product to material reclamation or waste treatment facilities. Emissions from disposal of product components in a landfill or from incineration are included. Packaging disposal is also included in this phase.

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.

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