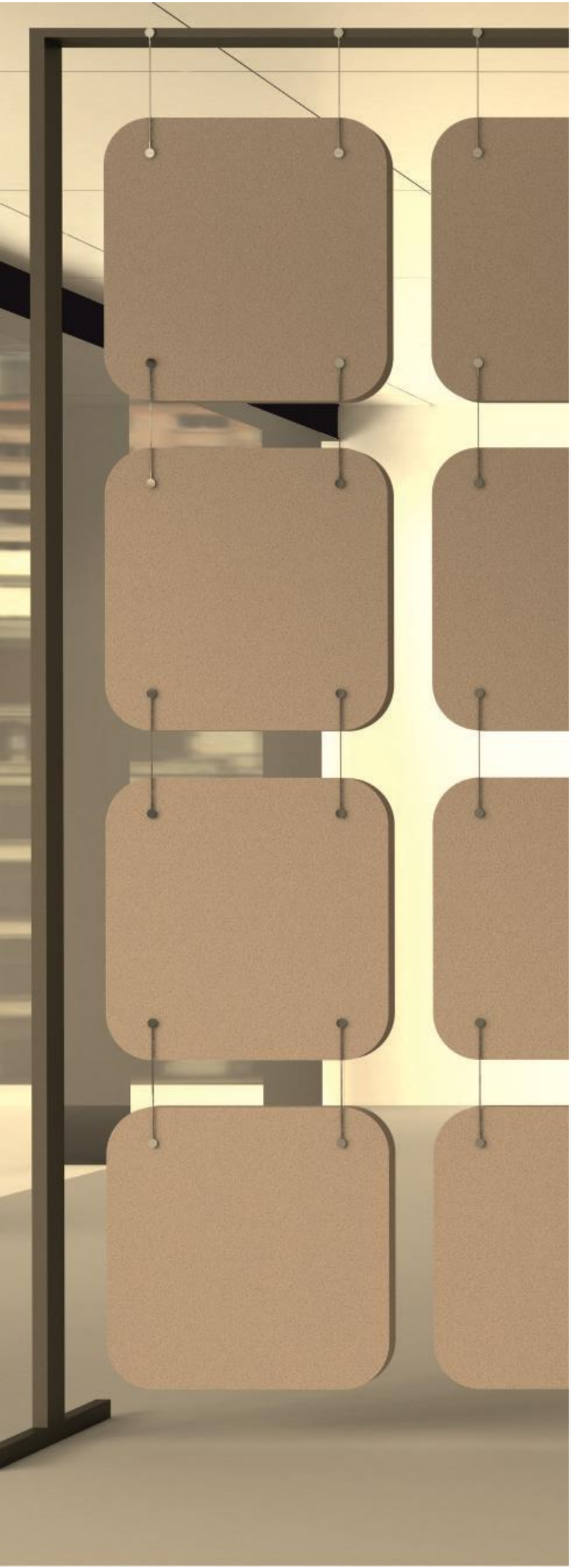

Declaration Owner

Senses Akustik pvt ltd
Plot no 102, new GIDC
Gundlav, Valsad
396035, Gujarat, INDIA
www.sensesakustik.com | info@senseakustik.com

Products

- Colorline Acoustic Products

Functional Unit

The functional unit is one square meter of acoustic product maintained for 75 years.

EPD Number and Period of Validity

SCS-EPD-06810
EPD Valid March 22, 2021 through March 21, 2026

Product Category Rule

ISO 21930:2017. Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services.

Program Operator

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

Declaration Owner:	Senses Akustik pvt ltd
Address:	Plot no 102, new GIDC, gundlav, valsad- 396035, Gujarat, INDIA
Declaration Number:	SCS-EPD-06810
Declaration Validity Period:	March 22, 2021 – March 21, 2026
Program Operator:	SCS Global Services
Declaration URL Link:	https://www.scsglobalservices.com/certified-green-products-guide
LCA Practitioner:	Lila Taheraly, SCS Global Services Ilan MacAdam-Somer, SCS Global Services
LCA Software:	OpenLCA 1.10 & Ecoinvent 3.7 database
Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071	☒ internal ☐ external
LCA Reviewer:	Gerard Mansell, Ph.D., SCS Global Services
Product Category Rule:	ISO 21930:2017. Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services.
PCR Review conducted by:	ISO Technical Committee
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
Declaration Contents:	

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

Senses Akustik started their journey with the intention of making the world a better place, a world that the next generation deserves. Since the time they realized the impact noise makes in our daily life, they are on a journey to serve the society and do their part to make this world a better noise-free place and help improve the quality of life.

Senses Akustik is committed to a policy of effectively managing environmental performance in order to minimize the impact of their business processes on the natural environment and the company at large. This commitment extends to all group business units, workplaces, employees and others affected by our operations. Their objective is to integrate the assessment, management and control of environmental issues into the management of our business.

2. Product

Senses Akustik offers a range of acoustic products, whose designs will blend into interiors and give a premium feel dearly craved for. Not only just for your acoustic needs, the carefully created designs will also stylize walls and ceilings bringing elegance to interiors. Customizable, there's something for everyone, no matter the kind of place from homes to hospitals, conference halls to corporate spaces, banquets to business offices.

The acoustic products are made from acoustic felt with white or black sound absorbent core are used to reduce and control reverberated noise for walls and ceilings.

2.1 Application

Senses Akustik products' primary function is to control and reduce reverberated noise for interior applications.

2.2 Base Materials

The primary materials include wool felt fibers and polyester fibers from various suppliers. Packaging materials consist of cardboard and plastic.

Table 1. *Material content for Senses Akustik's acoustic product in kg per square meter and percent of total mass.*

Material	kg/m^2	Percent
Wool Felt Fibers	0.931	39.5%
Polyester Fibers	1.43	60.5%
Total Product	2.36	100%

Table 2. *Material content for the Senses Akustik's acoustic product's packaging, per square meter.*

Material	kg/m^2	Percent
Cardboard	0.404	98.7%
Plastic	0.00540	1.32%
Total Packaging	0.409	100%

2.3 Manufacture

Senses Akustik acoustic products are manufactured at the company's production facility in Valsad, Gujarat, INDIA. Resource use at the production facility are all dedicated to the acoustic products production.

2.4 Environment and Health during Manufacture

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

2.5 Product Processing/Installation

Typical installation is accomplished using hand tools.

2.6 Packaging

The Senses Akustik products are packaged for shipment using plastic wrap and cardboard.

2.7 Condition of Use

No special conditions of use are noted.

2.8 Environment and Health during use

No environmental or health impacts are expected due to normal use of the movable wall system.

2.9 Reference Service Life

The Reference Service Life (RSL) of the acoustic product is based on the manufacturer's warranted lifetime and is summarized in Table 3 below. The building Estimated Service Life (ESL) is 75 years, consistent with the PCR.

2.10 Extraordinary Effects

No environmental or health impacts are expected.

2.11 Further Information

Further information on the product can be found on the manufacturers' website at https://www.sensesakustik.com

3. LCA: Calculation Rules

3.1 Functional Unit

The functional unit used in the study is defined as 1 m^2 of acoustic product maintained for 75 years. The reference flows for the product is summarized in Table 3.

Table 3. *Reference flows for the Senses Akustik's acoustic product, per square meter.*

Reference flow (m^2)	Reference Service Life (RSL)	Replacement Cycle ((ESL/RSL)-1)
1	10	6.5

3.2 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 in Table 4 and illustrated in Figure 1.

Table 4. *The modules and unit processes included in the scope for the Senses Akustik's acoustic product.*

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 movable wall system components.
A2	Transport (to the manufacturer)	Transport of component materials to the manufacturing facility.
A3	Manufacturing, including ancillary material production	Manufacturing of products and packaging (incl. upstream unit processes)
A4	Transport (to the building site)	Transport of product (including packaging) to the building site
A5	Construction-installation process	Impacts from the installation of product itself are assumed negligible. Impacts include scrap waste created during the installation, and packaging disposal.
B1	Product use	Impacts from the use of the product are assumed to be negligible.
B2	Product maintenance	Maintenance of product over the 75-year ESL, including periodic cleaning. Impacts from product maintenance are assumed negligible.
B3	Product repair	The product is not expected to require repair over its lifetime
B4	Product replacement	The materials and energy required for replacement of the product over the 75-year required service life of the assessment are included in this phase.
B5	Product refurbishment	The product is not expected to require refurbishment over their lifetime.
B6	Operational energy use by technical building systems	There is no operational energy use associated with the use of the product.
B7	Operational water use by technical building systems	There is no operational water use associated with the use of the product.
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 recycling of the product does not require any collection, sorting or processing.
C4	Disposal	Disposal of the product in a municipal landfill or incineration.
D	Reuse-recovery-recycling potential	Module Not Declared

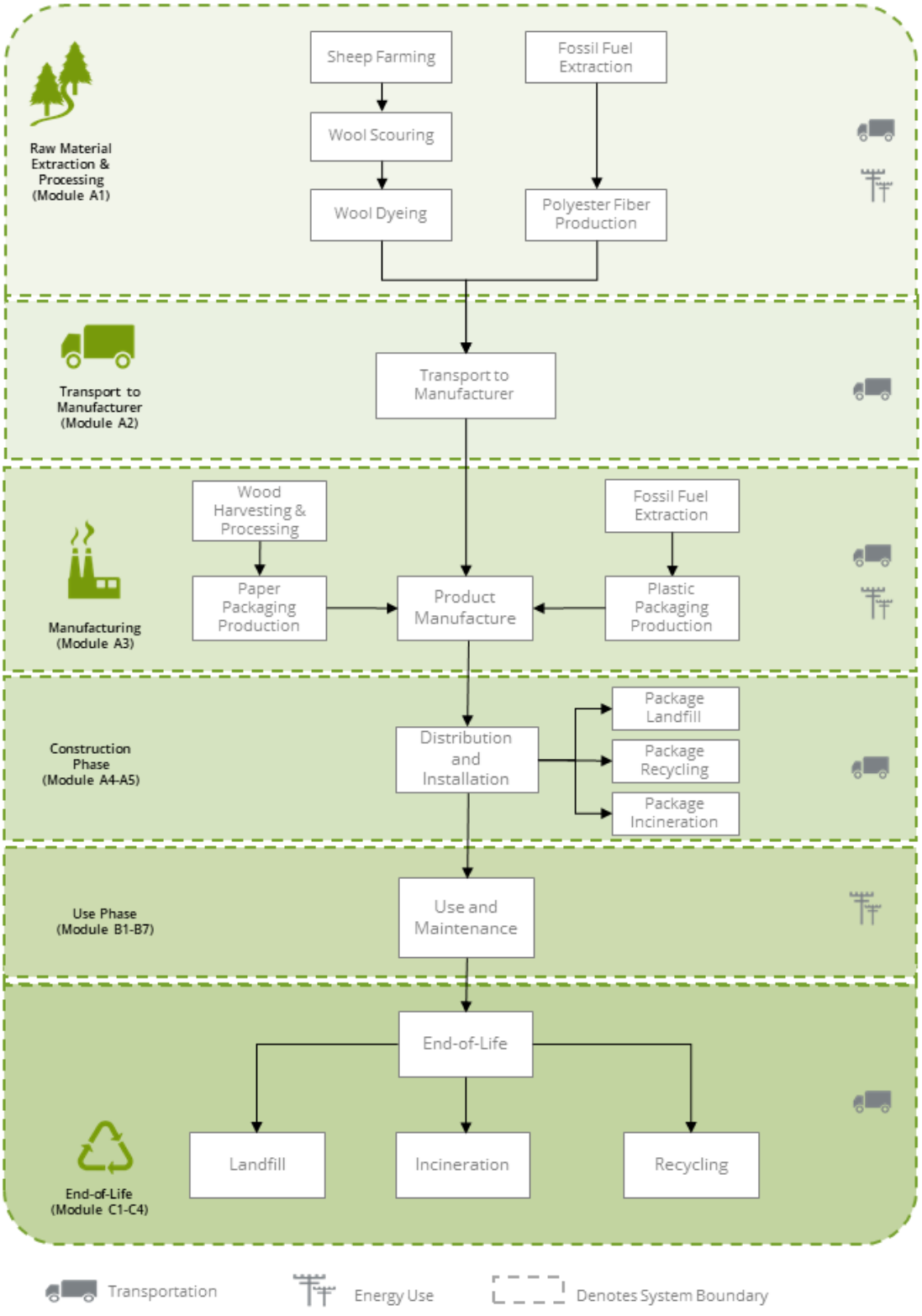

Figure 1. *Flow diagram representing the major unit operations in the life cycle of the Senses Akustik product.*

3.3 Estimates and Assumptions

- Senses Akustik's manufacturing facility is located in Valsad, Gujarat, India. An Ecoinvent inventory dataset for the energy mix for Western subregion of India is used to estimate resource use and emissions from electricity use at the manufacturing facility.
- Electricity and resource use are all dedicated to the acoustic products production. Data were provided by the manufacturer for the April 2019 – March 2020 period.
- Primary data for upstream component fabrication were not available. Representative LCI datasets from the ecoinvent database were used to model processing for wool felt fibers and polyesters fibers material components.

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.

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 Senses Akustik for manufacturing facility in Valsad, Gujarat, India. The sources of secondary LCI data are the Ecoinvent database.

Table 5. *Data sources for the Senses Akustik product system.*

Component	Material Dataset	Data Source	Publication Date
Product			
Wool Felt Fibers			
Greasy Wool	sheep production, for wool | sheep fleece in the grease | Cutoff, U - RoW	EI v3.7	2020
Scoured Wool	chemical production, inorganic | chemical, inorganic | Cutoff, U – GLO lubricating oil production | lubricating oil | Cutoff, U – RoW polyethylene terephthalate production, granulate, amorphous | polyethylene terephthalate, granulate, amorphous | Cutoff, U – RoW market for steel, low-alloyed | steel, low-alloyed | Cutoff, U - GLO	Literature[1] for process primary data EI v3.7 for secondary LCI data	2013 2020
Dyed Wool	chemical production, inorganic | chemical, inorganic | Cutoff, U – GLO non-ionic surfactant production, fatty acid derivate | non-ionic surfactant | Cutoff, U – GLO polyethylene terephthalate production, granulate, amorphous | polyethylene terephthalate, granulate, amorphous | Cutoff, U – RoW polyethylene production, high density, granulate | polyethylene, high density, granulate | Cutoff, U – RoW sodium hypochlorite production, product in 15% solution state | sodium hypochlorite, without water, in 15% solution state | Cutoff, U - RoW	Literature[1] for process primary data EI v3.7 for secondary LCI data	2013 2020
Polyester Fibers			
Fibre, Polyester	polyester fibre production, finished | fibre, polyester | Cutoff, U	EI v3.7	2020
Packaging			
Packaging plastic	market for polyethylene, linear low density, granulate | polyethylene, linear low density, granulate | Cutoff, U - GLO market for extrusion, plastic film | extrusion, plastic film | Cutoff, U - GLO	EI v3.7 EI v3.7	2020 2020
Cardboard	market for corrugated board box | corrugated board box | Cutoff, U - RoW	EI v3.7	2020
Resources			
Grid electricity	market for electricity, medium voltage | electricity, medium voltage | Cutoff, U-IN-Western Grid	EI v3.7	2020
Heat – natural gas	market for heat, district or industrial, natural gas | heat, district or industrial, natural gas | Cutoff, U – RoW heat production, light fuel oil, at boiler 100kW, non-modulating | heat, central or small-scale, other than natural gas | Cutoff, U - RoW	EI v3.7 EI v3.7	2020 2020
Transport			
Truck	market for transport, freight, lorry 16-32 metric ton, EURO4 | transport, freight, lorry 16-32 metric ton, EURO4 | Cutoff - RoW	EI v3.7	2020
Ship	market for transport, freight, sea, container ship | transport, freight, sea, container ship | Cutoff, U - GLO	EI v3.7	2020
Ship	transport, freight, sea, transoceanic ship | transport, freight, sea, transoceanic ship | Cutoff/GLO	EI v3.7	2020
Waste			
Product	treatment of municipal solid waste, sanitary landfill | municipal solid waste | Cutoff, U – RoW treatment of municipal solid waste, incineration | municipal solid waste | Cutoff, U – RoW treatment of waste polyethylene, for recycling, unsorted, sorting | waste polyethylene, for recycling, sorted | Cutoff, U	EI v3.7 EI v3.7 EI v3.7	2020 2020 2020
Paperboard	treatment of waste paperboard, sanitary landfill | waste paperboard | Cutoff, U – RoW treatment of waste paperboard, municipal incineration | waste paperboard | Cutoff, U - RoW treatment of waste paperboard, unsorted, sorting | waste paperboard, sorted | Cutoff, RoW	EI v3.7 EI v3.7 EI v3.7	2020 2020 2020
Packaging Plastic	treatment of waste polyethylene, sanitary landfill | waste polyethylene | Cutoff, U – RoW treatment of waste polyethylene, municipal incineration | waste polyethylene | Cutoff, U – RoW treatment of waste polyethylene, for recycling, unsorted, sorting | waste polyethylene, for recycling, sorted | Cutoff, U	EI v3.7 EI v3.7 EI v3.7	2020 2020 2020

[1] Life Cycle Assessment of Two Textiles Products: Wool and Cotton, Albino Cardoso, 2013

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.

Table 6. *Data quality assessment for the Senses Akustik 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 (typically 2016) beside wool processing data (7 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 annualized production for 2019-20.
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 Gujarat, India electricity mix. Surrogate data used in the assessment are representative of global or "Rest of the World" operations. Data representative of Global operations are considered sufficiently similar to actual processes.
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 v3.7 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 the production at Senses Akustik facility in Gujarat, India represent an actual 12-month period and are considered of good quality. Secondary LCI datasets Ecoinvent v3.7 LCI data are used.
Uncertainty of the Information: Uncertainty related to data, models, and assumptions	Uncertainty related to materials in the product and packaging is low. Actual supplier data for upstream operations was not available for all suppliers 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 April 2019 - March 2020.

3.8 Allocation

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

Impacts from production of the wool felt fibers were allocated based on the economic value of the different co-products of the wool production all along its supply: meat and fleece for sheep farming, and different grades of wool fibers and grease for wool scouring.

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

Delivery and Installation stage (A4 - A5)

Distribution of the acoustic products to the point of installation is included in the assessment. Transportation parameters for modeling product distribution are summarized in Table 7. Production-weighted average distances by transport mode were used to represent global product distribution.

Table 7. *Product distribution parameters, per 1 m^2 (A4).*

Transport Parameter	Unit	Value
Diesel truck – Fuel utilization	L/100 km	18.7
Diesel truck – Distance (km) India Singapore United States	km	 800 240 2,644
Ocean freighter – Fuel utilization	g/tkm	2.5
Ocean freighter – Distance India Singapore United States	km	 0 4,500 15,100
Gross density of products transported (including packaging)	kg/m^3	234

The impacts associated with the product installation are assumed negligible. The impacts associated with packaging disposal are included with the installation phase as per PCR requirements.

Table 8. *Installation parameters for the Senses Akustik acoustic products, per 1 m^2.*

Parameter		Value
Ancillary materials (kg)		-
Net freshwater consumption (m^3)		-
Electricity consumption (kWh)		-
Product loss per functional unit (m^2)		negligible
Waste materials generated by product installation (%)		7%
Output materials resulting from on-site waste processing (kg)		NA
Mass of packaging waste (kg)	Plastic	0.00540
	Cardboard	0.404
Direct emissions to ambient air, soil and water (kg)		-

Use stage (B1)

Impacts from the use of the product are assumed negligible.

Maintenance stage (B2)

Impacts from routine cleaning and maintenance of the products are assumed negligible.

Repair/Refurbishment stage (B3; B5)

Product repair and refurbishment are not relevant during the lifetime of the product.

Replacement stage (B4)

The materials and energy required for replacement of the product over the 75-year RSL of the assessment are included in this stage.

Building operation stage (B6 – B7)

There is no operational energy or water use associated with the use of the product.

Disposal stage (C1 - C4)

The disposal stage includes removal of the products (C1); transport of the products to waste treatment facilities (C2); waste processing (C3); and associated emissions as the product degrades in a landfill or is burned in an incinerator (C4). For the acoustic product system, no emissions are generated during demolition (C1) while no waste processing (C3) is required for incineration, landfill and recycling disposal.

Transportation of waste materials at end-of-life (C2) assumes a 32 km average distance to disposal, consistent with assumptions used in the US EPA WARM model, as well as literature for Singapore[2] and India[3]. The recycling rates for disposal of the product in India are based on information from the manufacturer for their take-back program (20% of products sold in India are returned at end of life for recycling). Disposal of for the product in Singapore, and packaging in Singapore and India, are based on the UL Part A PCR. Disposal practices in the United States are based on 2018 statistics from the US Environmental Protection Agency.

The relevant disposal statistics used for the product and packaging are summarized in Table 9.

[2] Current practices in selected Southeast Asian countries on managing construction and demolition waste, Borongan, 2007.
[3] Construction waste management in India, Thomas and Wilson, 2013.

Table 9. *Recycling rates for product and packaging materials at end-of-life.*

Material	Recycling Rate (%)	Landfill Rate (%)	Incineration Rate (%)
India			
Product	20%	80%	0%
Packaging - Plastic	10%	90%	0%
Packaging - Cardboard	10%	90%	0%
Singapore			
Product	94%	6%	0%
Packaging - Plastic	94%	6%	0%
Packaging - Cardboard	94%	6%	0%
United States			
Product	15%	66%	19%
Packaging – Plastic*	9%	76%	16%
Packaging - Cardboard	96%	3%	1%

*Note that the sum of percentages for US plastic disposal equal 101% due to rounding

Two waste disposal scenarios are also calculated to allow for scaling of impacts from two of the most commonly encountered types of product waste disposal: Scenario 1), 100% of product waste is incinerated at EOL and Scenario 2), 100% of product waste is landfilled at EOL. The results of these C4 scenarios are summarized in Table 10 below.

Table 10. *Results of waste disposal scenario 1, 100% of the product is landfilled at EOL, and scenario 2, 100% of the product is incinerated at EOL for each impact indicator. The percent difference from the baseline C4 module are included in parentheses, next to the absolute value.*

Impact Category	Unit	Scenario 1 (incineration)	Scenario 2 (landfill)
ReCiPe 2016			
Global Warming	kg CO_2 eq	3.07 (157%)	1.42 (19%)
Terrestrial Acidification	kg SO_2 eq	$4.56x10^{-4}$ (153%)	$2.08x10^{-4}$ (16%)
Marine Eutrophication	kg N eq	$3.24x10^{-5}$ (-96%)	$9.66x10^{-4}$ (25%)
Freshwater Eutrophication	kg P eq	$3.69x10^{-5}$ (50%)	$3.00x10^{-5}$ (22%)
Photochemical Oxidant Formation: Human Health	kg NOx eq	$9.33x10^{-5}$ (391%)	$2.07x10^{-4}$ (9%)
Ozone layer depletion	kg CFC-11 eq	$1.54x10^{-6}$ (1286%)	$9.69x10^{-8}$ (-13%)
CML			
Abiotic depletion (fossil fuels)	MJ	0.69 (43%)	0.59 (22%)

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 11. *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	X	X	X	X	X	X	X	X	X	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 international life cycle impact assessment method – ReCiPe:

Impact Category	Unit
Climate Change (GWP 100)	kg CO_2 eq
Ozone Depletion Potential (ODP)	kg CFC 11 eq
Freshwater Eutrophication Potential (FEP)	kg P eq
Marine Eutrophication Potential (MEP)	kg N eq
Terrestrial Acidification Potential (TAP)	kg SO_2 eq
Photochemical Oxidant Formation Potential (POFP)	kg, NMVOC

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 optional environmental impact category indicators are also reported based on the CML-IA characterization factors:

Impact Category	Unit
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	MJ, LHV

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	-	-

Table 12. *ReCiPe and CML-IA Life Cycle Impact Assessment (LCIA) results for the Senses Akustik acoustic products per 1 m^2. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.*

Module	GWP	ODP	FEP	MEP	TAP	POFP	ADPF
	kg CO_2 eq	kg CFC-11 eq	kg P eq	kg N eq	kg SO_2 eq	kg NMVOC	MJ eq
Total	136	$4.34x10^{-4}$	$3.91x10^{-2}$	$4.32x10^{-2}$	0.69	0.26	1550
	100%	100%	100%	100%	100%	100%	100%
A1	12.4	$5.64x10^{-5}$	$3.41x10^{-3}$	$4.55x10^{-3}$	$7.80x10^{-2}$	$2.22x10^{-2}$	155
	9.17%	12.99%	8.71%	10.53%	11.23%	8.60%	10.02%
A2	0.10	$4.57x10^{-8}$	$7.94x10^{-6}$	$7.14x10^{-7}$	$3.00 x10^{-4}$	$4.60x10^{-4}$	1.50
	0.075%	0.011%	0.020%	0.002%	0.043%	0.18%	0.10%
A3	3.78	$1.09x10^{-6}$	$1.74x10^{-3}$	$4.20 x10^{-4}$	$1.16x10^{-2}$	$8.41x10^{-3}$	42.0
	2.79%	0.25%	4.44%	0.97%	1.67%	3.25%	2.72%
A4	0.48	$2.31x10^{-7}$	$3.50 x10^{-5}$	$3.22x10^{-6}$	$2.43x10^{-3}$	$3.11x10^{-3}$	6.99
	0.36%	0.053%	0.089%	0.007%	0.35%	1.20%	0.45%
A5	0.07	$3.91x10^{-9}$	$4.65x10^{-7}$	$1.90 x10^{-5}$	$1.54 x10^{-5}$	$1.87 x10^{-5}$	$5.86x10^{-2}$
	0.05%	0.001%	0.001%	0.044%	0.002%	0.007%	0.004%
B1	0	0	0	0	0	0	0
B2	0	0	0	0	0	0	0
B3	0	0	0	0	0	0	0
B4	118	$3.76 x10^{-4}$	$3.39x^{10-2}$	$3.74x10^{-2}$	0.60	0.22	1340
	86.7%	86.7%	86.7%	86.7%	86.7%	86.7%	86.7%
B5	0	0	0	0	0	0	0
B6	0	0	0	0	0	0	0
B7	0	0	0	0	0	0	0
C1	0	0	0	0	0	0	0
C2	0.01	$4.57x10^{-9}$	$7.94x10^{-7}$	$7.14x10^{-8}$	$3.02 x10^{-5}$	$4.62 x10^{-5}$	0.15
	0.008%	0.001%	0.002%	0.0002%	0.004%	0.018%	0.010%
C3	0	0	0	0	0	0	0
C4	1.19	$1.11x10^{-7}$	$2.47 x10^{-5}$	$7.70 x10^{-4}$	$1.80 x10^{-4}$	$1.90 x10^{-4}$	0.48
	0.88%	0.026%	0.063%	1.78%	0.026%	0.074%	0.031%

Table 13. *Resource use for the Senses Akustik acoustic products per 1 m^2. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.*

Module	RPRe	RPRm	NRPRe	NRPRm	SM	RSF	NRSF	FW
	MJ	MJ	MJ	MJ	kg	MJ	MJ	m^3
Total	147	INA	1,320	142.1	2.68	Neg.	Neg.	2.97
	100%		100%	100%	100%			100%
A1	15.4	INA	175	-	-	Neg.	Neg.	0.247
	10.5%		9.6%	-	-			8.3%
A2	0.017	INA	1.4	-	-	Neg.	Neg.	$5.1x10^{-4}$
	0.01%		0.11%	-	-			0.02%
A3	4.1	INA	40.2	-	-	Neg.	Neg.	0.145
	2.8%		3.1%	-	-			4.9%
A4	0.075	INA	6.7	-	-	Neg.	Neg.	$2.3x10^{-3}$
	0.05%		0.51%	-	-			0.06%
A5	0.001	INA	0.06	-	-	Neg.	Neg.	$4.0x10^{-5}$
	<0.01%		<0.01%	-	-			<0.01%
B1	0	INA	0	-	-	0	0	0
B2	0	INA	0	-	-	0	0	0
B3	0	INA	0	-	-	0	0	0
B4	127	INA	1,140	-	-	Neg.	Neg.	2.6
	86.7%		86.7%	-	-			86.7%
B5	0	INA	0	-	-	0	0	0
B6	0	INA	0	-	-	0	0	0
B7	0	INA	0	-	-	0	0	0
C1	0	INA	0	-	-	0	0	0
C2	$1.7x10^{-3}$	INA	0.14	-	-	Neg.	Neg.	$5.13x10^{-5}$
	<0.01%		0.01%	-	-			<0.01%
C3	0	INA	0	-	-	0	0	0
C4	0.023	INA	0.45	-	-	Neg.	Neg.	$8.0x10^{-4}$
	0.02%		0.03%	-	-			0.03%

Neg. = Negligible
INA = Indicator Non-Assessed

Table 14. *Waste and outflows for the Senses Akustik's acoustic products per 1 m^2. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.*

Module	HWD	NHWD	RWD-HD	RWD-LL	CRU	MR	MER	EE
	kg	kg	kg	kg	kg	kg	kg	MJ
Total	0.06	27.4	$3.21x10^{-5}$	$5.32x10^{-3}$	INA	8.02	Neg.	Neg.
	100%	100%	100%	100%		100%		
A1	$7.64x10^{-3}$	1.1	$2.81x10^{-5}$	$2.70x10^{-4}$	INA	-	Neg.	Neg.
	13.3%	3.8%	11.7%	5.1%		-		
A2	$3.99x10^{-6}$	0.07	$7.96 x10^{-8}$	$9.93x10^{-6}$	INA	-	Neg.	Neg.
	0.01%	0.3%	0.03%	0.2%		-		
A3	$1.14x10^{-5}$	0.70	$3.47x10^{-6}$	$3.09x10^{-5}$	INA	-	Neg.	Neg.
	0.02%	2.6%	1.4%	0.6%		-		
A4	$1.73x10^{-5}$	0.30	$3.51x10^{-7}$	$3.96x10^{-5}$	INA	-	Neg.	Neg.
	0.03%	1.1%	0.2%	0.7%		-		
A5	$1.39x10^{-7}$	0.38	$6.23x10^{-9}$	$3.55x10^{-4}$	INA	-	Neg.	Neg.
	<0.01%	0.1%	<0.01%	6.7%		-		
B1	0	0	0	0	INA	-	0	0
B2	0	0	0	0	INA	-	0	0
B3	0	0	0	0	INA	-	0	0
B4	0.05	23.8	$2.09 x10^{-4}$	$4.61x10^{-3}$	0	-	Neg.	Neg.
	86.7%	86.7%	86.7%	86.7%		-		
B5	0	0	0	0	INA	-	0	0
B6	0	0	0	0	INA	-	0	0
B7	0	0	0	0	INA	-	0	0
C1	0	0	0	0	0	-	0	0
						-		
C2	$3.99x10^{-7}$	$7.20x10^{-3}$	$7.96x10^{-9}$	$1.07x10^{-6}$	INA	-	Neg.	Neg.
	<0.01%	0.03%	<0.01%	0.02%		-		
C3	0	0	0	0	0	-	0	0
C4	$1.71x10^{-6}$	1.5	$1.24 x10^{-7}$	$2.79x10^{-6}$	INA	-	Neg.	Neg.
	<0.01%	5.4%	0.1%	0.1%		-		

Neg. = Negligible
INA = Indicator Non Assessed

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.

Cradle-to-grave impact results are summarized by life cycle phase for the functional unit of one square meter of product maintained for 75 years. Results are also presented as a percentage of the total for each impact category indicator. The product replacement phase (*B4*) accounts for approximately 87% of the total impact over the 75-yr ESL of the assessment. The remaining life cycle phase contributions are dominated by the raw material extraction and processing phase (A1) followed by the manufacturing phase (A3). Depending on the indicator, the most impactful component of the raw material extraction and processing phase (A1) is either the polyester fiber fabrication, or the wool felt fiber fabrication.

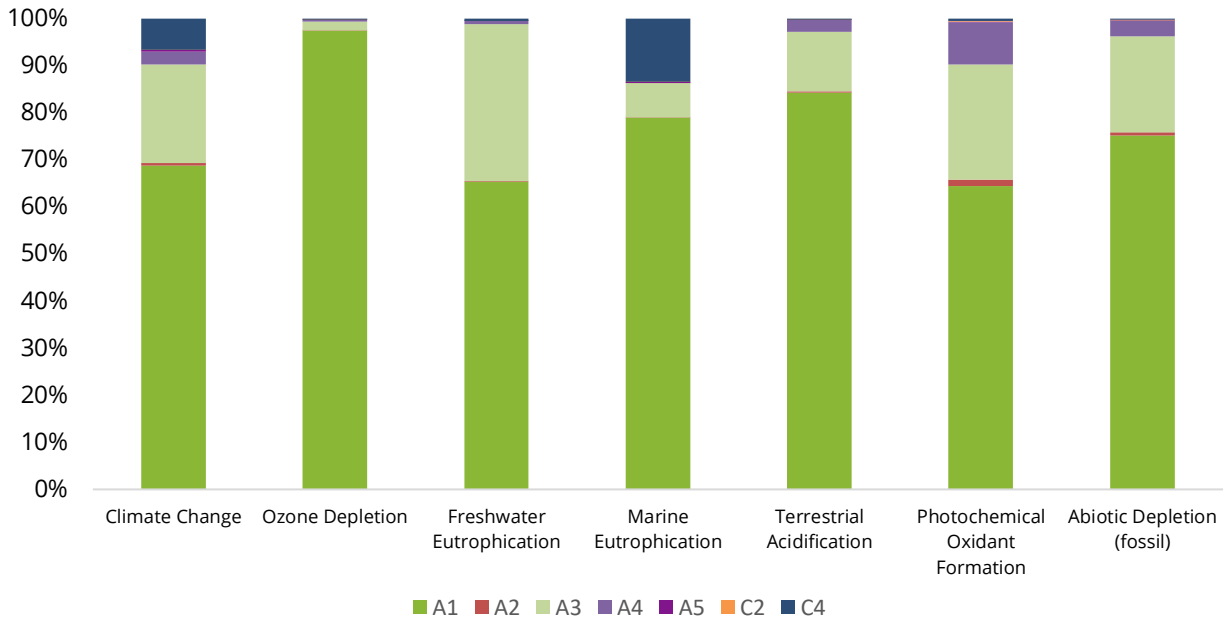

Figure 2. *Contribution analysis for the Senses Akustik's acoustic products – ReCiPe Midpoint (H) 2016 and CML-IA Baseline (excluding B4 product replacements).*

8. References

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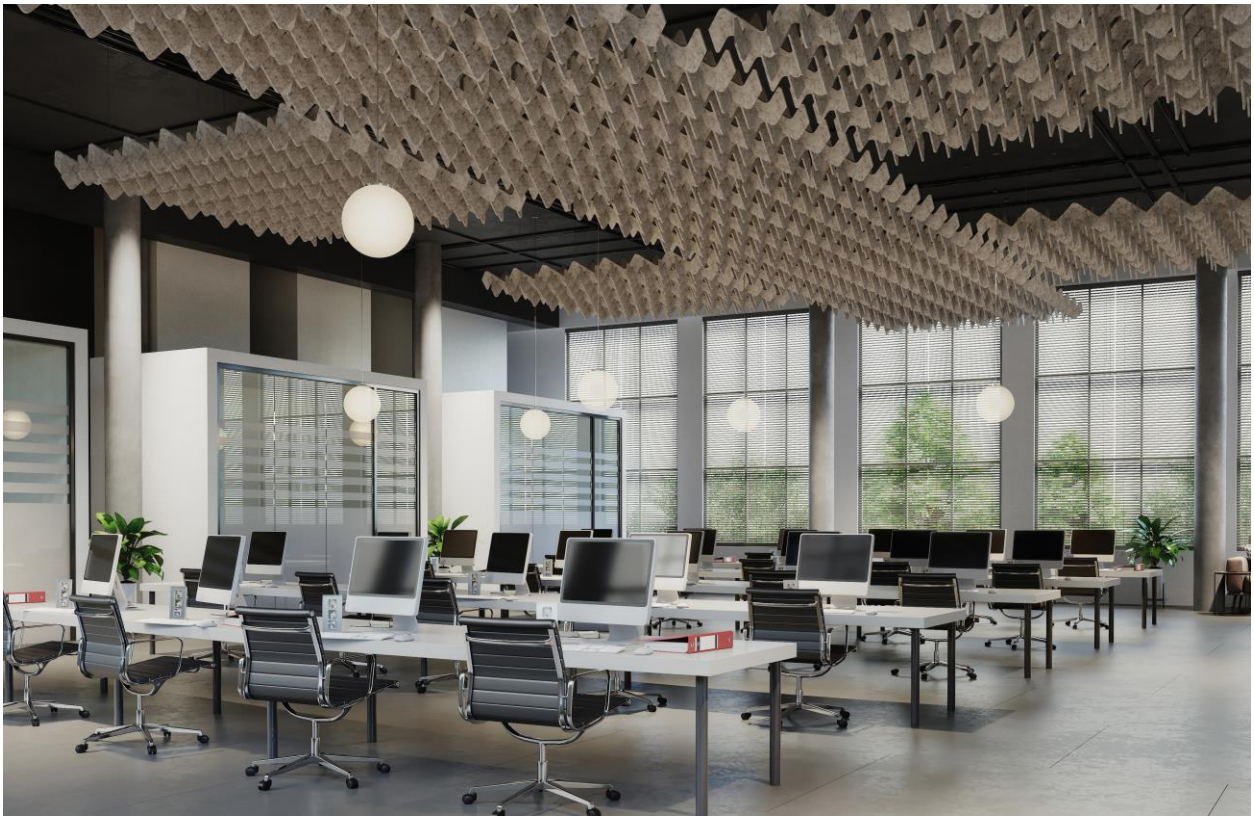

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