ENVIRONMENTAL-PRODUCT DECLARATION

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

Owner of the Declaration	GLAPOR Werk Mitterteich GmbH
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-GLP-20230179-CBA2-EN
Issue date	09.10.2023
Valid to	08.10.2028

GLAPOR cellular glass boards

GLAPOR Werk Mitterteich GmbH

Institut Bauen und Umwelt e.V.

ECO PLATFORM EPD VERIFIED

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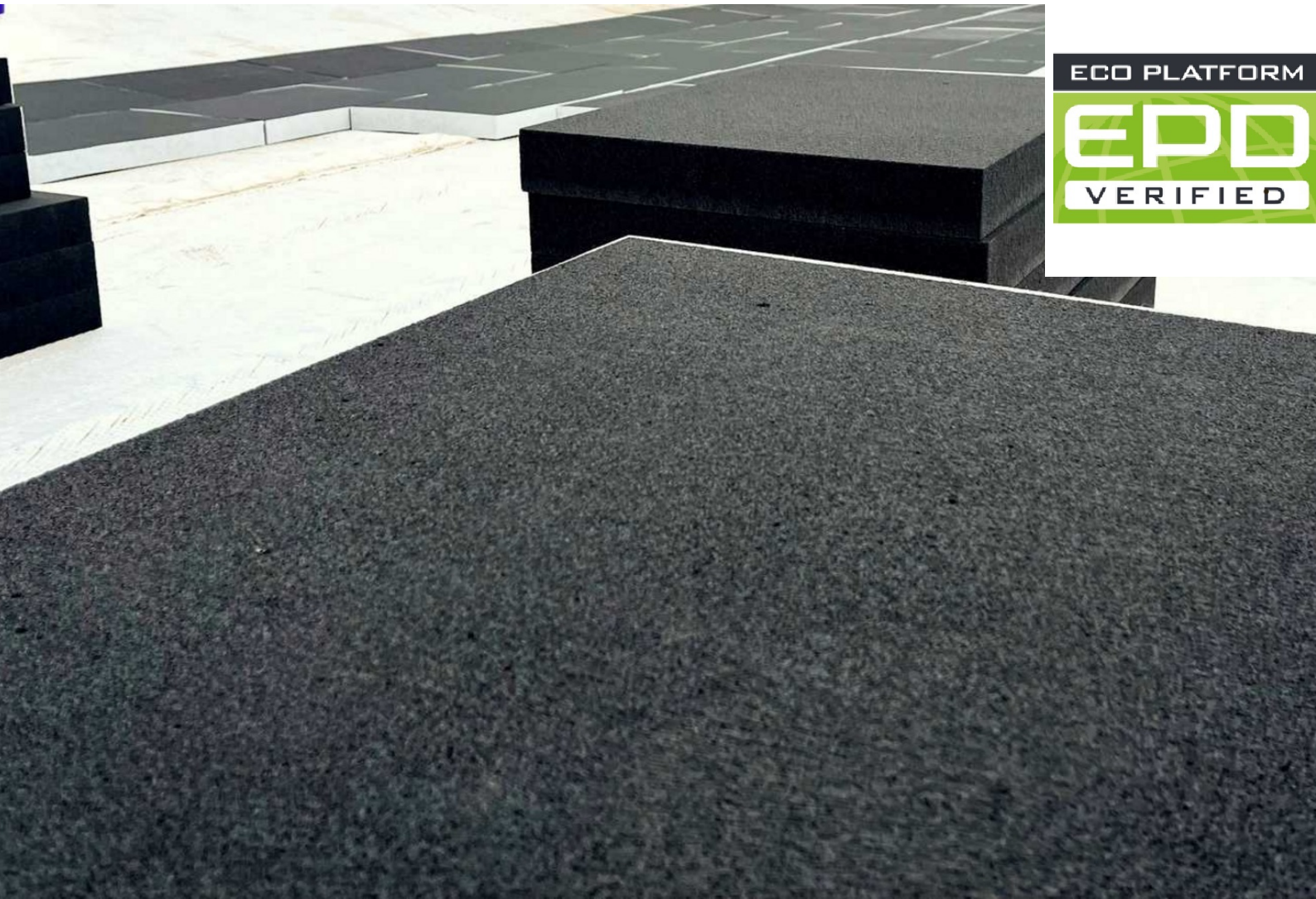

General Information

GLAPOR Werk Mitterteich GmbH

Programme holder

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

Declaration number

EPD-GLP-20230179-CBA2-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

09.10.2023

Valid to

08.10.2028

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

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

GLAPOR cellular glass boards

Owner of the declaration

GLAPOR Werk Mitterteich GmbH
Hüblteichstraße 17
95666 Mitterteich
Germany

Declared product / declared unit

GLAPOR cellular glass boards / 1 m^3 at 120 kg/m^3

Scope:

The EPD represents cellular glass produced at the GLAPOR production site at Mitterteich/GER.
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 bezeichnet*.

Verification

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

Angela Schindler,
(Independent verifier)

Product

Product description/Product definition

GLAPOR cellular glass boards are vapour-tight, lightweight insulation materials for the construction industry made of 100 % recycled glass. By combining the physical properties of glass with the insulating properties of a closed-cell structure, GLAPOR cellular glass products provide high compressive strength, are lightweight, fire resistant and resistant to rodents. The permanent, continuous production process guarantees consistent high quality.

This EPD is valid for the GLAPOR cellular glass boards:

- GLAPOR cellular glass boards PG600.3 (120 kg/m³);

The LCA-related information can be extrapolated to other products via their specific densities, notably to:

- GLAPOR cellular glass boards PG900.3 (130 kg/m³); 0.052 W/(m x K)
- GLAPOR cellular glass boards PG1600 (155 kg/m³); 0.058 W/(m x K)

For the placing on the market of the product in the European Union/European Free Trade Association (EU/EFTA) (with the exception of Switzerland) *Regulation (EU) No. 305/2011 (CPR)* applies. The product needs a Declaration of Performance taking into consideration *EN 13167:2012+A1:2015, Thermal insulation products for buildings. Factory made cellular glass (CG) product*s and the CE-marking.

Application

GLAPOR cellular glass boards are used in a wide range of applications. The cellular glass is always a great option, be it for lightweight wheelchair ramps through to high-strength helicopter landing pads.
The applications for its use in structural engineering projects are defined in the application norm *DIN 4108-10*. The cellular glass boards are also used in civil engineering projects, lightweight constructions and technical insulation.

Such applications include:

For structural engineering projects:

- unused, used roof surfaces that can be accessed on foot or with vehicles
- inside thermal insulation of ceilings and walls
- load-bearing thermal insulation for under screed and other floor constructions
- façade insulation systems under panels, wall bridge elements and base insulation and fire barriers
- perimeter insulation for walls and below floor slabs

Industrial buildings: technical insulation

- fresh water tank
- ventilation ducts and ventilation systems

Public buildings: special applications

- accessible building
- radon security thanks to cellular glass constructions
- lightweight constructions

More details on the application of GLAPOR cellular glass can be found at www.glapor.de.

Technical Data

Technical data

Name	Value	Unit
Thermal conductivity declared value (EN 13167)	0.052	W/(mK)
Calculation value for thermal conductivity (DIN 4108-4:2016)	0.054 - 0.06	W/(mK)
Water vapour diffusion resistance factor (value for calculations: 40'000)	∞	-
Gross density (EN 1602/+/- 10%)	120 - 155	kg/m^3
Compressive strength (EN 826)	>0.6 to >1.0	N/mm^2
Fire resistance (EN 13501-1)	Euroclass A1	

Performance data of the product in accordance with the Declaration of Performance with respect to its Essential Characteristics according to *EN 13167:2012+A1:2015, Thermal insulation products for buildings - Factory made cellular glass (CG) products - Specification.*

Base materials/Ancillary materials

GLAPOR cellular glass is composed of:

- 92 % of recycled glass
- 6.5 % of sodium silicate ("water glass")
- 1 % of glycerine

In addition, minor quantities of kaolin are used.

The product does not contain substances listed in the *ECHA Candidate List* of Substances of Very High Concern for Authorisation (accessed 5.11.2022) exceeding the limit value of 0.1% for registration by the European Chemicals Agency.

Environment and health during use

Reference service life

If installed according to the manufacturer's instructions, the service life of the insulation material will reach the service life of the building, i.e. 100 years or more.

According to the table on expected service lives for the German BNB scheme *BBSR 2017*, a service life of ≥ 50 years can be assumed for all relevant applications.

LCA: Calculation rules

Declared Unit

The declaration is valid for 1 m^3 of GLAPOR cellular glass with a density of 120 kg/m^3, with a typical thickness of 160 mm and with a thermal conductivity of 0.054 W/(mK) (Source: *Fraunhofer 2017*).

Declared unit

Name	Value	Unit
Gross density	120	kg/m^3
Declared unit	1	m³

The selected product represents the product with the highest production volume as the "typical product". The declared values can be extrapolated to any product and thickness via the respective area weight.

System boundary

Type of EPD: "cradle to gate with options, modules C1-C3, and module D (A1–A3, C, D and additional modules. The additional modules may be A4 and/or A5 and/or B1–B7)".

The system boundary of *module A1–A3* encompasses all processes related to the production of cellular glass. The

system boundary for the recycled glass is assumed to be after the sorting of the glass cullets that are to be recycled. Within the system boundary of A1–A3 are considered:

- grinding of recycled glass cullets
- production of all ancillary materials
- electricity production
- heat generation for the production process
- production of packaging material
- all transport, including transport of glass cullets to the external grinding and transport of inputs to the production site.

The process does not generate waste water.

The process generates about 30 % of production waste that is used for the production of cellular glass gravel. For this product an economic allocation is applied.

No other waste is generated in significant quantities.

Module A4 contains the average transport scenario from the production site to the construction site.

Module A5 contains the disposal of the PE packaging in a municipal waste incineration plant, from which energy is exported from the product system; the benefits of this exported energy are reported in Module D.
Module C1 does not contain any impacts as manual de-construction is assumed.

After de-construction, 2 scenarios are declared

Scenario 1: recycling into cellular glass gravel

Module C2/1 contains a default transport scenario (350 km by lorry) of the cellular glass from the deconstruction site to the GLAPOR production site (see also module A4).

Module C3/1 contains the electricity consumption used to crush the deconstructed cellular foam board into gravel smaller than 60 mm.

Module D/1 contains the benefits of replacing natural crushed gravel, calculated for the net flow calculated as the difference between the output of recycled cellular glass and the input of glass cullet. It also includes the exported energy from the energy recovery from the treatment of PE in a municipal waste incineration plant.

Scenario 2: landfilling:

Module C2/2 contains a default transport scenario (50 km by lorry) of the cellular glass from the deconstruction site to the inert material landfill.

Module C4/2 contains the landfilling of the cellular glass.

Module D/2 contains the benefits of the exported energy from the energy recovery from the treatment of PE in a municipal waste incineration plant.

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.
The database *ecoinvent 3.9.1* (system model "cut-off by classification) was used as background database.

LCA: Scenarios and additional technical information

Characteristic product properties
Information on biogenic carbon

Information on biogenic carbon content at factory gate

Name	Value	Unit
Biogenic carbon content in product	0	kg C
Biogenic carbon content in accompanying packaging	0	kg C

Transport to construction site (A4)

A default distance of 350 km is assumed for the transport from the production to the construction site. Capacity utilisation and fuel consumption are taken from the ecoinvent dataset for an average transport by lorry in Europe and have not been modified.

Construction (A5)

0,66 kg of PE packaging foil has been inventoried that is used for energy recovery in a municipal waste incineration plant. According to the ecoinvent DS used, 5 MJ/kg of electricity and 10.2 MJ/kg of heat are recovered from 1 kg of PE waste.

The use of multi-way pallets has not been taken into account as packaging material.

Service life

Name	Value	Unit
Life Span (according to BBSR)	≥ 50	a
Life Span according to the manufacturer	100 years and beyond, depending on the service life of the building	a
Declared product properties (at the gate) and finishes	compliance with EN 13167	-
Design application parameters (if instructed by the manufacturer), including the references to the appropriate practices and application codes	according to the instructions by the manufacturer	-
An assumed quality of work, when installed in accordance with the manufacturer's instructions	installation according to assembly instructions and state of the art.	-
Outdoor environment, (for outdoor applications), e.g. weathering, pollutants, UV and wind exposure, building orientation, shading, temperature	not applicable	-
Indoor environment (for indoor applications), e.g. temperature, moisture, chemical exposure	usual conditions in structural engieering	-
Usage conditions, e.g. frequency of use, mechanical exposure	not applicalbe	-
Maintenance e.g. required frequency, type and quality and replacement of components	no maintenance required	-

C1-C4 End-of-life scenario

Module C1 does not contain any impacts as manual de-construction is assumed.
After de-construction, 2 scenarios are declared:

Scenario 1: recycling into cellular glass gravel

Module C2/1 contains a default transport scenario (350 km by lorry) of the cellular glass from the deconstruction site to the GLAPOR production site (see also module A4).

Module C3/1 contains the electricity consumption used to crush the deconstructed cellular foam board into gravel smaller than 60 mm.

Scenario 2: landfilling

Module C2/2 contains a default transport scenario (50 km by lorry) of the cellular glass from the deconstruction site to the inert material landfill.

Module C4/2 contains the landfilling of the cellular glass in an inert material landfill.

D Benefits and burdens beyond system boundary

Module D/1 contains the benefits of replacing natural crushed gravel, calculated for the net flow calculated as the difference between the output of recycled cellular glass and the input of glass cullet. It also contains the benefits of the exported energy from the energy recovery from the treatment of PE packaging in a municipal waste incineration plant.

Module D/2 contains solely the benefits of the exported energy from the energy recovery from the treatment of PE packaging in a municipal waste incineration plant.

GLAPOR
SCHAUMGLASPRODUKTE

LCA: Results

For the calculation of the impact assessment, *EN 15804*:2012+A2:2019 + AC:2021 based on EF 3.1 has been used.

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	MND	MND	MNR	MNR	MNR	MND	MND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: GLAPOR cellular glass boards / per m³ (120 kg/m³)

Parameter	Unit	A1-A3	A4	A5	C1	C2/1	C2/2	C3/1	C4/2	D/1	D/2
GWP-total	kg CO_2 eq	9.73E+01	6.21E+00	1.99E+00	0	6.21E+00	8.87E-01	7.05E-01	7.22E-01	-1.07E+00	-1.18E+00
GWP-fossil	kg CO_2 eq	9.72E+01	6.2E+00	1.99E+00	0	6.2E+00	8.86E-01	7.06E-01	7.2E-01	-1.08E+00	-1.18E+00
GWP-biogenic	kg CO_2 eq	8.37E-02	5.63E-03	9.64E-05	0	5.63E-03	8.05E-04	-1.16E-03	2.32E-03	4.92E-03	8.92E-04
GWP-luluc	kg CO_2 eq	2.52E-02	2.96E-03	4.34E-06	0	2.96E-03	4.23E-04	7.89E-05	1.35E-04	-4.47E-05	-1.18E-04
ODP	kg CFC11 eq	2.82E-06	1.32E-07	9.28E-10	0	1.32E-07	1.88E-08	7.7E-09	2.35E-08	-2.88E-08	-3.05E-08
AP	mol H^+ eq	2.9E-01	1.98E-02	2.21E-04	0	1.98E-02	2.84E-03	1.63E-03	4.38E-03	-1.06E-03	-1.88E-03
EP-freshwater	kg P eq	2.46E-03	4.94E-05	1.91E-07	0	4.94E-05	7.05E-06	3.36E-05	3.89E-06	-2.98E-05	-3.22E-05
EP-marine	kg N eq	1.24E-01	6.73E-03	1.02E-04	0	6.73E-03	9.61E-04	3.51E-04	1.91E-03	-2.13E-04	-4.51E-04
EP-terrestrial	mol N eq	9.14E-01	7.19E-02	1.16E-03	0	7.19E-02	1.03E-02	4.04E-03	2.05E-02	-1.9E-03	-5.13E-03
POCP	kg NMVOC eq	2.37E-01	3.02E-02	3.14E-04	0	3.02E-02	4.31E-03	1.23E-03	8.13E-03	-1.2E-03	-2.03E-03
ADPE	kg Sb eq	3.06E-04	1.86E-05	2.69E-08	0	1.86E-05	2.65E-06	5.98E-07	7.15E-07	6.79E-07	-6.9E-07
ADPF	MJ	1.35E+03	8.68E+01	8.73E-02	0	8.68E+01	1.24E+01	1.06E+01	1.72E+01	-1.57E+01	-1.72E+01
WDP	m^3 world eq deprived	1.03E+01	3.87E-01	2.91E-03	0	3.87E-01	5.53E-02	1.51E-02	6.28E-02	2.09E-03	-2.28E-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: GLAPOR cellular glass boards / per m³ (120 kg/m³)

Parameter	Unit	A1-A3	A4	A5	C1	C2/1	C2/2	C3/1	C4/2	D/1	D/2
PERE	MJ	1.07E+02	1.34E+00	5.14E-03	0	1.34E+00	1.92E-01	6.88E-02	3.34E-01	3.67E-01	-9.75E-02
PERM	MJ	0	0	0	0	0	0	0	0	0	0
PERT	MJ	1.07E+02	1.34E+00	5.14E-03	0	1.34E+00	1.92E-01	6.88E-02	3.34E-01	3.67E-01	-9.75E-02
PENRE	MJ	1.32E+03	8.68E+01	2.93E+01	0	8.68E+01	1.24E+01	1.06E+01	1.72E+01	-1.57E+01	-1.72E+01
PENRM	MJ	2.92E+01	0	-2.92E+01	0	0	0	0	0	0	0
PENRT	MJ	1.35E+03	8.68E+01	8.74E-02	0	8.68E+01	1.24E+01	1.06E+01	1.72E+01	-1.57E+01	-1.72E+01
SM	kg	1.53E+02	0	0	0	0	0	0	0	-2.8E+01	0
RSF	MJ	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0
FW	m^3	5.71E-01	2.37E-02	4.06E-04	0	2.37E-02	3.39E-03	2.3E-03	2.34E-03	8.03E-03	-2.58E-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: GLAPOR cellular glass boards / per m³ (120 kg/m³)

Parameter	Unit	A1-A3	A4	A5	C1	C2/1	C2/2	C3/1	C4/2	D/1	D/2
HWD	kg	4.87E-03	5.46E-04	7.25E-07	0	5.46E-04	7.8E-05	1.31E-05	8.43E-05	-3.52E-05	-4.49E-05
NHWD	kg	1.98E+01	5.7E+00	2.28E-02	0	5.7E+00	8.15E-01	2.32E-02	1.2E+02	-5.1E-03	-3.25E-02
RWD	kg	2.97E-03	5.04E-05	1.55E-07	0	5.04E-05	7.2E-06	7.38E-05	6.66E-06	-5.96E-05	-6.97E-05

CRU	kg	0	0	0	0	0	0	0	0	0	0
MFR	kg	6.29E-03	0	0	0	0	0	1.2E+02	0	0	0
MER	kg	0	0	0	0	0	0	0	0	0	0
EEE	MJ	0	0	3.33E+00	0	0	0	0	0	0	0
EET	MJ	0	0	6.79E+00	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: GLAPOR cellular glass boards / per m³ (120 kg/m³)

Parameter	Unit	A1-A3	A4	A5	C1	C2/1	C2/2	C3/1	C4/2	D/1	D/2
PM	Disease incidence	3.03E-06	5.24E-07	1.77E-09	0	5.24E-07	7.49E-08	5.35E-09	1.1E-07	1.07E-08	-7.1E-09
IR	kBq U235 eq	1.45E+00	4.46E-02	1.35E-04	0	4.46E-02	6.38E-03	3.04E-02	6.75E-03	-1.91E-02	-2.92E-02
ETP-fw	CTUe	4.78E+02	4.59E+01	3.41E-01	0	4.59E+01	6.55E+00	1.12E+00	7.66E+00	-6.21E-01	-1.42E+00
HTP-c	CTUh	2.8E-08	2.7E-09	2.38E-10	0	2.7E-09	3.86E-10	1.21E-10	2.3E-10	4.38E-12	-1.88E-10
HTP-nc	CTUh	1.05E-06	8.04E-08	1.84E-09	0	8.04E-08	1.15E-08	5.83E-09	5.68E-09	-3.81E-09	-6.19E-09
SQP	SQP	6.39E+02	6.71E+01	3.1E-02	0	6.71E+01	9.59E+00	8.14E-01	3.56E+01	2.05E+00	-8.52E-01

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 nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – 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 or as there is limited experienced with the indicator.

Remark: the negative value of the GWPbiogenic in module C3/1 is due to inconsistencies in the modelling of wooden supportive structures in infrastructure datasets for the mining of hard coal related to the German residual electricity mix.

References

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EN 826
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EN 933-1
DIN EN 933-1:2012-03, Tests for geometrical properties of aggregates – Part 1: Determination of particle size distribution – Sieving method.

EN 1097-3
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EN 1602
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EN 13167+A1
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EN 13501-1
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ecoinvent 3.9.1
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Regulation (EU) Nr. 305/2011(CPR)
REGULATION (EU) No 305/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC.

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Owner of the Declaration

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