Environmental Product Declaration

In accordance with EN 15804 and ISO 14025

Product name:	Loose fill cellulose insulation • Open blowing for attics, • Blown into pitched roofs, • Blown into walls, • Sprayed application (with glue).
Date of Issue:	Janurary 2018
Validity:	5 years
Product unit:	Kg or m^2 depending on the product
Verification	Independent verification by external third-party verifier: **Dr. Frank Werner**

Scope of the declaration

This EPD is a core EPD for the European market. Covering the environmental impacts of the loose fill cellulose insulation products over the complete lifecycle from 'Cradle to grave' The LCA is carried out by **Agrodome**, **[avniR] by cd2e** and **WeLOOP**, based on the process and production data provided by 14 participating cellulose insulation producing companies, all members of the European Cellulose Insulation Association (ECIA).

Product Description

The loose fill cellulose insulation products are made from recycled newspaper with additives of inorganic flame retardant minerals. This insulation material is used for thermal and acoustical insulation of buildings. It is used to insulate walls, roofs, attics and mezzanine floors.

European Cellulose Insulation Association (ECIA)
Dreve du Pressoir 38
1190 Forest Brussels, Belgium
www.ecia.eu.com

General information

This EPD gives information about these applications for loose fill cellulose insulation:

- Open blowing, attics;
- Roof applications (pitched roofs);
- Wall applications;
- Sprayed applications (with glue).

Loose fill cellulose insulation products are made from recycled newspaper (up to 95%) and inorganic flame retardant minerals. It is an insulation material that is mainly applied as loose fill cellulose insulation, but is sometimes converted into mats and in some cases applied in a wet spraying process (water or glue). It is used for thermal and acoustical insulation of buildings.

Loose fill cellulose insulation products may be reused or recycled at the end-of-life, the products can be easily recovered by the reverse process of the installation. Several of products among the cellulose insulation products participating in this EPD are labeled Nature Plus. Several producers have also a FSC 'Chain of Custody' Certificate.

Figure 1: Loose fill cellulose insulation material

Goal and scope

The goal of this study is to gather data regarding the environmental effects during the lifespan of loose fill cellulose insulation products to get a better understanding of the environmental impact over the complete lifecycle. The results can be used to eco-design the product.

Furthermore, the results can be used to inform potential customers about the environmental impact of loose fill cellulose insulation products in all European countries.

Reference service life

The information on the lifespan of loose fill cellulose insulation products is provided by ECIA. If installed correctly according to the manufacturers guidelines, loose fill cellulose insulation products need no further maintenance, repair, replacement or refurbishment during the full life span of the product. If the product is applied and maintained following the installation and maintenance instructions the life span of 50 years is applicable based on CEN-TC88 requirements.

Geographical scope

The cellulose insulation material that is assessed in the LCA-study is coming from 13 production sites in Europe (Austria (2), Belgium, Czech Republic, Germany (3), Finland (2), France, Spain, Sweden and Switzerland) and one production site in the USA.

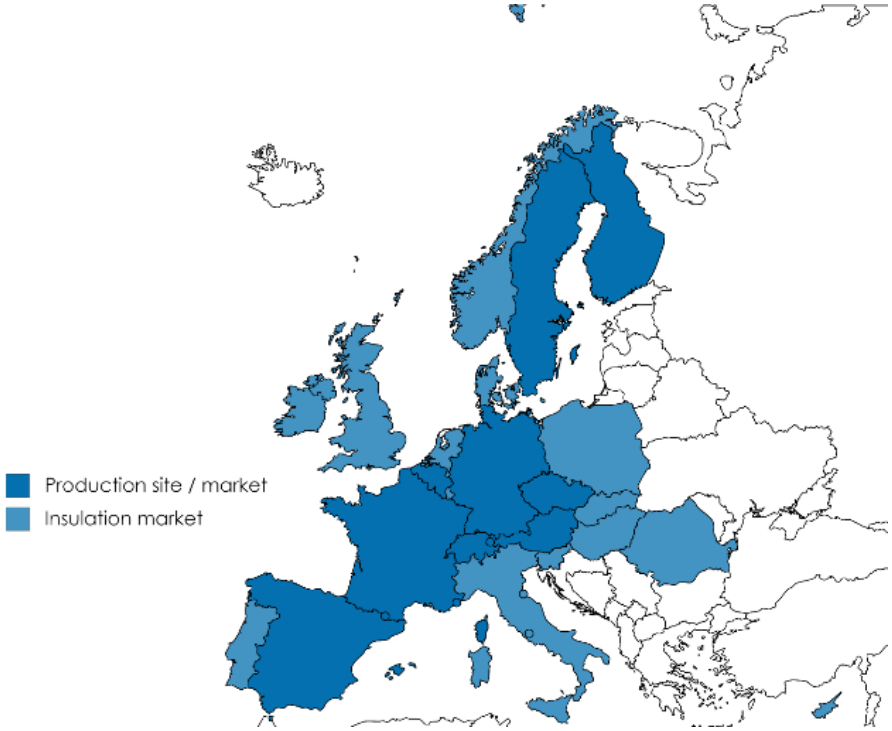


Figure 2: European production sites and markets covered by this EPD

Participating companies

- AislaNat, S.L., Spain,
- Cellulose dämmstoffproduktion Hartberg, Isocell Austria,
- Scandinavian Cellulose Production AB, Isocell Sweden,
- CIUR a.s., Czech Republic,
- CWA Cellulosewerk Angelbachtal GmbH, Germany,
- Ekovilla Oy, Finland,
- Igloo France Cellulose SAS, France,
- International Cellulose Corporation, USA,
- isofloc AG, Isofloc Switzerland,
- isofloc Wärmedämmtechnik GmbH, Germany (Lohfelden),
- isofloc Dämmstatt GmbH, Isofloc Germany (Berlin),
- ISOPROC, Belgium,
- Termex-Eriste Oy, Finland,
- WOLFINGER GmbH, Austria.

Representativeness production process

This product is made following the production protocols of the companies and their national standards. The total output of the fourteen studied production sites is representative for main part of cellulose insulation material sold in Europe.

Information on products/applications

Declared Unit

The declared unit is 1 kg of cellulose loose fill insulation. The average density[1] in case of the calculation of $1m^3$ is 45 kg/m^3. The declared unit is used instead of the functional unit when the precise function of the product is not defined or not covered among the functional units included in this report.

Functional Units

Functional unit for the open blowing attics application

Cellulose insulation is installed in open attics using a dry blowing process without any glue or water as shown in figure 3. The functional unit in open attics is defined as:

"The thermal insulation of $1m^2$ open attic, with a cellulose loose fill insulation, density of 31.5 kg/m3 with a thickness of 273 mm that gives an overall thermal resistance, R-value, of 7 $m^2 \cdot K/W$, with a design life span of 50 years".

Figure 3: Cellulose insulation in open attics

Product description	Average	Units
Lowest density	23	kg/m^3
Highest density	40	kg/m^3
Average gross density[1]	31.5	kg/m^3
Lambda value (λ)	0.039	W/(m·K)

Functional unit for the pitched roof application

The cellulose insulation is installed in a pitched roof by blowing dry cellulose into the roof cavity (compartment) without adding any glue or water as shown in figure 4a, underside and 4b, top side. The functional unit of the pitched roof application is defined as:

"*The thermal insulation of $1m^2$ pitched roof applications, with a cellulose loose fill insulation, density of 47 kg/m3 with a thickness of 273 mm that gives an overall thermal resistance, R-value, of 7 $m^2 \cdot K/W$, with a design life span of 50 years".*

Figure 4: Cellulose insulation in a pitched roof (a: left side and b: right side)

[1] Average density is obtained based on weighted average (based on sale volumes) of the declared density provided by the participating companies.

Product description	Average	Units
Lowest density	40	kg/m³
Highest density	60	kg/m³
Average gross density[5]	47	kg/m³
Lambda value (λ)	0.039	W/(m·K)

Functional unit for the wall applications

The cellulose insulation is installed in walls by blowing dry cellulose into the closed wall cavity (compartment) as shown in figure 5. The functional unit of the wall applications is defined as:

"The thermal insulation of 1m² wall applications, with a cellulose loose fill insulation, density of 50 kg/m3 with a thickness of 136,5 mm that gives an overall thermal resistance, R-value, of 3.5 m²·K/W, with a design life span of 50 years".

Figure 5: Cellulose insulation in walls

Product description	Average	Units
Lowest density	40	kg/m³
Highest density	65	kg/m³
Average gross density[2]	50	kg/m³
Lambda value (λ)	0.039	W/(m·K)

Functional unit for the sprayed application

The Loose fill cellulose insulation is installed in sprayed application using glue and water as shown in figure 6. The functional unit in the sprayed application is defined as:

"The thermal insulation of 1m² sprayed applications, with a sprayed adhered density *cellulose insulation, density of 55 kg/m3 with a thickness of 136,5 mm that gives an overall thermal resistance, R-value, of 3.5 m²·K/W, with a design life span of 50 years".*

Figure 6: Cellulose insulation in sprayed application (left side the installation process – right side the installed product

[2] Average density is obtained based on weighted average (based on sale volumes) of the declared density provided by the participating companies.

Product description	AVERAGE	Units
Lowest density	30	kg/m³
Highest density	80	kg/m³
Average gross density[7]	55	kg/m³
Lambda value (λ)	0.039	W/(m·K)

Data quality

The data about the process and products are based upon frequent contact with the production sites to guarantee that this EPD dated 2017 is based on the most up-to-date production data. No adaptions of the data was found necessary. Missing data was collected from Eco-invent version 3.2.

Variability of results

The average results were compared to individual company results for the 3 indicators: global warming potential, use of non-renewable as energy and non-hazardous waste over module A1 to A3. Based on the assessment, the individual results for each participating company for the 3 mentioned indicators show a moderate variation.

Qualitative information

Loose fill cellulose insulation products from the members of ECIA are made according to the production protocols of the companies and their national standards.

Sourcing raw materials

The companies are working with a limited number of suppliers for the main input material, the old or wasted newspaper. The various other ingredients are sourced from several suppliers which are therefore based on generic LCA data from the Ecoinvent 3.2 database.

Comparability

A comparison or evaluation of EPD data is only possible if all datasets are made following EN 15804 applying the same relevant product category rules and for the same modules.

Methodological considerations

The European norm EN 15804 is based on four main modules corresponding with the various phases in the lifecycle of a building product: Module A1-A5 (production and construction stages), Module B1-B7 (use stages), Module C1-C4 (End of life stages) and Module D (Environmental effects outside of the system boundary). See figure 7.

The system boundaries of EN 15804 stop at the end of the disposal stage (module C4), which is defined as the end of the building life cycle. All processes (and related benefits and loads) beyond the building life cycle (i.e. system boundary) may however be reported as additional environmental information within the Module D. Module C includes demolition, waste processing and disposal, and all related transport processes. Module D includes reuse, energy recovery and recycling potential.

System boundary

This Core- EPD is made for "Cradle to Grave' (including modules A1-A5, B1-7, C1-4 and D)

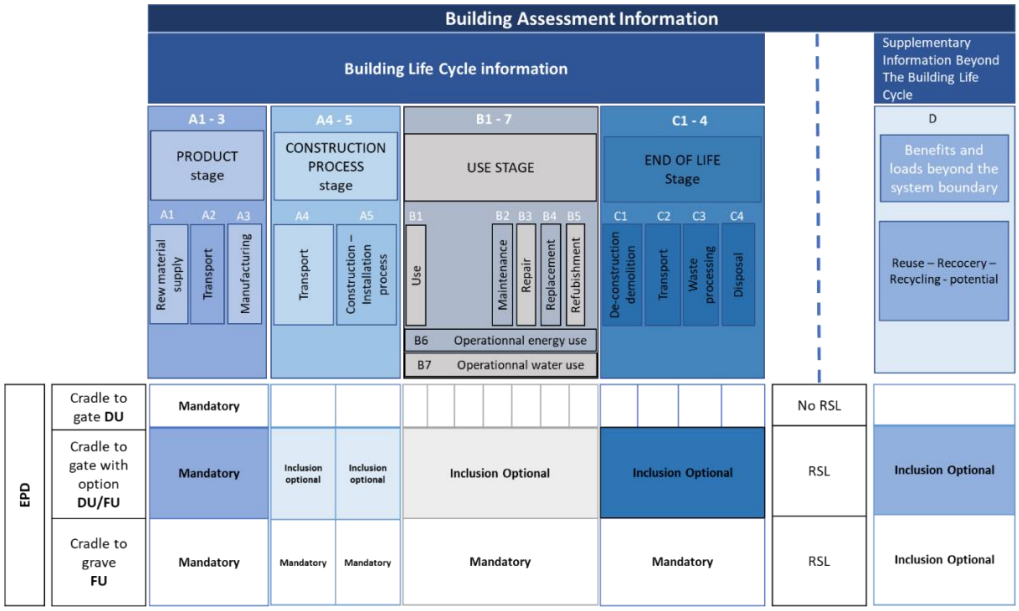


Figure 7: Modules over the life cycle of a building material as determined in EN 15804.

Scenario information

Cradle to gate flow chart

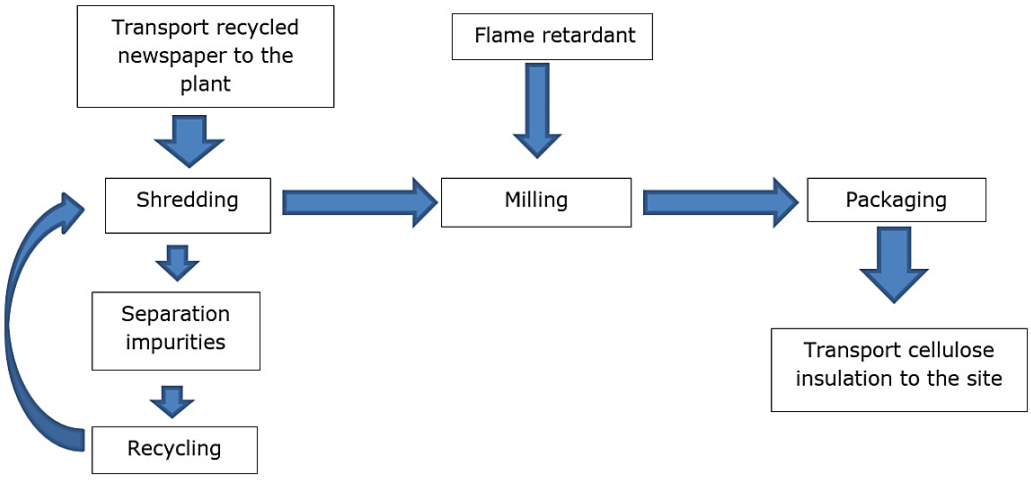


Figure 8: Flowchart illustrating the production process of cellulose insulation material.

Product stage (A1-3)

The recycled newspaper is transported to the cellulose insulation production plant. The impurities are separated, and the paper is shredded. Paper which still contains tiny amounts of impurities is recycled into the process. When milling the shredded paper, fire retardants are added. The final product is packed and transported to the construction site.

Construction stage (A4-5)

Transport to building site (A4)

The final product is packed and transported to the construction site. Wherever the case, as the insulation product has a low density, the transport is volume based. A compression factor of the material during transportation is considered when applicable. There is a broad variety in distances and transportation vehicles used by the producers, for the calculations we used an arithmetic average based upon market share this has been checked by the verifier. The average distance of transport from production to building site is equal to 380 km based on average market share for loose fill cellulose insulation.

Installation of the product in the building (A5)

The loose fill cellulose insulation is applied into the construction by a machine. Therefore, the energy consumption of the blowing or spraying machine is considered.

For wall and roof applications, no water or glue is added. This is the same for the open attic application, only in a few cases a tiny amount of water may be added on top in an attic to avoid displacement by air movement (ventilated attic). For the sprayed application water and glue is added.

Use stage (B1-7)

If installed correctly according to the manufacturers and suppliers guidelines, loose fill cellulose insulation products need no further maintenance, repair, replacement or refurbishment during the full life span of the product. If the product is applied following the installation instructions the life span of 50 years is applicable.

End of life stage (C1-4)

Demolition (C1)

The dismantling is very easy: the cellulose material may be sucked with a hose to the truck at the road and may be reused or recycled if appropriate. This process is a fast reverse process of installing. Although cellulose is easily reclaimed to be recyclable and reusable, a deconstruction-demolition scenario is considered as a current practice in Europe.

Transport (C2)

Assumptions transport phase: 50 km to sorting installation and 100 km from sorting location to final waste processing. Transport with a Euro 0,1.2.3.4 (European average); 22 t total weight lorry, 17,3t max payload

Waste processing (C3-C4)

Although cellulose is easily recyclable and reusable, these scenarios are not yet mainstreamed in Europe. As waste scenario after demolition, incineration with energy recovery and landfilling was assumed. Market share in different EU countries and different scenarios per country have been used.

Benefits and loads beyond the system boundary (D)

The avoided energy use as a result from the incineration of the loose fill cellulose insulation products are considered as benefits beyond the system boundary.

Life Cycle Assessment Results for loose fill cellulose insulation products

Environmental impacts for loose fill cellulose insulation products

The results of the LCIA are calculated by merging the results at product level using the market shares. The results are provided for 1kg of average insulation product. The average installed density[3] for the assessed product is 45 kg/m3.

Impact categories	Units	A1	A2	A3	A4	A5	B1-7	C1	C2	C3	C4	D
PARAMETERS DESCRIBING ENVIRONMENTAL IMPACTS												
EN 15804 Abiotic depletion elements	kg Sb eq	9,58E-09	1,66E-09	1,00E-08	4,91E-09	1,19E-10	0,00E+00	7,87E-12	9,99E-10	0,00E+00	5,61E-09	-1,66E-08
EN 15804 Abiotic depletion – fossil fuels	MJ	1,20E+00	2,96E-01	1,14E+00	8,23E-01	1,88E-02	0,00E+00	5,89E-02	1,66E-01	0,00E+00	1,37E-01	-3,80E+00
EN 15804 Acidification for soil / water	kg SO2 eq	7,58E-04	1,24E-04	1,93E-04	2,79E-04	2,01E-05	0,00E+00	2,94E-05	5,60E-05	0,00E+00	1,39E-04	-9,04E-04
EN 15804 Ozone depletion	kg CFC-11 eq	1,27E-08	2,73E-10	6,77E-09	1,78E-10	-1,17E-10	0,00E+00	7,18E-10	2,40E-11	0,00E+00	2,33E-09	-3,13E-08
GWP Climate change excluding biogenic	kg CO_2 eq	7,16E-02	2,10E-02	6,49E-02	5,86E-02	1,82E-02	0,00E+00	3,76E-03	1,18E-02	0,00E+00	2,23E-01	-2,71E-01
GWP C-content	kg CO_2 eq	-1,37E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,09E+00	0,00E+00
EN 15804 Global Warming	kg CO_2 eq	-1,30E+00	2,10E-02	6,49E-02	5,86E-02	1,82E-02	0,00E+00	3,76E-03	1,18E-02	0,00E+00	1,32E+00	-2,71E-01
EN 15804 Eutrophication	kg PO4--- eq	7,98E-05	2,41E-05	2,96E-05	6,29E-05	9,13E-06	0,00E+00	6,38E-06	1,29E-05	0,00E+00	1,68E-04	-1,03E-04
EN 15804 Photochemical ozone creation	kg C2H4 eq	2,90E-05	7,63E-06	1,17E-05	1,97E-05	3,48E-06	0,00E+00	7,05E-07	4,03E-06	0,00E+00	6,23E-05	-4,46E-05
PARAMETERS DESCRIBING RESOURCE USE												
Use of renewable primary energy as energy	MJ	6,82E-02	4,05E-04	6,81E-01	1,11E-03	3,87E-03	0,00E+00	1,01E-04	2,23E-04	0,00E+00	3,33E-02	-6,31E-01
Use of renewable primary energy as raw material	MJ	0,00E+00	0,00E+00	8,17E-03	0,00E+00	-8,17E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of renewable primary energy resources	MJ	6,82E-02	4,05E-04	6,89E-01	1,11E-03	-4,30E-03	0,00E+00	1,01E-04	2,23E-04	0,00E+00	3,33E-02	-6,31E-01
Use of non renewable primary energy as energy	MJ	1,36E+00	2,96E-01	1,71E+00	8,23E-01	3,24E-02	0,00E+00	5,91E-02	1,66E-01	0,00E+00	2,35E-01	-5,31E+00
Use of non renewable primary energy as raw material	MJ	0,00E+00	0,00E+00	3,74E-01	0,00E+00	-3,74E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of non-renewable primary energy resources	MJ	1,36E+00	2,96E-01	2,08E+00	8,23E-01	-3,42E-01	0,00E+00	5,91E-02	1,66E-01	0,00E+00	2,35E-01	-5,31E+00
Use of secondary material	kg	9,00E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,20E-03
Use of renewable secondary fuel	MJ, net cal	1,19E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of non renewable secondary fuel	MJ, net cal	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Net use of fresh water	m3	2,38E-05	-2,50E-06	7,13E-06	-8,28E-06	1,00E+00	0,00E+00	1,01E-06	-1,70E-06	0,00E+00	1,37E-06	-1,78E-05
OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES												
Hazardous waste disposed	kg	6,54E-07	3,38E-09	1,00E-06	8,68E-10	-5,13E-08	0,00E+00	9,76E-09	0,00E+00	0,00E+00	5,35E-07	-4,77E-06
Non-hazardous waste disposed	kg	2,62E-07	2,99E-08	7,05E-08	7,37E-08	2,73E-05	0,00E+00	7,35E-09	1,47E-08	0,00E+00	2,04E-06	-3,25E-06

[3] Average density is obtained based on weighted average (based on sale volume) of the declared density provided by the participating companies.

Impact categories	Units	A1	A2	A3	A4	A5	B1-7	C1	C2	C3	C4	D
Radioactive waste disposed	kg	8,22E-06	1,31E-07	8,61E-06	3,36E-08	-1,04E-07	0,00E+00	4,05E-07	0,00E+00	0,00E+00	1,81E-06	-2,44E-05
Components for re-use	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,03E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,20E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for energy recovery	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy heat	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,66E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,83E+00	0,00E+00
Exported energy electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,35E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,44E+00	0,00E+00

Table 1: Environmental impacts for 1kg of loose fill cellulose insulation products

Environmental impacts for loose fill cellulose insulation products in open blowing application

The results of the LCIA are calculated for each application by merging the results at product level using the market shares. The Life Cycle Impact assessment results and the results for additional indicators are provided in Table 2 for 1m^2 of insulated open blowing attics with an R value equal to 7 m².K/W. The average installed density[4] used for the calculation is 31.5 kg/m^3 in open blowing application.

Impact categories	Units	A1	A2	A3	A4	A5	B	C1	C2	C3	C4	D
PARAMETERS DESCRIBING ENVIRONMENTAL IMPACTS												
EN 15804 Abiotic depletion elements	kg Sb eq	8,24E-08	1,43E-08	8,61E-08	4,22E-08	1,02E-09	0,00E+00	6,77E-11	8,59E-09	0,00E+00	4,82E-08	-1,43E-07
EN 15804 Abiotic depletion – fossil fuels	MJ	1,03E+01	2,54E+00	9,79E+00	7,08E+00	1,62E-01	0,00E+00	5,07E-01	1,43E+00	0,00E+00	1,18E+00	-3,26E+01
EN 15804 Acidification for soil / water	kg SO2 eq	6,52E-03	1,07E-03	1,66E-03	2,40E-03	1,73E-04	0,00E+00	2,53E-04	4,82E-04	0,00E+00	1,19E-03	-7,77E-03
EN 15804 Ozone depletion	kg CFC-11 eq	1,09E-07	2,34E-09	5,82E-08	1,53E-09	-1,01E-09	0,00E+00	6,18E-09	2,06E-10	0,00E+00	2,01E-08	-2,69E-07
GWP Climate change excluding biogenic	kg CO_2 eq	6,16E-01	1,81E-01	5,58E-01	5,04E-01	1,56E-01	0,00E+00	3,23E-02	1,02E-01	0,00E+00	1,92E+00	-2,33E+00
GWP C-content	kg CO_2 eq	-1,18E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,42E+00	0,00E+00
EN 15804 Global Warming	kg CO_2 eq	-1,11E+01	1,81E-01	5,58E-01	5,04E-01	1,56E-01	0,00E+00	3,23E-02	1,02E-01	0,00E+00	1,13E+01	-2,33E+00
EN 15804 Eutrophication	kg PO4--- eq	6,86E-04	2,07E-04	2,54E-04	5,41E-04	7,85E-05	0,00E+00	5,49E-05	1,11E-04	0,00E+00	1,44E-03	-8,82E-04
EN 15804 Photochemical ozone creation	kg C2H4 eq	2,49E-04	6,56E-05	1,00E-04	1,70E-04	2,99E-05	0,00E+00	6,06E-06	3,47E-05	0,00E+00	5,35E-04	-3,83E-04
PARAMETERS DESCRIBING RESOURCE USE												
Use of renewable primary energy as energy	MJ	5,86E-01	3,48E-03	5,86E+00	9,51E-03	3,33E-02	0,00E+00	8,70E-04	1,92E-03	0,00E+00	2,86E-01	-5,43E+00
Use of renewable primary energy as raw material	MJ	0,00E+00	0,00E+00	7,03E-02	0,00E+00	-7,03E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of renewable primary energy resources	MJ	5,86E-01	3,48E-03	5,93E+00	9,51E-03	-3,70E-02	0,00E+00	8,70E-04	1,92E-03	0,00E+00	2,86E-01	-5,43E+00

[4] Average density is obtained based on weighted average (based on sale volume) of the declared density provided by the participating companies.

Impact categories	Units	A1	A2	A3	A4	A5	B	C1	C2	C3	C4	D
Use of non renewable primary energy as energy	MJ	1,17E+01	2,54E+00	1,47E+01	7,08E+00	2,79E-01	0,00E+00	5,08E-01	1,43E+00	0,00E+00	2,02E+00	-4,56E+01
Use of non renewable primary energy as raw material	MJ	0,00E+00	0,00E+00	3,22E+00	0,00E+00	-3,22E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of non-renewable primary energy resources	MJ	1,17E+01	2,54E+00	1,79E+01	7,08E+00	-2,94E+00	0,00E+00	5,08E-01	1,43E+00	0,00E+00	2,02E+00	-4,56E+01
Use of secondary material	kg	7,74E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,75E-02
Use of renewable secondary fuel	MJ, net cal	1,02E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of non renewable secondary fuel	MJ, net cal	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Net use of fresh water	m3	2,05E-04	-2,15E-05	6,13E-05	-7,12E-05	8,60E+00	0,00E+00	8,64E-06	-1,46E-05	0,00E+00	1,18E-05	-1,53E-04
OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES												
Hazardous waste disposed	kg	5,63E-06	2,91E-08	8,61E-06	7,46E-09	-4,41E-07	0,00E+00	8,40E-08	0,00E+00	0,00E+00	4,60E-06	-4,10E-05
Non-hazardous waste disposed	kg	2,25E-06	2,57E-07	6,07E-07	6,34E-07	2,35E-04	0,00E+00	6,32E-08	1,26E-07	0,00E+00	1,75E-05	-2,80E-05
Radioactive waste disposed	kg	7,07E-05	1,13E-06	7,41E-05	2,89E-07	-8,92E-07	0,00E+00	3,48E-06	0,00E+00	0,00E+00	1,56E-05	-2,10E-04
Components for re-use	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,84E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,75E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for energy recovery	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy heat	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,28E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,44E+01	0,00E+00
Exported energy electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,16E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,24E+01	0,00E+00

Table 2: Environmental impacts for loose fill cellulose insulation products in open blowing application

Environmental impacts for loose fill cellulose insulation products in Roof applications (pitched roof)

The results of the LCIA are calculated for each application by merging the results at product level using the market shares. The Life Cycle Impact assessment results and the results for additional indicators are provided in Table 3 for 1m² of insulated roof with an R value equal to 7 m².K/W Table 2. The average installed density[5] used for the calculation is 47 kg/m³ in roof application.

Impact categories	Units	A1	A2	A3	A4	A5	B	C1	C2	C3	C4	D
PARAMETERS DESCRIBING ENVIRONMENTAL IMPACTS												
EN 15804 Abiotic depletion elements	kg Sb eq	1,23E-07	2,13E-08	1,28E-07	6,30E-08	1,53E-09	0,00E+00	1,01E-10	1,28E-08	0,00E+00	7,20E-08	-2,13E-07
EN 15804 Abiotic depletion – fossil fuels	MJ	1,53E+01	3,79E+00	1,46E+01	1,06E+01	2,41E-01	0,00E+00	7,56E-01	2,13E+00	0,00E+00	1,76E+00	-4,87E+01

[5] Average density is obtained based on weighted average (based on sale volume) of the declared density provided by the participating companies.

Impact categories	Units	A1	A2	A3	A4	A5	B	C1	C2	C3	C4	D
EN 15804 Acidification for soil / water	kg SO2 eq	9,73E-03	1,60E-03	2,47E-03	3,58E-03	2,58E-04	0,00E+00	3,78E-04	7,19E-04	0,00E+00	1,78E-03	-1,16E-02
EN 15804 Ozone depletion	kg CFC-11 eq	1,63E-07	3,50E-09	8,68E-08	2,28E-09	-1,51E-09	0,00E+00	9,22E-09	3,08E-10	0,00E+00	2,99E-08	-4,01E-07
GWP Climate change excluding biogenic	kg CO_2 eq	9,19E-01	2,69E-01	8,32E-01	7,52E-01	2,33E-01	0,00E+00	4,83E-02	1,52E-01	0,00E+00	2,87E+00	-3,47E+00
GWP C-content	kg CO_2 eq	-1,75E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,40E+01	0,00E+00
EN 15804 Global Warming	kg CO_2 eq	-1,66E+01	2,69E-01	8,32E-01	7,52E-01	2,33E-01	0,00E+00	4,83E-02	1,52E-01	0,00E+00	1,69E+01	-3,47E+00
EN 15804 Eutrophication	kg PO4--- eq	1,02E-03	3,09E-04	3,80E-04	8,07E-04	1,17E-04	0,00E+00	8,19E-05	1,65E-04	0,00E+00	2,16E-03	-1,32E-03
EN 15804 Photochemical ozone creation	kg C2H4 eq	3,72E-04	9,79E-05	1,50E-04	2,53E-04	4,47E-05	0,00E+00	9,05E-06	5,18E-05	0,00E+00	7,99E-04	-5,72E-04
PARAMETERS DESCRIBING RESOURCE USE												
Use of renewable primary energy as energy	MJ	8,75E-01	5,20E-03	8,74E+00	1,42E-02	4,96E-02	0,00E+00	1,30E-03	2,86E-03	0,00E+00	4,27E-01	-8,10E+00
Use of renewable primary energy as raw material	MJ	0,00E+00	0,00E+00	1,05E-01	0,00E+00	-1,05E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of renewable primary energy resources	MJ	8,75E-01	5,20E-03	8,84E+00	1,42E-02	-5,52E-02	0,00E+00	1,30E-03	2,86E-03	0,00E+00	4,27E-01	-8,10E+00
Use of non renewable primary energy as energy	MJ	1,74E+01	3,79E+00	2,19E+01	1,06E+01	4,16E-01	0,00E+00	7,59E-01	2,13E+00	0,00E+00	3,01E+00	-6,81E+01
Use of non renewable primary energy as raw material	MJ	0,00E+00	0,00E+00	4,80E+00	0,00E+00	-4,80E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of non-renewable primary energy resources	MJ	1,74E+01	3,79E+00	2,67E+01	1,06E+01	-4,39E+00	0,00E+00	7,59E-01	2,13E+00	0,00E+00	3,01E+00	-6,81E+01
Use of secondary material	kg	1,16E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,11E-02
Use of renewable secondary fuel	MJ, net cal	1,52E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of non renewable secondary fuel	MJ, net cal	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Net use of fresh water	m3	3,06E-04	-3,21E-05	9,15E-05	-1,06E-04	1,28E+01	0,00E+00	1,29E-05	-2,18E-05	0,00E+00	1,76E-05	-2,28E-04
OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES												
Hazardous waste disposed	kg	8,40E-06	4,34E-08	1,28E-05	1,11E-08	-6,58E-07	0,00E+00	1,25E-07	0,00E+00	0,00E+00	6,86E-06	-6,12E-05
Non-hazardous waste disposed	kg	3,36E-06	3,83E-07	9,05E-07	9,46E-07	3,50E-04	0,00E+00	9,43E-08	1,89E-07	0,00E+00	2,62E-05	-4,17E-05
Radioactive waste disposed	kg	1,05E-04	1,68E-06	1,11E-04	4,32E-07	-1,33E-06	0,00E+00	5,20E-06	0,00E+00	0,00E+00	2,32E-05	-3,13E-04
Components for re-use	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,32E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,11E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Impact categories	Units	A1	A2	A3	A4	A5	B	C1	C2	C3	C4	D
Materials for energy recovery	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy heat	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,41E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,64E+01	0,00E+00
Exported energy electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,73E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,85E+01	0,00E+00

Table 3: Environmental impacts for loose fill cellulose insulation products in roof applications (pitched roof)

Environmental impacts for loose fill cellulose insulation products in Wall applications

The results of the LCIA are calculated for each application by merging the results at product level using the market shares. The Life Cycle Impact assessment results and the results for additional indicators are provided in Table 4 for 1m^2 of insulated wall with an R value equal to 3.5 m^2·K/W. The average installed density[6] used for the calculation is 50 kg/m^3 in wall application.

Impact categories	Units	A1	A2	A3	A4	A5	B	C1	C2	C3	C4	D
PARAMETERS DESCRIBING ENVIRONMENTAL IMPACTS												
EN 15804 Abiotic depletion elements	kg Sb eq	6,54E-08	1,13E-08	6,83E-08	3,35E-08	8,12E-10	0,00E+00	5,37E-11	6,82E-09	0,00E+00	3,83E-08	-1,13E-07
EN 15804 Abiotic depletion – fossil fuels	MJ	8,16E+00	2,02E+00	7,77E+00	5,62E+00	1,28E-01	0,00E+00	4,02E-01	1,14E+00	0,00E+00	9,36E-01	-2,59E+01
EN 15804 Acidification for soil / water	kg SO2 eq	5,18E-03	8,49E-04	1,32E-03	1,90E-03	1,37E-04	0,00E+00	2,01E-04	3,82E-04	0,00E+00	9,47E-04	-6,17E-03
EN 15804 Ozone depletion	kg CFC-11 eq	8,68E-08	1,86E-09	4,62E-08	1,21E-09	-8,02E-10	0,00E+00	4,90E-09	1,64E-10	0,00E+00	1,59E-08	-2,13E-07
GWP Climate change excluding biogenic	kg CO_2 eq	4,89E-01	1,43E-01	4,43E-01	4,00E-01	1,24E-01	0,00E+00	2,57E-02	8,09E-02	0,00E+00	1,53E+00	-1,85E+00
GWP C-content	kg CO_2 eq	-9,33E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,47E+00	0,00E+00
EN 15804 Global Warming	kg CO_2 eq	-8,84E+00	1,43E-01	4,43E-01	4,00E-01	1,24E-01	0,00E+00	2,57E-02	8,09E-02	0,00E+00	9,00E+00	-1,85E+00
EN 15804 Eutrophication	kg PO4--- eq	5,45E-04	1,64E-04	2,02E-04	4,29E-04	6,23E-05	0,00E+00	4,36E-05	8,80E-05	0,00E+00	1,15E-03	-7,00E-04
EN 15804 Photochemical ozone creation	kg C2H4 eq	1,98E-04	5,21E-05	7,96E-05	1,35E-04	2,38E-05	0,00E+00	4,81E-06	2,75E-05	0,00E+00	4,25E-04	-3,04E-04
PARAMETERS DESCRIBING RESOURCE USE												
Use of renewable primary energy as energy	MJ	4,65E-01	2,76E-03	4,65E+00	7,55E-03	2,64E-02	0,00E+00	6,91E-04	1,52E-03	0,00E+00	2,27E-01	-4,31E+00
Use of renewable primary energy as raw material	MJ	0,00E+00	0,00E+00	5,58E-02	0,00E+00	-5,58E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

[6] Average density is obtained based on weighted average (based on sale volume) of the declared density provided by the participating companies.

Impact categories	Units	A1	A2	A3	A4	A5	B	C1	C2	C3	C4	D
Total use of renewable primary energy resources	MJ	4,65E-01	2,76E-03	4,70E+00	7,55E-03	-2,94E-02	0,00E+00	6,91E-04	1,52E-03	0,00E+00	2,27E-01	-4,31E+00
Use of non renewable primary energy as energy	MJ	9,27E+00	2,02E+00	1,17E+01	5,62E+00	2,21E-01	0,00E+00	4,04E-01	1,14E+00	0,00E+00	1,60E+00	-3,62E+01
Use of non renewable primary energy as raw material	MJ	0,00E+00	0,00E+00	2,55E+00	0,00E+00	-2,55E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of non-renewable primary energy resources	MJ	9,27E+00	2,02E+00	1,42E+01	5,62E+00	-2,33E+00	0,00E+00	4,04E-01	1,14E+00	0,00E+00	1,60E+00	-3,62E+01
Use of secondary material	kg	6,14E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-4,05E+01
Use of renewable secondary fuel	MJ, net cal	8,10E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of non renewable secondary fuel	MJ, net cal	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Net use of fresh water	m3	1,63E-04	-1,71E-05	4,87E-05	-5,65E-05	6,82E+00	0,00E+00	6,86E-06	-1,16E-05	0,00E+00	9,37E-06	-1,21E-04
OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES												
Hazardous waste disposed	kg	4,47E-06	2,31E-08	6,83E-06	5,92E-09	-3,50E-07	0,00E+00	6,66E-08	0,00E+00	0,00E+00	3,65E-06	-3,25E-05
Non-hazardous waste disposed	kg	1,78E-06	2,04E-07	4,81E-07	5,03E-07	1,86E-04	0,00E+00	5,02E-08	1,00E-07	0,00E+00	1,39E-05	-2,22E-05
Radioactive waste disposed	kg	5,61E-05	8,96E-07	5,88E-05	2,30E-07	-7,08E-07	0,00E+00	2,77E-06	0,00E+00	0,00E+00	1,24E-05	-1,67E-04
Components for re-use	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,02E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,19E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for energy recovery	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy heat	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,81E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,93E+01	0,00E+00
Exported energy electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,22E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,83E+00	0,00E+00

Table 4: Environmental impacts for loose fill cellulose insulation products in wall applications

Environmental impacts for loose fill cellulose insulation products in Sprayed application

The results of the LCIA are calculated for each application by merging the results at product level using the market shares. The Life Cycle Impact assessment results and the results for additional indicators are provided in Table 5 for 1m^2 of insulated sprayed building element with an R value equal to 3.5 m^2·K/W. The average installed density[7] used for the calculation is 55 kg/m^3 in sprayed application.

[7] Average density is obtained based on weighted average (based on sale volume) of the declared density provided by the participating companies.

Impact categories	Units	A1	A2	A3	A4	A5	B	C1	C2	C3	C4	D
PARAMETERS DESCRIBING ENVIRONMENTAL IMPACTS												
EN 15804 Abiotic depletion elements	kg Sb eq	1,23E-07	2,15E-08	9,07E-08	3,09E-08	3,84E-08	0,00E+00	5,91E-11	7,43E-09	0,00E+00	4,16E-08	-1,19E-07
EN 15804 Abiotic depletion – fossil fuels	MJ	3,34E+01	4,21E+00	1,19E+01	8,23E+00	2,06E+00	0,00E+00	4,42E-01	1,24E+00	0,00E+00	1,02E+00	-2,80E+01
EN 15804 Acidification for soil / water	kg SO2 eq	1,06E-02	1,63E-03	2,38E-03	6,79E-03	8,45E-04	0,00E+00	2,21E-04	4,17E-04	0,00E+00	1,02E-03	-6,59E-03
EN 15804 Ozone depletion	kg CFC-11 eq	1,67E-07	9,57E-09	7,15E-08	3,82E-08	3,81E-09	0,00E+00	5,39E-09	1,78E-10	0,00E+00	1,83E-08	-2,24E-07
GWP Climate change excluding biogenic	kg CO_2 eq	1,27E+00	2,98E-01	6,95E-01	5,67E-01	3,01E-01	0,00E+00	2,82E-02	8,81E-02	0,00E+00	1,78E+00	-1,96E+00
GWP C-content	kg CO_2 eq	-9,96E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,82E+00	0,00E+00
EN 15804 Global Warming	kg CO_2 eq	-8,69E+00	2,98E-01	6,95E-01	5,67E-01	3,01E-01	0,00E+00	2,82E-02	8,81E-02	0,00E+00	9,60E+00	-1,96E+00
EN 15804 Eutrophication	kg PO4--- eq	9,48E-04	3,57E-04	2,81E-04	8,25E-04	1,27E-04	0,00E+00	4,79E-05	9,59E-05	0,00E+00	1,32E-03	-7,37E-04
EN 15804 Photochemical ozone creation	kg C2H4 eq	7,07E-04	1,00E-04	1,30E-04	2,82E-04	6,14E-05	0,00E+00	5,29E-06	3,00E-05	0,00E+00	4,97E-04	-3,25E-04
PARAMETERS DESCRIBING RESOURCE USE												
Use of renewable primary energy as energy	MJ	9,48E-01	1,09E-02	5,35E+00	1,23E-02	7,65E-01	0,00E+00	7,60E-04	1,66E-03	0,00E+00	3,01E-01	-4,26E+00
Use of renewable primary energy as raw material	MJ	0,00E+00	0,00E+00	6,14E-02	0,00E+00	-6,14E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of renewable primary energy resources	MJ	9,48E-01	1,09E-02	5,41E+00	1,23E-02	7,03E-01	0,00E+00	7,60E-04	1,66E-03	0,00E+00	3,01E-01	-4,26E+00
Use of non renewable primary energy as energy	MJ	3,60E+01	4,22E+00	1,77E+01	8,24E+00	2,10E+00	0,00E+00	4,44E-01	1,24E+00	0,00E+00	1,91E+00	-3,88E+01
Use of non renewable primary energy as raw material	MJ	0,00E+00	0,00E+00	2,81E+00	0,00E+00	-2,81E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of non-renewable primary energy resources	MJ	3,60E+01	4,22E+00	2,06E+01	8,24E+00	-7,07E-01	0,00E+00	4,44E-01	1,24E+00	0,00E+00	1,91E+00	-3,88E+01
Use of secondary material	kg	6,56E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,40E-02
Use of renewable secondary fuel	MJ, net cal	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of non renewable secondary fuel	MJ, net cal	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Net use of fresh water	m3	2,68E-04	-2,26E-05	5,72E-05	6,40E-07	7,27E+02	0,00E+00	7,55E-06	-1,26E-05	0,00E+00	1,00E-05	-6,97E-05
OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES												
Hazardous waste disposed	kg	1,07E-05	1,80E-07	1,46E-05	5,46E-07	-1,12E-07	0,00E+00	7,33E-08	0,00E+00	0,00E+00	3,94E-06	-3,39E-05
Non-hazardous waste disposed	kg	3,45E-06	4,67E-07	1,00E-06	1,33E-06	1,42E-03	0,00E+00	5,52E-08	1,09E-07	0,00E+00	1,45E-05	-3,40E-05

Impact categories	Units	A1	A2	A3	A4	A5	B	C1	C2	C3	C4	D
Radioactive waste disposed	kg	1,04E-04	5,17E-06	8,80E-05	2,12E-05	8,51E-07	0,00E+00	3,04E-06	0,00E+00	0,00E+00	1,58E-05	-1,74E-04
Components for re-use	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,72E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,40E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for energy recovery	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy heat	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,99E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,13E+01	0,00E+00
Exported energy electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,01E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,08E+01	0,00E+00

Table 5: Environmental impacts for loose fill cellulose insulation products in sprayed application

Additional information

Technical data Loose fill cellulose insulation

(based upon the average[8] product)

Product description	Average	Units
Lambda value (λ)	0.039	W/(m·K)
Settlement according to ISO/CD 18393, Method C – Settling of wall cavity insulation by vibration	0	%
Water vapour diffusion resistance factor (μ-value)	2	
Fire resistance class (EN 13501-01) 40 – 100 mm ≥ 100 mm	40-100mm: E; ≥ 100mm: B, s2-d0	
Specific heat value (decrement delay)	2100	

Bill of Materials (based upon the average[1] product)

Material	Mass %
Waste newspaper	85 – 95 %
Inorganic flame retardants	5 - 15 %

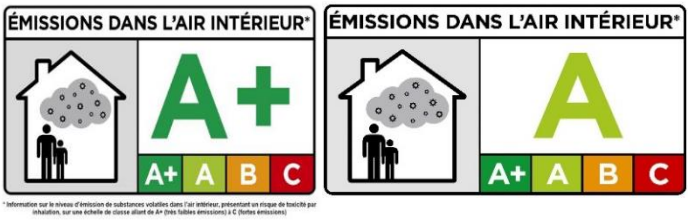
The loose fill cellulose insulation may contain boric acid - SVHC substance registered at ECHA - in a concentration above 0.1-% of final product mass, as a fire retardant.

Biogenic CO2 sequestration

Loose fill cellulose insulation products are mainly made from old newspapers. With a high biogenic carbon content. As long as the product is in use this carbon is stored in the product. For loose fill and sprayed cellulose insulation products, this amount is assessed based on the following formula[9] and is provided in the overall LCA results. To be in conformance with countries (e.g. the Netherlands), where these impacts can only be provided separately, we also provide global warming potential impacts excluding biogenic CO_2 emissions.

Indoor Air Quality during use phase

The VOC emission test, as part of mandatory environmental labeling, was carried out according to NF ISO EN 16000-3, NF ISO EN 16000-6, NF ISO EN 16000-9 and NF ISO EN 16000-11. The loose fill cellulose insulation is rated as A + or A.



The loose fill cellulose insulation products are not a favorable medium for fungal growth and are in their applications separated from the indoor air.

[8] Average density is obtained based on weighted average (based on sale volumes) of the declared density provided by the participating companies.

[9] CO_2 content kg in air = (paper content) x 0,9 (factor 10% > 0% moisture content) x 0,46 (IPCC, 2006) (carbon content) x 3,67 (mol ratio CO_2 – C) presented in kg CO_2 / kg Cellulose materials.

Accountability

The LCA study for this EPD was executed in 2016/2017. The information contained in this document is provided under the responsibility of CAPEM according to EN 15804.

The assessment is undertaken separately for each product and each production site. The results from the participating companies and their products gave the base line for calculating the overall average product for each application based on arithmetic averaging of the sales mass volumes.

The LCA was executed following EN 15804 and was verified following EN 15804.

CEN standard ➔ EN 15804 serves as the core PCR[a]
Independent external verification of the declaration and data, according to EN ISO 14025:2010.
Third party verifier [b]: **Dr. Frank Werner** T: +41 44 241 39 06 Werner Umwelt & Entwicklung E: frank@frankwerner.ch Idaplatz 3 W: www.frankwerner.ch CH 8003 Zürich, Switzerland
[a] Product Category Rules [b] Optional for business-to-business communication; mandatory for business-to-consumer communication (see EN ISO 14025:2010, 9.4).

When calculating the environmental impact categories Simapro version 8.1.1 was used as well as environmental data from Ecoinvent database, version 3.2. When making calculations in Simapro long term effects (emissions occurring after 100 years) were not included. Effects of capital goods and infrastructural processes have been excluded.

References

- **ISO 14025:2010** Environmental labels and declarations — Type III environmental declarations — Principles and procedures, International Organization for Standardization, Geneva**.**
- **EN 15804:2012-04+Amendment 1:2013** Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction.
- **CEN-TC88, 2017. EN 16783 and NF EN16783.**
- **CAPEM Environmental Product Declaration Background Report Loose Fill Cellulose Insulation**, October 2017, Loos-en-Gohelle/Wageningen, authors **Dr. Naeem Adibi, Fred van der Burgh, Sissy Verspeek** and **Aubin Roy**.

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