Environmental Product Declaration

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

Lightweight expanded clay aggregate

Nexclay 0-2, Nexclay 2-4, Nexclay 3-8F, Nexclay 3-8, Nexclay 8-16

from

Nexclay – Argila Expandida S.A.

Programme:	The International EPD® System, www.environdec.com
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An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com

General information

Programme information

Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	www.environdec.com
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Accountabilities for PCR, LCA and independent, third-party verification
Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product Category Rules (PCR): *PCR 2019:14 Construction products (EN 15804+A2), version 1.3.4 (2024-04-30)*
PCR review was conducted by: *The Technical Committee of the International EPD® System. See www.environdec.com/TC for a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact.*
Life Cycle Assessment (LCA)
LCA accountability: *Rita Pinheiro Garcia, Itecons – Institute for Research and Technological Development in Construction, Energy, Environment and Sustainability*
Third-party verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: ☒ EPD verification by individual verifier Third-party verifier: *Elisabet Amat, GREENIZE* Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☒ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

Company information

Owner of the EPD:
Nexclay – Argila Expandida S.A.
Contact:
geral@nexclay.pt

Description of the organisation:
Founded in 2002 as Argex, the company of the Preceram Group, producer of expanded clay, which over the years has had constant growth, now adopts in 2023 a new identity that better reflects our dedication to innovation, sustainability, modernity and ability to satisfy the customer. At Nexclay, we continuously research the most suitable clays and use the most advanced technology in order to guarantee increasing quality standards for our products. We have large reserves of the best quality clay for the manufacture of expanded clay, whose exploitation is carefully planned and executed to ensure the least possible impact on the environment. The technology we employ corresponds to state-of-the-art technology and we continually invest in updating it. From extraction to marketing, the entire process is controlled with total dedication and continuous work. More and more, we are determined to share our knowledge, present innovative solutions, contribute to the quality of construction, provide more comfort and economy.

Product-related or management system-related certifications:
Nexclay expanded clay meets the requirements of standard EN 13055-1, according to system 2+, which recognises the existence of strict internal quality control, certified by an external entity (AENOR. Nexclay holds ISO 14001 Environmental Management System Certification (IPAC) and ISO 9001 Quality Management System Certification (IPAC).

Name and location of production site:
Nexclay – Argila Expandida S.A.
Zona Industrial de Bustos, Azurveira 3770-011 Bustos – Portugal
https:// https://nexclay.pt/

Product information

Product name:
Nexclay 0-2, Nexclay 2-4, Nexclay 3-8F, Nexclay 3-8, and Nexclay 8-16

Product identification:
Lightweight expanded clay aggregate

Product description:
Lightweight spherical aggregate with an internal structure formed by a ceramic foam with micropores and a rigid, resistant surface. This EPD represents an average product, weighted according to the production volumes of the following products:

- **Nexclay 0-2**, used in lightweight mortars and plasters, with good thermal performance and fire resistance. The mechanical and physical properties of the aggregate make it suitable for use in prefabricated elements with special features.
- **Nexclay 2-4**, used in lightweight concrete with good thermal and acoustic behavior and structural lightweight concrete for special projects and for rehabilitation works. The mechanical and physical properties of the aggregate make it suitable for use in prefabricated elements with special features, such as blocks and arch bricks.

- **Nexclay 3-8F**, used as lightweight concrete filling, with good thermal and acoustic behavior, for insulation and regularization of floors in buildings, shape layers on roofs, bridges and viaducts. The mechanical and physical properties of the aggregate make it suitable for use in prefabricated elements with special features, such as blocks and arch bricks.
- **Nexclay 3-8**, used as filler solutions with good thermal and acoustic behaviour, such as insulation and regularization of floors in buildings, form layers in roofs and for filling air-boxes in double walls. The mechanical and physical properties of the aggregate make it suitable for being applied in geotechnical works, landscaping and agriculture, including drainage, embankments, flower beds and gardened roofs.
- **Nexclay 8-16**, used as filler solutions with good thermal and acoustic behavior, such as insulation and regularization of floors in buildings, form layers in roofs and for filling air-boxes in double walls. The mechanical and physical properties of the aggregate make it suitable for being applied in geotechnical works, landscaping and agriculture, including drainage, embankments, flower beds and gardened roofs.

Characteristics	Nexclay 0-2	Nexclay 2-4	Nexclay 3-8F	Nexclay 3-8	Nexclay 8-16
Crushing resistance (± 10%) (MPa)	5,1	4,8	2,1	1,8	1,2
Loose bulk density (kg/m³)	312 - 422	304 - 412	255 - 345	244 - 330	184 - 250
Particle size distribution (mm)	0,25 - 5,6	4,0 - 8,0	6,3 - 12,5	8,0 - 12,5	8,0 - 20,0
Thermal conductivity (W/m °C)	0,13	0,11	0,11	0,11	0,10
Water absorption (% dry mass)	< 30	26,2	24,9	22,7	22,9
Reaction to fire	Incombustible Euro Category A1				

UN CPC code:
UN CPC 3799 - Non-metallic mineral products n.e.c. (including mineral wool, expanded mineral materials, worked mica, articles of mica, non-electrical articles of graphite or other carbon and articles of peat) (based on version 2.1: 2015)

Geographical scope:
The LCA study was carried out according to the European scope.
Product Market: Global.

LCA information

Functional unit / declared unit:
1 m³ of lightweight expanded clay aggregates, including packaging (303 kg/DU).

Reference service life:
Not relevant.

Time representativeness:
2022

Database(s) and LCA software used:
- ecoinvent v3.10 (cut-off), EF Database v2.0
- SimaPro v9.6.0.1

Data quality:
Primary data was provided by Nexclay and was based on the average production of lightweight expanded clay aggregates in 2022. For processes which the producer had no influence on or no specific information about, such as extraction of raw materials, production of customised products and electricity generation, literature and generic data from ecoinvent database v3.10 (cut-off), and EF Database 2.0 was used, considering geographical and temporal significance.

Cut-off rules:
Criteria for the exclusion of inputs and outputs followed the requirements of EN 15804: 2012+A2:2019. The LCA considered all the production processes of the materials and energy consumed in the system, as well as the management processes of the wastes generated, for which inventory data were available. Personnel-related processes, such as transportation of employees to and from work, production and end-of-life processes of infrastructure and capital goods used in the product system as well as in upstream and downstream processes, and consumption and emissions in administrative areas and laboratories were not considered. Except for the latter, no material or energy flows were excluded from the modelling for which the project managers would have known that a significant contribution could be expected on the indicators.

Allocation:
Allocation of inputs and outputs per aggregate size was performed on a mass basis. Waste inputs to the production process with no economic value were assumed to enter the system boundary burden-free, except for the transportation to Nexclay premises. Furthermore, all products sent to recycling are treated under the “polluter pays” principle.

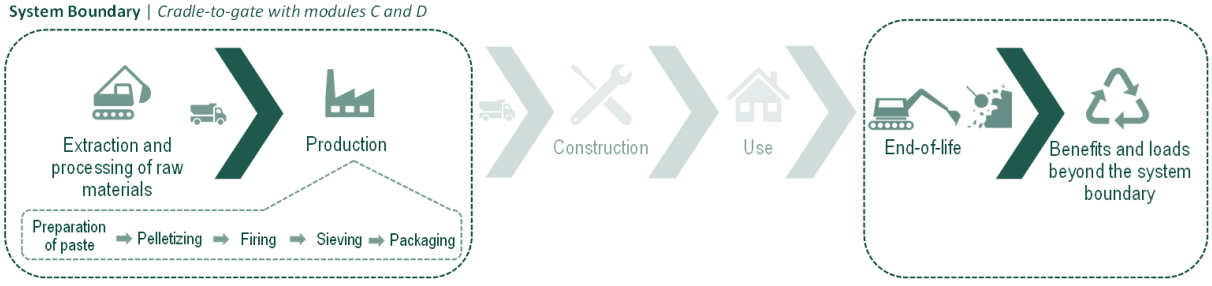
Electricity sources:
Electricity used in module A3 was modelled using the Portuguese energy grid residual mix from ecoinvent v3.10.

Type of information	Description
Electricity mix	Hydro: 6%; Natural gas: 39%; European attribute mix[a]: 55%
GWP-GHG (kg CO_2 eq/kWh)	0,623

[a] EAM corresponds to: 41% coal; 33% natural gas; 16% nuclear; 3% hydro; 7% others.

Description of system boundaries:
Cradle-to-gate with modules C and D.

This EPD covers the information module A1-A3, C1-C4 and D, comprising of the following modules: [A1] raw material extraction and processing, processing of secondary material input; [A2] transport to the manufacturer; [A3] manufacturing; [C1] de-construction, demolition; [C2] transport to waste processing; [C3] waste processing for reuse, recovery and/or recycling; [C4] disposal and module D.



Product stage [A1-A3]:
Modules A1-A3 cover the extraction, production and acquisition of the main raw materials and pre-products, as well as electricity generation, transport of all raw materials considered in module A1 to the factory gate, and production of the final products, including waste management.

Construction process stage [A4-A5]:
The construction process stage is not included.

Use stage [B1-B7]:
The use stage is not included.

End of life stage [C1-C4]:
A scenario of 75% reuse and 25% landfilling of waste is considered, based on other EPDs of similar products.

Module C1:
This module includes the demolition of the product from the building using a crane, including initial on-site sorting of materials, based on the ecoinvent 3.10 process *Machine operation, diesel, >= 18.64 kW and < 74.57 kW, steady-state {GLO}| market for machine operation, diesel, >= 18.64 kW and < 74.57 kW, steady-state | Cut-off, U.*

Module C2:
For the transport of the lightweight expanded clay aggregate at the end-of-life, a distance of 50 km to the waste operators was considered.

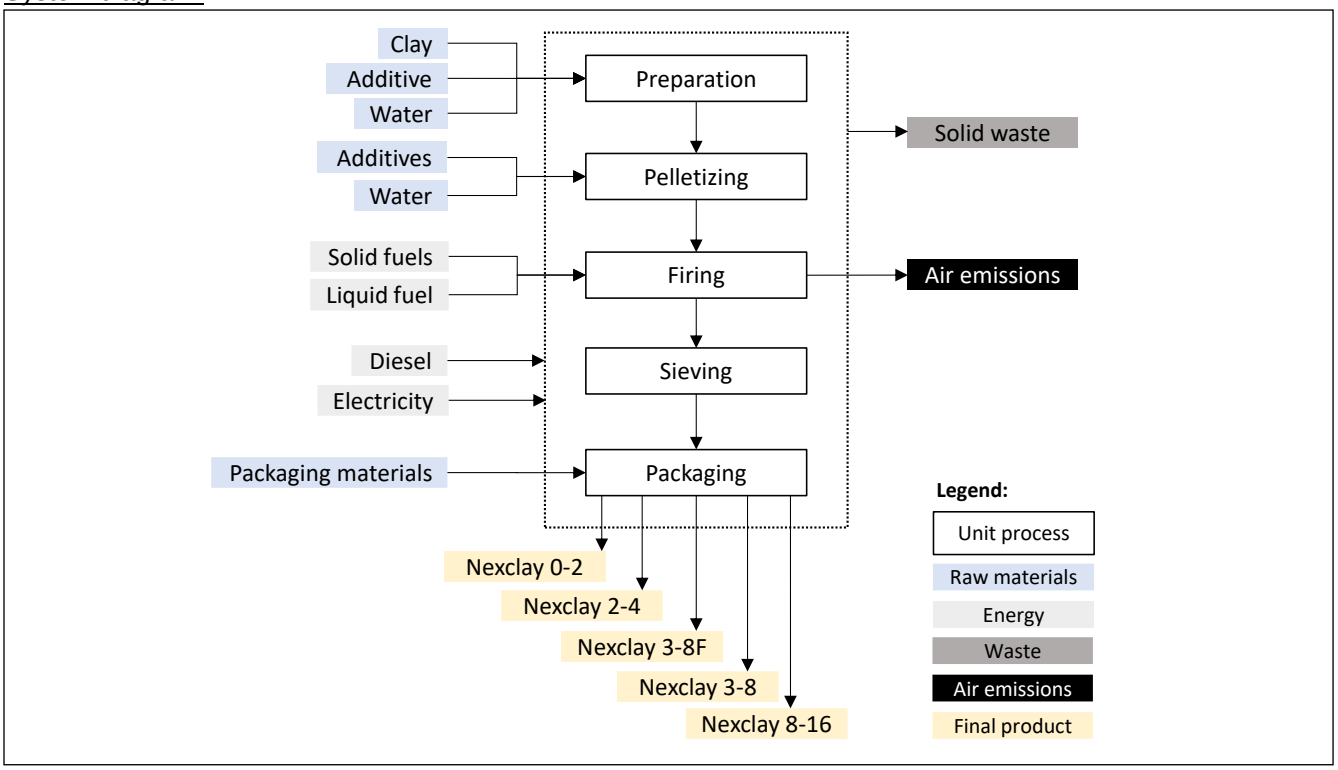
Module C3:
There is no waste processing for reuse as all sorting operations are performed in Module C1; therefore, there are no impacts to report in Module C3.

Module C4:
A scenario of landfill disposal as inert materials was considered.

Resource recovery stage [D]:
This module includes the net benefits and loads from net flows of secondary materials leaving the product system.

Module	Parameters	Quantity
De-construction, demolition [C1]	Crane operation (h/m^3)	0,04
Transport to recovery/disposal [C2]	Distance to end-of-life (km)	50
	Type of transport	Truck
Waste processing for reuse, recovery and/or recycling [C3]	Waste to reuse (kg)	214,54
Final disposal [C4]	Waste to landfill (kg)	71,51
Benefits and loads beyond the system boundary [D]	Primary lightweight expanded clay aggregate substituted (kg)	214,54

System diagram:



The production of lightweight expanded clay aggregates begins with the conversion of clay into pellets. This phase includes the preparation and pelletizing of the raw material, consisting of breaking down, screening, rolling and extruding the clay and mixing it with additives. After this phase, the clay pellets are fed into the rotary kiln for the expansion process. The temperature inside the kiln reaches 1200 °C, causing the clay pellets to melt and a gas to be produced inside, which causes them to expand. At the end of this process, the expanded clay is removed from the kiln, passed through cooling equipment, and then sorted through sieves in different size categories. The final products are stored and dispatched in bulk or in big bags with capacities of 1,5 m^3 and 3 m^3 or in 50-litre bags packed on pallets.

Modules declared, geographical scope, share of specific data (in GWP-GHG results) and data variation (in GWP-GHG results):

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	PT	PT	PT	-	-	-	-	-	-	-	-	-	EU				EU
Specific data used	87%					-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	28%					-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	0					-	-	-	-	-	-	-	-	-	-	-	-

X: included / ND: not declared / PT: Portugal / EU: European.

The variation of each environmental impact indicator results for which the variation is above 10%, aggregated over all included modules (A and C), is presented in Additional Environmental Information.

Content information

Lightweight expanded clay aggregate (average product)*

Product components	Weight, kg	Post-consumer material, weight-%	Biogenic material (C)		Biogenic material (CO_2)
			weight-% of product	kg C/DU	kg CO_2/DU
Clay	289	0%	0	0	0
Additives	14	43%	0	0	0
TOTAL	303	2%	0	0	0
Packaging materials**	**Weight, kg**	**Weight-% (versus the product)**	**Biogenic material, kg C/DU**		**Biogenic material, kg CO_2/DU**
LDPE bags	0,30	0,10%	0,00		0,00
LDPE film	0,02	0,01%	0,00		0,00
PP bags	0,10	0,03%	0,00		0,00
Wood pallets	0,77	0,25%	0,28		1,01

*The product does not contain any substance included in the Candidate List of Substances of Very High Concern (SVHCs) for authorization with concentrations higher than 0.1% weight by weight (w/w).
**Packaging materials correspond to a weighted average of the different types of packaging used in Nexclay's lightweight expanded clay aggregates.

Results of the environmental performance indicators

The life cycle impact assessment (LCIA) results represent an average product and were calculated based on a weighted average considering the production of each type of products (Nexclay 0-2, Nexclay 2-4, Nexclay 3-8F, Nexclay 3-8, Nexclay 8-16) in 2022. LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks. The use of the results of modules A1-A3 without considering the results of module C is discouraged. A1-A3 results include the "balancing-out reporting" of biogenic CO_2 of packaging released in module A5.

Mandatory impact category indicators according to EN 15804 (based on EF 3.1)

Results per declared unit (1 m^3)							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-fossil	kg CO_2 eq.	1,17E+02	8,19E-01	2,35E+00	0,00E+00	1,98E-01	-5,12E+01
GWP-biogenic	kg CO_2 eq.	1,16E+00	1,26E-04	7,70E-04	0,00E+00	5,65E-04	-2,25E-01
GWP-luluc	kg CO_2 eq.	2,00E-02	2,79E-05	5,78E-05	0,00E+00	1,04E-05	-1,80E-02
GWP-total	kg CO_2 eq.	1,18E+02	8,20E-01	2,36E+00	0,00E+00	1,98E-01	-5,14E+01
ODP	kg CFC 11 eq.	1,37E-06	1,28E-08	4,80E-08	0,00E+00	3,13E-09	-3,21E-07
AP	mol H^+ eq.	1,91E-01	3,33E-03	5,86E-03	0,00E+00	1,81E-03	-3,70E-01
EP-freshwater	kg P eq.	2,50E-03	6,63E-06	1,70E-05	0,00E+00	1,68E-06	-2,33E-02
EP-marine	kg N eq.	1,50E-01	1,46E-03	2,25E-03	0,00E+00	8,49E-04	-5,14E-02
EP-terrestrial	mol N eq.	4,20E-01	1,61E-02	2,46E-02	0,00E+00	9,31E-03	-5,38E-01
POCP	kg NMVOC eq.	7,33E-01	5,42E-03	1,02E-02	0,00E+00	2,78E-03	-1,70E-01
ADP-minerals&metals*	kg Sb eq.	7,85E-07	3,39E-08	7,77E-08	0,00E+00	8,18E-09	-7,89E-07
ADP-fossil*	MJ	9,54E+02	1,07E+01	3,11E+01	0,00E+00	2,60E+00	-5,28E+02
WDP*	m^3	1,44E+01	8,43E-03	1,32E-02	0,00E+00	2,07E-03	-3,39E+00
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption						

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

Additional mandatory and voluntary impact category indicators

Results per declared unit (1 m^3)							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-GHG[1]	kg CO_2 eq.	1,17E+02	8,19E-01	2,35E+00	0,00E+00	1,98E-01	-5,12E+01
Additional voluntary indicators e.g. the voluntary indicators from EN 15804 or the global indicators according to ISO 21930:2017							

Resource use indicators

Results per declared unit (1 m^3)							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	2,57E+01	2,12E-02	9,64E-02	0,00E+00	1,12E-02	-1,48E+01
PERM	MJ	8,56E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	3,43E+01	2,12E-02	9,64E-02	0,00E+00	1,12E-02	-1,48E+01
PENRE	MJ	9,52E+02	1,07E+01	3,11E+01	0,00E+00	2,65E+00	-5,94E+02
PENRM	MJ	3,70E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	9,89E+02	1,07E+01	3,11E+01	0,00E+00	2,65E+00	-5,94E+02
SM	kg	7,69E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	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
FW	m^3	1,60E+00	3,35E-04	7,97E-04	0,00E+00	1,01E-04	-3,23E-01
Acronyms	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 re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water						

[1] This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO_2 is set to zero.

Waste indicators

Results per declared unit (1 m³)							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	3,94E-03	7,33E-05	2,06E-04	0,00E+00	1,78E-05	-1,18E-03
Non-hazardous waste disposed	kg	1,21E-02	6,43E-06	2,29E-05	0,00E+00	1,30E-05	-2,06E-02
Radioactive waste disposed	kg	9,01E-02	3,06E-04	9,24E-04	0,00E+00	7,57E+01	-2,54E-01

Output flow indicators

Results per declared unit (1 m³)							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
Components for re-use	kg	0,00E+00	0,00E+00	0,00E+00	2,15E+02	0,00E+00	0,00E+00
Material for recycling	kg	3,29E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for energy recovery	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, thermal	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Additional environmental information

Variation (from average) of mandatory impact category indicators, aggregated over all included modules, for all products included on the EPD

Indicator	Nexclay 0-2	Nexclay 2-4	Nexclay 3-8F	Nexclay 3-8	Nexclay 8-16
GWP-fossil	28%	25%	5%	0%	-24%
GWP-biogenic	29%	26%	5%	0%	-24%
GWP-luluc	28%	25%	5%	0%	-24%
GWP-total	28%	25%	5%	0%	-24%
ODP	28%	25%	5%	0%	-24%
AP	28%	25%	5%	0%	-24%
EP-freshwater	28%	25%	5%	0%	-24%
EP-marine	28%	25%	5%	0%	-24%
EP-terrestrial	27%	24%	5%	0%	-23%
POCP	28%	25%	5%	0%	-24%
ADP-minerals&metals	27%	24%	5%	0%	-24%
ADP-fossil*	28%	25%	5%	0%	-24%
WDP*	28%	25%	5%	0%	-24%
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption.				

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SimaPro software, PRé Consultants bv 1990-2024, Release 9.6.0.1.

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