

ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804+A2

Owner of the Declaration	Knauf Performance Materials GmbH
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-KNA-20250052-CBA1-EN
Issue date	05.03.2025
Valid to	04.03.2030

Expanded perlite, coarse grain size (0/6)

Knauf Performance Materials GmbH

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General Information

Knauf Performance Materials GmbH

Programme holder

IBU – Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

Declaration number

EPD-KNA-20250052-CBA1-EN

This declaration is based on the product category rules:

Mineral insulating materials, 01.08.2021
(PCR checked and approved by the SVR)

Issue date

05.03.2025

Valid to

04.03.2030



Dipl.-Ing. Hans Peters
(Chairman of Institut Bauen und Umwelt e.V.)



Florian Pronold
(Managing Director Institut Bauen und Umwelt e.V.)

Expanded perlite, coarse grain size (0/6)

Owner of the declaration

Knauf Performance Materials GmbH
Kipperstrasse 19
44147 Dortmund
Germany

Declared product / declared unit

1 m³ of expanded perlite, coarse grain size (0/6) with a bulk density of 90 kg/m³

Scope:

This EPD is prepared as a representative EPD for the Expanded perlite, coarse grain size (0/6) product group produced from Knauf Performance Materials GmbH, plant Dortmund, Kipperstraße 19, 44147 Dortmund. The life cycle assessment is based on production data for the period 01/03/2021--28/02/2022.

The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

The EPD was created according to the specifications of EN 15804+A2. In the following, the standard will be simplified as *EN 15804*.

Verification

The standard EN 15804 serves as the core PCR		
Independent verification of the declaration and data according to ISO 14025:2011		
☐	internally	☒ externally



Dr.-Ing. Nikolay Minkov,
(Independent verifier)

Product

Product description/Product definition

Perlite is a natural volcanic mineral typically formed by the hydration of obsidian.

Perlite softens when it reaches temperatures of 850–1.000 °C. Water, trapped in the structure of the material, vaporises and escapes. This causes the expansion of the material up to 20 times its original volume. The expanded material is brilliant white and lightweight with a porous structure.

The declared product group of Expanded perlite, coarse grain size (0/6) consists of expanded perlite in coarse fraction with grain sizes between 0 mm and 6 mm. The basic material is raw perlite coarse. The coarse raw perlite is expanded in the perlite oven. For some products in the declared product group, a coating is added as a final process step. The coating consists of either a hydrophobation or a dust binding. The calculation is based on the product **ISOSELF®** as the worst case scenario.

The following products are belonging to the product group Expanded perlite, coarse grain size (0/6):

- SUPERLITE® 0/6
- SUPERLITE® 2/6
- PERLIGRAN® Classic
- PERLIGRAN® Extra
- PERLIGRAN® Premium
- PERLIGRAN® Organic
- ESTROPERL®
- Sorbix
- HYPERLITE®- KD (Hydrophobic coating)
- ESTROPLAN® (Hydrophobic coating)
- STAUBEX® (Dust binding coating)
- **ISOSELF® (Dust binding coating)**

For the use and application of the product the respective national provisions at the place of use apply. In Germany for example the building codes of the federal states and the corresponding national specifications.

Application

The expanded perlite lightweight aggregates are used in many industries as fillers.

In the building industry, they are mainly used as lightweight fillers for plasters and mortars.

In horticulture the products are used as all-natural inorganic amendments for growing media, peat substitutes and soil additives in substrates. For this field of application the products are water sprayed in order to minimize dust formation. The high proportion of air pore volume ensures good aeration and thus promotes root growth. The high porosity ensures good water storage. In addition, the mineral material is not exposed to decomposition and preserves the substrate volume. For certain applications, the product can also be used as a pure substrate,

e.g., for the cultivation of anthurie.

Another field of application is levelling or insulation fill. The water-repellent insulating material fill made of perlite is used for subsequent core insulation of double-shell outer walls, as cavity insulation in ceilings, roofs and shafts. For this application, a hydrophobation is added.

Provided with dust binding coating the material is used as a soil levelling fill for the renovation of old buildings.

Technical Data

SUPERLITE® is produced in accordance to *EN 13055--1*.

PERLIGRAN® is produced in accordance to *RHP certification* from the Netherlands.

HYPERLITE® KD is produced in accordance with *ETA-18/0451*.

ESTROPERL® is produced in accordance to *ETA 18/0452*.

Sorbix is produced in accordance to internal standards.

--ESTROPLAN® (Hydrophobic coating) is produced in accordance to *ETA 18/0452*.

--ISOSELF® (Dust binding coating) is produced in accordance to *EN 14316*.

--STAUBEX® (Dust binding coating) is produced in accordance to *ETA 18/0454*.

Technical datasheets can be downloaded from the website:
<https://knauf.com/de-DE/p/produkte?division%5B0%5D=Knauf%20Performance%20Materials>

Technical data ISOSELF®

Name	Value	Unit
Bulk density	90	kg/m³
thermal conductivity, declared value	0,055	W/mK
compressive strength at 10% strain	>0,130	N/mm²
water vapour diffusion resistance factor	3	μ

Performance data of the product with respect to its characteristics in accordance with the relevant technical provision (no CE-marking).

Base materials/Ancillary materials

table of base materials

Name	Value	Unit
Superlite 0/6	99,4	%
PLA	0,6	%

Expanded perlite, coarse grain size (0/6) is made from 100 % raw perlite coarse.

Reference service life

Depending on the area of use the reference service life for this product group is up to 50 years.

LCA: Calculation rules

Declared Unit

This declaration refers to the declared unit of 1 m³ of insulation material as the granulate 'Expanded perlite, coarse grain size (0/6)'.
 The weight of the product is 90 kg/m³.

Declared unit and mass reference

Name	Value	Unit
Gross density	90	kg/m³
Declared unit	1	m³
bulk density	90	kg/m³

System boundary

Type of EPD: cradle to gate with options. The EPD considers module A1-A3, A4, A5, C1-C4 and D.

Module A1 includes provision of all raw materials, production of pre-products (e.g. mining of perlite) and energy supply.

Module A2 considers a 300 km transportation to the production site located in Germany.

Module A3 considers the manufacturing of the product at the production site including provision of electricity (0,67 kg CO₂-eq./kWh) and thermal energy from natural gas. The production of packaging materials is also included.

Module A4 considers a 230 km truck transport to the construction site.

Module A5 considers the treatment and disposal of packaging materials. Benefits for potential avoided burdens due to energy substitution of electricity and thermal energy generation are declared in module D.

Module C1 considers the dismantling of the product at EoL with an excavator.

Module C2 considers a 50 km transportation to waste processing by truck.

Two scenarios are considered in the End--of--life: recycling (1) and landfilling (2).

Module C3 (Scenario 1) calculates the recycling processing efforts, in which the product is processed (considering 3 % losses) and a material benefit for roadworks (gravel) is applied in module D. For C3/1 the results are '0'.

Module C4/1 (Scenario 2) considers landfilling of the product. For C4 the results are '0'.

Module D includes potential benefits for the thermal and electrical energy generated in module A5 due to packaging treatment and also the material benefit due to the product processing in module C3. Avoided burdens have been calculated by the inversion of electricity grid mix and thermal energy from natural gas. The material benefit is calculated by using a generic data set for gravel.

Module D/1 accounts for the avoided burdens for electricity grid mix and thermal energy from natural gas due to packaging incineration resulting from A5 only. The CO₂ incorporation in the product (from the sequestration in the PLA) and the packaging (from the sequestration in the wooden pallets) is considered. The C-balance is closed by considering the biotic CO₂ emissions according to the incorporation on the input side.

Period under review

The period under review for the collection of production data is the following period: March 2021 – February 2022.

Geographic Representativeness

Land or region, in which the declared product system is manufactured, used or handled at the end of the product's lifespan: Germany

Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to *EN 15804* and the building context, respectively the product-specific characteristics of performance, are taken into account. Background dataset: *Sphera LCA FE* (former GaBi database), *CUP 2023.2*.

LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

Biogenic carbon is present in the product as well as the packaging materials.

Information on describing the biogenic carbon content at factory gate

Name	Value	Unit
Biogenic carbon content in product	0.267	kg C
Biogenic carbon content in accompanying packaging	0.82	kg C

Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO₂.

The following technical information is a basis for the declared modules.

Transport to the building site (A4)

Module A4 considers a 230 km truck transport to construction site (diesel-driven).

Name	Value	Unit
Litres of fuel	0.77	l/100km
Transport distance	230	km
Capacity utilisation (including empty runs)	61	%

Installation into the building (A5)

For the installation of the insulation material as granulate, no auxiliaries are necessary.

The packaging material treatment and disposal are also considered in module A5.

Name	Value	Unit
PE-film (packaging)	0.219	kg/m ³
wodden pallets (packaging)	2	kg/m ³

End of life (C1 - C4)

The deconstruction (module C1) including the installation material is assumed to be done machine-assisted (demolition excavator – diesel-powered).

The transport to waste processing (module C2) is assumed to be 50 km by truck.

Scenario 1: crushing/recycling for use in road construction (module C3)

Scenario 2: Landfill (module C4/1)

Name	Value	Unit
Collected as mixed construction waste	90	kg
Recycling (scenario 1)	90	kg
Landfilling (scenario 2)	90	kg

Reuse, recovery and/or recycling potentials (D), relevant scenario information

Module D considers the benefits of packaging treatment (from Module A5) and material benefits after waste processing (from Module C3).

Module D/1 considers the benefits of packaging treatment (from Module A5) only.

LCA: Results

The following tables display the environmentally relevant results according to *EN 15804+A2*, EF 3.1 for 1 m³ of insulation material as the granulate 'Expanded perlite, coarse grain size (0/6)'.

Two end-of-life scenarios are declared in the EPD:

The recycling scenario (EoL 1) shows the corresponding results in C3, for C3/1 the results are '0'.

The landfilling scenario (EoL 2) shows the results in C4/1, for C4 the results are '0'.

Module D considers the benefits of packaging treatment (from Module A5) and material benefit after waste processing (from Module C3).

Module D/1 considers the benefits of packaging treatment (from Module A5) only.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

Product stage			Construction process stage		Use stage							End of life stage				Benefits and loads beyond the system boundaries
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	MND	MND	MNR	MNR	MNR	MND	MND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 m³ insulation material as granulate "expanded perlite, coarse grain size (0/6)"

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
GWP-total	kg CO ₂ eq	5.74E+01	1.72E+00	4.34E+00	2.38E-02	3.66E-01	1.24E+00	0	0	2.35E+00	-1.49E+00	-1.3E+00
GWP-fossil	kg CO ₂ eq	6.12E+01	1.71E+00	1.34E+00	2.35E-02	3.63E-01	2.29E-01	0	0	1.33E+00	-1.48E+00	-1.29E+00
GWP-biogenic	kg CO ₂ eq	-3.87E+00	4.86E-03	3E+00	8.67E-05	1.03E-03	1.01E+00	0	0	1.01E+00	-5.83E-03	-9.13E-03
GWP-luluc	kg CO ₂ eq	7.32E-02	1.04E-02	8.44E-06	1.42E-04	2.2E-03	1.13E-03	0	0	4.2E-03	-6.72E-04	-1.16E-04
ODP	kg CFC11 eq	2.89E-11	4.27E-13	5.27E-13	5.87E-15	9.06E-14	7.01E-13	0	0	3.48E-12	-1.74E-11	-1.53E-11
AP	mol H ⁺ eq	1.08E-01	2.3E-03	1.61E-03	3.26E-04	4.89E-04	1.17E-03	0	0	9.59E-03	-2.17E-03	-1.29E-03
EP-freshwater	kg P eq	4.65E-04	4.08E-06	1.32E-07	5.61E-08	8.66E-07	6.07E-07	0	0	2.73E-06	-4.41E-06	-3.38E-06
EP-marine	kg N eq	5.05E-02	8.61E-04	6.94E-04	1.48E-04	1.83E-04	5.45E-04	0	0	2.48E-03	-8.02E-04	-4.81E-04
EP-terrestrial	mol N eq	5.61E-01	1.02E-02	8.71E-03	1.63E-03	2.16E-03	6.01E-03	0	0	2.73E-02	-8.65E-03	-5.12E-03
POCP	kg NMVOC eq	1.45E-01	2.04E-03	1.78E-03	4.43E-04	4.34E-04	1.47E-03	0	0	7.48E-03	-2.1E-03	-1.24E-03
ADPE	kg Sb eq	1.8E-06	1.25E-07	4.01E-09	1.72E-09	2.66E-08	2.49E-07	0	0	6.27E-08	-1.33E-07	-1.09E-07
ADPF	MJ	1.01E+03	2.35E+01	9.61E-01	3.24E-01	4.99E+00	4.48E+00	0	0	1.8E+01	-2.3E+01	-2.04E+01
WDP	m ³ world eq deprived	6.1E+00	9.09E-03	3.61E-01	1.25E-04	1.93E-03	4.06E-02	0	0	1.48E-01	-2.51E-02	-1.65E-02

GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; 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

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 m³ insulation material as granulate "expanded perlite, coarse grain size (0/6)"

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
PERE	MJ	6.39E+01	1.58E+00	2.98E+01	2.17E-02	3.35E-01	4.93E-01	0	0	2.94E+00	-8.58E+00	-7.42E+00
PERM	MJ	2.95E+01	0	-2.95E+01	0	0	0	0	0	0	0	0
PERT	MJ	9.34E+01	1.58E+00	2.58E-01	2.17E-02	3.35E-01	4.93E-01	0	0	2.94E+00	-8.58E+00	-7.42E+00
PENRE	MJ	9.99E+02	2.36E+01	1.04E+01	3.24E-01	5E+00	4.48E+00	0	0	1.8E+01	-2.3E+01	-2.04E+01
PENRM	MJ	9.42E+00	0	-9.42E+00	0	0	0	0	0	0	0	0
PENRT	MJ	1.01E+03	2.36E+01	9.61E-01	3.24E-01	5E+00	4.48E+00	0	0	1.8E+01	-2.3E+01	-2.04E+01
SM	kg	0	0	0	0	0	0	0	0	0	8.73E+01	0
RSF	MJ	0	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0	0
FW	m ³	2.16E-01	1.4E-03	8.49E-03	1.93E-05	2.98E-04	1.18E-03	0	0	4.54E-03	-3.23E-03	-2.64E-03

PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; 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 net fresh water

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2:

1 m³ insulation material as granulate "expanded perlite, coarse grain size (0/6)"

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
HWD	kg	1.89E-07	3.97E-11	4.68E-11	5.47E-13	8.43E-12	0	0	0	3.88E-10	-1.23E-09	-1.41E-09
NHWD	kg	9.99E-01	3.53E-03	2.25E-02	4.85E-05	7.49E-04	1.26E-03	0	0	9.01E+01	-3.65E+00	-1.06E-02
RWD	kg	8.39E-03	3.1E-05	2.67E-05	4.27E-07	6.58E-06	3.67E-05	0	0	2.02E-04	-8.75E-04	-7.68E-04
CRU	kg	0	0	0	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	0	9E+01	0	0	0	0	0
MER	kg	0	0	0	0	0	0	0	0	0	0	0
EEE	MJ	0	0	0	0	0	0	0	0	0	0	0
EET	MJ	0	0	0	0	0	0	0	0	0	0	0

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 electrical energy; EET = Exported thermal energy

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional:

1 m³ insulation material as granulate "expanded perlite, coarse grain size (0/6)"

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
PM	Disease incidence	2.77E-06	1.89E-08	5.5E-09	1.74E-08	4.01E-09	2.26E-08	0	0	1.18E-07	-6.14E-08	-9.34E-09
IR	kBq U235 eq	7.22E-01	3.32E-03	2.82E-03	4.57E-05	7.05E-04	3.86E-03	0	0	2.3E-02	-9.26E-02	-8.12E-02
ETP-fw	CTUe	1.3E+02	1.72E+01	3.19E-01	2.37E-01	3.64E+00	3.22E+00	0	0	9.74E+00	-4.48E+00	-3.05E+00
HTP-c	CTUh	8.96E-09	3.42E-10	4.72E-11	4.71E-12	7.27E-11	7.04E-11	0	0	1.51E-09	-3.63E-10	-2.43E-10
HTP-nc	CTUh	4.8E-07	1.44E-08	3.01E-09	2.01E-10	3.05E-09	2.46E-09	0	0	1.6E-07	-1.74E-08	-6.68E-09
SQP	SQP	6.67E+02	8.38E+00	2.74E-01	1.15E-01	1.78E+00	1.13E+00	0	0	4.54E+00	-6.64E+00	-5.15E+00

PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

Disclaimer 1 – for the indicator "Potential Human exposure efficiency relative to U235". 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 or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators "abiotic depletion potential for non-fossil resources", "abiotic depletion potential for fossil resources", "water (user) deprivation potential, deprivation-weighted water consumption", "potential comparative toxic unit for ecosystems", "potential comparative toxic unit for humans – cancerogenic", "Potential comparative toxic unit for humans - not cancerogenic", "potential soil quality index". The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

References

Standards

EN 13055--1

EN 13055--1: Lightweight aggregates - Part 1: Lightweight aggregates for concrete, mortar and grout

EN 15804

EN 15804:2012+A2:2019+AC:2021, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

EN 14316

EN 14316-1:2004-11: Thermal insulation products for buildings - In-situ thermal insulation formed from expanded perlite (EP) products - Part 1: Specification for bonded and loose-fill products before installation

EN ISO 14025

EN ISO 14025:2011, Environmental labels and declarations — Type III environmental declarations — Principles and procedures

PCR

IBU 2021

Institut Bauen und Umwelt e.V.: General Instructions for the EPD programme of Institut Bauen und Umwelt e.V., Version 2.0, Berlin: Institut Bauen und Umwelt e.V., 2024, www.ibu-epd.com

PCR - Part A

PCR - Part A: Calculation rules for the Life Cycle Assessment

and Requirements on the Background Report, version 1.4, Institut Bauen und Umwelt e.V., 2024, www.bau-umwelt.com

PCR - Part B

PCR - Part B: Requirements on the EPD for Mineral Insulating materials, version from 08/2021, Institut Bauen und Umwelt e.V., 2024, www.bau-umwelt.com

Software and databases

Sphera LCA FE

Sphera LCA for Experts (LCA FE) software -system and databases, Managed LCA content MLC (fka GaBi database), University of Stuttgart and Sphera Solutions GmbH, CUP Version: 2023.2, MLC data set documentation under <https://lcadatabase.sphera.com/> (Feb 2025)

other references

ETA- 18/0451

European Technical Assessment for a specific product of the product family "Thermal insulation filling made of expanded Perlite" for Knauf Performance Materials GmbH

ETA 18/0452

European Technical Assessment for a specific product of the product family "Thermal insulation filling made of expanded Perlite" for Knauf Performance Materials GmbH

ETA 18/0454

European Technical Assessment for specific products of the product family "Thermal insulation filling made of expanded



Perlite" for Knauf Performance Materials GmbH

RHP certification

RHP= "Regeling Handelspotgronden"

This facility certifies substrates with the RHP quality mark. The RHP quality mark ensures that the substrate meets the relevant quality standards, e.g. B. for water absorption, air content, pH

value and nutrient availability. It also offers greater security regarding the cleanliness and purity of the substrate and safe use without endangering the crop.

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Annex

For additional granulates

to the

ENVIRONMENTAL PRODUCT DECLARATION

as per /ISO 14025/ and /EN 15804+A2/

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General Information

This document is considered a public annex to the EPD "*Expanded perlite, coarse grain size (0/6)*" with the declaration number EPD-KNA-20250052-CBA1-EN. The declared unit is 1 m³. The life cycle assessment data is based on production data from the following period: March 2021 – February 2022.

1. General Information on the products

Product description

The product group of **Raw Perlite**, consists of unexpanded crushed and classified perlite in different sizes. The calculation is based on the product **Raw perlite coarse**.

The following products are belonging to the Product group **Raw Perlite**:

- **Raw perlite coarse**
- Raw perlite Emag coarse
- Raw perlite middle
- Raw perlite fine
- Raw perlite Emag fine
- Pearl filler Z
- Pearl filler F
- Pearl filler 20
- Pearl filler 50
- Pearl filler 20-50
- Slag binder fine

The product group of **Expanded perlite, fine grain size (0/1)** consists of expanded perlite in fine fraction with grain sizes between 0-1 mm. The base material is raw perlite fine. The raw perlite fine is expanded in the perlite oven at a temperature of approx. 1000 degrees Celsius. No coating is added.

The calculation is based on the product **SUPERLITE® 0/1**.

The following products are belonging to the Product group **Expanded perlite, fine grain size (0/1)**:

- **SUPERLITE® 0/1**
- SUPERLITE® 0/0,7
- SUPERLITE® ST
- CRYOPERL® EL
- CRYOPERL® EL-T
- Ekoperl 66
- PERLIGRAN® Hydro

The product group of **Expanded perlite, medium grain size (0/3) (hydrophobized)** consists of expanded perlite in medium fraction with grain sizes between 0-3 mm. The base material is raw perlite middle. The raw perlite middle is expanded in the perlite oven at a temperature of approx. 1000 degrees Celsius. The calculation is based on the product **Hyperdämm** where a hydrophobation is added as a last process step. Manufactured at the plant Bülstringen.

The following products are belonging to the Product group **Expanded perlite, medium grain size (0/3) (hydrophobized)**:

- **Hyperdämm** (hydrophobic)
- SUPERLITE® 0/3 (no coating)
- PERLIGRAN® Medium (no coating)

The product group **Expanded perlite, medium grain size (0/3), bitumen coated** consist of expanded perlite in medium fraction with grain sizes between 0-3 mm. The base material is raw perlite middle. The medium fragments are expanded in the perlite oven at a temperature of approx. 1000 degrees Celsius. The last process step is a bitumen-coating. The calculation is based on the product **THERMOPERL®-RM** manufactured at the plant Neuburg.

The following products are belonging to the Product group **Expanded perlite, medium grain size (0/3), bitumen coated**:

- **THERMOPERL®-RM**

The product group of **VOLITE® products** consists of expanded perlite in **very fine** fraction with grain sizes between 0-0,5 mm. The base material is raw perlite of very fine grain size. The raw perlite is expanded in the perlite oven at a temperature of approx. 1000 degrees Celsius. For some of the products (h) a hydrophobation is added.

The calculation is based on the product **VOLITE® 200**.

The following products are belonging to the Product group **VOLITE® products**:

- **VOLITE® 200**
- VOLITE® 200 h
- VOLITE® 200 SD 110
- VOLITE® 200 h SD 110
- VOLITE® 500
- VOLITE® 500 h
- VOLITE® 500 F
- VOLITE® 500 Fh

The product group of **Filter perlite** consists of expanded perlite that is milled after expansion. The base material is raw perlite. The raw perlite is expanded in the perlite oven at a temperature of approx. 1000 degrees Celsius.

The calculation is based on the product **Filter perlite D12**.

The following products are belonging to the Product group **Filter perlite**:

- **Filter perlite D12**
- Filter perlite D14
- Filter perlite D18
- SUPERLITE® Powder 1
- SUPERLITE® D12
- SUPERLITE® filler B
- SUPERLITE® filler D
- SUPERLITE® filler N
- Gurlite

2. LCA: Calculation rules

Declared Unit

This declaration refers to the declared unit of 1 m³ of insulation material as granulate. Seven different types of granulates are calculated. In this annex six

granulates are declared: "Raw Perlite", "Expanded perlite, fine grain size (0/1)", "Expanded perlite, medium grain size (0/3) (hydrophobized)", "Expanded perlite, medium grain size (0/3), (bitumen)

coated", "VOLITE® products" and "Filter perlite". The quality of the relevant data used for the EPD in terms of its time, geography and technology representativeness is mostly very good.

Specification of the declared unit

Name	Value	Unit
Declared unit	1	m³
Bulk density "Raw Perlite"	1205	kg/m³
Bulk density "Expanded perlite, fine grain size (0/1)"	60	kg/m³
Bulk density "Expanded perlite, medium grain size (0/3) (hydrophobized)"	70	kg/m³
Bulk density "Expanded perlite, medium grain size (0/3), (bitumen) coated"	180	kg/m³
Bulk density "VOLITE® products"	140	kg/m³
Bulk density "Filter perlite"	95	kg/m³

System boundary

The type of EPD is cradle to gate with options. The additional modules are modules A4, A5, C1-C4 and D.

The environmental product declaration relates to the production stage (A1: provision of raw materials; A2:

transport; A3: manufacture), the transport to the construction site (A4), the energetic recovery of the packaging (A5), deconstruction by excavator (C1), transport to the waste processing site (C2), crushing/recycling (C3) as well as landfill (C4) including credits outside the system boundary (module D).

Module C3 considers scenario 1: 100% crushing/recycling for use in road construction.

Module C4 considers scenario 2: 100% landfill.

The usage stage (module B) is not taken into account in this study.

The granulates produced in Germany are modeled on the boundary conditions typical for the country (electricity, diesel).

Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to *EN 15804* and the building context, respectively the product-specific characteristics of performance, are taken into account.

Background database: LCA FE software, CUP 2023.2

3. LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

Information on describing the biogenic Carbon Content at factory gate for the granulate "Raw Perlite"

Name	Value	Unit
Biogenic Carbon Content in the granulate	0	kg C
Biogenic Carbon Content in the packaging	0	kg C

Information on describing the biogenic Carbon Content at factory gate for the granulate "Expanded perlite, fine grain size (0/1)"

Name	Value	Unit
Biogenic Carbon Content in the granulate	0	kg C
Biogenic Carbon Content in the packaging	0	kg C

Information on describing the biogenic Carbon Content at factory gate for the granulate "Expanded perlite, medium grain size (0/3) (hydrophobized)"

Name	Value	Unit
Biogenic Carbon Content in the granulate	0	kg C
Biogenic Carbon Content in the packaging	0,683	kg C

Information on describing the biogenic Carbon Content at factory gate for the granulate "Expanded perlite, medium grain size (0/3), (bitumen) coated"

Name	Value	Unit
Biogenic Carbon Content in the granulate	0	kg C
Biogenic Carbon Content in the packaging	0,82	kg C

Information describing the biogenic Carbon Content at factory gate for the granulate "VOLITE® products"

Name	Value	Unit
Biogenic Carbon Content in the granulate	0	kg C
Biogenic Carbon Content in the packaging	0	kg C

Information on describing the biogenic Carbon Content at factory gate for the granulate "Filter perlite"

Name	Value	Unit
Biogenic Carbon Content in the granulate	0	kg C
Biogenic Carbon Content in the packaging	3,15	kg C

The following technical scenario information is required for the declared modules.

End of Life (C1-C4) for the granulate "Raw Perlite"

Name	Value	Unit
Collected as mixed construction waste	1000	kg
Recycling (Scenario 1)	1000	kg
Landfill (Scenario 2)	1000	kg

End of Life (C1-C4) for the granulate "Expanded perlite, fine grain size (0/1)"

Name	Value	Unit
Collected as mixed construction waste	60	kg
Recycling (Scenario 1)	60	kg
Landfill (Scenario 2)	60	kg

End of Life (C1-C4) for the granulate "Expanded perlite, medium grain size (0/3) (hydrophobized)"

Name	Value	Unit
Collected as mixed construction waste	70	kg

Recycling (Scenario 1)	70	kg
Landfill (Scenario 2)	70	kg

End of Life (C1-C4) for the granulate “Expanded perlite, medium grain size (0/3), (bitumen) coated”

Name	Value	Unit
Collected as mixed construction waste	180	kg
Recycling (Scenario 1)	180	kg
Landfill (Scenario 2)	180	kg

End of Life (C1-C4) for the granulate “VOLITE® products”

Name	Value	Unit
Collected as mixed construction waste	140	kg
Recycling (Scenario 1)	140	kg
Landfill (Scenario 2)	140	kg

End of Life (C1-C4) for the granulate “Filter perlite”

Name	Value	Unit
Collected as mixed construction waste	95	kg
Recycling (Scenario 1)	95	kg
Landfill (Scenario 2)	95	kg

Reuse, recovery and/or recycling potentials (D)

Module D considers the benefits of packaging treatment (from Module A5) and material credit after waste processing (from Module C3).

Module D/1 considers the benefits of packaging treatment (from Module A5) only.

4. LCA: Results

The following tables show the results for 1m³ of the insulation granulates.

Two end-of-life scenarios are declared in the EPD:

The recycling scenario (EoL 1) shows the corresponding results in C3, for C3/1 the results are '0'.

The landfilling scenario (EoL 2) shows the results in C4/1, for C4 the results are '0'.

Module D considers the benefits of packaging treatment (from Module A5) and material credit after waste processing (from Module C3).

Module D/1 considers the benefits of packaging treatment (from Module A5) only.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; ND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

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

LCA: Results for the granulate “Raw Perlite”

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 m³ insulation material as granulate “Raw Perlite”

Core Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
GWP-total	[kg CO ₂ -Eq.]	1,41E+02	1,87E+01	0,00E+00	2,64E-01	4,07E+00	2,57E+00	0,00E+00	0,00E+00	1,49E+01	-2,08E+00	0,00E+00
GWP-fossil	[kg CO ₂ -Eq.]	1,39E+02	1,85E+01	0,00E+00	2,62E-01	4,03E+00	2,55E+00	0,00E+00	0,00E+00	1,48E+01	-2,11E+00	0,00E+00
GWP-biogenic	[kg CO ₂ -Eq.]	4,31E-01	5,27E-02	0,00E+00	9,64E-04	1,15E-02	1,17E-02	0,00E+00	0,00E+00	5,07E-02	3,66E-02	0,00E+00
GWP-luluc	[kg CO ₂ -Eq.]	8,65E-01	1,12E-01	0,00E+00	1,58E-03	2,44E-02	1,25E-02	0,00E+00	0,00E+00	4,67E-02	-6,17E-03	0,00E+00
ODP	[kg CFC11-Eq.]	1,93E-11	4,63E-12	0,00E+00	6,53E-14	1,01E-12	7,79E-12	0,00E+00	0,00E+00	3,86E-11	-2,34E-11	0,00E+00
AP	[mol H ⁺ -Eq.]	9,35E-01	2,50E-02	0,00E+00	3,62E-03	5,43E-03	1,30E-02	0,00E+00	0,00E+00	1,07E-01	-9,77E-03	0,00E+00
EP-freshwater	[kg P-Eq.]	3,46E-04	4,42E-05	0,00E+00	6,23E-07	9,62E-06	6,74E-06	0,00E+00	0,00E+00	3,03E-05	-1,14E-05	0,00E+00
EP-marine	[kg N-Eq.]	4,63E-01	9,34E-03	0,00E+00	1,65E-03	2,03E-03	6,06E-03	0,00E+00	0,00E+00	2,75E-02	-3,57E-03	0,00E+00
EP-terrestrial	[mol N-Eq.]	5,10E+00	1,11E-01	0,00E+00	1,81E-02	2,40E-02	6,68E-02	0,00E+00	0,00E+00	3,03E-01	-3,93E-02	0,00E+00
POCP	[kg NMVOC-Eq.]	1,35E+00	2,22E-02	0,00E+00	4,92E-03	4,82E-03	1,63E-02	0,00E+00	0,00E+00	8,31E-02	-9,58E-03	0,00E+00
ADPE	[kg Sb-Eq.]	6,55E-06	1,36E-06	0,00E+00	1,91E-08	2,95E-07	2,77E-06	0,00E+00	0,00E+00	6,96E-07	-2,60E-07	0,00E+00
ADPF	[MJ]	2,03E+03	2,55E+02	0,00E+00	3,60E+00	5,55E+01	4,98E+01	0,00E+00	0,00E+00	2,00E+02	-2,89E+01	0,00E+00
WDP	[m ³ world-Eq deprived]	1,73E+00	9,85E-02	0,00E+00	1,39E-03	2,14E-02	4,52E-01	0,00E+00	0,00E+00	1,65E+00	-9,51E-02	0,00E+00

Caption: GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; 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

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 m³ insulation material as granulate “Raw Perlite”

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
PERE	[MJ]	9,85E+01	1,71E+01	0,00E+00	2,41E-01	3,72E+00	5,48E+00	0,00E+00	0,00E+00	3,27E+01	-1,28E+01	0,00E+00
PERM	[MJ]	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
PERT	[MJ]	9,85E+01	1,71E+01	0,00E+00	2,41E-01	3,72E+00	5,48E+00	0,00E+00	0,00E+00	3,27E+01	-1,28E+01	0,00E+00
PENRE	[MJ]	2,04E+03	2,56E+02	0,00E+00	3,60E+00	5,56E+01	4,98E+01	0,00E+00	0,00E+00	2,00E+02	-2,89E+01	0,00E+00
PENRM	[MJ]	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
PENRT	[MJ]	2,04E+03	2,56E+02	0,00E+00	3,60E+00	5,56E+01	4,98E+01	0,00E+00	0,00E+00	2,00E+02	-2,89E+01	0,00E+00
SM	[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	9,70E+02	0,00E+00
RSF	[MJ]	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
NRSF	[MJ]	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
FW	[m ³]	1,38E-01	1,52E-02	0,00E+00	2,15E-04	3,31E-03	1,32E-02	0,00E+00	0,00E+00	5,05E-02	-6,48E-03	0,00E+00

Caption: PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; 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 net fresh water

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 m³ insulation material as granulate “Raw Perlite”

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
HWD	[kg]	1,53E-07	4,31E-10	0,00E+00	6,07E-12	9,37E-11	0,00E+00	0,00E+00	0,00E+00	4,31E-09	1,96E-09	0,00E+00
NHWD	[kg]	2,06E+02	3,83E-02	0,00E+00	5,39E-04	8,32E-03	1,40E-02	0,00E+00	0,00E+00	1,00E+03	-4,04E+01	0,00E+00
RWD	[kg]	1,46E-02	3,37E-04	0,00E+00	4,74E-06	7,32E-05	4,08E-04	0,00E+00	0,00E+00	2,25E-03	-1,19E-03	0,00E+00
CRU	[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
MFR	[kg]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,00E+03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MER	[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
EEE	[MJ]	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
EET	[MJ]	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
Caption	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 electrical energy; EET = Exported thermal energy											

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 m³ insulation material as granulate “Raw Perlite”

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
PM	[Disease Incidence]	2,83E-05	2,05E-07	0,00E+00	1,93E-07	4,45E-08	2,51E-07	0,00E+00	0,00E+00	1,31E-06	-5,79E-07	0,00E+00
IRP	[kBq U235-Eq.]	1,27E+00	3,60E-02	0,00E+00	5,08E-04	7,84E-03	4,29E-02	0,00E+00	0,00E+00	2,56E-01	-1,27E-01	0,00E+00
ETP-fw	[CTUe]	9,24E+02	1,86E+02	0,00E+00	2,63E+00	4,05E+01	3,58E+01	0,00E+00	0,00E+00	1,08E+02	-1,59E+01	0,00E+00
HTP-c	[CTUh]	2,62E-08	3,71E-09	0,00E+00	5,23E-11	8,07E-10	7,83E-10	0,00E+00	0,00E+00	1,68E-08	-1,33E-09	0,00E+00
HTP-nc	[CTUh]	1,41E-06	1,56E-07	0,00E+00	2,23E-09	3,38E-08	2,73E-08	0,00E+00	0,00E+00	1,77E-06	-1,19E-07	0,00E+00
SQP	[-]	5,36E+02	9,08E+01	0,00E+00	1,28E+00	1,97E+01	1,26E+01	0,00E+00	0,00E+00	5,04E+01	-1,65E+01	0,00E+00
Caption	PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index											

Disclaimer 1 – for the indicator “Potential Human exposure efficiency relative to U235”.

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 or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators “abiotic depletion potential for non-fossil resources”, “abiotic depletion potential for fossil resources”, “water (user) deprivation potential, deprivation-weighted water consumption”, “potential comparative toxic unit for ecosystems”, “potential comparative toxic unit for humans – cancerogenic”, “Potential comparative toxic unit for humans - not cancerogenic”, “potential soil quality index”.

The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

LCA: Results for the granulate “Expanded perlite, fine grain size (0/1)”

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 m³ insulation material as granulate “Expanded perlite, fine grain size (0/1)”

Core Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
GWP-total	[kg CO ₂ -Eq.]	3,34E+01	1,12E+00	0,00E+00	1,59E-02	2,44E-01	1,54E-01	0,00E+00	0,00E+00	8,95E-01	-1,25E-01	0,00E+00
GWP-fossil	[kg CO ₂ -Eq.]	3,33E+01	1,11E+00	0,00E+00	1,57E-02	2,42E-01	1,53E-01	0,00E+00	0,00E+00	8,89E-01	-1,27E-01	0,00E+00
GWP-biogenic	[kg CO ₂ -Eq.]	6,87E-02	3,16E-03	0,00E+00	5,78E-05	6,88E-04	7,02E-04	0,00E+00	0,00E+00	3,04E-03	2,20E-03	0,00E+00
GWP-luluc	[kg CO ₂ -Eq.]	4,48E-02	6,74E-03	0,00E+00	9,49E-05	1,46E-03	7,50E-04	0,00E+00	0,00E+00	2,80E-03	-3,70E-04	0,00E+00
ODP	[kg CFC11-Eq.]	2,64E-12	2,78E-13	0,00E+00	3,92E-15	6,04E-14	4,67E-13	0,00E+00	0,00E+00	2,32E-12	-1,40E-12	0,00E+00
AP	[mol H ⁺ -Eq.]	6,33E-02	1,50E-03	0,00E+00	2,17E-04	3,26E-04	7,78E-04	0,00E+00	0,00E+00	6,39E-03	-5,86E-04	0,00E+00
EP-freshwater	[kg P-Eq.]	1,95E-05	2,65E-06	0,00E+00	3,74E-08	5,77E-07	4,04E-07	0,00E+00	0,00E+00	1,82E-06	-6,84E-07	0,00E+00
EP-marine	[kg N-Eq.]	3,07E-02	5,60E-04	0,00E+00	9,88E-05	1,22E-04	3,63E-04	0,00E+00	0,00E+00	1,65E-03	-2,14E-04	0,00E+00
EP-terrestrial	[mol N-Eq.]	3,39E-01	6,63E-03	0,00E+00	1,09E-03	1,44E-03	4,01E-03	0,00E+00	0,00E+00	1,82E-02	-2,36E-03	0,00E+00
POCP	[kg NMVOC-Eq.]	8,87E-02	1,33E-03	0,00E+00	2,95E-04	2,89E-04	9,79E-04	0,00E+00	0,00E+00	4,98E-03	-5,75E-04	0,00E+00
ADPE	[kg Sb-Eq.]	6,03E-07	8,15E-08	0,00E+00	1,15E-09	1,77E-08	1,66E-07	0,00E+00	0,00E+00	4,18E-08	-1,56E-08	0,00E+00
ADPF	[MJ]	5,46E+02	1,53E+01	0,00E+00	2,16E-01	3,33E+00	2,99E+00	0,00E+00	0,00E+00	1,20E+01	-1,73E+00	0,00E+00
WDP	[m ³ world-Eq deprived]	1,01E-01	5,91E-03	0,00E+00	8,33E-05	1,29E-03	2,71E-02	0,00E+00	0,00E+00	9,87E-02	-5,71E-03	0,00E+00
Caption	GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; 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											

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 m³ insulation material as granulate “Expanded perlite, fine grain size (0/1)”

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
PERE	[MJ]	6,67E+00	1,03E+00	0,00E+00	1,45E-02	2,23E-01	3,29E-01	0,00E+00	0,00E+00	1,96E+00	-7,70E-01	0,00E+00
PERM	[MJ]	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
PERT	[MJ]	6,67E+00	1,03E+00	0,00E+00	1,45E-02	2,23E-01	3,29E-01	0,00E+00	0,00E+00	1,96E+00	-7,70E-01	0,00E+00
PENRE	[MJ]	5,46E+02	1,53E+01	0,00E+00	2,16E-01	3,34E+00	2,99E+00	0,00E+00	0,00E+00	1,20E+01	-1,74E+00	0,00E+00
PENRM	[MJ]	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
PENRT	[MJ]	5,46E+02	1,53E+01	0,00E+00	2,16E-01	3,34E+00	2,99E+00	0,00E+00	0,00E+00	1,20E+01	-1,74E+00	0,00E+00
SM	[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	5,82E+01	0,00E+00
RSF	[MJ]	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
NRSF	[MJ]	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
FW	[m³]	1,18E-02	9,13E-04	0,00E+00	1,29E-05	1,99E-04	7,89E-04	0,00E+00	0,00E+00	3,03E-03	-3,89E-04	0,00E+00

Caption	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; 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 net fresh water											
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RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 m³ insulation material as granulate “Expanded perlite, fine grain size (0/1)”

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
HWD	[kg]	1,08E-07	2,59E-11	0,00E+00	3,64E-13	5,62E-12	0,00E+00	0,00E+00	0,00E+00	2,59E-10	1,18E-10	0,00E+00
NHWD	[kg]	1,59E+00	2,30E-03	0,00E+00	3,23E-05	4,99E-04	8,37E-04	0,00E+00	0,00E+00	6,01E+01	-2,42E+00	0,00E+00
RWD	[kg]	2,64E-03	2,02E-05	0,00E+00	2,85E-07	4,39E-06	2,45E-05	0,00E+00	0,00E+00	1,35E-04	-7,17E-05	0,00E+00
CRU	[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
MFR	[kg]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,00E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MER	[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
EEE	[MJ]	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
EET	[MJ]	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

Caption	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 electrical energy; EET = Exported thermal energy											
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RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 m³ insulation material as granulate “Expanded perlite, fine grain size (0/1)”

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
PM	[Disease Incidence]	1,53E-06	1,23E-08	0,00E+00	1,16E-08	2,67E-09	1,51E-08	0,00E+00	0,00E+00	7,86E-08	-3,47E-08	0,00E+00
IRP	[kBq U235-Eq.]	2,17E-01	2,16E-03	0,00E+00	3,05E-05	4,70E-04	2,57E-03	0,00E+00	0,00E+00	1,53E-02	-7,63E-03	0,00E+00
ETP-fw	[CTUe]	5,10E+01	1,12E+01	0,00E+00	1,58E-01	2,43E+00	2,15E+00	0,00E+00	0,00E+00	6,49E+00	-9,53E-01	0,00E+00
HTP-c	[CTUh]	4,34E-09	2,23E-10	0,00E+00	3,14E-12	4,84E-11	4,70E-11	0,00E+00	0,00E+00	1,01E-09	-7,99E-11	0,00E+00
HTP-nc	[CTUh]	2,14E-07	9,34E-09	0,00E+00	1,34E-10	2,03E-09	1,64E-09	0,00E+00	0,00E+00	1,06E-07	-7,12E-09	0,00E+00
SQP	[-]	2,83E+01	5,45E+00	0,00E+00	7,68E-02	1,18E+00	7,54E-01	0,00E+00	0,00E+00	3,03E+00	-9,89E-01	0,00E+00

Caption	PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index											
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Disclaimer 1 – for the indicator “Potential Human exposure efficiency relative to U235”.

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 or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators “abiotic depletion potential for non-fossil resources”, “abiotic depletion potential for fossil resources”, “water (user) deprivation potential, deprivation-weighted water consumption”, “potential comparative toxic unit for ecosystems”, “potential comparative toxic unit for humans – cancerogenic”, “Potential comparative toxic unit for humans - not cancerogenic”, “potential soil quality index”.

The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

LCA: Results for the granulate “Expanded perlite, medium grain size (0/3) (hydrophobized)”

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 m³ insulation material as granulate “Expanded perlite, medium grain size (0/3) (hydrophobized)”

Core Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
GWP-total	[kg CO ₂ -Eq.]	4,44E+01	1,37E+00	8,90E+00	1,85E-02	2,84E-01	1,80E-01	0,00E+00	0,00E+00	1,04E+00	-4,00E+00	3,85E+00
GWP-fossil	[kg CO ₂ -Eq.]	4,67E+01	1,36E+00	6,40E+00	1,83E-02	2,82E-01	1,78E-01	0,00E+00	0,00E+00	1,03E+00	-3,97E+00	3,82E+00
GWP-biogenic	[kg CO ₂ -Eq.]	-2,38E+00	3,87E-03	2,50E+00	6,73E-05	8,01E-04	8,18E-04	0,00E+00	0,00E+00	3,54E-03	-2,42E-02	-2,68E-02
GWP-luluc	[kg CO ₂ -Eq.]	5,38E-02	8,24E-03	1,47E-05	1,11E-04	1,71E-03	8,74E-04	0,00E+00	0,00E+00	3,26E-03	-7,73E-04	-3,42E-04
ODP	[kg CFC11-Eq.]	4,52E-11	3,40E-13	8,96E-13	4,56E-15	7,03E-14	5,44E-13	0,00E+00	0,00E+00	2,70E-12	-4,63E-11	-4,47E-11
AP	[mol H ⁺ -Eq.]	8,53E-02	1,83E-03	2,15E-03	2,53E-04	3,80E-04	9,06E-04	0,00E+00	0,00E+00	7,44E-03	-4,48E-03	-3,80E-03
EP-freshwater	[kg P-Eq.]	3,53E-05	3,25E-06	2,20E-07	4,36E-08	6,72E-07	4,71E-07	0,00E+00	0,00E+00	2,12E-06	-1,07E-05	-9,91E-06
EP-marine	[kg N-Eq.]	3,92E-02	6,86E-04	7,07E-04	1,15E-04	1,42E-04	4,23E-04	0,00E+00	0,00E+00	1,92E-03	-1,67E-03	-1,42E-03
EP-terrestrial	[mol N-Eq.]	4,31E-01	8,11E-03	1,10E-02	1,27E-03	1,68E-03	4,67E-03	0,00E+00	0,00E+00	2,12E-02	-1,78E-02	-1,51E-02
POCP	[kg NMVOC-Eq.]	1,14E-01	1,63E-03	1,83E-03	3,44E-04	3,37E-04	1,14E-03	0,00E+00	0,00E+00	5,81E-03	-4,32E-03	-3,66E-03
ADPE	[kg Sb-Eq.]	1,78E-05	9,97E-08	6,76E-09	1,34E-09	2,06E-08	1,93E-07	0,00E+00	0,00E+00	4,87E-08	-3,38E-07	-3,20E-07
ADPF	[MJ]	8,38E+02	1,87E+01	1,59E+00	2,51E-01	3,88E+00	3,48E+00	0,00E+00	0,00E+00	1,40E+01	-6,23E+01	-6,03E+01
WDP	[m ³ world-Eq deprived]	3,95E-01	7,23E-03	7,85E-01	9,70E-05	1,50E-03	3,16E-02	0,00E+00	0,00E+00	1,15E-01	-5,50E-02	-4,83E-02
Caption	GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; 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											

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 m³ insulation material as granulate "Expanded perlite, medium grain size (0/3) (hydrophobized)"

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
PERE	[MJ]	3,76E+01	1,26E+00	2,50E+01	1,68E-02	2,60E-01	3,83E-01	0,00E+00	0,00E+00	2,29E+00	-2,26E+01	-2,17E+01
PERM	[MJ]	2,46E+01	0,00E+00	-2,46E+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
PERT	[MJ]	6,22E+01	1,26E+00	4,38E-01	1,68E-02	2,60E-01	3,83E-01	0,00E+00	0,00E+00	2,29E+00	-2,26E+01	-2,17E+01
PENRE	[MJ]	7,58E+02	1,88E+01	8,19E+01	2,52E-01	3,88E+00	3,48E+00	0,00E+00	0,00E+00	1,40E+01	-6,24E+01	-6,03E+01
PENRM	[MJ]	8,03E+01	0,00E+00	-8,03E+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
PENRT	[MJ]	8,38E+02	1,88E+01	1,59E+00	2,52E-01	3,88E+00	3,48E+00	0,00E+00	0,00E+00	1,40E+01	-6,24E+01	-6,03E+01
SM	[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	6,78E+01	0,00E+00
RSF	[MJ]	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
NRSF	[MJ]	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
FW	[m ³]	5,11E-02	1,12E-03	1,84E-02	1,50E-05	2,31E-04	9,19E-04	0,00E+00	0,00E+00	3,53E-03	-8,19E-03	-7,74E-03

Caption	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; 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 net fresh water											
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RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 m³ insulation material as granulate "Expanded perlite, medium grain size (0/3) (hydrophobized)"

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
HWD	[kg]	1,38E-07	3,16E-11	5,06E-11	4,24E-13	6,55E-12	0,00E+00	0,00E+00	0,00E+00	3,01E-10	-4,13E-09	-4,26E-09
NHWD	[kg]	8,26E-01	2,81E-03	4,01E-02	3,77E-05	5,81E-04	9,75E-04	0,00E+00	0,00E+00	6,99E+01	-2,85E+00	-3,11E-02
RWD	[kg]	9,05E-03	2,47E-05	4,53E-05	3,31E-07	5,11E-06	2,85E-05	0,00E+00	0,00E+00	1,57E-04	-2,33E-03	-2,25E-03
CRU	[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
MFR	[kg]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,99E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MER	[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
EEE	[MJ]	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
EET	[MJ]	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

Caption	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 electrical energy; EET = Exported thermal energy											
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RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 m³ insulation material as granulate "Expanded perlite, medium grain size (0/3) (hydrophobized)"

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
PM	[Disease Incidence]	2,19E-06	1,50E-08	9,61E-09	1,35E-08	3,11E-09	1,76E-08	0,00E+00	0,00E+00	9,16E-08	-6,79E-08	-2,75E-08
IRP	[kBq U235-Eq.]	8,12E-01	2,65E-03	4,79E-03	3,55E-05	5,48E-04	3,00E-03	0,00E+00	0,00E+00	1,79E-02	-2,47E-01	-2,38E-01
ETP-fw	[CTUe]	1,32E+02	1,37E+01	5,54E-01	1,84E-01	2,83E+00	2,50E+00	0,00E+00	0,00E+00	7,56E+00	-1,00E+01	-8,92E+00
HTP-c	[CTUh]	1,16E-08	2,73E-10	7,48E-11	3,65E-12	5,64E-11	5,47E-11	0,00E+00	0,00E+00	1,17E-09	-8,10E-10	-7,17E-10
HTP-nc	[CTUh]	8,38E-07	1,14E-08	2,80E-09	1,56E-10	2,37E-09	1,91E-09	0,00E+00	0,00E+00	1,24E-07	-2,80E-08	-1,98E-08
SQP	[-]	4,46E+02	6,67E+00	4,69E-01	8,94E-02	1,38E+00	8,78E-01	0,00E+00	0,00E+00	3,53E+00	-1,62E+01	-1,51E+01

Caption	PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index											
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Disclaimer 1 – for the indicator "Potential Human exposure efficiency relative to U235".

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 or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators "abiotic depletion potential for non-fossil resources", "abiotic depletion potential for fossil resources", "water (user) deprivation potential, deprivation-weighted water consumption", "potential comparative toxic unit for ecosystems", "potential comparative toxic unit for humans – cancerogenic", "Potential comparative toxic unit for humans - not cancerogenic", "potential soil quality index".

The results of this environmental impact indicator shall be used with care as the

uncertainties on these results are high as there is limited experience with the indicator.

LCA: Results for the granulate “Expanded perlite, medium grain size (0/3), (bitumen) coated”

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 m³ insulation material as granulate “Expanded perlite, medium grain size (0/3), (bitumen) coated”

Core Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
GWP-total	[kg CO ₂ -Eq.]	9,10E+01	3,45E+00	1,13E+01	4,76E-02	7,32E-01	4,63E-01	0,00E+00	0,00E+00	2,68E+00	-5,31E+00	-4,93E+00
GWP-fossil	[kg CO ₂ -Eq.]	9,33E+01	3,42E+00	8,27E+00	4,71E-02	7,25E-01	4,59E-01	0,00E+00	0,00E+00	2,67E+00	-5,28E+00	-4,90E+00
GWP-biogenic	[kg CO ₂ -Eq.]	-2,51E+00	9,72E-03	3,00E+00	1,73E-04	2,06E-03	2,11E-03	0,00E+00	0,00E+00	9,12E-03	-2,77E-02	-3,43E-02
GWP-luluc	[kg CO ₂ -Eq.]	1,85E-01	2,07E-02	1,86E-05	2,85E-04	4,39E-03	2,25E-03	0,00E+00	0,00E+00	8,40E-03	-1,55E-03	-4,38E-04
ODP	[kg CFC11-Eq.]	3,23E-10	8,54E-13	1,13E-12	1,17E-14	1,81E-13	1,40E-12	0,00E+00	0,00E+00	6,95E-12	-6,14E-11	-5,72E-11
AP	[mol H ⁺ -Eq.]	2,30E-01	4,61E-03	2,67E-03	6,51E-04	9,78E-04	2,33E-03	0,00E+00	0,00E+00	1,92E-02	-6,62E-03	-4,87E-03
EP-freshwater	[kg P-Eq.]	5,21E-04	8,16E-06	2,77E-07	1,12E-07	1,73E-06	1,21E-06	0,00E+00	0,00E+00	5,46E-06	-1,47E-05	-1,27E-05
EP-marine	[kg N-Eq.]	8,83E-02	1,72E-03	8,63E-04	2,97E-04	3,65E-04	1,09E-03	0,00E+00	0,00E+00	4,96E-03	-2,46E-03	-1,82E-03
EP-terrestrial	[mol N-Eq.]	9,31E-01	2,04E-02	1,37E-02	3,26E-03	4,32E-03	1,20E-02	0,00E+00	0,00E+00	5,45E-02	-2,64E-02	-1,93E-02
POCP	[kg NMVOC-Eq.]	1,64E+01	4,09E-03	2,23E-03	8,86E-04	8,67E-04	2,94E-03	0,00E+00	0,00E+00	1,50E-02	-6,41E-03	-4,68E-03
ADPE	[kg Sb-Eq.]	9,39E-06	2,51E-07	8,49E-09	3,45E-09	5,32E-08	4,98E-07	0,00E+00	0,00E+00	1,25E-07	-4,57E-07	-4,10E-07
ADPF	[MJ]	3,75E+03	4,71E+01	2,00E+00	6,47E-01	9,98E+00	8,96E+00	0,00E+00	0,00E+00	3,60E+01	-8,25E+01	-7,73E+01
WDP	[m³ world-Eq deprived]	4,52E+00	1,82E-02	9,97E-01	2,50E-04	3,86E-03	8,13E-02	0,00E+00	0,00E+00	2,96E-01	-7,90E-02	-6,19E-02
Caption	GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; 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											

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 m³ insulation material as granulate “Expanded perlite, medium grain size (0/3), (bitumen) coated”

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
PERE	[MJ]	2,25E+02	3,16E+00	3,01E+01	4,34E-02	6,70E-01	9,86E-01	0,00E+00	0,00E+00	5,89E+00	-3,01E+01	-2,78E+01
PERM	[MJ]	2,95E+01	0,00E+00	-2,95E+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
PERT	[MJ]	2,54E+02	3,16E+00	5,50E-01	4,34E-02	6,70E-01	9,86E-01	0,00E+00	0,00E+00	5,89E+00	-3,01E+01	-2,78E+01
PENRE	[MJ]	1,41E+03	4,72E+01	1,06E+02	6,49E-01	1,00E+01	8,97E+00	0,00E+00	0,00E+00	3,60E+01	-8,25E+01	-7,73E+01
PENRM	[MJ]	2,34E+03	0,00E+00	-1,04E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	[MJ]	3,76E+03	4,72E+01	2,00E+00	6,49E-01	1,00E+01	8,97E+00	0,00E+00	0,00E+00	3,60E+01	-8,25E+01	-7,73E+01
SM	[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	1,75E+02	0,00E+00
RSF	[MJ]	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
NRSF	[MJ]	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
FW	[m³]	3,58E-01	2,81E-03	2,34E-02	3,86E-05	5,96E-04	2,37E-03	0,00E+00	0,00E+00	9,08E-03	-1,11E-02	-9,91E-03
Caption	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; 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 net fresh water											

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 m³ insulation material as granulate “Expanded perlite, medium grain size (0/3), (bitumen) coated”

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
HWD	[kg]	1,31E-07	7,95E-11	6,20E-11	1,09E-12	1,69E-11	0,00E+00	0,00E+00	0,00E+00	7,76E-10	-5,11E-09	-5,47E-09
NHWD	[kg]	6,94E+00	7,06E-03	5,06E-02	9,70E-05	1,50E-03	2,51E-03	0,00E+00	0,00E+00	1,80E+02	-7,31E+00	-3,98E-02
RWD	[kg]	2,42E-02	6,21E-05	5,70E-05	8,54E-07	1,32E-05	7,35E-05	0,00E+00	0,00E+00	4,05E-04	-3,09E-03	-2,88E-03
CRU	[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
MFR	[kg]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,80E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MER	[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
EEE	[MJ]	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
EET	[MJ]	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
Caption	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 electrical energy; EET = Exported thermal energy											

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 m³ insulation material as granulate “Expanded perlite, medium grain size (0/3), (bitumen) coated”

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
PM	Disease Incidence	4,12E-06	3,78E-08	1,21E-08	3,48E-08	8,02E-09	4,52E-08	0,00E+00	0,00E+00	2,36E-07	-1,39E-07	-3,52E-08
IRP	[kBq U235-Eq.]	2,39E+00	6,65E-03	6,02E-03	9,14E-05	1,41E-03	7,72E-03	0,00E+00	0,00E+00	4,60E-02	-3,27E-01	-3,04E-01
ETP-fw	[CTUe]	2,31E+03	3,44E+01	6,98E-01	4,73E-01	7,29E+00	6,44E+00	0,00E+00	0,00E+00	1,95E+01	-1,43E+01	-1,14E+01
HTP-c	[CTUh]	4,81E-08	6,85E-10	9,38E-11	9,42E-12	1,45E-10	1,41E-10	0,00E+00	0,00E+00	3,02E-09	-1,16E-09	-9,18E-10
HTP-nc	[CTUh]	2,68E-06	2,87E-08	3,39E-09	4,01E-10	6,09E-09	4,92E-09	0,00E+00	0,00E+00	3,19E-07	-4,67E-08	-2,53E-08
SQP	[-]	9,57E+02	1,68E+01	5,90E-01	2,30E-01	3,55E+00	2,26E+00	0,00E+00	0,00E+00	9,08E+00	-2,23E+01	-1,93E+01
Caption	PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index											

Disclaimer 1 – for the indicator “Potential Human exposure efficiency relative to U235”.
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 or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators “abiotic depletion potential for non-fossil resources”, “abiotic depletion potential for fossil resources”, “water (user) deprivation potential, deprivation-weighted water consumption”, “potential comparative toxic unit for ecosystems”, “potential comparative toxic unit for humans – cancerogenic”, “Potential comparative toxic unit for humans - not cancerogenic”, “potential soil quality index”.

The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

LCA: Results for the granulate “VOLITE® products”

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 m³ insulation material as granulate “VOLITE® products”

Core Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
GWP-total	[kg CO ₂ -Eq.]	9,94E+01	2,62E+00	0,00E+00	3,70E-02	5,69E-01	3,60E-01	0,00E+00	0,00E+00	2,09E+00	-2,92E-01	0,00E+00
GWP-fossil	[kg CO ₂ -Eq.]	9,91E+01	2,59E+00	0,00E+00	3,66E-02	5,64E-01	3,57E-01	0,00E+00	0,00E+00	2,07E+00	-2,96E-01	0,00E+00
GWP-biogenic	[kg CO ₂ -Eq.]	1,49E-01	7,38E-03	0,00E+00	1,35E-04	1,60E-03	1,64E-03	0,00E+00	0,00E+00	7,09E-03	5,13E-03	0,00E+00
GWP-luluc	[kg CO ₂ -Eq.]	1,06E-01	1,57E-02	0,00E+00	2,21E-04	3,42E-03	1,75E-03	0,00E+00	0,00E+00	6,53E-03	-8,64E-04	0,00E+00
ODP	[kg CFC11-Eq.]	7,17E-12	6,48E-13	0,00E+00	9,14E-15	1,41E-13	1,09E-12	0,00E+00	0,00E+00	5,41E-12	-3,28E-12	0,00E+00
AP	[mol H ⁺ -Eq.]	1,75E-01	3,50E-03	0,00E+00	5,06E-04	7,61E-04	1,82E-03	0,00E+00	0,00E+00	1,49E-02	-1,37E-03	0,00E+00
EP-freshwater	[kg P-Eq.]	4,69E-05	6,19E-06	0,00E+00	8,73E-08	1,35E-06	9,44E-07	0,00E+00	0,00E+00	4,25E-06	-1,60E-06	0,00E+00
EP-marine	[kg N-Eq.]	7,99E-02	1,31E-03	0,00E+00	2,31E-04	2,84E-04	8,48E-04	0,00E+00	0,00E+00	3,85E-03	-4,99E-04	0,00E+00
EP-terrestrial	[mol N-Eq.]	8,79E-01	1,55E-02	0,00E+00	2,54E-03	3,36E-03	9,36E-03	0,00E+00	0,00E+00	4,24E-02	-5,50E-03	0,00E+00
POCP	[kg NMVOC-Eq.]	2,29E-01	3,10E-03	0,00E+00	6,89E-04	6,75E-04	2,28E-03	0,00E+00	0,00E+00	1,16E-02	-1,34E-03	0,00E+00
ADPE	[kg Sb-Eq.]	1,43E-06	1,90E-07	0,00E+00	2,68E-09	4,13E-08	3,88E-07	0,00E+00	0,00E+00	9,75E-08	-3,64E-08	0,00E+00
ADPF	[MJ]	1,58E+03	3,57E+01	0,00E+00	5,03E-01	7,77E+00	6,97E+00	0,00E+00	0,00E+00	2,80E+01	-4,05E+00	0,00E+00
WDP	[m³ world-Eq deprived]	3,85E-01	1,38E-02	0,00E+00	1,94E-04	3,00E-03	6,32E-02	0,00E+00	0,00E+00	2,30E-01	-1,33E-02	0,00E+00
Caption	GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; 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											

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 m³ insulation material as granulate “VOLITE® products”

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
PERE	[MJ]	1,63E+01	2,40E+00	0,00E+00	3,38E-02	5,21E-01	7,67E-01	0,00E+00	0,00E+00	4,58E+00	-1,80E+00	0,00E+00
PERM	[MJ]	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
PERT	[MJ]	1,63E+01	2,40E+00	0,00E+00	3,38E-02	5,21E-01	7,67E-01	0,00E+00	0,00E+00	4,58E+00	-1,80E+00	0,00E+00
PENRE	[MJ]	1,58E+03	3,58E+01	0,00E+00	5,04E-01	7,78E+00	6,98E+00	0,00E+00	0,00E+00	2,80E+01	-4,05E+00	0,00E+00
PENRM	[MJ]	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
PENRT	[MJ]	1,58E+03	3,58E+01	0,00E+00	5,04E-01	7,78E+00	6,98E+00	0,00E+00	0,00E+00	2,80E+01	-4,05E+00	0,00E+00
SM	[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	1,36E+02	0,00E+00
RSF	[MJ]	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
NRSF	[MJ]	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
FW	[m³]	9,10E-02	2,13E-03	0,00E+00	3,00E-05	4,63E-04	1,84E-03	0,00E+00	0,00E+00	7,06E-03	-9,07E-04	0,00E+00
Caption	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; 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 net fresh water											

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 m³ insulation material as granulate “VOLITE® products”

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
HWD	[kg]	2,45E-07	6,03E-11	0,00E+00	8,50E-13	1,31E-11	0,00E+00	0,00E+00	0,00E+00	6,03E-10	2,75E-10	0,00E+00
NHWD	[kg]	4,31E-01	5,36E-03	0,00E+00	7,55E-05	1,16E-03	1,95E-03	0,00E+00	0,00E+00	1,40E+02	-5,66E+00	0,00E+00
RWD	[kg]	4,34E-02	4,71E-05	0,00E+00	6,64E-07	1,02E-05	5,72E-05	0,00E+00	0,00E+00	3,15E-04	-1,67E-04	0,00E+00
CRU	[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
MFR	[kg]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,40E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MER	[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
EEE	[MJ]	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
EET	[MJ]	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
Caption	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 electrical energy; EET = Exported thermal energy											

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 m³ insulation material as granulate “VOLITE® products”

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
PM	Disease Incidence	3,81E-06	2,87E-08	0,00E+00	2,70E-08	6,24E-09	3,52E-08	0,00E+00	0,00E+00	1,83E-07	-8,10E-08	0,00E+00
IRP	[kBq U235-Eq.]	3,39E+00	5,05E-03	0,00E+00	7,11E-05	1,10E-03	6,01E-03	0,00E+00	0,00E+00	3,58E-02	-1,78E-02	0,00E+00
ETP-fw	[CTUe]	1,62E+02	2,61E+01	0,00E+00	3,68E-01	5,67E+00	5,01E+00	0,00E+00	0,00E+00	1,52E+01	-2,22E+00	0,00E+00
HTP-c	[CTUh]	1,10E-08	5,20E-10	0,00E+00	7,32E-12	1,13E-10	1,10E-10	0,00E+00	0,00E+00	2,35E-09	-1,86E-10	0,00E+00
HTP-nc	[CTUh]	5,46E-07	2,18E-08	0,00E+00	3,12E-10	4,74E-09	3,83E-09	0,00E+00	0,00E+00	2,48E-07	-1,66E-08	0,00E+00
SQP	[]	6,81E+01	1,27E+01	0,00E+00	1,79E-01	2,76E+00	1,76E+00	0,00E+00	0,00E+00	7,06E+00	-2,31E+00	0,00E+00
Caption	PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index											

Disclaimer 1 – for the indicator “Potential Human exposure efficiency relative to U235”.

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 or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators “abiotic depletion potential for non-fossil resources”, “abiotic depletion potential for fossil resources”, “water (user) deprivation potential, deprivation-weighted water consumption”, “potential comparative toxic unit for ecosystems”, “potential comparative toxic unit for humans – cancerogenic”, “Potential comparative toxic unit for humans - not cancerogenic”, “potential soil quality index”.

The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

LCA: Results for the granulate “Filter Perlite”

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 m³ insulation material as granulate “Filter Perlite”

Core Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
GWP-total	[kg CO ₂ -Eq.]	4,61E+01	1,89E+00	1,34E+01	2,51E-02	3,86E-01	2,44E-01	0,00E+00	0,00E+00	1,42E+00	-3,94E+00	-3,75E+00
GWP-fossil	[kg CO ₂ -Eq.]	5,75E+01	1,87E+00	2,20E+00	2,48E-02	3,83E-01	2,42E-01	0,00E+00	0,00E+00	1,41E+00	-3,92E+00	-3,72E+00
GWP-biogenic	[kg CO ₂ -Eq.]	-1,14E+01	5,33E-03	1,12E+01	9,15E-05	1,09E-03	1,11E-03	0,00E+00	0,00E+00	4,81E-03	-2,27E-02	-2,62E-02
GWP-luluc	[kg CO ₂ -Eq.]	7,73E-02	1,14E-02	3,64E-05	1,50E-04	2,32E-03	1,19E-03	0,00E+00	0,00E+00	4,43E-03	-9,20E-04	-3,34E-04
ODP	[kg CFC11-Eq.]	2,22E-11	4,68E-13	1,91E-12	6,20E-15	9,56E-14	7,39E-13	0,00E+00	0,00E+00	3,67E-12	-4,60E-11	-4,38E-11
AP	[mol H ⁺ -Eq.]	1,19E-01	2,53E-03	5,31E-03	3,43E-04	5,16E-04	1,23E-03	0,00E+00	0,00E+00	1,01E-02	-4,63E-03	-3,71E-03
EP-freshwater	[kg P-Eq.]	6,35E-05	4,47E-06	4,92E-07	5,92E-08	9,13E-07	6,40E-07	0,00E+00	0,00E+00	2,88E-06	-1,08E-05	-9,72E-06
EP-marine	[kg N-Eq.]	5,46E-02	9,44E-04	2,30E-03	1,56E-04	1,93E-04	5,75E-04	0,00E+00	0,00E+00	2,61E-03	-1,72E-03	-1,38E-03
EP-terrestrial	[mol N-Eq.]	5,98E-01	1,12E-02	2,83E-02	1,72E-03	2,28E-03	6,35E-03	0,00E+00	0,00E+00	2,88E-02	-1,84E-02	-1,47E-02
POCP	[kg NMVOC-Eq.]	1,57E-01	2,24E-03	5,89E-03	4,67E-04	4,58E-04	1,55E-03	0,00E+00	0,00E+00	7,89E-03	-4,47E-03	-3,56E-03
ADPE	[kg Sb-Eq.]	1,23E-06	1,37E-07	1,44E-08	1,82E-09	2,80E-08	2,63E-07	0,00E+00	0,00E+00	6,61E-08	-3,38E-07	-3,13E-07
ADPF	[MJ]	9,05E+02	2,58E+01	3,35E+00	3,41E-01	5,27E+00	4,73E+00	0,00E+00	0,00E+00	1,90E+01	-6,14E+01	-5,86E+01
WDP	[m³ world-Eq deprived]	4,73E-01	9,96E-03	1,18E+00	1,32E-04	2,03E-03	4,29E-02	0,00E+00	0,00E+00	1,56E-01	-5,64E-02	-4,74E-02
Caption	GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; 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											

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 m³ insulation material as granulate “Filter Perlite”

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
PERE	[MJ]	5,69E+01	1,73E+00	1,16E+02	2,29E-02	3,53E-01	5,20E-01	0,00E+00	0,00E+00	3,11E+00	-2,25E+01	-2,13E+01
PERM	[MJ]	1,15E+02	0,00E+00	-1,15E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	[MJ]	1,72E+02	1,73E+00	9,31E-01	2,29E-02	3,53E-01	5,20E-01	0,00E+00	0,00E+00	3,11E+00	-2,25E+01	-2,13E+01
PENRE	[MJ]	9,03E+02	2,59E+01	5,50E+00	3,42E-01	5,28E+00	4,73E+00	0,00E+00	0,00E+00	1,90E+01	-6,14E+01	-5,86E+01
PENRM	[MJ]	2,15E+00	0,00E+00	-2,15E+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
PENRT	[MJ]	9,05E+02	2,59E+01	3,35E+00	3,42E-01	5,28E+00	4,73E+00	0,00E+00	0,00E+00	1,90E+01	-6,14E+01	-5,86E+01
SM	[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	9,21E+01	0,00E+00
RSF	[MJ]	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
NRSF	[MJ]	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
FW	[m³]	6,75E-02	1,54E-03	2,79E-02	2,04E-05	3,14E-04	1,25E-03	0,00E+00	0,00E+00	4,79E-03	-8,20E-03	-7,59E-03
Caption	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; 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 net fresh water											

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 m³ insulation material as granulate “Filter Perlite”

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
HWD	[kg]	4,62E-07	4,36E-11	1,47E-10	5,77E-13	8,90E-12	0,00E+00	0,00E+00	0,00E+00	4,09E-10	-3,87E-09	-4,06E-09
NHWD	[kg]	3,51E-01	3,87E-03	1,06E-01	5,12E-05	7,90E-04	1,33E-03	0,00E+00	0,00E+00	9,50E+01	-3,87E+00	-3,04E-02
RWD	[kg]	2,78E-02	3,40E-05	9,63E-05	4,50E-07	6,95E-06	3,88E-05	0,00E+00	0,00E+00	2,14E-04	-2,32E-03	-2,20E-03
CRU	[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
MFR	[kg]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,50E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MER	[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
EEE	[MJ]	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
EET	[MJ]	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
Caption	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 electrical energy; EET = Exported thermal energy											

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 m³ insulation material as granulate “Filter Perlite”

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
PM	[Disease Incidence]	3,80E-06	2,07E-08	1,87E-08	1,83E-08	4,23E-09	2,39E-08	0,00E+00	0,00E+00	1,24E-07	-8,18E-08	-2,68E-08
IRP	[kBq U235-Eq.]	2,27E+00	3,64E-03	1,02E-02	4,82E-05	7,44E-04	4,07E-03	0,00E+00	0,00E+00	2,43E-02	-2,45E-01	-2,33E-01
ETP-fw	[CTUe]	1,20E+02	1,88E+01	1,13E+00	2,50E-01	3,85E+00	3,40E+00	0,00E+00	0,00E+00	1,03E+01	-1,03E+01	-8,75E+00
HTP-c	[CTUh]	7,21E-09	3,75E-10	1,49E-10	4,97E-12	7,67E-11	7,43E-11	0,00E+00	0,00E+00	1,60E-09	-8,26E-10	-6,99E-10
HTP-nc	[CTUh]	3,19E-07	1,57E-08	9,45E-09	2,12E-10	3,21E-09	2,59E-09	0,00E+00	0,00E+00	1,68E-07	-3,04E-08	-1,92E-08
SQP	[-]	1,72E+03	9,18E+00	9,86E-01	1,22E-01	1,87E+00	1,19E+00	0,00E+00	0,00E+00	4,79E+00	-1,64E+01	-1,48E+01
Caption	PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index											

Disclaimer 1 – for the indicator “Potential Human exposure efficiency relative to U235”.

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 or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators “abiotic depletion potential for non-fossil resources”, “abiotic depletion potential for fossil resources”, “water (user) deprivation potential, deprivation-weighted water consumption”, “potential comparative toxic unit for ecosystems”, “potential comparative toxic unit for humans – cancerogenic”, “Potential comparative toxic unit for humans - not cancerogenic”, “potential soil quality index”.

The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator.