Environmental Product Declaration

In accordance with ISO 14025 and EN 15804 for:

Knauf KN13 (A)
Knauf KEK13 (DIR)
Knauf KPS15 (DF)
Knauf KXT9 (EH2)

from

Knauf Oy, Finland

ECO EPD 00001313

Programme:	The International EPD® System, www.environdec.com
Programme operator:	EPD International AB
EPD registration number:	S-P-02204
Publication date:	2020-08-19
Valid until:	2025-08-11

Programme information

Programme:	The International EPD® System EPD® International AB Box 210 60 SE-100 31 Stockholm, Sweden www.environdec.com
Product Category Rules:	EN 15804:2012+A2:2019 (Core PCR) PCR 2019:14. Construction Products and Construction Services. Version 1.0 PCR review was conducted by: Technical Committee of the International EPD® System
Product group classification:	UN CPC 37520
Reference year for data:	2019
Geographical scope:	Finland

Independent third-party verification of the declaration and data, according to ISO 14025:2006: ☐ EPD process certification ☒ EPD verification
Third party verifier: Hannu Karppi, Ramboll, Espoo, Finland In case of recognised individual verifiers: 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 from different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804.

Company information

Owner of the EPD: Knauf Oy, Finland, www.knauf.fi, info@knauf.fi, T +358 (0)9 476 40 0, F +358 (0)9 476 40 300

Description of the organisation: Knauf was founded in 1932 and is one of the world's leading manufacturers for building products with manufacturing sites and sales organizations in more than 80 countries. The headquarters are in Iphofen, Germany, and the company is still family-owned. The Knauf Group is managed by the general partners Alexander Knauf, Manfred Grundke, and Joerg Kampmeyer. Starting with gypsum as the basic building material, the company group has expanded and diversified. It is now providing high quality solutions for drywall and ceiling systems, plasters for indoor and outdoor applications, flowing screeds, floor systems, thermal insulation materials as well as construction machines.

Product-related or management system-related certifications: Knauf Oy is certified according to ISO 9001, ISO 14001 as well as OHSAS 18001.

Name and location of production site:
Knauf Oy
Kenttäkatu 4
38700 Kankaanpää
www.knauf.fi

Product information

For detailed information on the products declared in this Environmental Product Declaration please see Table 1 below.

Product identification: The products covered by this environmental product declaration are 4 different plasterboards consisting of a gypsum core with varying properties according to the type of board which is wrapped in board liner.

UN CPC code: 37530 Articles of plaster or of compositions based on plaster

Geographical scope: The boards are produced in Kankanpää, Finland, and marketed mainly in Finland.

Table 1: Product description and technical specification

Products	Knauf KN13	Knauf KEK13	Knauf KPS15	Knauf KXT9
Type (EN 520)	A	DIR	DF	EH2
Application Area	Internal structures and surfaces in various building types such as residential, industrial, school, hospital, and commercial.	Internal structures and surfaces with enhanced strength, stiffness, sound insulation and fire resistance in various building types as residential, school, industrial, hospital, and commercial.	Internal structures and surfaces with very good fire resistance for various building types as residential, school, industrial, hospital, and commercial.	Wind shield in external walls behind ventilated cladding. The board gives also stiffness to the building. Boards should be protected from water and cladded as soon as possible after installation.
System	Internal cladding of walls, ceilings, pillars, and beams	Internal cladding of walls, ceilings, pillars, and beams	Internal cladding of walls, ceilings, pillars, and beams	External walls/ ventilated facade
Technical Specifications				
Reaction to fire	A2-s1,d0	A2-s1,d0	A2-s1,d0	A2-s1,d0
Nominal thickness (mm)	13	13	15	9
Thickness (mm)	12.5	12.5	15.4	9.5
Width (mm)	1200 – 900	1200 – 900	1200 – 900	1200
Length (mm)	*	*	*	*
Weight (kg/m²)	8.2	10.2	14.0	7.0
Density (kg/m³)	660	820	900	740
Flexural Strength, longitudinal (EN 520) (N)	> 550	> 725	> 650	> 400
Flexural Strength, lateral (EN 520) (N)	> 210	> 300	> 250	> 160
Shear Strength (N)	> 500	> 800	> 500	> 400
Thermal conductivity (λ) (W/m²K)	0.21	0.25	0.25	0.21
Max. temperature, constant (°C)	< 50	< 50	< 50	< 50
Water vapour resistance factor (μ)	10	10	10	13
Water vapour permeability (kg/m²sPa)	1.6 E^{-9}	1.6 E^{-9}	1.6 E^{-9}	1.6 E^{-9}

* Please see product catalogue

LCA information

Table 2: System boundaries chosen for EPD

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	MND	MND	MND	MND	MND	X	X	X*	X	X*

* only in Scenario 2: Recycling

Declared unit: 1 m² of gypsum board linked to the following board weights:

Knauf KN13	8.2 kg/m²
Knauf KEK13	10.2 kg/m²
Knauf KPS15	14.0 kg/m²
Knauf KXT	7.0 kg/m²

Reference service life: Since there are no influences on ageing of the gypsum boards during use following the rules of engineering, a service life of at least 50 years can be considered for gypsum plasterboards according to /BBSR2017/

Time representativeness: The life cycle assessment is based on primary data from the production year 2019.

Database(s) and LCA software used: GaBi2019 was used as LCA software. Only datasets from this software and corresponding database(s) were used during modelling.

System diagram: The manufacturing process for plasterboards is presented in Figure 1. The life cycle stages of plasterboards are presented in Figure 2.

Description of system boundaries: The type of the EPD is cradle-to-gate with options.
Declared modules are A1-A3, A4, A5, C1, C2, and two scenarios at End of Life (

Table 2)

The Use phase (B1 to B7) was excluded from the EPD. Plasterboards are passive construction products with no energy or water consumption during use. Following the rules of engineering there are usually no influences on the ageing of the boards as long as they are installed. Minor damages can be repaired by applying appropriate gypsum fillers.

The **product stage** includes modules A1 (raw material supply, provision of secondary material), A2 (transport of raw and secondary materials to the manufacturer), and A3 (manufacturing including preparation (e. g., calcination) and processing of raw materials for the manufacture of the product, provision of energy and (transport) packaging materials). The product stage is given as aggregated information.
In the **construction process stage** (A4, A5) a default distance of 100 km by truck-trailer, Euro 5, 34 - 40 t gross weight / 27t payload capacity was considered in A4 (transport from the gate of the manufacturer to the construction site). Please note that this may not be the average distance between the manufacturing plant and the construction site, but is a default to support the extrapolation to the real impact of transportation on building level.
In A5 manual assembly using an electric screwdriver was considered. The electricity

consumption, e. g., for screw drivers, the loss of material at construction site (assumption: 3 % cutting waste) as well as the treatment of packaging waste (incineration of plastics and wooden pallets, recycling of metal parts) were included in the model.

The **use stage** (B1 to B7) was excluded from the modelling. Following the rules of engineering there are usually no influences on the ageing of the boards as long as they are installed. Minor damages can be repaired by applying appropriate gypsum fillers.

At the **end of life stage** (C1 to C4) the de-construction and demolition (C1) was modelled assuming that only 10 % is disassembled using machinery, whereas 90 % of deconstruction waste are disassembled manually. For transport (C2) from the deconstruction site to waste processing (C3) and/or disposal (C4) again a default distance of 100 km by truck-trailer, Euro 5, 34 – 40 t gross weight / 27t payload capacity was assumed (Table 3). This way, the resulting environmental burdens can easily be extrapolated to the situation at hand. Finally, the following two scenarios were defined for modelling the end of life:

- Scenario 1: plasterboards are disposed of (100 % landfilling) – corresponding module: C4/1
- Scenario 2: plasterboards are recycled and only non-recyclable fractions are disposed of – corresponding modules: C3/2 (waste processing: material separation, recycling), C4/2 (disposal: non-separable/non-recyclable fractions), D/2 (benefits from use of recycled gypsum instead of virgin material)

In this EPD, benefits and loads beyond the system boundaries (module D) originate only from the potential recycling of the gypsum boards in scenario 2 and the saving of virgin material in the next product cycle. Benefits from the incineration of packaging or other waste was not considered to contribute to module D.
Excluded lifecycle stages: B1-B7

Further assumptions:
For all transports by truck (A2, A4, C2) a capacity utilization of 50 % was assumed, meaning one full run to the destination and an empty run back (Table 3).
For the recycling of the plasterboards at end of life (scenario 2) it was assumed to obtain 5 % non-recyclable fraction, which has to be disposed of. Since the plasterboards are partially manufactured from FGD gypsum (gypsum from the flue gas desulphurisation at hard coal power plants), a potential partial substitution of FGD gypsum was assumed in module D/2.

More information: More product-related information is available at www.knauf.fi

This LCA study was carried out by:

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D-97346 Iphofen
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Table 3: General assumptions for transport processes (A2, A4, C2)

Vehicle type	Truck-trailer, Euro 5, 34 - 40 t gross weight / 27 t payload capacity
Transport distance A4	100 km
Transport distance C2	100 km
Capacity utilisation (including empty runs)	50 %

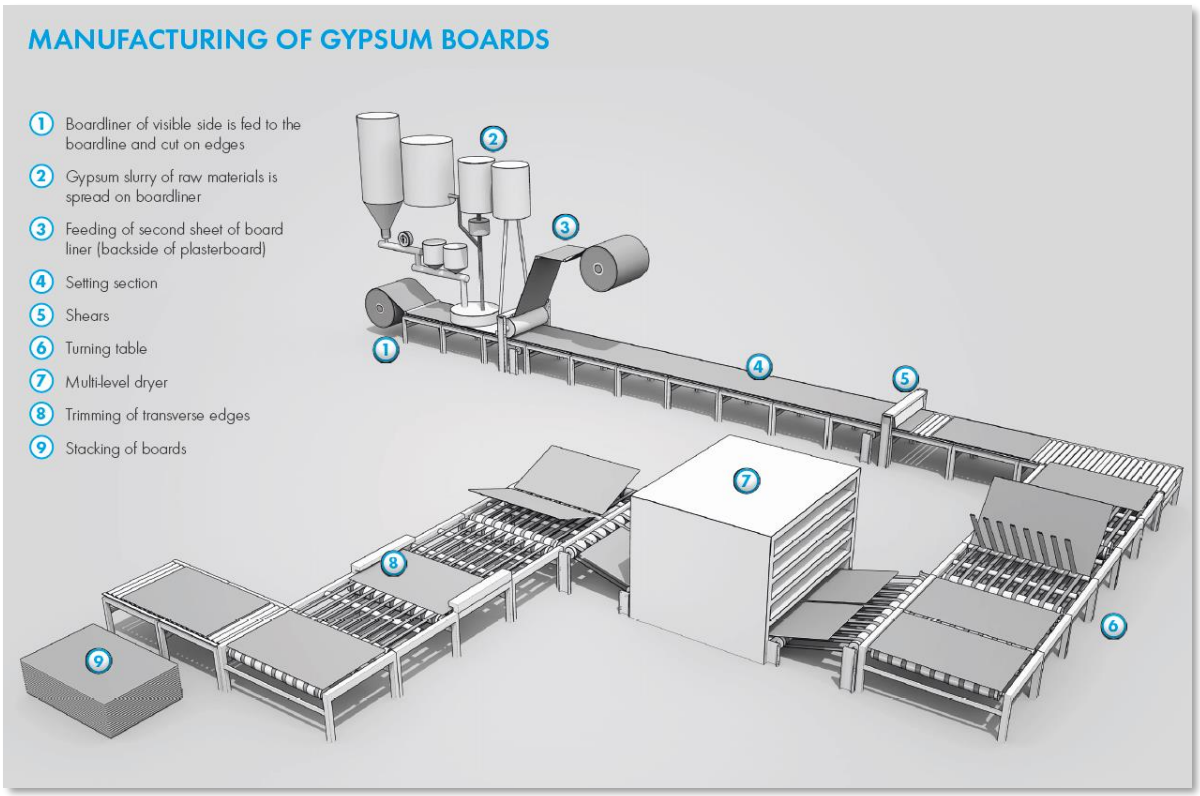

Figure 1: Manufacturing process of gypsum boards

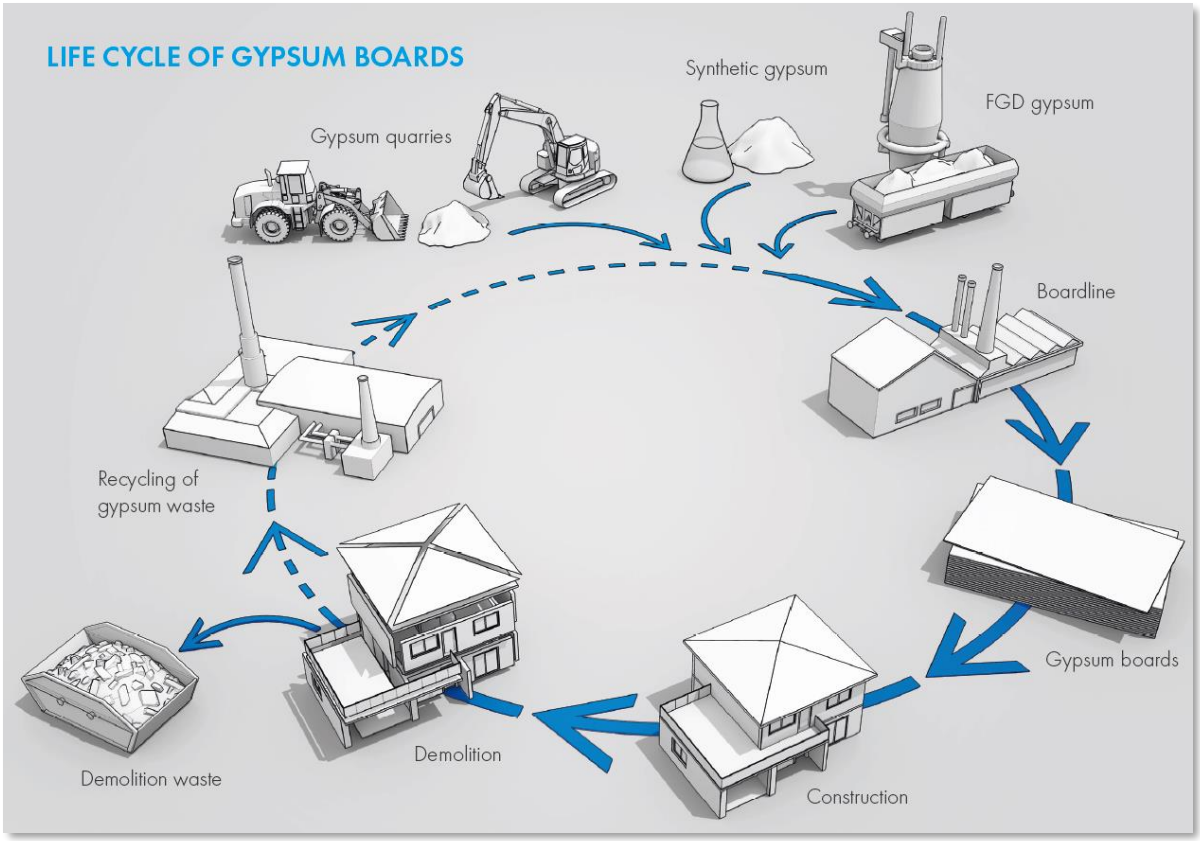

Figure 2: Principal life cycle of gypsum boards with potential recycling and disposal of demolition waste

Content declaration

Product

Table 4: Content of declared plasterboards and packaging material

Product components	Weight %	Thereof: Pre-consumer material, weight-%	Thereof: Post-consumer material, weight-%	Thereof: Renewable material, weight-%
Gypsum	**88.0-94.3**	25		
Boardliner	**2.5-5.4**		100	100
Additives	**1.1-6.6**		-	0.7-3.7
Board weight kg/m²	**7.0-14.0**			
Packaging materials	**Weight, kg/DU**	**Weight-% (versus the product)**		
Paper (cover of top board)	**0.0008**	0.01		
Wooden pallet	**0.162**	1.16-2.32		
PE film (only on customer request)	**0.01**	0.07-0.14		
PP straps	**0.000056**	0.00		
TOTAL	**0.173**	1.24-2.47		

The declared products contain no or below 0.1 % of hazardous substances listed on the Candidate list of Substances of Very High Concern, last updated: 2020-01-16.

Packaging

Distribution packaging: Stacking on wooden pallets and strapped with polypropylene (PP) straps. Edges are protected with cardboard. Upon customer request, the board stacks are wrapped in polyethylene (PE) film.

Consumer packaging: none (no individual packaging of plasterboards)

Recycled material

Provenience of recycled materials (pre-consumer or post-consumer) in the product: The board liner is made of 100 % waste paper (post-consumer recycled material). Stucco is made from FGD gypsum (pre-consumer recycled material), externally recycled gypsum (only construction waste/pre-consumer recycled material), and natural gypsum. Thus, for the board liner only the environmental burdens from the processing of the waste paper are considered (waste paper enters the product system without burdens). For FGD gypsum which originates from the flue gas desulphurisation in hard coal power plants, only the environmental burdens for the processing of the obtained gypsum slurry is considered in the LCA.

Environmental performance

Note: Two scenarios for the end of life stage were considered as 100 % scenario, each.
Scenario 1: Landfilling (module C4/1)
Scenario 2: Recycling und landfilling of non-recyclable fractions as well as the credit for recycled materials (modules C3/2, C4/2, D/2).

Knauf KN13, 1 m², 8.2 kg/m²

ENVIRONMENTAL IMPACTS, Knauf KN13, 1 m², 8.2 kg/m², Scenario 1: Landfilling (C4/1), Scenario 2: Recycling (C3/2, C4/2, D/2)

Parameter		Unit	TOTAL A1-3	A4	A5	C1	C2	C3/2	C4/1	C4/2	D/2
Global warming potential (GWP)	Fossil	kg CO_2-eq.	2.22E+00	5.80E-02	-1.06E-01	7.95E-04	5.76E-02	3.25E-02	1.31E-01	1.03E-02	-2.42E-02
	Biogenic	kg CO_2-eq.	5.74E-01	6.26E-03	2.41E-01	1.10E-03	6.32E-03	4.52E-02	1.93E-02	1.51E-03	-2.72E-03
	Land use and land transformation	kg CO_2-eq.	2.35E-03	8.78E-04	-1.48E-04	7.58E-07	8.61E-04	3.10E-05	6.36E-04	4.99E-05	-3.63E-05
	TOTAL	kg CO_2-eq.	2.79E+00	6.51E-02	1.35E-01	1.90E-03	6.48E-02	7.77E-02	1.51E-01	1.19E-02	-2.70E-02
Depletion potential of the stratospheric ozone layer (ODP)		kg CFC11-eq.	4.74E-12	1.92E-14	6.98E-18	1.90E-18	2.11E-17	7.78E-17	5.43E-16	4.26E-17	-3.64E-15
Acidification potential (AP)		kg SO_2-eq.	3.51E-03	1.31E-02	2.03E-04	2.99E-06	2.13E-04	1.22E-04	9.10E-04	7.14E-05	-9.99E-05
Eutrophication potential (EP)	Freshwater	kg PO_4^{3-}-eq.	2.04E-05	2.77E-07	-2.53E-07	1.59E-09	2.73E-07	6.50E-08	2.97E-07	2.33E-08	-3.99E-08
	Marine	kg N eq.	3.71E-03	9.22E-05	2.51E-06	7.35E-07	9.37E-05	3.01E-05	2.33E-04	1.83E-05	-4.20E-05
	Terrestrial	mol N eq.	4.09E-02	1.03E-03	1.03E-04	7.89E-06	1.04E-03	3.23E-04	2.56E-03	2.01E-04	-4.76E-04
Formation potential of tropospheric ozone (POCP)		kg NMVOC eq.	2.70E-04	1.04E-02	1.79E-04	2.10E-06	1.84E-04	8.60E-05	7.07E-04	5.55E-05	-1.18E-04
Abiotic depletion potential	Minerals and metals[1)]	kg Sb-eq.	3.13E-06	4.00E-09	-1.70E-07	1.31E-10	4.10E-09	5.36E-09	1.21E-08	9.47E-10	-2.33E-09
	Fossil energy carriers[1)]	MJ, net calorific value	3.55E+01	7.66E-01	-1.98E+00	2.30E-02	7.59E-01	9.42E-01	1.77E+00	1.39E-01	-2.70E-01
Water scarcity potential[1)]		m3 eq.	4.30E-01	1.24E-03	3.08E-02	8.51E-05	1.22E-03	3.48E-03	1.37E-02	1.07E-03	-1.18E-03

ENVIRONMENTAL IMPACTS – ADDITIONAL MANDATORY AND VOLUNTARY INDICATORS, Knauf KN13, 1 m², 8.2 kg/m², Scenario 1: Landfilling (C4/1), Scenario 2: Recycling (C3/2, C4/2, D/2)										
Parameter	**Unit**	**TOTAL A1-3**	**A4**	**A5**	**C1**	**C2**	**C3/2**	**C4/1**	**C4/2**	**D/2**
Global warming potential excl. Biogenic carbon (GWP-GHG)	kg CO_2-eq.	2.17E+00	5.71E-02	-1.04E-01	7.82E-04	5.67E-02	3.20E-02	1.29E-01	1.01E-02	-2.37E-02
Human toxicity, cancer effects[1)]	CTUh	1.87E-09	1.03E-11	-1.13E-10	4.79E-13	1.03E-11	1.96E-11	1.60E-10	1.26E-11	-3.77E-12
Human toxicity, non-cancer effects[1)]	CTUh	8.47E-09	4.98E-10	-1.82E-10	8.23E-12	4.91E-10	3.37E-10	1.49E-08	1.17E-09	-1.41E-10
Eco-toxicity (freshwater)[1)]	CTUe	1.13E+01	5.16E-01	-2.93E-01	9.50E-03	5.10E-01	3.89E-01	9.12E-01	7.16E-02	-1.09E-01
Land use related impacts / soil quality[1)]	-	4.73E+01	3.45E-01	-3.61E-01	1.58E-02	3.41E-01	6.46E-01	4.23E-01	3.32E-02	-1.09E-01
Particulate Matter emissions	Disease incidences	2.99E-07	1.08E-09	-9.70E-10	2.74E-11	1.28E-09	1.12E-09	1.11E-08	8.72E-10	-6.70E-08
Ionizing radiation, human health[2)]	kBq U235 eq.	8.80E-02	1.52E-04	-6.40E-03	6.16E-04	2.03E-04	2.52E-02	2.49E-03	1.96E-04	-6.07E-04

Disclaimers according to EN 15804 + A2

[1)] 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.

[2)] 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.

USE OF RESOURCES, Knauf KN13, 1 m², 8.2 kg/m², Scenario 1: Landfilling (C4/1), Scenario 2: Recycling (C3/2, C4/2, D/2)

Parameter		Unit	TOTAL A1-3	A4	A5	C1	C2	C3/2	C4/1	C4/2	D/2
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value	2.98E+00	4.45E-02	-3.88E-01	1.28E-02	4.66E-02	5.21E-01	2.25E-01	1.76E-02	-3.71E-02
	Used as raw materials	MJ, net calorific value	3.54E+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
	TOTAL	MJ, net calorific value	6.52E+00	4.45E-02	-3.88E-01	1.28E-02	4.66E-02	5.21E-01	2.25E-01	1.76E-02	-3.71E-02
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value	3.53E+01	7.66E-01	-1.98E+00	2.30E-02	7.60E-01	9.42E-01	1.77E+00	1.39E-01	-2.70E-01
	Used as raw materials	MJ, net calorific value	2.15E-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
	TOTAL	MJ, net calorific value	3.55E+01	7.66E-01	-1.98E+00	2.30E-02	7.60E-01	9.42E-01	1.77E+00	1.39E-01	-2.70E-01
Secondary material		kg	2.48E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.23E+00
Renewable secondary fuels		MJ, net calorific value	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
Non-renewable secondary fuels		MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water		m3	1.42E-02	7.52E-05	5.39E-04	2.07E-05	7.52E-05	8.46E-04	4.45E-04	3.49E-05	-4.68E-05

WASTE PRODUCTION, Knauf KN13, 1 m², 8.2 kg/m², Scenario 1: Landfilling (C4/1), Scenario 2: Recycling (C3/2, C4/2, D/2)

Parameter	Unit	TOTAL A1-3	A4	A5	C1	C2	C3/2	C4/1	C4/2	D/2
Hazardous waste disposed	kg	1.12E-07	4.28E-08	-1.08E-08	2.43E-11	4.19E-08	9.93E-10	3.01E-08	2.37E-09	-4.36E-09
Non-hazardous waste disposed	kg	1.79E+00	2.58E-03	-3.44E-01	9.94E-04	5.28E-03	4.06E-02	8.50E+00	6.67E-01	-5.06E-02
Radioactive waste disposed	kg	8.60E-04	1.04E-06	-6.14E-05	6.06E-06	1.56E-06	2.48E-04	2.35E-05	1.84E-06	-5.98E-06

OUTPUT FLOWS, Knauf KN13, 1 m², 8.2 kg/m², Scenario 1: Landfilling (C4/1), Scenario 2: Recycling (C3/2, C4/2, D/2)

Parameter	Unit	TOTAL A1-3	A4	A5	C1	C2	C3/2	C4/1	C4/2	D/2
Components for reuse	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
Material for recycling	kg	0.00E+00	0.00E+00	5.00E-03	0.00E+00	0.00E+00	7.56E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity	MJ	0.00E+00	0.00E+00	-3.69E-01	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	-1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Knauf KEK13, 1 m², 10.2 kg/m²

ENVIRONMENTAL IMPACTS, Knauf KEK13, 1 m², 10.2 kg/m², Scenario 1: Landfilling (C4/1), Scenario 2: Recycling (C3/2, C4/2, D/2)

Parameter		Unit	TOTAL A1-3	A4	A5	C1	C2	C3/2	C4/1	C4/2	D/2
Global warming potential (GWP)	Fossil	kg CO_2-eq.	2.73E+00	7.19E-02	-1.06E-01	9.89E-04	7.16E-02	4.05E-02	1.63E-01	1.28E-02	-2.99E-02
	Biogenic	kg CO_2-eq.	6.25E-01	7.75E-03	2.41E-01	1.37E-03	7.86E-03	5.62E-02	2.40E-02	1.88E-03	-3.37E-03
	Land use and land transformation	kg CO_2-eq.	3.12E-03	1.09E-03	-1.48E-04	9.43E-07	1.07E-03	3.86E-05	7.91E-04	6.21E-05	-4.50E-05
	TOTAL	kg CO_2-eq.	3.35E+00	8.07E-02	1.35E-01	2.36E-03	8.05E-02	9.67E-02	1.88E-01	1.47E-02	-3.33E-02
Depletion potential of the stratospheric ozone layer (ODP)		kg CFC11-eq.	2.28E-14	8.65E-18	3.85E-10	2.37E-18	2.63E-17	9.68E-17	6.76E-16	5.30E-17	-4.50E-15
Acidification potential (AP)		kg SO_2-eq.	1.80E-02	2.52E-04	-3.63E-05	3.72E-06	2.65E-04	1.52E-04	1.13E-03	8.89E-05	-1.24E-04
Eutrophication potential (EP)	Freshwater	kg PO_4^{3-}-eq.	2.09E-05	3.43E-07	-2.53E-07	1.98E-09	3.40E-07	8.08E-08	3.70E-07	2.90E-08	-4.94E-08
	Marine	kg N eq.	5.05E-03	1.14E-04	2.51E-06	9.14E-07	1.17E-04	3.74E-05	2.90E-04	2.28E-05	-5.21E-05
	Terrestrial	mol N eq.	5.55E-02	1.27E-03	1.03E-04	9.82E-06	1.30E-03	4.01E-04	3.19E-03	2.50E-04	-5.89E-04
Formation potential of tropospheric ozone (POCP)		kg NMVOC eq.	1.41E-02	2.21E-04	-6.47E-06	2.62E-06	2.29E-04	1.07E-04	8.80E-04	6.90E-05	-1.46E-04
Abiotic depletion potential	Minerals and metals[1)]	kg Sb-eq.	3.36E-06	4.95E-09	-1.70E-07	1.63E-10	5.10E-09	6.67E-09	1.50E-08	1.18E-09	-2.89E-09
	Fossil energy carriers[1)]	MJ, net calorific value	4.35E+01	9.48E-01	-1.98E+00	2.87E-02	9.44E-01	1.17E+00	2.20E+00	1.73E-01	-3.34E-01
Water scarcity potential[1)]		m3 eq.	4.23E-01	1.54E-03	3.08E-02	1.06E-04	1.52E-03	4.33E-03	1.70E-02	1.34E-03	-1.46E-03

ENVIRONMENTAL IMPACTS – ADDITIONAL MANDATORY AND VOLUNTARY INDICATORS, Knauf KEK13, 1 m², 10.2 kg/m², Scenario 1: Landfilling (C4/1), Scenario 2: Recycling (C3/2, C4/2, D/2)										
Parameter	**Unit**	**TOTAL A1-3**	**A4**	**A5**	**C1**	**C2**	**C3/2**	**C4/1**	**C4/2**	**D/2**
Global warming potential excl. Biogenic carbon (GWP-GHG)	kg CO_2-eq.	2.68E+00	7.07E-02	-1.04E-01	9.73E-04	7.05E-02	3.98E-02	1.60E-01	1.26E-02	-2.93E-02
Human toxicity, cancer effects[1)]	CTUh	2.22E-09	1.28E-11	-1.13E-10	5.96E-13	1.28E-11	2.44E-11	1.99E-10	1.56E-11	-4.66E-12
Human toxicity, non-cancer effects[1)]	CTUh	1.07E-08	6.17E-10	-1.82E-10	1.02E-11	6.11E-10	4.19E-10	1.85E-08	1.45E-09	-1.75E-10
Eco-toxicity (freshwater)[1)]	CTUe	1.44E+01	6.39E-01	-2.93E-01	1.18E-02	6.35E-01	4.83E-01	1.13E+00	8.91E-02	-1.34E-01
Land use related impacts / soil quality[1)]	-	4.77E+01	4.28E-01	-3.61E-01	1.97E-02	4.24E-01	8.04E-01	5.26E-01	4.13E-02	-1.35E-01
Particulate Matter emissions	Disease incidences	4.04E-07	1.34E-09	-9.70E-10	3.41E-11	1.59E-09	1.39E-09	1.38E-08	1.08E-09	-8.30E-08
Ionizing radiation, human health[2)]	kBq U235 eq.	1.11E-01	1.89E-04	-6.40E-03	7.66E-04	2.52E-04	3.13E-02	3.10E-03	2.43E-04	-7.51E-04

Disclaimers according to EN 15804 + A2

[1)] 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.

[2)] 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.

USE OF RESOURCES, Knauf KEK13, 1 m², 10.2 kg/m², Scenario 1: Landfilling (C4/1), Scenario 2: Recycling (C3/2, C4/2, D/2)											
Parameter		**Unit**	**TOTAL A1-3**	**A4**	**A5**	**C1**	**C2**	**C3/2**	**C4/1**	**C4/2**	**D/2**
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value	2.98E+00	4.45E-02	-3.88E-01	1.59E-02	5.80E-02	6.49E-01	2.79E-01	2.19E-02	-4.60E-02
	Used as raw materials	MJ, net calorific value	3.54E+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
	TOTAL	MJ, net calorific value	6.52E+00	4.45E-02	-3.88E-01	1.59E-02	5.80E-02	6.49E-01	2.79E-01	2.19E-02	-4.60E-02
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value	3.53E+01	7.66E-01	-1.98E+00	2.87E-02	9.45E-01	1.17E+00	2.20E+00	1.73E-01	-3.34E-01
	Used as raw materials	MJ, net calorific value	2.15E-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
	TOTAL	MJ, net calorific value	3.55E+01	7.66E-01	-1.98E+00	2.87E-02	9.45E-01	1.17E+00	2.20E+00	1.73E-01	-3.34E-01
Secondary material		kg	3.51E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.95E+00
Renewable secondary fuels		MJ, net calorific value	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
Non-renewable secondary fuels		MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water		m3	1.45E-02	9.31E-05	5.39E-04	2.57E-05	9.36E-05	1.05E-03	5.53E-04	4.34E-05	-5.80E-05

WASTE PRODUCTION, Knauf KEK13, 1 m², 10.2 kg/m², Scenario 1: Landfilling (C4/1), Scenario 2: Recycling (C3/2, C4/2, D/2)										
Parameter	**Unit**	**TOTAL A1-3**	**A4**	**A5**	**C1**	**C2**	**C3/2**	**C4/1**	**C4/2**	**D/2**
Hazardous waste disposed	kg	1.44E-07	5.30E-08	-1.08E-08	3.02E-11	5.21E-08	1.24E-09	3.75E-08	2.94E-09	-5.40E-09
Non-hazardous waste disposed	kg	2.26E+00	3.19E-03	-3.44E-01	1.24E-03	6.57E-03	5.05E-02	1.06E+01	8.30E-01	-6.27E-02
Radioactive waste disposed	kg	1.08E-03	1.29E-06	-6.14E-05	7.54E-06	1.94E-06	3.08E-04	2.92E-05	2.29E-06	-7.40E-06

OUTPUT FLOWS, Knauf KEK13, 1 m², 10.2 kg/m², Scenario 1: Landfilling (C4/1), Scenario 2: Recycling (C3/2, C4/2, D/2)										
Parameter	**Unit**	**TOTAL A1-3**	**A4**	**A5**	**C1**	**C2**	**C3/2**	**C4/1**	**C4/2**	**D/2**
Components for reuse	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
Material for recycling	kg	0.00E+00	0.00E+00	5.00E-03	0.00E+00	0.00E+00	9.40E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity	MJ	0.00E+00	0.00E+00	-3.69E-01	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	-1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Knauf KPS15, 1 m², 14.0 kg/m²

ENVIRONMENTAL IMPACTS, Knauf KPS15, 1 m², 14.0 kg/m², Scenario 1: Landfilling (C4/1), Scenario 2: Recycling (C3/2, C4/2, D/2)

Parameter		Unit	TOTAL A1-3	A4	A5	C1	C2	C3/2	C4/1	C4/2	D/2
Global warming potential (GWP)	Fossil	kg CO_2-eq.	3.23E+00	9.82E-02	-1.06E-01	1.68E-03	9.83E-02	5.55E-02	2.24E-01	1.76E-02	-4.20E-02
	Biogenic	kg CO_2-eq.	6.52E-01	1.06E-02	2.41E-01	2.34E-03	1.08E-02	7.71E-02	3.29E-02	2.58E-03	-4.73E-03
	Land use and land transformation	kg CO_2-eq.	4.27E-03	1.49E-03	-1.48E-04	1.61E-06	1.47E-03	5.29E-05	1.09E-03	8.52E-05	-6.31E-05
	TOTAL	kg CO_2-eq.	3.88E+00	1.10E-01	1.35E-01	4.02E-03	1.11E-01	1.33E-01	2.58E-01	2.03E-02	-4.68E-02
Depletion potential of the stratospheric ozone layer (ODP)		kg CFC11-eq.	2.32E-14	1.18E-17	3.85E-10	4.03E-18	3.61E-17	1.33E-16	9.27E-16	7.28E-17	-6.32E-15
Acidification potential (AP)		kg SO_2-eq.	2.28E-02	3.44E-04	-3.63E-05	6.34E-06	3.63E-04	2.09E-04	1.55E-03	1.22E-04	-1.74E-04
Eutrophication potential (EP)	Freshwater	kg PO_4^{3-}-eq.	1.91E-05	4.69E-07	-2.53E-07	3.36E-09	4.67E-07	1.11E-07	5.08E-07	3.98E-08	-6.94E-08
	Marine	kg N eq.	6.30E-03	1.56E-04	2.51E-06	1.56E-06	1.60E-04	5.13E-05	3.99E-04	3.13E-05	-7.31E-05
	Terrestrial	mol N eq.	6.94E-02	1.74E-03	1.03E-04	1.67E-05	1.78E-03	5.51E-04	4.38E-03	3.43E-04	-8.28E-04
Formation potential of tropospheric ozone (POCP)		kg NMVOC eq.	1.75E-02	3.02E-04	-6.47E-06	4.45E-06	3.15E-04	1.47E-04	1.21E-03	9.48E-05	-2.05E-04
Abiotic depletion potential	Minerals and metals[1)]	kg Sb-eq.	4.24E-06	6.77E-09	-1.70E-07	2.78E-10	6.99E-09	9.15E-09	2.06E-08	1.62E-09	-4.06E-09
	Fossil energy carriers[1)]	MJ, net calorific value	5.09E+01	1.30E+00	-1.98E+00	4.88E-02	1.30E+00	1.61E+00	3.02E+00	2.37E-01	-4.69E-01
Water scarcity potential[1)]		m3 eq.	4.98E-01	2.10E-03	3.08E-02	1.80E-04	2.09E-03	5.94E-03	2.34E-02	1.83E-03	-2.05E-03

ENVIRONMENTAL IMPACTS – ADDITIONAL MANDATORY AND VOLUNTARY INDICATORS, Knauf KPS15, 1 m², 14.0 kg/m², Scenario 1: Landfilling (C4/1), Scenario 2: Recycling (C3/2, C4/2, D/2)										
Parameter	**Unit**	**TOTAL A1-3**	**A4**	**A5**	**C1**	**C2**	**C3/2**	**C4/1**	**C4/2**	**D/2**
Global warming potential excl. Biogenic carbon (GWP-GHG)	kg CO_2-eq.	3.17E+00	9.66E-02	-1.04E-01	1.66E-03	9.68E-02	5.46E-02	2.20E-01	1.73E-02	-4.12E-02
Human toxicity, cancer effects[1)]	CTUh	2.72E-09	1.75E-11	-1.13E-10	1.01E-12	1.76E-11	3.35E-11	2.73E-10	2.14E-11	-6.55E-12
Human toxicity, non-cancer effects[1)]	CTUh	1.26E-08	8.42E-10	-1.82E-10	1.74E-11	8.39E-10	5.75E-10	2.54E-08	1.99E-09	-2.46E-10
Eco-toxicity (freshwater)[1)]	CTUe	1.58E+01	8.73E-01	-2.93E-01	2.01E-02	8.71E-01	6.63E-01	1.56E+00	1.22E-01	-1.89E-01
Land use related impacts / soil quality[1)]	-	4.84E+01	5.85E-01	-3.61E-01	3.35E-02	5.82E-01	1.10E+00	7.21E-01	5.66E-02	-1.90E-01
Particulate Matter emissions	Disease incidences	4.97E-07	1.83E-09	-9.70E-10	5.80E-11	2.19E-09	1.91E-09	1.90E-08	1.49E-09	-1.17E-07
Ionizing radiation, human health[2)]	kBq U235 eq.	1.26E-01	2.58E-04	-6.40E-03	1.30E-03	3.46E-04	4.30E-02	4.26E-03	3.34E-04	-1.06E-03

Disclaimers according to EN 15804 + A2

[1)] 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 experience with the indicator.

[2)] 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.

USE OF RESOURCES, Knauf KPS15, 1 m², 14.0 kg/m², Scenario 1: Landfilling (C4/1), Scenario 2: Recycling (C3/2, C4/2, D/2)											
Parameter		**Unit**	**TOTAL A1-3**	**A4**	**A5**	**C1**	**C2**	**C3/2**	**C4/1**	**C4/2**	**D/2**
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value	3.90E+00	7.52E-02	-3.88E-01	2.70E-02	7.96E-02	8.90E-01	3.83E-01	3.01E-02	-6.46E-02
	Used as raw materials	MJ, net calorific value	3.54E+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
	TOTAL	MJ, net calorific value	7.44E+00	7.52E-02	-3.88E-01	2.70E-02	7.96E-02	8.90E-01	3.83E-01	3.01E-02	-6.46E-02
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value	5.06E+01	1.30E+00	-1.98E+00	4.88E-02	1.30E+00	1.61E+00	3.02E+00	2.37E-01	-4.69E-01
	Used as raw materials	MJ, net calorific value	2.15E-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
	TOTAL	MJ, net calorific value	5.09E+01	1.30E+00	-1.98E+00	4.88E-02	1.30E+00	1.61E+00	3.02E+00	2.37E-01	-4.69E-01
Secondary material		kg	4.06E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	12.57E+00
Renewable secondary fuels		MJ, net calorific value	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
Non-renewable secondary fuels		MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water		m3	1.68E-02	1.27E-04	5.39E-04	4.38E-05	1.28E-04	1.45E-03	7.59E-04	5.96E-05	-2.23E-02

WASTE PRODUCTION, Knauf KPS15, 1 m², 14.0 kg/m², Scenario 1: Landfilling (C4/1), Scenario 2: Recycling (C3/2, C4/2, D/2)										
Parameter	**Unit**	**TOTAL A1-3**	**A4**	**A5**	**C1**	**C2**	**C3/2**	**C4/1**	**C4/2**	**D/2**
Hazardous waste disposed	kg	2.05E-07	7.24E-08	-1.08E-08	5.14E-11	7.15E-08	1.70E-09	5.15E-08	4.04E-09	-7.58E-09
Non-hazardous waste disposed	kg	2.35E+00	4.36E-03	-3.44E-01	2.10E-03	9.01E-03	6.94E-02	1.45E+01	1.14E+00	-8.80E-02
Radioactive waste disposed	kg	1.23E-03	1.76E-06	-6.14E-05	1.28E-05	2.67E-06	4.23E-04	4.00E-05	3.14E-06	-1.04E-05

OUTPUT FLOWS, Knauf KPS15, 1 m², 14.0 kg/m², Scenario 1: Landfilling (C4/1), Scenario 2: Recycling (C3/2, C4/2, D/2)										
Parameter	**Unit**	**TOTAL A1-3**	**A4**	**A5**	**C1**	**C2**	**C3/2**	**C4/1**	**C4/2**	**D/2**
Components for reuse	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
Material for recycling	kg	0.00E+00	0.00E+00	5.00E-03	0.00E+00	0.00E+00	1.29E+01	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity	MJ	0.00E+00	0.00E+00	-3.69E-01	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	-1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Knauf KXT9, 1 m², 7.0 kg/m²

ENVIRONMENTAL IMPACTS, Knauf KXT9, 1 m², 7.0 kg/m², Scenario 1: Landfilling (C4/1), Scenario 2: Recycling (C3/2, C4/2, D/2)

Parameter		Unit	TOTAL A1-3	A4	A5	C1	C2	C3/2	C4/1	C4/2	D/2
Global warming potential (GWP)	Fossil	kg CO_2-eq.	2.71E+00	4.97E-02	-1.06E-01	5.16E-04	4.91E-02	2.78E-02	1.12E-01	8.78E-03	-2.04E-02
	Biogenic	kg CO_2-eq.	6.01E-01	5.36E-03	2.41E-01	7.17E-04	5.40E-03	3.86E-02	1.64E-02	1.29E-03	-2.30E-03
	Land use and land transformation	kg CO_2-eq.	3.17E-03	7.53E-04	-1.48E-04	4.92E-07	7.35E-04	2.65E-05	5.43E-04	4.26E-05	-3.06E-05
	TOTAL	kg CO_2-eq.	3.32E+00	5.58E-02	1.35E-01	1.23E-03	5.52E-02	6.64E-02	1.29E-01	1.01E-02	-2.27E-02
Depletion potential of the stratospheric ozone layer (ODP)		kg CFC11-eq.	2.06E-14	5.98E-18	3.85E-10	1.23E-18	1.81E-17	6.64E-17	4.64E-16	3.64E-17	-3.07E-15
Acidification potential (AP)		kg SO_2-eq.	1.39E-02	1.74E-04	-3.63E-05	1.94E-06	1.82E-04	1.04E-04	7.77E-04	6.10E-05	-8.43E-05
Eutrophication potential (EP)	Freshwater	kg PO_4^{3-}-eq.	2.26E-05	2.37E-07	-2.53E-07	1.03E-09	2.33E-07	5.55E-08	2.54E-07	1.99E-08	-3.37E-08
	Marine	kg N eq.	3.64E-03	7.90E-05	2.51E-06	4.77E-07	8.00E-05	2.57E-05	1.99E-04	1.56E-05	-3.55E-05
	Terrestrial	mol N eq.	4.05E-02	8.79E-04	1.03E-04	5.12E-06	8.90E-04	2.76E-04	2.19E-03	1.72E-04	-4.01E-04
Formation potential of tropospheric ozone (POCP)		kg NMVOC eq.	1.03E-02	1.53E-04	-6.47E-06	1.36E-06	1.57E-04	7.34E-05	6.04E-04	4.74E-05	-9.94E-05
Abiotic depletion potential	Minerals and metals[1)]	kg Sb-eq.	1.41E-05	3.43E-09	-1.70E-07	8.51E-11	3.50E-09	4.58E-09	1.03E-08	8.08E-10	-1.97E-09
	Fossil energy carriers[1)]	MJ, net calorific value	4.58E+01	6.56E-01	-1.98E+00	1.49E-02	6.48E-01	8.04E-01	1.51E+00	1.18E-01	-2.28E-01
Water scarcity potential[1)]		m3 eq.	3.10E-01	1.06E-03	3.08E-02	5.52E-05	1.04E-03	2.97E-03	1.17E-02	9.17E-04	-9.96E-04

ENVIRONMENTAL IMPACTS – ADDITIONAL MANDATORY AND VOLUNTARY INDICATORS, Knauf KXT9, 1 m², 7.0 kg/m², Scenario 1: Landfilling (C4/1), Scenario 2: Recycling (C3/2, C4/2, D/2)										
Parameter	**Unit**	**TOTAL A1-3**	**A4**	**A5**	**C1**	**C2**	**C3/2**	**C4/1**	**C4/2**	**D/2**
Global warming potential excl. Biogenic carbon (GWP-GHG)	kg CO_2-eq.	2.66E+00	4.89E-02	-1.04E-01	5.07E-04	4.84E-02	2.73E-02	1.10E-01	8.63E-03	-2.00E-02
Human toxicity, cancer effects[1)]	CTUh	1.99E-09	8.86E-12	-1.13E-10	3.11E-13	8.79E-12	1.67E-11	1.37E-10	1.07E-11	-3.18E-12
Human toxicity, non-cancer effects[1)]	CTUh	1.80E-08	4.26E-10	-1.82E-10	5.34E-12	4.19E-10	2.87E-10	1.27E-08	9.95E-10	-1.19E-10
Eco-toxicity (freshwater)[1)]	CTUe	2.69E+01	4.42E-01	-2.93E-01	6.17E-03	4.36E-01	3.32E-01	7.79E-01	6.11E-02	-9.15E-02
Land use related impacts / soil quality[1)]	-	4.80E+01	2.96E-01	-3.61E-01	1.03E-02	2.91E-01	5.52E-01	3.61E-01	2.83E-02	-9.21E-02
Particulate Matter emissions	Disease incidences	2.81E-07	9.27E-10	-9.70E-10	1.78E-11	1.09E-09	9.57E-10	9.48E-09	7.44E-10	-5.65E-08
Ionizing radiation, human health[2)]	kBq U235 eq.	9.22E-02	1.30E-04	-6.40E-03	4.00E-04	1.73E-04	2.15E-02	2.13E-03	1.67E-04	-5.12E-04

Disclaimers according to EN 15804 + A2

[1)] 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 experience with the indicator.

[2)] 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.

USE OF RESOURCES, Knauf KXT9, 1 m², 7.0 kg/m², Scenario 1: Landfilling (C4/1), Scenario 2: Recycling (C3/2, C4/2, D/2)											
Parameter		**Unit**	**TOTAL A1-3**	**A4**	**A5**	**C1**	**C2**	**C3/2**	**C4/1**	**C4/2**	**D/2**
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value	3.35E+00	3.81E-02	-3.88E-01	8.27E-03	3.98E-02	4.45E-01	1.92E-01	1.50E-02	-3.13E-02
	Used as raw materials	MJ, net calorific value	3.54E+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
	TOTAL	MJ, net calorific value	6.89E+00	3.81E-02	-3.88E-01	8.27E-03	3.98E-02	4.45E-01	1.92E-01	1.50E-02	-3.13E-02
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value	4.57E+01	6.57E-01	-1.98E+00	1.49E-02	6.49E-01	8.04E-01	1.51E+00	1.18E-01	-2.28E-01
	Used as raw materials	MJ, net calorific value	2.15E-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
	TOTAL	MJ, net calorific value	4.59E+01	6.57E-01	-1.98E+00	1.49E-02	6.49E-01	8.04E-01	1.51E+00	1.18E-01	-2.28E-01
Secondary material		kg	2.17E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.09E+00
Renewable secondary fuels		MJ, net calorific value	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
Non-renewable secondary fuels		MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water		m3	1.29E-02	6.44E-05	5.39E-04	1.34E-05	6.42E-05	7.23E-04	3.80E-04	2.98E-05	-3.95E-05

WASTE PRODUCTION, Knauf KXT9, 1 m², 7.0 kg/m², Scenario 1: Landfilling (C4/1), Scenario 2: Recycling (C3/2, C4/2, D/2)										
Parameter	**Unit**	**TOTAL A1-3**	**A4**	**A5**	**C1**	**C2**	**C3/2**	**C4/1**	**C4/2**	**D/2**
Hazardous waste disposed	kg	1.49E-07	3.67E-08	-1.08E-08	1.58E-11	3.58E-08	8.48E-10	2.57E-08	2.02E-09	-3.68E-09
Non-hazardous waste disposed	kg	4.14E+00	2.21E-03	-3.44E-01	6.45E-04	4.51E-03	3.47E-02	7.26E+00	5.70E-01	-4.27E-02
Radioactive waste disposed	kg	8.82E-04	8.91E-07	-6.14E-05	3.93E-06	1.33E-06	2.11E-04	2.00E-05	1.57E-06	-5.04E-06

OUTPUT FLOWS, Knauf KXT9, 1 m², 7.0 kg/m², Scenario 1: Landfilling (C4/1), Scenario 2: Recycling (C3/2, C4/2, D/2)										
Parameter	**Unit**	**TOTAL A1-3**	**A4**	**A5**	**C1**	**C2**	**C3/2**	**C4/1**	**C4/2**	**D/2**
Components for reuse	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
Material for recycling	kg	0.00E+00	0.00E+00	5.00E-03	0.00E+00	0.00E+00	6.45E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity	MJ	0.00E+00	0.00E+00	-3.69E-01	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	-1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Interpretation of Environmental Information

In general, the highest environmental impacts of the plasterboards covered by this EPD result from the product stage A1-A3 (at least 50 %). A significant exception is Ozone Depletion Potential which is dominated by the assembly A5. This results mainly from a database induced potential overestimation of the impacts of the incineration of the wooden pallets.

In Scenario 1 (100 % landfilling at end of life), the landfilling causes at least 60 % of the impact category Human toxicity, non-cancer effects (exception plasterboard Knauf KXT9: 40 %) and more than 80 % of the impact category Non-hazardous waste disposed (exception plasterboard Knauf KXT9: 60 %). Further high impacts for Scenario 1 are observed in the following impact categories:

- Global Warming Potential, biogenic: > 25 % A5 due to incineration of wood
- Global Warming Potential, land use and land use change: at least 15 % caused by transports in A4 and C2 as well as at least 11 % caused by disposal in C4/1
- Hazardous waste disposed: at least 15 % caused by transports in A4 and C2 as well as at least 11 % caused by disposal in C4/1

In **Scenario 2** (100 % recycling at end of life), significant impacts in addition to A1-A3 are caused:

- Global Warming Potential, biogenic: > 24 % A5 due to incineration of wood
- Global Warming Potential, land use and land use change: at least 20 % caused by transports in A4 and C2 (Knauf KXT9: 16 %)
- Ionizing radiation, human health: at least 20 % caused by waste treatment in C3/2 due to the electricity consumption during material separation
- Hazardous waste disposed: at least 20 % caused by transports in A4 and C2 (Knauf KXT9: 17 %)
- Non-hazardous waste disposed: at least 30 % caused by disposal of non-recyclable fractions in C4/2 at end of life (Knauf KXT9: 13 %)
- Radioactive waste disposed: at least 20 % caused by waste treatment in C3/2 due to the electricity consumption during material separation

The benefit from substituting gypsum (esp. natural gypsum) in the next product cycle becomes visible by a credit in module D of at least 20 % for indicator Particulate Matter emissions.

Biogenic Carbon Content

Table 5: Content of biogenic carbon in product and packaging according to EN 15804+A2

BIOGENIC CARBON CONTENT, per 1 m² of board					
BIOGENIC CARBON CONTENT	**Unit**	**Knauf KN13**	**Knauf KEK13**	**Knauf KPS15**	**Knauf KXT9**
Biogenic carbon content in product	kg C	0.178	0.233	0.173	0.192
Biogenic carbon content in packaging	kg C	0.073	0.073	0.073	0.073

The content of biogenic carbon in the plasterboards covered by this EPD is less than 3 % of the board weight. This is due to the high content of minerals in the boards.

Additional information

Plasterboards Knauf KN13 (A), Knauf KEK13 (DIR), and Knauf KPS15 (DF) have been tested for VOC emissions and are classified as emission class M1. M1 emission certificates can be downloaded via the following links:
- https://knauf.fi/fileadmin/user_upload/hyvaksynnat/M1_luokitus/M1_KN_KEK_KS_kipsilevyt.pdf
- https://knauf.fi/fileadmin/user_upload/hyvaksynnat/M1_luokitus/KnaufOy_3140_kipsilevyt_FIN.pdf
Knauf KXT9 (EH2) is mainly used in exterior applications (ventilated facades) and, thus, no indoor air emissions have been tested.

Plasterboards from construction waste are collected via a take back system and transported back to the plant in Kankanpää where the plasterboards are crushed and fed back into the production process for new plasterboards.

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ISO 14025: ISO 14025:2006-07, Environmental labels and declarations - Type III environmental declarations - Principles and procedures

EN 15804: EN 15804:2+A2:2020, Sustainability of construction works — Environmental product declarations — Core rules for the product category of construction products

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OHSAS 18001: OHSAS 18001:2007 Occupational health and safety management systems – Requirements

BBSR2017: Service life of building components for life cycle analyses according to the Assessment System for Sustainable Building, editor: German Federal Institute for Research on Building, Urban Affairs and Spatial Development, 2017 (Nutzungsdauern von Bauteilen für Lebenszyklusanalysen nach Bewertungssystem Nachhaltiges Bauen (BNB), Bundesinstitut für Bau-, Stadt- und Raumforschung (BBSR), Stand 24.02.2017)

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