EPD - ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804+A2

OWNER AND PUBLISHER	Bau EPD GmbH, A-1070 Wien, Seidengasse 13/3, www.bau-epd.at
PROGRAMME OPERATOR	Bau EPD GmbH, A-1070 Wien, Seidengasse 13/3, www.bau-epd.at
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ISOLENA Sheep's wool insulation
Isolena Naturfaservliese GmbH


ISOLENA
♥ 100% WOOL

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1 General information

Product name Sheep's wool insulation	**Declared Product / Declared Unit** 1 m³ average Sheep's wool insulation **Number of datasets in EPD Document(s): 1** **Range of validity** The data used here represents the sheep's wool insulation from the manufacturer Isolena Naturfaservliese GmbH from the year 2023 from the plant Waizenkirchen with a production volume of 600 tonnes per year.
Declaration number BAU-EPD-Isolena-2025-1-Ecoinvent-Schafwolldämmung	
Declaration data ☒ Specific data ☐ Average data	
Declaration based on MS-HB Version 5.0.0 date 20.09.2023 PCR: Insulating materials made from renewable resources A2 PCR-Code: 2.22.5 Version 12.0 date 20.09.2023 (PCR tested and approved by the independent expert committee = PKR-Gremium) M-14A2 content and format template: Version 7.0 date 20.09.2023 The owner of the declaration is liable for the underlying information and evidence; Bau EPD GmbH is not liable with respect to manufacturer information, life cycle assessment data and evidence.	
Type of Declaration as per EN 15804 From cradle to gate and Modul D LCA-method: Cut-off by classification	**database, software, version** Database: ecoinvent v3.9.1 Software: SimaPro (Version 9.5.0.1) **Version Characterisation factors:** Joint Research Center, EF 3.1
Author of the Life Cycle Assessment IBO GmbH Alserbachstraße 5/8 1090 Wien Österreich	**The CEN standard EN 15804:2022-02-15 serves as the core-PCR.** **Independent verification of the declaration according to ISO 14025:2010** ☐ intern ☒ extern **Verifier 1:** Dipl.-Ing. (FH) Angela Schindler **Verifier 2:** DI Dr. Florian Gschösser
Holder of the Declaration ISOLENA Naturfaservliese GmbH Klosterstraße 20 4730 Waizenkirchen Austria	**Owner, Publisher and Programme Operator** Bau EPD GmbH Seidengasse 13/3 1070 Wien Österreich

DI (FH) DI DI Sarah Richter
Head of Conformity Assessment Body

Dipl.-Ing. (FH) Angela Schindler
Verifier

DI Dr. Florian Gschösser
Verifier

Note: EPDs from similar product groups from different programme operators might not be comparable.

2 Product

2.1 General product description

The product under consideration, ISOLENA sheep's wool insulation is produced in rolls for heat, cold and sound insulation at the factory in Waizenkirchen. It is available in thicknesses from 3.5 mm to 300 mm. Sheep's wool is hygroscopic and can absorb up to 33% of its own weight in moisture without losing its insulating properties. In addition, sheep's wool does not form a breeding ground for mould. Sheep's wool has been proven to be able to break down pollutants and odours. Thanks to the use of 100% virgin sheep's wool, the special ISOLENA processing technology and the biocide-free Ionic Protect® wool protection, the sheep's wool insulation achieves a fire classification of C or D according to EN 13501-1, depending on the product. ISOLENA sheep's wool insulation is manufactured without adhesives or synthetic support fibres offers biocide-free wool protection that is certified and long-term tested with the Ionic Protect® process. The sheep's wool can be returned 100% to the natural cycle and is fully compostable. The product has the European Technical Assessment ETA-07/0214, a declaration of performance in accordance with Regulation (EU) No. 305/2011 and CE labelling. All ISOLENA products bear the natureplus® test mark for sustainable building materials: it stands for environmentally friendly production, health compatibility, conservation of finite resources and suitability for use.

2.2 Application field

Sheep's wool insulation can be used for all conceivable building construction projects in roofs, walls, façades, ceilings, floors, windows and joint seals. It is also suitable as impact sound and acoustic insulation, as well as a room air filter and sound absorber.

2.3 Standards, guidelines and regulations relevant for the product

Table 1: Product-relevant standards

Standard	Title
ETA-07/0214	ETA for Thermal and/or acoustic insulation mat made of sheep wool
EN 13501-1	Fire classification of construction products and building elements
DIN EN ISO 354	Acoustics — Measurement of sound absorption in a reverberation room
DIN EN ISO 11654	Acoustics — Sound absorbers for use in buildings — Rating of sound absorption
EAD 040005-00-1201	Factory-made thermal and/or acoustic insulation products made of vegetable or animal fibres
EN 1608:1996	Thermal insulating products for building applications - Determination of tensile strength parallel to faces
ISO 3998:1997 EAD Annex C	Textiles – Determination of resistance to certain insect pests
EN 1609:1996	Thermal insulating products for building applications - Determination of short term water absorption by partial immersion
EN 1604:1996	Thermal insulating products for building applications - Determination of dimensional stability under specified temperature and humidity conditions

2.4 Technical Data

Table 2: Technical data for ISOLENA sheep's wool insulation

Characterization	Value	Unit
Nominal density	18-100	kg/m³
Density range	18-100	kg/m³
Average density	23,26	kg/m³
Nominal value of thermal conductivity λD indicating the test geometry	0,043 -0,036	W/(mK)
Average thermal conductivity λ	0,037	W/(mK)
Conversion factor for calculating the rated value of the thermal conductivity (23 °C/80 % rel. humidity)	1	-
Reaction to fire classification according to ÖNORM EN 13501-1	B s1 d0 D-s2, d0 C-s2, d0	-
Resistance to biological influences (against mould growth), long-term test	Class 0	-
Resistance to insect pests biocide-free wool protection	Ionic Protect® Long-term test	-
Flow resistance (measurement method: EN 29053)	4,1–29,5	(kPa s) / m²

Water vapour diffusion resistance factor	1	µ
Tensile strength (parallel)	Twice the weight of the product can be carried	
Resistance to biological effects (against mould growth)	Class 0	Long-term test
Water absorption	0,98–2,45	kg/m²
Dimensional stability	± 6,1	% thickness

2.5 Basic/auxiliary materials

Table 3: Basic and auxiliary materials in mass percentage

Components:	Function	Mass fraction in percent
Sheep's wool	Insulating function	100 %

2.6 Production

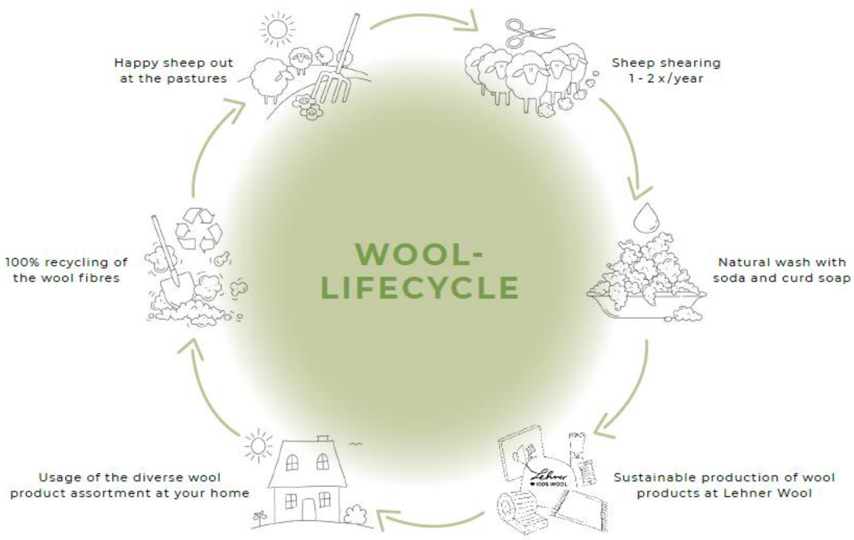

Figure 1: Flowchart production processes

The sheep are shorn once or twice a year and the wool is transported in big bags to regional collection centres. At the collection centres, the wool is repacked, compacted and then transported to the laundry. There, the wool is washed with water and soda. After washing, the material is dried and compressed into bales and transported to the production site in Waizenkirchen. To produce the high-quality insulation material, the raw wool is then transported directly into the machine via the bale openers. There it passes through the carding machine for loosening and sorting out vegetation. The individual wool flocks are then formed into a thin fleece over many rollers, which is then activated with Ionic Protect® wool protection (plasma ion treatment). Immediately, these fibres provide no longer food for keratin-digesting insects. The fleece layers are then mechanically consolidated by a needling machine. Finally, the products are cut to size, quality checked (length, width, thickness and weight) and packaged so that they can then be palletised and dispatched.

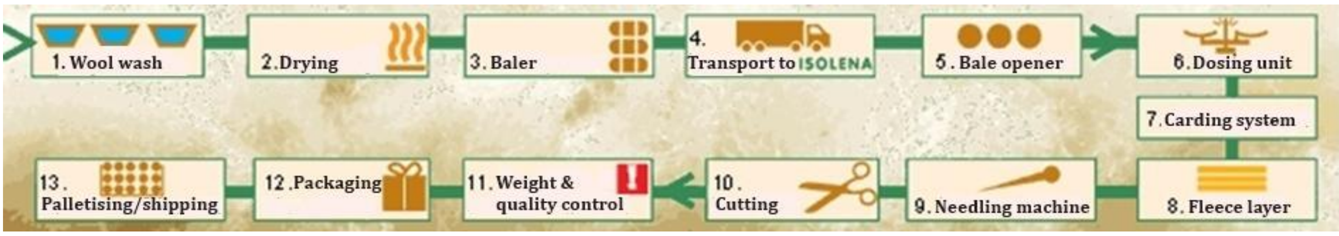

Figure 2: Production process

Quality management is carried out throughout the entire production chain to ensure the quality and purity of the product. The weight, dimensions and bulk density of the goods are continuously checked internally and all production batches are tested by an external authorised testing laboratory. Batches are continuously allocated and archived for each order. External monitoring is also carried out according to the criteria of the ETA test plan in accordance with CE labelling. The wool protector Ionic Protect® is tested in accordance with EAD/CUAP.

2.7 Packaging

Polyethylene (PE) film, wood and cardboard are used to package ISOLENA sheep's wool insulation materials. All packaging materials are recyclable by type or can be utilised for energy recovery.

2.8 Conditions of delivery

ISOLENA sheep's wool insulation is rolled and compressed, packed in PE film (bags) or cardboard boxes and assembled on wooden pallets. It can be stored indefinitely in storage rooms.

2.9 Transport

The products are transported to all countries by lorry, only to Ireland are they transported by container freight.

2.10 Processing/ installation

ISOLENA sheep's wool insulation is supplied ready-made to size and is easy to work with. The rolls are easy to carry and the sheep's wool is very kind to the skin and health during further processing. ISOLENA can be processed without protective clothing and dust masks because it is made of 100% virgin sheep's wool and has no respirable fibres. Fibre contamination of the room air can be ruled out, as the sheep's wool fibres have a minimum length of approx. 20 mm for spinning reasons. As the fleece rolls are cut at the side edges for assembly, it is possible that shorter fibres may occur there and come loose during installation work. Once installed, no more fibres are released and therefore fibre contamination of the room air can be ruled out. The material does not itch or scratch during installation. The insulation can be cut to length by hand without tools. The insulation rolls are inserted from the bottom upwards and the sheep's wool is fixed to the rafters at the sides by tacking. The mechanical stabilisation of the sheep's wool gives the insulation material sufficient stability to prevent settlement, provided it is installed correctly. The premium insulation rolls offer additional time savings with high strengths and insulation thicknesses, up to 300 mm in a single layer. If Metal profiles are used, the Installation is also from the bottom up, but the material should be fixed to the rear panelling at regular intervals (Mounting aid WoolFix®).

2.11 Use stage

With sheep's wool insulation materials from ISOLENA, there are no changes in the material composition over the period of use if they are planned properly, installed correctly and used professionally and trouble-free. Thanks to its basic protein building block keratin, the material is able to absorb and neutralise toxins such as formaldehyde. Mould also has no chance to grow. Due to its hygroscopic properties, sheep's wool can absorb up to 33 per cent of its own weight in moisture - but the thermal insulation remains intact.

2.12 Reference service life (RSL)

There is no reference service life according to the rules of ÖNORM EN 15804:2022-02-15 (Annex A). According to ÖNORM EN 16783:2017-05-15, the general reference service life for thermal insulation materials is at least 50 years. According to the service life catalogue of Bau-EPD GmbH for the preparation of EPDs, the service life of sheep’s wool insulation felt and sheep’s wool floor impact protection is 50 years. For this reason, 50 years was used in this EPD. Sheep's wool offers a high building physics safety factor due to its natural ability to absorb 33 % of its own weight in moisture without being damp and losing its insulating effect. The ability to bind moisture can be a great advantage, for example, in installation situations where there is a risk of condensation forming. Another natural advantage of protein fibres is that they do not form a breeding ground for mould.

Table 4: Reference service life (RSL)

Characterization	value	unit
Sheep’s wool insulation	50	years

2.13 Reuse and recycling

Sheep's wool insulation can easily be reused if it is removed without causing damage. The sheep's wool can also be recycled in other textile processes or uncontaminated sheep's wool can be composted and used as fertiliser. However, these two reutilisation scenarios do not currently correspond to common practice and are therefore not taken into account in the current EPD. Instead, the scenario of incineration with energy recovery is considered in this EPD, as required by PCR-B.

2.14 Disposal

At the end of its service life, the product can be composted and used as a nitrogen fertiliser. It can also be reused and recycled into new insulation materials, if it is removed without destroying it. The EWC waste code is 17 06 04.

2.15 Further information

You can find more information about the product at www.isolena.com.

3 LCA: Calculation rules

3.1 Declared unit/ Functional unit

Table 5 shows the declared unit with the corresponding lambda value and the bulk density for the average product in this product range. The products were averaged on the basis of the sales quantities.

Table 5: Declared unit

Characterization	value	unit
Declared unit	1	m³
Bulk Density	23,26	kg/m³
Lambda-value	0,037	W/(mK)

3.2 System boundary

This is a cradle-to-grave and module D (Modules A+B+C+D) EPD. All modules contained in the following table have been declared.

Table 6: Declared life cycle stages

PRODUCT STAGE			CON-STRUCTION PROCESS STAGE		USE STAGE							END-OF-LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Construction, installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction, demolition	Transport	Waste processing	Disposal	Reuse- Recovery- Recycling- potential
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

A1–A3:
The sheep's wool used comes from Europe. For the expenses from sheep farming, see allocation under 3.9. The largest share is sourced from Austria, Spain, Germany, the Netherlands and France. Smaller shares also come from Luxembourg and Greece. Each of these countries has central collection centres to which the wool is transported. The exact collection centres in each country are not known, so a central point in the country was assumed. Transport from the pasture to the collection centre was assumed to be 50 km. The transport kilometres from the collection point to the laundry were averaged over the annual production. At the laundry, the wool is washed with a loss of 45%, pressed into bales and transported to the production site. There, the wool flocks are processed into fleeces using various machines (see 2.6) and cut to size. During the production process, 8% of cutting waste is generated, which is returned to the internal manufacturing process.

A4–A5:
Transport to the installation site is by lorry and to Ireland by container freight. The values were averaged according to distribution shares. As installation is carried out by hand, only the fastening aids and waste from product packaging are recognised in stage A5.

C1–C4
As required by PCR-B, a scenario with incineration is selected for the disposal stage. This is in this EPD the incineration with energy recovery. Recycling and reuse without incineration would be possible, as described in 2.14.

D:
In Module D, the loads and benefits associated with the useful energy generated are calculated.

3.3 Flow chart of processes/stages in the life cycle

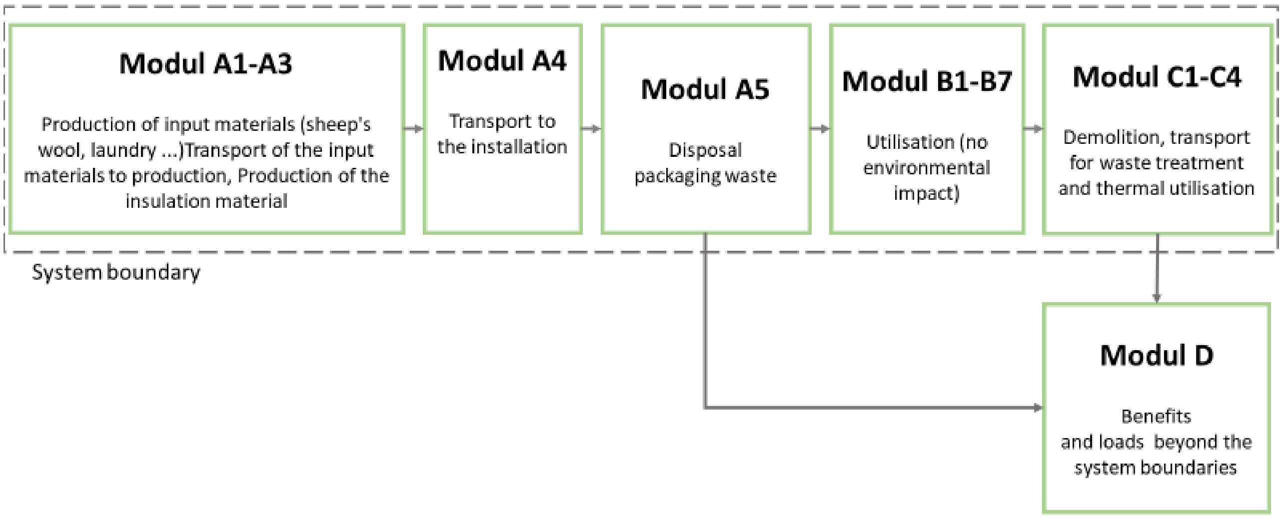

Figure 3: Flow chart of life cycle stages

3.4 Estimations and assumptions

The calorific value of the sheep's wool of 20.58 MJ/kg was calculated using data from the KATALYSE Institute and the calorific value calculation tool from Ingenieurbüro Peters (2019). According to the KATALYSE Institute, the chemical composition is 50 % carbon, 25 % oxygen, 15 % nitrogen, hydrogen and sulphur. For hydrogen and sulphur, 5 % each was assumed. With a moisture content of 17 %, this results in a calorific value of 17.23 MJ/kg. The calorific values for the packaging and biogenic carbon were taken from ecoinvent.
It was assumed that 4 staple needles of 0,04 g each are required to install 1 m² of average insulating wool. For the electric shearing of the sheep, 2.5 Wh/kg sheep wool was assumed. The calculation is based on the following data: One sheep provides 4 kg of wool, the shearing is done electrically with 200 Watt and takes 3 min per sheep.

3.5 Cut-off criteria

In principle, all available input and output flows in the production stage were taken into account. The packaging of auxiliary materials from installation was cut off due to very small quantities. The infrastructure of the plants was also not included.

3.6 Data sources

The background data comes from the ecoinvent database version 3.9.1.

3.7 Data quality

The foreground data was collected using a data collection form sent to the company Isolena Naturfaservliese GmbH. Queries were clarified in an iterative process in writing via e-mail or by telephone. The completeness and plausibility of the manufacturer's data was checked on site during a visit to the production site as part of a natureplus audit.
A consistent and standardised calculation method in accordance with ISO 14044 was applied. In the absence of specific data, generic data sets were used. When selecting the background data, attention was paid to the technological, geographical and time-related representativeness of the data basis. The data sets used are not older than ten years. According to the database documentation, these are mostly data sets that have been updated accordingly or extrapolated to current conditions.

3.8 Reporting period

The data collected relates to the production year 2023.

3.9 Allocation

Austria supplies the most wool for the insulation, which is why the annual report of the Austrian Federal Association for Sheep and Goats was used for information on meat, milk and wool production and their prices (ÖSBZ 2023, 2024). The wool comes from sheep kept for milk/cheese production. The prices for the reject wool, used in ISOLENA products, are provided by the washing facility. The calculation in Table 7 shows that there is a very low allocation of 0,023% for sheep's wool.

Table 7: Information on allocation

Market for sheep products	Allocation in %
Meat	0,371
Milk	99,533
High-quality Wool	0,073
Reject wool for ISOLENA products	0,023

3.10 Comparability

In principle, a comparison or evaluation of EPD data is only possible under certain conditions.
All data sets to be compared must have been created according to the same version of EN 15804 and according to the same programme-specific PCR or any additional rules. The same background database must have been used and in addition, the building context or product-specific performance characteristics must have been taken into account.

4 LCA: Scenarios and additional technical information

4.1 A1–A3 Production stage

According to ÖNORM EN 15804, no technical scenario information is required for modules A1–A3 because the balancing of these modules is the responsibility of the manufacturer and may not be changed by the user of the LCA.

4.2 A4-A5 Construction process stage

In Table 8 the details of the calculation basis for the transport phase are listed.

Table 8: Description of the scenario "Transport to the construction site (A4)"

Parameters to descre the transport to the building site (A4)	Value	Unit
Average transport distance	402,68	km
Vehicle type, Commission Directive 2007/37/EC (European Emission Standard)	EURO 4	-
Fuel type and average consumption of vehicle	17,2	l/100 km
Maximum transport mass	4,98	tons
Capacity utilisation (including empty returns)	19	%
Bulk density of transported products	0,023	t /m3
Volume capacity utilisation factor (factor: =1 or <1 or ≥ 1 for compressed or nested packaged products)	> 1	-
Average transport distance with containerised freight	300,34	km

Table 9: Description of the Scenario „Installation of the product in the building (A5)“

Parameters to describe the installation of the product in the building (A5)	Value	Unit
Ancillary materials for installation (specified by material); Staple needles	6,5E-5	kg/kg
Ancillary materials for installation (specified by type);		-
Water use		m3/t l/t
Other resource use		kg/t t/t l/t
Electricity demand		kWh oder MJ/t
Other energy carrier(s): …………….		kWh oder MJ/t
Wastage of materials on the building site before waste processing, generated by the product’s installation (specified by type)		kg/t
Output materials (specified by type) as result of waste processing at the building site e.g. of collection for recycling, for energy recovery, disposal (specified by route)	0,02 0,015	kg/kg
Direct emissions to ambient air (such as dust, VOC), soil and water		kg/t

4.3 B1-B7 use stage

Reference service life: 50 a

In the utilisation stage (B1), there are no material and energy flows relevant to the LCA for insulation materials made from renewable raw materials. During use, no maintenance, repair, replacement or conversion processes take place for insulations made from renewable raw material, which is why modules B2 to B5 have no environmental impact. Modules B6 and B7 are not relevant for insulations made from renewable raw material, which means that they also have no environmental impact. It follows that there are no material or mass flows in modules B1-B7, input +/- output = 0.

4.4 C1-C4 End of Life stage

The disposal scenario of this EPD is thermal utilisation with energy recovery; other reuse options are described under 2.13. For C1, no material and energy flows take place during demolition, as it is assumed that work is primarily carried out manually, as is the case with installation. Transport distance in life cycle stage C2 to the plant was assumed to be 150 km. According to CEWEP (2013), it can be assumed for European waste incineration plants that the plant has an R1 value > 0,6. It is therefore a waste management operation declared in stage C3. With regard to C4, according to CEWEP (2013), it can be assumed for European waste incineration plants that the plant has an R1 value > 0.6. It is therefore a waste management facility that is declared in phase C3.

Table 10: Description of the scenario „Disposal of the product (C1 to C4)"

Parameters for End-of-Life stage (C1-C4)	value	Quantity per m3 insulation material
Collection process specified by type	1	kg collected separately
		kg collected with mixed construction waste
Recovery system specified by type		kg for re-use
		kg for recycling
	1	kg for energy recovery
Disposal specified by type		kg product or material for final deposition

4.5 D Potential of reuse, recovery and recycling

In Module D, the credit from incineration was calculated. No reuse or material recovery was considered.

Table 11: Description of the scenario „re-use, recovery and recycling potential (module D)"

Parameters for module D	value	unit
Materials for reuse, recovery or recycling from A4-A5		%
Energy recovery or secondary fuels from A4-A5	0,266	MJ/t resp. kg/t
Materials for reuse, recovery or recycling from B2-B5		%
Energy recovery or secondary fuels from B2-B5		MJ/t resp. kg/t
Materials for reuse, recovery or recycling from C1-C4		%
Energy recovery or secondary fuels from C1-C4	7,79	MJ/t resp. kg/t

5 LCA: results

The following tables show the results for 1 m³ of ISOLENA insulation with a bulk density of 23.26 kg/m³.

Table 12: Parameters to describe the environmental impact

Parameter	Unit	A1-3	A4	A5	B1-B7	C1	C2	C3	C4	D from A5	D from C3
GWP total	kg CO2 eq.	-1,93E+01	5,26E+00	7,18E-01	0,00	0,00	1,93E+00	3,74E+01	0,00	-2,48E-01	-6,72E+00
GWP fossil fuels	kg CO2 eq.	1,69E+01	5,25E+00	6,07E-03	0,00	0,00	1,93E+00	9,12E-01	0,00	-2,48E-01	-6,71E+00
GWP biogenic[1]	kg CO2 eq.	-3,64E+01	0,00E+00	7,12E-01	0,00	0,00	0,00E+00	3,64E+01	0,00	0,00E+00	0,00E+00
GWP luluc	kg CO2 eq.	1,76E-01	3,10E-03	2,35E-06	0,00	0,00	1,14E-03	3,12E-04	0,00	-1,43E-04	-3,88E-03
ODP	kg CFC-11 eq.	3,23E-07	1,14E-07	2,64E-10	0,00	0,00	4,22E-08	2,20E-08	0,00	-1,06E-08	-2,86E-07
AP	mol H+ eq.	1,45E-01	2,22E-02	1,55E-04	0,00	0,00	7,49E-03	5,75E-03	0,00	-4,36E-04	-1,18E-02
EP freshwater	kg P eq.	3,56E-03	4,43E-04	3,21E-06	0,00	0,00	1,64E-04	1,13E-03	0,00	-1,27E-04	-3,43E-03
EP marine	kg N eq.	3,37E-02	7,85E-03	8,00E-05	0,00	0,00	2,73E-03	3,23E-03	0,00	-1,26E-04	-3,42E-03
EP terrestrial	mol N eq.	5,59E-01	8,39E-02	8,21E-04	0,00	0,00	2,91E-02	2,55E-02	0,00	-1,17E-03	-3,17E-02
POCP	kg NMVOC eq.	8,41E-02	3,03E-02	2,19E-04	0,00	0,00	1,07E-02	6,68E-03	0,00	-5,42E-04	-1,47E-02
ADPE	kg Sb eq.	1,40E-04	2,28E-05	1,42E-08	0,00	0,00	8,45E-06	1,51E-06	0,00	-3,49E-07	-9,46E-06
ADPF	MJ Hu	2,50E+02	7,41E+01	6,08E-02	0,00	0,00	2,73E+01	5,86E+00	0,00	-3,75E+00	-1,02E+02
WDP	m3 eq.	1,62E+01	3,05E-01	2,29E-03	0,00	0,00	1,13E-01	3,20E-01	0,00	-3,21E-02	-8,70E-01
Legend	GWP = Global warming potential; luluc = land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance: EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources WDP = Water (user) deprivation potential, deprivation-weighted water consumption										

[1] The biogenic GWP represents only the theoretically stored value of the product and the methane emissions from sheep farming. The other very low emissions from the upstream chain were neglected.

Table 13: Additional environmental impact indicators

Parameter	Unit	A1–A3	A4	A5	B1-B7	C1	C2	C3	C4	D from A5	D from A3
PM	disease incidence	1,54E-06	3,14E-07	1,33E-09	0,00	0,00	1,16E-07	6,30E-08	0,00	-2,05E-09	-5,55E-08
IRP	kBq U235 eq.	8,22E-01	1,46E-01	2,18E-04	0,00	0,00	5,44E-02	1,04E-02	0,00	-2,83E-02	-7,67E-01
ETP- fw	CTUe	2,96E+02	3,92E+01	1,19E-01	0,00	0,00	1,44E+01	2,18E+01	0,00	-4,21E-01	-1,14E+01
HTP-c	CTUh	1,02E-08	2,70E-09	1,45E-10	0,00	0,00	9,93E-10	2,17E-09	0,00	-5,65E-11	-1,53E-09
HTP-nc	CTUh	2,67E-07	5,13E-08	3,75E-10	0,00	0,00	1,90E-08	8,63E-08	0,00	-1,03E-09	-2,80E-08
SQP	dimension-less	3,36E+02	3,05E+01	2,07E-02	0,00	0,00	1,13E+01	3,63E+00	0,00	-5,85E-01	-1,59E+01
Legend					PM = Potential incidence of disease due to Particulate Matter emissions; IRP = Potential Human exposure efficiency relative to U235; ETP-fw = Potential Comparative Toxic Unit for ecosystems; HTP-c = Potential Comparative Toxic Unit for humans – cancer effect; HTP-nc = Potential Comparative Toxic Unit for humans – non-cancer effect; SQP = Potential soil quality index						

Table 14: Parameters to describe the use of resources

Parameter	Unit	A1–A3	A4	A5	B1-B7	C1	C2	C3	C4	D from A5	D from C3
PERE	MJ, net calorific value	7,71E+01	1,54E+00	5,18E+00	0,00	0,00	5,70E-01	4,09E+02	0,00	-1,31E+00	-3,55E+01
PERM	MJ, net calorific value	4,14E+02	0,00E+00	-5,18E+00	0,00	0,00	0,00E+00	-4,09E+02	0,00	0,00E+00	0,00E+00
PERT	MJ, net calorific value	4,91E+02	1,54E+00	4,51E-03	0,00	0,00	5,70E-01	1,90E-01	0,00	-1,31E+00	-3,55E+01
PENRE	MJ, net calorific value	2,35E+02	7,41E+01	1,52E+01	0,00	0,00	2,73E+01	5,86E+00	0,00	-3,75E+00	-1,02E+02
PENRM	MJ, net calorific value	1,51E+01	0,00E+00	-1,51E+01	0,00	0,00	0,00E+00	0,00E+00	0,00	0,00E+00	0,00E+00
PENRT	MJ, net calorific value	2,50E+02	7,41E+01	6,08E-02	0,00	0,00	2,73E+01	5,86E+00	0,00	-3,75E+00	-1,02E+02
SM	kg	6,05E-06	0,00E+00	0,00E+00	0,00	0,00	0,00E+00	0,00E+00	0,00	0,00E+00	0,00E+00
RSF	MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00	0,00	0,00	0,00E+00	0,00E+00	0,00	0,00E+00	0,00E+00
NRSF	MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00	0,00	0,00	0,00E+00	0,00E+00	0,00	0,00E+00	0,00E+00
FW	m3	5,28E-01	1,03E-02	1,26E-04	0,00	0,00	3,82E-03	1,69E-02		-2,71E-03	-7,36E-02
Legend						PERE = Renewable primary energy as energy carrier; PERM = Renewable primary energy resources as material utilization; PERT = Total use of renewable primary energy resources; PENRE = Non-renewable primary energy as energy carrier; PENRM = Non-renewable primary energy as material utilization; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of fresh water					

Table 15: Parameters describing LCA-output flows and waste categories

Parameter	Unit	A1–A3	A4	A5	B1-B7	C1	C2	C3	C4	D from A5	D from C3
HWD	kg	1,20E-03	4,69E-04	3,10E-07	0,00	0,00	1,73E-04	2,74E-05	0,00	-1,20E-05	-3,26E-04
NHWD	kg	1,14E+01	2,34E+00	8,14E-03	0,00	0,00	8,69E-01	4,51E+00	0,00	-1,59E-02	-4,30E-01
RWD	kg	3,81E-04	6,60E-05	9,90E-08	0,00	0,00	2,45E-05	4,68E-06	0,00	-1,35E-05	-3,67E-04
CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00	0,00	0,00E+00	0,00E+00	0,00	0,00E+00	0,00E+00
MFR	kg	0,00E+00	0,00E+00	0,00E+00	0,00	0,00	0,00E+00	0,00E+00	0,00	0,00E+00	0,00E+00
MER	kg	0,00E+00	0,00E+00	0,00E+00	0,00	0,00	0,00E+00	0,00E+00	0,00	0,00E+00	0,00E+00
EEE	MJ	0,00E+00	0,00E+00	1,74E+00	0,00	0,00	0,00E+00	4,75E+01	0,00	0,00E+00	0,00E+00
EET	MJ	0,00E+00	0,00E+00	4,43E+00	0,00	0,00	0,00E+00	1,20E+02	0,00	0,00E+00	0,00E+00
Legend	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electric energy; EET = Exported thermal energy										

Table 16: Classification of disclaimers to the declaration of core and additional environmental impact indicators

ILCD-classification	Indicator	disclaimer
ILCD-Type 1	Global warming potential (GWP)	none
	Depletion potential of the stratospheric ozone layer (ODP)	none
	Potential incidence of disease due to PM emissions (PM)	none
ILCD-Type 2	Acidification potential, Accumulated Exceedance (AP)	none
	Eutrophication potential, Fraction of nutrients reaching freshwater end compartment (EP-freshwater)	none
	Eutrophication potential, Fraction of nutrients reaching marine end compartment (EP-marine)	none
	Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	none
	Formation potential of tropospheric ozone (POCP)	none
	Potential Human exposure efficiency relative to U235 (IRP)	1
ILCD-Type 3	Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	2
	Abiotic depletion potential for fossil resources (ADP-fossil)	2
	Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	2
	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	2
	Potential Comparative Toxic Unit for humans (HTP-c)	2
	Potential Comparative Toxic Unit for humans (HTP-nc)	2
	Potential Soil quality index (SQP)	2
Disclaimer 1 – This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.		
Disclaimer 2 – The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.		

Table 17: Information describing the biogenic carbon content at the factory gate

Biogenic carbon content	Unit
Biogenic carbon content in product	9,94 kg C
Biogenic carbon content in accompanying packaging	0,19 kg C
NOTE 1 kg biogenic carbon is equivalent to 44/12 kg of CO_2	

6 LCA: Interpretation

The results show that the production stages (A1–A3) account for the largest share (50–99 %) for all indicators, with the exception of total GWP and PERE. As the carbon stored in the product is released again during thermal incineration in C3, stage C3 also dominates the GWP biogenic indicator at 50 % and thus also GWP total at 56 %. The PERM in C3 is booked out after PERE, so that the C3 stage is just as relevant at just over 83 %. The same occurs with the incineration of packaging materials in the PENRM with deregistration in stage A5. In addition to stages A1–A3, transport to the construction site (A4) has the second largest impact for some indicators, with 13-23 % for the indicators ODP, POCP, ADPE, ADPF, PENRE, PENRT, total GWP and GWP fossil. Stage A4 is insignificant for the remaining indicators.

An analysis of the production stages A1–A3 shows that sheep's wool is dominant for all indicators as the products consist only of wool. Although it is an average product, the composition of the products is the same, only the bulk density and in some cases the shape of the products varies. This means that the range between the products is linear based on the bulk density.

7 Presentation of the representativeness of average EPD

The average EPD is representative for the following products:

- ISOLENA Optimal
- ISOLENA Premium
- ISOLENA Optimal Plus
- ISOLENA Klemmfilz
- ISOLENA Loose Wool
- ISOLENA Window filler
- ISOLENA Sheep wool felt/ -strips

8 Literature

CEWEP (2013)
O.Reimann: CEWEP Energy Report III (Status 2007-2010). Results of Specific Data for Energy, R1 Plant Efficiency Factor and NCV of 314 European Waste-to-Energy (WtE) Plants. Würzburg/Brussels 2013

EN 16485: Round and sawn timber - Environmental Product Declarations - Product category rules for wood and wood-based products for use in construction

EN 16449: Wood and wood-based products - Calculation of the biogenic carbon content of wood and conversion to carbon dioxide

EN ISO 14025: Environmental labels and declarations – Typ III environmental declarations – Principles and procedures

EN ISO 14040: Environmental management — Life cycle assessment — Principles and framework

EN ISO 14044: Environmental management – Life cycle assessment – Requirements and guidelines

Ingenieurbüro Peters (2019)
Ingenieurbüro Peters (2019): Heizwertberechnung. accessed on 24.01.24 at https://www.ib-peters.com/

KATALYSE Institut
KATALYSE Institut: Schafwolle. accessed on 24.01.24 at http://umweltlexikon.katalyse.de/?p=3004

Management System Handbook incl. applicable documents of Bau EPD GmbH

ÖBSZ (2023)
Österreichischer Bundesverband für Schafe und Ziegen (ÖBSZ) (2023): Jahresbericht 2022 at https://www.oebsz.at/fileadmin/user_upload/jahresbericht_2022_final_27.09.2023.pdf

ÖBSZ (2024)
Österreichischer Bundesverband für Schafe und Ziegen (ÖBSZ) (2024): Jahresbericht 2023 unter https://www.oebsz.at/fileadmin/user_upload/jahresbericht_2023_final.pdf

ÖNORM 16783:2017-05-15
Thermal insulation products - Product category rules (PCR) for factory made and in-situ formed products for preparing environmental product declarations

ÖNORM EN 15804:2022-02-15 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products

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9.3 Abbreviations

9.3.1 Abbreviations as per EN 15804

EPD environmental product declaration
PCR product category rules
LCA life cycle assessment
LCI life cycle inventory
LCIA life cycle impact assessment
RSL reference service life
ESL estimated service life
EPBD Energy Performance of Buildings Directive
GWP global warming potential
ODP depletion potential of the stratospheric ozone layer
AP acidification potential of soil and water
EP eutrophication potential
POCP formation potential of tropospheric ozone
ADP abiotic depletion potential

9.3.2 Abbreviations as per corresponding PCR

CE-mark french: Communauté Européenne or Conformité Européenne = EC certificate of conformity
REACH Registration, Evaluation, Authorisation and Restriction of Chemicals

Owner and Publisher

Bau EPD GmbH	Tel	+43 664 2427429
Seidengasse 13/3	Mail	office@bau-epd.at
1070 Wien	Web	www.bau-epd.at
Österreich		

Programm Operator

Bau EPD GmbH		
Seidengasse 13/3	Tel	+43 664 2427429
1070 Wien	Mail	office@bau-epd.at
Österreich	Web	www.bau-epd.at

Author of the Life Cycle Assessment

IBO GmbH	Tel	+43 1 3192005-38
Alserbachstraße 5/8	Fax	+43 1 3192005 50
1090 Wien	Mail	ibo@ibo.at
Österreich	Web	www.ibo.at

Holder of the declaration

Isolena Naturfaservliese GmbH	Tel	+43 (0) 7277-2496-0
Klosterstraße 20	Fax	+43 (0) 7277-2496-14
4730 Waizenkirchen	Mail	office@lehner-wool.com
Österreich	Web	https://www.isolena.com/en/