# **ENVIRONMENTAL** PRODUCT DECLARATION



# Floor Tile

### In accordance with ISO 14025 and EN 15804:2012+A2:2019 for



ENVIRONMENTAL PRODUCT DECLARATIONS



The International EPD® System www.environdec.com

Programme Operator: **EPD International AB** 

**Local Operator: EPD Turkey** 

S-P Code: S-P-04111



THE INTERNATIONAL EPD® SYSTEM

**Publication Date:** 2022.01.07

Validity Date: 2027.01.06





# Programme Information

**Environmental Product Declarations** 

#### **Programme**

EPD Turkey. managed and run by:

#### **SÜRATAM**

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Product Category Rules (PCR): 2019:14 Version 1.11. 2021-02-05. Construction Products and CPC 54 Construction Services. EN 15804:2012 + A2:2019 Sustainability of Construction Works

Independent third-party verification of the declaration and data. according to ISO 14025:2006:

EPD process certification

EPD verification X

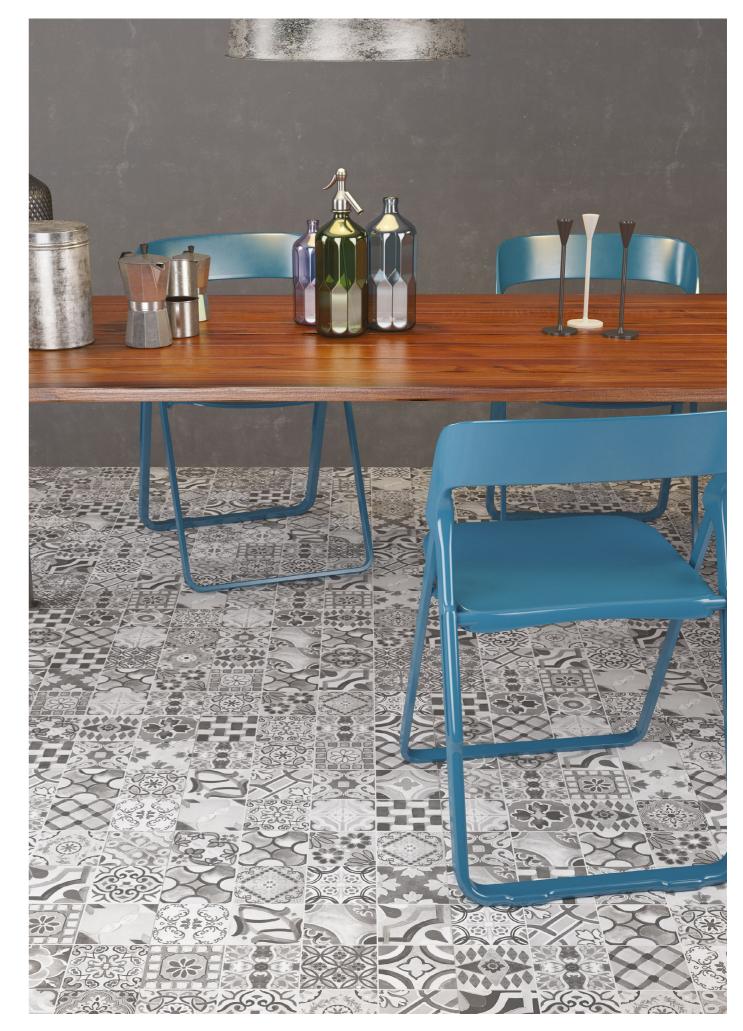
Third party verifier: Prof. Vladimír Kocí

Approved by: The International EPD® System

Procedure for follow-up of data during EPD validity involves third party verifier:

Yes No X

The EPD owner has the sole ownership. liability. and responsibility for the EPD. EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804.



# About the Company

#### **Environmental Product Declarations**

GRANİSER GRANİT SERAMİK A.Ş. was established in 1997 by focusing on infrastructure. technology. design and quality standards. The company has grown rapidly with the innovations it has brought to the sector and has become one of Turkey's leading ceramic tile manufacturers aiming for excellence in customer care.

The Head Office of GRANISER GRANIT SERAMIK A.Ş. is in İzmir/ Turkey. The production facility is located in Akhisar / Manisa Organized Industrial Zone, which is 1 kilometer distance to the Izmir-Istanbul highway. The production facility established on an area of 275 decares and the factory has an annual production capacity of 22 million square meters. The double-fired wall tiles, floor tiles and glazed porcelain tiles in various sizes and designs are produced with 11 kilns and 20 production lines.

Our company has a strong distribution channel with over 40 authorized dealers in the Turkish market. Meanwhile it continues to increase its strength in the foreign market day by day with its exports to more than 60 countries. The needs of all markets, especially Israel. UK. USA and Germany, are met with a product portfolio that is constantly renewed and follows the trends closely. Our company continues to be the center of attention with its products that leading the sector in Unicera and Cersaie fairs with more than 40 new designs every year.

Graniser Seramik was awarded the 1st place prize for ten consecutive times that exports the most in the sector at the "Stars of Export" award ceremony organized by the Aegean Exporters' Association.

Graniser Seramik. which carries many novelties in the ceramic industry. continues its goal of creating products that are as real as natural with the motto of "In Pursuit of Perfection" within the framework of the principle of sustainable management of environment and energy resources.

GRANISER GRANIT SERAMIK A.Ş. which exhibits its stance on providing quality products and unlimited customer satisfaction with ISO 9001 Quality Management System and ISO 10002 Customer Satisfaction Management System certificates. has adopted the manufacture of products by preserving and increasing the value of the products. while reducing the use of raw materials. energy consumption and waste generation at the production stage as the general principle of production.

Our company has been registered with Zero Waste. ISO 14001 Environmental Management System and ISO 50001 Energy Management system certificates to realize sustainable production by using reliable and healthy processes and systems for employees. society and consumers that do not pollute the nature. protect natural resources at every step from the first stage of the product to its presentation to the consumer.

The security sought in processes such as the health and safety of employees and visitors. the management of warehouse shipping areas, the physical security of the factory, loading operations, electronic data circulation and logistics have been provided with the implementation of the ISO 45001 Occupational Health and Safety Management System.

Our company protects information resources and increases the awareness of employees and related parties with the ISO 27001 Information Security Management System based on the fact that it is not possible to protect information security and business continuity with only technical measures, also needs to provide precautions and audits.

#### GRANISER GRANIT SERAMIK A.Ş. is audited by the Turkish Standards Institute

(TSE) every year in accordance with the Turkish and European Standards with TS EN 14411 Ceramic Tiles" and "TSE Double Star" certificates. CE and UKCA labels are used on the products. LCA report and Product Carbon Footprint documents in compliance with ISO 14040/44. EN15804-A2:2019 and EN 16903 have been obtained to take place in Leed and Breeam Green Building projects. Our ISO 14025 EPD Environmental Product Statements have been published on the ECO-Platform for wall tiles. floor tiles and ceramic products.

GRANİSER GRANİT SERAMİK A.Ş owes its rapid and successful rise to its qualified and devoted employees. it supports the continuous training and development with the motto "Together We are Stronger".



# **Product Information**

**E**nviromental **Product Declarations** 



#### Composition

Graniser Floor Tile is produced from kaolin. clay and feldspar. The distribution of the composition is given in the table. After production. the final products are packed. Products are packaged with recycleable cardboards and plastics. UN CPC code for Graniser Porcelain Tiles is 37310.

Raw Material	%
Kaolin	15-20
Clay	40-50
Feldspar	30-40

#### Manufacturing

Ceramic tile produced from clays and/or other inorganic raw materials. Tiles are pressed by dry-pressing at room temperature followed by drying and firing at temperatures sufficient to develop the required technical properties. Ceramic tiles manufactured through a defined process and featuring a specific water absorption.

#### **Applications**

Houses. office and administration buildings. business and shopping centers. hotels and any type of building.

# **Product Information**

Technical Specifications

Graniser	FLOO	OR TILES
C E R A M I C S	TS EN 14411:2016 EK H. BIb	GRANISER CERAMICS
LENGTH AND WIDTH	N ≥ 15 cm Max. ± 2 mm 7 cm ≤ N <15 cm Max. ± 0.9 mm	N ≥ 15 cm Max. ± 1.8 mm 7 cm ≤ N <15 cm Max. ± 0.9 mm
THICKNESS	N ≥ 15 cm Max. ± 0.5 mm 7 cm ≤ N <15 cm Max. ± 0.5 mm	N ≥ 15 cm Max. ± 0.5 mm 7 cm ≤ N <15 cm Max. ± 0.5 mm
STRAIGHTNESS OF SIDES	N ≥ 15 cm Max. ± 1.5 mm 7 cm ≤ N <15 cm Max. ± 0.75 mm	N ≥ 15 cm Max. ± 1.2 mm 7 cm ≤ N <15 cm Max. ± 0.6 mm
RECTANGULARITY	N ≥ 15 cm Max. ± 2.0 mm 7 cm ≤ N <15 cm Max. ± 0.75 mm	N ≥ 15 cm Max. ± 1.8 mm 7 cm ≤ N <15 cm Max. ± 0.6 mm
SURFACE FLATNESS N ≥15 cm	Centre curvature: ± 2.0 mm Edge curvature: ± 2.0 mm Warpage: ± 2.0 mm	Centre curvature: ± 1.8 mm Edge curvature: ± 1.8 mm Warpage: ± 1.8 mm
SURFACE FLATNESS 7 cm ≤ N <15 cm	Centre curvature: ± 0.75 mm Edge curvature: ± 0.75 mm Warpage: ± 0.75 mm	Centre curvature: ± 0.75 mm Edge curvature: ± 0.75 mm Warpage: ± 0.75 mm
WATER ABSORPTION ( $\mathbf{E}_{_{\!$	0.5% < Ev ≤ 3 % Individual max. 3.3 %	Max. 3 % Individual max. 3.3%
MODULUS OF RUPTURE (N/ mm²)	Min: 30 N / mm <sup>2</sup> Individual Min. 27 N / mm <sup>2</sup>	Min: 30 N/mm²
ABRASION RESISTANCE (P.E.I)	Declared value(s)	Indicated for each product
COEFFICIENT OF THERMAL EXPANSION	Declared value(s)	Max. 9 X 10 <sup>-6</sup>
THERMAL SHOCK RESISTANCE	Pass	Passed
CRAZING RESISTANCE	Pass	Passed
FROST RESISTANCE	Pass	Passed
REACTION TO LOW AND HIGH CONCENTRATIONS OF ACIDS AND ALKALIS	Declared value(s)	Indicated for each product
RESISTANCE TO HOUSEHOLD CHEMICALS	Min. Class B	Min. Class B
RESISTANCE TO STAINING	Min. Class 3	Min. Class 3
RELEASE OF DANGEROUS SUBSTANCES a) Cadmium (in mg/dm²) b) Lead (in mg/dm²)	Declared value(s) Declared value(s)	< 0.005 mg/dm <sup>2</sup> < 0.005 mg/dm <sup>2</sup>

## LCA Information

#### **E**nviromental **P**roduct **D**eclarations

# System Boundary

**E**nviromental **P**roduct **D**eclarations

Declared Unit	1 m <sup>2</sup> of average Floor Tile (15 kg)
Time Representativeness	2020
Database(s) and LCA Software Used	Ecoinvent 3.5. SimaPro 9.1

The inventory for the LCA study is based on the 2020 production figures for Graniser Floor Tiles.

This EPD's system boundary is cradle to grave. The results of the LCA with the indicators as per EPD requirement are given in the following tables for product manufacture (A1, A2, A3), construction process stage (A4, A5), use stage (B2,B3,B4,B5), end of life stage (C1, C2, C3, C4) and benefits and load stage (D).

The system boundaries in tabular form for all modules are shown in the table below.

		rodu Stage		tio Pro	strcu- on cess age			Ç	Use Stage						of Life age	2	Bene- fits and Loads
	Raw Material Supply	Transport	Manufacturing	Transport	Construction Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	Deconstruction. demolition	Transport	Waste Processing	Disposal	Future reuse. recycling or energy recovery potentials
Module	Al	A2	A3	A4	A5	B1	B2	В3	В4	B5	В6	В7	C1	C2	C3	C4	D
Modules Declared	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Geography	TR	TR	TR	GLO	GLO	GLO	GLO	GLO	GLO	GLO	GLO	GLO	GLO	GLO	GLO	GLO	GLO
Specific Data Used	90%	90%	90%	90%	90%	-	-	-	-	-	-	-	-	-	-	-	-
Variation - products			NR			-	-	-	-	-	-	-	-	-	-	-	-
Variation - Sites			NR			-	-	-	_	-	-	-	-	-	-	-	-

Description of the system boundary (X = Included in LCA, NR: Not Relevant)

Note: The LCA was modelled for specific product at plant so there is no variation.

Note: All primary data is taken from Graniser Manisa Plant and Ecoinvent was used for secondary data.





**Benefits & Loads** 

--- System Boundary

### More LCA Information

**Environmental Product Declarations** 

**Al:** Raw Material Supply includes raw material extraction and pre-treatment processes before production. For floor tiles. production starts with raw materials.

**A2:** Transportation to Production Site is relevant for delivery of raw materials to the plant and forklift usage within the factory.

**A3:** Manufacturing stages include production of granules by spray drying, forming, drying, glazing, firing and packaging. Transport is only relevant for delivery of raw materials to the plant and forklift usage within the factory.

**A4:** Transport From the Gate to the Site stage involves transportation of floor tiles to the construction site.

**A5:** Installation stage includes the adhesive mortar and water usage in the construction site. For 1 m<sup>2</sup> floor tile installation; 6 kg mortar and 1.5 L water usage was assumed.

**B1:** Use Stage concerns emissions into environment. Floor tiles are inert materials. so during the use stage. they do not cause any emissions.

**B2:** Maintenance Stage includes cleaning of tiles with water and detergent. Graniser advices to use detergent containing stain remover or neutral lowsulphate and rinse with tap water after cleaning. 0.2 mL detergent and 0.1 L water use is assumed to wash 1 m<sup>2</sup> tiles. Maintenance cycle of floor tiles is 4 times a year.

**B3:** Repair is not required during the use phase and therefore no impacts should be declared.

**B4:** Replacement is not required during the use phase and therefore no impacts ocurred in this module.

**B5:** Refurbishment is not required during the use phase and therefore no impacts has occurred in this module.

**B6:** Operational Energy Use is not required in the use stage.

**B7:** Operational Water Use is not required in the use stage.

**C1:** Deconstruction and Demolition at the end of RSL is usually conducted with a selective deconstruction/ demolition. The environmental impacts generated during this phase are very low and therefore can be neglected.

**C2:** Transport includes the transportation of the discarded tiles and adhesive mortar to final disposal. Average distance from demolition site to inert landfill site for final disposal is assumed to be 50 km.

C3: Waste Processing concerns crushing of discarded floor tiles before recycle or reuse. The environmental impacts generated during the C3 phase are very low and therefore can be neglected.

**C4:** Disposal is the final stage of product life. Floor tiles end up at construction and demolition waste landfills as their final fate and modelled as such in this LCA.

**D**: Benefits and Loads stage includes calculation of inert filler benefits and recycling of packaging materials specified in the disposal stage.

#### **Goal and Scope**

Evaluation of environmental impacts for 1 m<sup>2</sup> average floor tiles from cradle to grave.

#### **System Boundary**

The system boundary covers A1 - A3 product stages referred as 'Raw material supply', 'Transport' and 'Manufacturing', A4 - A5 'Construction', B1 - B7 'Use', C1 – C4 'End of life' and benefits and load (D) stages.

#### **Background Data**

Ecoinvent database (Ver.3.5) (www.ecoinvent.org)

#### **Data Quality**

Raw materials. energy and water consumption, waste, material and product transport data is primary data collected from Graniser.

#### **Period Under Review**

All primary data collected from Graniser is for the period year of 2020.

#### **REACH Regulation**

No substances included in the Candidate List of Substances of Very High Concern for authorization under the REACH regulations are present in this product either above the threshold for registration with the European Chemicals Agency or above 0.1% (wt/wt).

#### Allocations

No allocation was performed for this EPD. There are no coproducts in the production of floor tiles. Hence, there is no need for co-product allocation. Transport is allocated according to tonnages for raw materials bought by Graniser. Similarly, water consumption and energy consumption are also allocated according to the production figures.

#### **Cut-Off Criteria**

1% cut-off applied. Data for elementary flows to and from the product system contributing to a minimum of 99% of the declared environmental impacts have been included.

#### **Geographical Scope**

The geographical scope of this EPD is global.



Impact Category	Unit	A1-A3	A4	A5	B	B2	B3	B4	B5	Be	B7	บิ	77	S	, A	۵
GWP - Fossil	kg CO <sub>2</sub> eq	9.37	0.797	8.05	0	386E-6	0	0	0	0	0	0	0.198	0	0.404	-0.579
GWP - Bio- genic	kg CO <sub>2</sub> eq	-0.099	303E-6	0.034	0	-766E-6	0	0	0	0	0	0	22.5E-6	0	0.003	-441E-6
GWP - Luluc	kg CO <sub>2</sub> eq	0.008	274E-6	0.006	0	629E-6	0	0	0	0	0	0	69.7E-6	0	165E-6	-291E-6
GWP - Total	kg CO <sub>2</sub> eq	9.28	0.798	8.09	0	249E-6	0	0	0	0	0	0	0.198	0	0.407	-0.579
ОДЬ	kg CFC-11 eq	1.27E-6	177E-9	761E-9	0	52.7E-12	0	0	0	0	0	0	43.8E-9	0	135E-9	-117E-9
АР	mol H+ eq	0.022	0.007	0.051	0	4.5E-6	0	0	0	0	0	0	798E-6	0	0.004	-0.005
EP - Fresh- water	kg P eq	1.24E-3	72.5E-6	0.003	0	167E-9	0	0	0	0	0	0	17.9E-6	0	126E-6	-92.6E-6
*EP - Fresh- water	kg PO, eq	0.004	222E-6	0.009	0	512E-9	0	0	0	0	0	0	54.7E-6	0	384E-6	-283E-6
EP - Marine	kg N eq	0.005	0.002	0.008	0	4.5E-6	0	0	0	0	0	0	224E-6	0	1.2E-3	-1.4E-3
EP - Terres- trial	mol N eq	0.058	0.018	0.087	0	16.0E-6	0	0	0	0	0	0	0.002	0	0.013	-0.016
POCP	kg NMVOC	0.017	0.005	0.029	0	2.5E-6	0	0	0	0	0	0	752E-6	0	0.004	-0.004
ADPE	kg Sb eq	6.74E-6	1.9E-6	41.5E-6	0	1.8E-9	0	0	0	0	0	0	775E-9	0	520E-9	-1.65E-6
ADPF	Σ	150	12.0	113	0		0	0	0	0	0	0	2.95	0	1.01	-8.52
WDP	m³ depriv.	3.91	0.081	4.69	0	900.0	0	0	0	0	0	0	0.021	0	0.437	-0.930
Σ	disease inc.	199E-9	49.2E-9	456E-9	0	70.3E-12	0	0	0	0	0	0	12.3E-9	0	6-30.99	-50.0E-9
프	kBq U-235 eq	0.279	090:0	0.512	0	25.4E-6	0	0	0	0	0	0	0.014	0	0.048	-0.048
ETP - FW	CTUe	58.8	8.45	222	0	0.039	0	0	0	0	0	0	2.20	0	6.58	1.7-
HTTP - C	CTUh	1.56E-9	253E-12	9.7E-9	0	943E-15	0	0	0	0	0	0	71.9E-12	0	244E-12	-399E-12
HTTP - NC	CTUh	38.1E-9	9.0E-9	233E-9	0	21.0E-12	0	0	0	0	0	0	2.43E-9	0	5.1E-9	-8.4E-9
SQP	Pt	29.9	6.76	33.0	0	0.040	0	0	0	0	0	0	1.70	0	22.3	-5.82
Acronyms	GWP-total: Climate change. GWP-fossil: Climate change- fossil. GWP- biogenic: Climate change - biogenic. GWP-luluc: Climate change - land use and transformation. ODP: Ozone layer depletion. AP: Acidification terrestrial and freshwater. EP-freshwater. Eutrophication freshwater. EP-marine: Eutrophication marine. EP-terrestrial: Eutrophication terrestrial. POCP: Photochemical oxidation. ADPE: Abiotic depletion - elements. ADPF: Abiotic depletion - fossil resources. WDP: Water scarcity. PM: Respiratory inorganics - particulate matter. IR: Ionising radiation. ETP-FW: Ecotoxicity freshwater. HTP-c: Cancer human health effects. HTP-nc: Non-cancer human health effects. SQP: Land use related impacts. soil quality.	mate chang ation. ODP: n marine. EP sil resources P-c: Cancer	e. GWP-fos: Ozone layer -terrestrial: . WDP: Wat human he.	sil: Climate depletion. Eutrophica er scarcity.	change- fc AP: Acidifi tion terres PM: Respir HTP-nc: N	fossil. GWP- lification terre estrial. POCP piratory inorg : Non-cancer	bioger strial a : Photo anics human	ic: Clir and fre chemi - parti healt	iic: Climate cl ind freshwate chemical oxi - particulate health effect	hange er. EP-1 idation m.s. SQP	biogenic: Climate change - biogenic. strial and freshwater. EP-freshwater: Photochemical oxidation. ADPE: Abi anics - particulate matter. IR: Io numan health effects. SQP: Land us	ater: Eu :: Abioti R: Ionisi d use re	nic: Climate change - biogenic. GWP-luluc: Climate change - land use and freshwater. EP-freshwater. Eutrophication freshwater. EP-marine: ochemical oxidation. ADPE: Abiotic depletion - elements. ADPF: Abioti - particulate matter. IR: Ionising radiation. ETP-FW: Ecotoxicity n health effects. SQP: Land use related impacts. soil quality.	nate ci freshv eleme . ETP-F ts. soil	hange - lar water. EP-n snts. ADPF: =W: Ecotox quality.	nd use narine: Abiotic icity
Legend	AI: Raw Material Supply. A2: Transport. A3: Manufacturing. A1-A3: Sum of A1. A2. and A3. A4: Transport to Site. A5: Installation. B1: Use. B2: Maintenance. B3: Repair. B4: Replacement. B5: Refurbishment. B6:Operational Enrgy Use. B7: Operational Water Use C1: De-Construction. C2: Waste Transport. C3: Waste Processing. C4: Disposal. D: Benefits and Loads Beyond the System Boundary.	al Supply. Az olacement.   : Disposal. D	2: Transport B5: Refurbi: ): Benefits a	. A3: Manul shment. B6 nd Loads B	acturing. <i>f</i> :Operation eyond the	Al-A3: Sum and Enrgy Us System Bou	of Al. Az e. B7: C ındary.	2. and , )perati	43. A4: onal V	Transp ⁄ater U	oort to !  se C1:	Site. A5: De-Con	Installation. struction. C2	Bl: Use : Wast	e. B2: Maint e Transpor	tenance. B3: t. C3: Waste
Disclaimer 1	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. Pote ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.	tegory deals s due to pos ion from the	s mainly wit ssible nucle soil. from	h the even: ar accident adon and f	tual impac s. occupati rom some	t of low dose ionizing radiation on human health of the nuclear ional exposure nor due to radioactive waste disposal in under construction materials is also not measured by this indicator.	e ionizi ure no on mat	ng rad r due erials is	iation to radi s also	oactive	nan he s waste sasured	alth of t dispos d by this	iation on human health of the nuclear fuel cycle. It does not to radioactive waste disposal in underground facilities. Potential s also not measured by this indicator.	uel cyc	ile. It does r facilities. P	otential
Disclaimer 2	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.	his environr ith the indic	mental imp tator.	act indicato	or shall be u	used with ca	are as t	he unc	ertain	ies on	these r	esults	are high or as	there	is limited	
*Disclaimer 3	2009b as implemented in DeciDe: http://enlcair.com/analongedin/On/Javalone/EEyhtm/	: This indicat	tor is calcula	ated both ir	kg PO₄ ec	and kg P e	eyelope	quired	in the	charac	starizat	ion mo	eq as required in the charactarization model. (EUTREND model. Struijs et al	₽ D mo	del. Struijs	et al.

Indicator	Unit	Al-A3	A4	A5	В	B2	B3	B4	BS	Be	B7	ū	C2	C3	C4	Ω
GWP-GHG* kg CO <sub>2</sub> eq	kg CO <sub>2</sub> eq	9.25	0.790	7.87	0	0 0 0 0 O	0	0	0	0	0	0	961.0	0	0.324 -0.572	-0.572
Acronyms	GWP-GHG = Global Warming Potential total excl. biogenic carbon following IPCC AR5 methodology	lobal Warm	ing Potential	total excl. b	iogenic carl	bon following	IPCC AR5	method	ygolc							
*Disclaimer 1	*Disclaimer 1 The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus equal to the GWP indicator originally defined in EN 15804:2012+A1:2013	includes all gator is thus e	greenhouse g equal to the G	ases includes	ed in GWP-t or originally	total but exclu / defined in EN	des bioge I 15804:2	enic carbo	on dioxic 2013	le uptake	and emis	sions and	d biogenic c	arbon st	ored in the	prod-

Impact Category	Unit	Al-A3	A4	AS	В	B2	B3	B4	B5	B6	B7	ū	S	C3	C4	۵
PERE	Σ	7.15	0.150	6.82	0	900.0	0	0	0	0	0	0	0.033	0	0.157	-0.186
PERM	Σ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PERT	Σ	7.15	0.150	6.82	0	900.0	0	0	0	0	0	0	0.033	0	0.157	-0.186
PENRE	Σ	150	12.0	113	0	0.005	0	0	0	0	0	0	2.95	0	1.01	-8.53
PENRM	Σ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PENRT	Σ	150	12.0	113	0	0.005	0	0	0	0	0	0	2.95	0	1.01	-8.53
SM	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RSF	Σ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NRSF	Σ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ΡW	m³	0.065	0.002	0.085	0	208.0E-6	0	0	0	0	0	0	493.3E-6	0	0.010	-0.022
Acronyms	PERE: Use of renewable primary energy excluding resources used as raw materials. PERM: U materials. PERT: Total use of renewable primary energy. PENRE: Use of non-renewable primary energy resources used as raw materials. PENRT: Total use of non-penawable secondary fields NDSE: Non-renewable secondary fields NDSE: NDSE: Non-renewable secondary fields NDSE: NDSE: NON-renewable secondary fields NDSE:	of renewable ERT: Total use enewable p	le primary es of renewary ene primary ene	able primal	luding re ry energy. ses used a	sources use PENRE: Use is raw mate	d as ray of non- rials. PE	w mater renewa NRT: Tot	ials. PE ble prir al use of	ERM: Use nary ene of non-re	of rene rgy exclu newable	wable p Iding res primar	PERE: Use of renewable primary energy excluding resources used as raw materials. PERM: Use of renewable primary energy resources used as raw materials. PENRM: Use of non-renewable primary energy excluding resources used as raw materials. PENRT: Total use of non-renewable primary energy. SM: Secondary materials. PENRT: Total use of non-renewable primary energy. SM: Secondary material. RSF:	gy resou las raw i : Second	urces used materials. F dary mater	l as raw DENRM: ial. RSF:

Ω	0	0	0	0	0	0	0	0	FR.
75	0	0	0	0	0	0	0	0	r reuse. M Thermal.
0									ents fo
C3	0	0	0	0	0	0	0	0	orted e
C2	0	0	0	0	0	0	0	0	IWD: Non-hazardous waste disposed. RWD: Radioactive waste disposed. CRU: Components for reuse. MFR: for energy recovery. EE (Electrical): Exported energy electrical. EE (Thermal): Exported energy. Thermal.
ū	0	0	0	0	0	0	0	0	dispose EE (The
B7	0	0	0	0	0	0	0	0	ve waste lectrical. I
B6	0	0	0	0	0	0	0	0	adioacti nergy el
B5	0	0	0	0	0	0	0	0	RWD: Raported e
B4	0	0	0	0	0	0	0	0	sposed. rical): Ex
B3	0	0	0	0	0	0	0	0	aste di: : (Electi
B2	0	0	0	0	0	0	0	0	rdous w overy. EE
Б	0	0	0	0	0	0	0	0	lon-haza ergy recc
A5	0	0	0	0	0	0	0	0	. NHWD: N ials for ene
A4	0	0	0	0	0	0	0	0	disposed IER: Mater
A1-A3	0.002	0.021	0	0	0	0	0	0	lous waste ecycling. N
Unit	kg	Kg	Ķg	Ą	Ķģ	Ķg	Σ	Σ	HWD: Hazardous waste disposed. NH Material for recycling. MER: Materials
Impact Category	НМБ	NHWD	RWD	CRU	MFR	MER	EE (Electrical)	EE (Thermal)	Acronyms

### References

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/SimaPro/ SimaPro LCA Software. Pré Consultants. the Netherlands. www.pre-sustainability.com

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