Environmental Product Declaration (EPD)
According to ISO 14025 and EN 15804+A2

Cement-Based Masonry Mortars – Group MM G: ZM M10, ZF M10, ZM M15, ZF M15, ZM M20, ZF M20, PM SUPER, MULTIMIX

Registration number:	EPD-Kiwa-EE-204844-EN
Issue date:	04-06-2025
Valid until:	04-06-2030
Declaration owner:	SIA SAKRET
Publisher:	Kiwa-Ecobility Experts
Programme operator:	Kiwa-Ecobility Experts
Status:	verified

1 General information

1.1 PRODUCT

Cement-Based Masonry Mortars – Group MM G: ZM M10, ZF M10, ZM M15, ZF M15, ZM M20, ZF M20, PM SUPER, MULTIMIX

1.2 REGISTRATION NUMBER

EPD-Kiwa-EE-204844-EN

1.3 VALIDITY

Issue date: 04-06-2025

Valid until: 04-06-2030

1.4 PROGRAMME OPERATOR

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1.5 OWNER OF THE DECLARATION

Manufacturer: SIA SAKRET

Address: "Ritvari", Rumbula, Stopiņu pag., Ropažu nov., LV-2121 Latvia

E-mail: info@sakret.lv

Website: www.sakret.lv

Production location: SIA SAKRET

Address production location: "Ritvari", Rumbula, Stopiņu pag., Ropažu nov., LV-2121 Latvia

1.6 VERIFICATION OF THE DECLARATION

The independent verification is in accordance with the ISO 14025:2011. The LCA is in compliance with ISO 14040:2006 and ISO 14044:2006. The EN 15804+A2:2019 serves as the core PCR.

☐ Internal ☒ External

Gaurav Das, Gaurav Das

1.7 STATEMENTS

The owner of this EPD shall be liable for the underlying information and evidence. The programme operator Kiwa-Ecobility Experts shall not be liable with respect to manufacturer data, life cycle assessment data and evidence.

1.8 PRODUCT CATEGORY RULES

Kiwa-Ecobility Experts (Kiwa-EE) – General Product Category Rules (2022-02-14)

EN 16908:2017+A1:2022, Cement and building lime – Environmental product declarations – Product category rules complementary to EN 15804

1 General information

1.9 COMPARABILITY

In principle, a comparison or assessment of the environmental impacts of different products is only possible if they have been prepared in accordance with EN 15804+A2:2019. For the evaluation of the comparability, the following aspects have to be considered in particular: PCR used, functional or declared unit, geographical reference, the definition of the system boundary, declared modules, data selection (primary or secondary data, background database, data quality), scenarios used for use and disposal phases, and the life cycle inventory (data collection, calculation methods, allocations, validity period). PCRs and general program instructions of different EPD program operators may differ. Comparability needs to be evaluated. For further guidance, see EN 15804+A2:2019 and ISO 14025.

1.10 CALCULATION BASIS

LCA method R<THINK: Ecobility Experts | EN 15804+A2

LCA software*: Simapro 9.6

Characterization method: EN 15804+A2 Method v1.0 / EF 3.1

LCA database profiles: ecoinvent 3.9.1

Version database: v3.19 (20250306)

** Simapro is used for calculating the characterized results of the Environmental profiles within R<THINK.*

1.11 LCA BACKGROUND REPORT

This EPD is generated on the basis of the LCA background report 'Cement-Based Masonry Mortars – Group MM G: ZM M10, ZF M10, ZM M15, ZF M15, ZM M20, ZF M20, PM SUPER, MULTIMIX' with the calculation identifier ReTHiNK-104844.

2 Product

2.1 PRODUCT DESCRIPTION

SAKRET is one of the leading manufacturers of building materials in the Baltic States, offering a comprehensive range of products for various construction applications. The company specializes in cement-based dry construction mixes, including thermal insulation adhesives, concrete, masonry and repair compounds, plaster mortars, tile adhesives, decorative plasters, and other related materials.

This EPD covers multiple products from the Group MM G product family, based on a representative product using the worst-case approach. Group MM G includes the masonry mortars ZM M10, ZF M10, ZM M15, ZF M15, ZM M20, ZF M20, PM SUPER, and MULTIMIX. These products are distributed globally.

Masonry mortar is a dry mix that, when combined with water, is used in construction to bond building materials such as bricks, stones, or concrete blocks. It typically contains a binder (such as cement and lime), fine aggregates (like sand), and may also include additions and/or admixtures.

UN CPC code: 37510 Articles of concrete, cement and plaster

Declaration of the main product components and/or materials

The table below summarizes the relative composition of the mortars. The specified composition ranges apply to all masonry mortars in the Group MM G product family.

Materials	Weight (kg), value range (%)
Cement	12-20%
Sand and other fine aggregates	75-82%
Limestone and hydrated lime	3-13%
Additives	<1%

Packaging Information

All masonry mortars in the Group MM G product family are supplied in moisture-resistant bags, typically available in 25 kg units. Bulk delivery options, such as big bags or silo systems, may also be available upon request, depending on the project requirements and delivery logistics.

Packaging materials	Weight versus the product (%)
Industrial paper bag	0.33%
Cardboard	0.02%
Low-density polyethylene film	0.06%
Wood pallet	1.42%

Note: Packaging materials are not modeled in Modules C–D, as they are assumed to be disposed of in Module A5, which is not declared. Wooden pallets, in particular, contribute to biogenic carbon uptake; however, since Module A5 is excluded, their inclusion would distort the results. As a conservative approach, wooden pallets are excluded from the system boundaries. This modeling strategy has been adopted to ensure transparency and prevent any potential misinterpretation by users.

2.2 APPLICATION (INTENDED USE OF THE PRODUCT)

Group MM G comprises masonry mortars suitable for various applications. SAKRET produces designed mortars that are specifically formulated and manufactured to meet defined performance criteria, with both composition and production processes tailored to

2 Product

achieve the required properties. Depending on the application, the mortars may include additives or admixtures to enhance characteristics such as workability, durability, and setting time.

All masonry mortars are manufactured in accordance with EN 998-2 standard and are CE marked. Declarations of Performance (DoP) for the products are available at www.sakret.lv.

2.3 REFERENCE SERVICE LIFE

RSL PRODUCT

The generic life cycle of the products is assumed to be 50 years, with the product's service life determined by the Reference Service Life (RSL) of the structure or building in which it is used. It should be noted that the Use stage, including modules B1 to B7, is not declared.

USED RSL (YR) IN THIS LCA CALCULATION:

50

2.4 TECHNICAL DATA

Main physical and applicative properties

Characteristic	ZM M10	ZF M10	ZM M15	ZF M15
Base	cement	cement	cement	cement
Color	grey	grey	grey	grey
Compressive strength, N/mm²	10	10	15	15
Application temperature	+5°C to +25°C	-10°C to +25°C	+5°C to +25°C	-10°C to +25°C

Characteristic	ZM M20	ZF M20	PM super	Multimix
Base	cement	cement	cement - lime	cement - lime
Color	grey	grey	grey	grey
Compressive strength, N/mm²	20	20	5	10
Application temperature	+5°C to +25°C	-10°C to +25°C	+5°C to +25°C	+5°C to +25°C

More detailed technical information about the mortars, including product specifications, performance characteristics, and recommended applications, can be found in the Technical Data Sheets (TDS) available on SAKRET's website. These documents offer detailed information on mixing ratios, curing times, and material properties to ensure the product is used optimally in construction or Do It Yourself (DIY) projects.

2.5 SUBSTANCES OF VERY HIGH CONCERN

The products do not contain any substance included in the list of Substances of Very High Concern with concentrations higher than 0.1% in weight.

Safety information for the mortars is provided in the Material Safety Data Sheets (MSDS), which available on SAKRET's website. The MSDS outlines essential guidance on handling, storage, and potential hazards associated with the product. It is important to follow the safety instructions in the MSDS to ensure safe use and minimize risks.

2.6 DESCRIPTION PRODUCTION PROCESS

The mortar production process at SIA SAKRET involves a well-structured sequence of operations designed to ensure high product quality and efficiency.

The key stages of the production route include:

Extraction and Delivery of Raw Materials: High-quality raw materials, such as cement, sand, other fine aggregates, limestone, hydrated lime, and additives or admixtures, are sourced and transported to the production facility.

Sand Drying: Upon arrival, the sand is dried using specialized equipment to reduce moisture content, which is crucial for maintaining the consistency and quality of the final product.

Sand Sieving: The dried sand is then sieved to remove any impurities and to ensure uniform grain size, which is essential for the performance of the mortar.

Storage in Dedicated Silos: All raw materials, including the processed sand and other components, are stored in dedicated silos to maintain their quality and allow for efficient handling during production.

2 Product

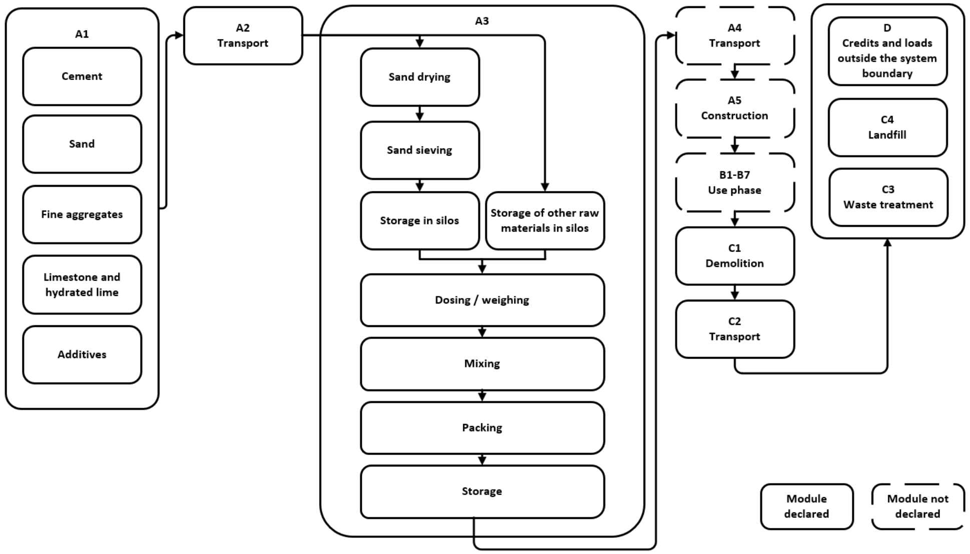
Dosing and Weighing: Precise quantities of each raw material are measured and dosed according to specific formulation requirements, ensuring consistency in every batch.

Mixing: The accurately dosed materials are blended in an industrial mixer to create a homogeneous mortar mix with the desired properties and performance characteristics.

Packing: The finished product is packed into industrial bags, stacked on wooden pallets with cardboard layers and wrapped in protective packaging film, using automated packaging systems, ensuring efficient handling, storage, and transport.

Storage and Delivery: Finally, the packed products are stored in the warehouse before being dispatched to customers, ensuring timely and reliable delivery.

SAKRET's production process ensures the maintenance of high standards in product quality, sustainability, and operational efficiency. The process is illustrated in the flow diagram below.



3 Calculation rules

3.1 DECLARED UNIT

1 metric ton

1 metric ton of cement-based masonry mortar (dry mix)

Reference unit: ton (ton)

3.2 CONVERSION FACTORS

Description	Value	Unit
Reference unit	1	ton
Weight per reference unit	1000.000	kg
Conversion factor to 1 kg	0.001000	ton

3.3 SCOPE OF DECLARATION AND SYSTEM BOUNDARIES

This is a Cradle to gate with modules C1-C4 and module D EPD. The life cycle stages included are as shown below:

(X = module included, ND = module not declared)

A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X

The modules of the EN 15804 contain the following:

Module A1 = Raw material supply	Module B5 = Refurbishment
Module A2 = Transport	Module B6 = Operational energy use
Module A3 = Manufacturing	Module B7 = Operational water use
Module A4 = Transport	Module C1 = De-construction / Demolition
Module A5 = Construction - Installation process	Module C2 = Transport
Module B1 = Use	Module C3 = Waste Processing
Module B2 = Maintenance	Module C4 = Disposal
Module B3 = Repair	Module D = Benefits and loads beyond the product system boundaries
Module B4 = Replacement	

3.4 REPRESENTATIVENESS

This EPD represents the Cement-Based Masonry Mortars of Group MM G – including ZM M10, ZF M10, ZM M15, ZF M15, ZM M20, ZF M20, PM SUPER, and MULTIMIX – based on the worst-case approach. Group MM G consists of versatile masonry mortars, gray in color, suitable for both indoor and outdoor use.

The variation in the core environmental indicators within the product range are summarized in Section 6 (Interpretation of results) of the EPD.

3 Calculation rules

3.5 CUT-OFF CRITERIA

Product stage (A1-A3)

All input flows (e.g. raw materials, transportation, energy use, packaging, etc.) and output flows (e.g. production waste) are considered in this LCA. The total neglected input flows do therefore not exceed the limit of 5% of energy use and mass.

End of life stage (C1-C4)

All input flows (e.g. energy use for demolition or disassembly, transport to waste processing, etc.) and output flows (e.g. end-of-life waste processing of the product, etc.) are considered in this LCA. The total neglected input flows do therefore not exceed the limit of 5% of energy use and mass.

Benefits and loads beyond the system boundary (Module D)

All benefits and loads beyond the system boundary resulting from reusable products, recyclable materials and/or useful energy carriers leaving the product system are considered in this LCA.

Based on EN 15804+A4, the end-of-life system boundary of the product system is set, where outputs of the system under study, have reached the end-of-waste state. Thus, waste processing of the materials flows during any module of the product system (e.g. the production stage, end-of-life stage) are included up to the system boundary of the respective module. A product reaches its end-of-waste state when there is a market for the recovered product and when the recovered product fulfils the technical requirements for the specific purposes and meets the legislation and standards applicable to the product. Therefore producers of waste bear the burden of the waste treatment, based on the “polluter pays” principle. Consumers of recycled products receive them burden-free.

In the Module D the net impacts and substitution effects were calculated as stated in Annex D of EN 15804+A2.

Due to the recycling potential of metals, the end-of-life product is mainly converted into recycled raw materials (Module D). Loads and benefits of recycling, re-use and exported energy are part of module D. The benefits are calculated based on the primary content and the primary equivalent.

3.6 ALLOCATION

There are no co-products in the raw material supply and manufacturing phases, so no allocation methods were applied for co-products at this stage. The allocation of inputs and outputs, such as auxiliary materials, energy (utilities), and production waste, was based on production volumes. The Life Cycle Assessment was modeled using the R<THiNK software from NIBE. Background data was sourced from the Ecoinvent version 3.9.1 (2022) Allocation, Cut-off Library. Nearly all of the consistent datasets in the Ecoinvent database are documented and available for review in the online Ecoinvent documentation. Allocation principles in the background align with those in the foreground. Detailed information regarding allocations within the background data can be found in the Ecoinvent version 3.9.1 (2022) documentation.

3.7 DATA COLLECTION & REFERENCE PERIOD

The data collection was conducted according to the EN ISO 14044, Chapter 4.3.2. According to the goal definition, all significant input and output flows that belong to the examined products are identified and quantified. The input and output flows are attributed to the process stages where they occur, raw material supply (Module A1), transport to manufacturer (Module A2) and manufacturing (Module A3), the input and output flows could be clearly assigned.

Data on product composition, production waste and energy consumption reflect a 12-month reference period (11.2023-10.2024).

3.8 ESTIMATES AND ASSUMPTIONS

Product stage (A1-A3)

The production stage includes materials, energy and waste flows only related to the production processes (e.g. energy and water use related to company management and sales activities are excluded where technically possible; production, manufacture, and construction of manufacturing capital goods and infrastructure, other processes which are not directly related to the production of dry mixes).

All installed raw materials of the products are analyzed, and the masses are determined following the allocation and cut-off requirements. Production-specific energy consumption were measured and provided by SAKRET. Supplier information regarding mode of transport and distances also are provided by SAKRET.

Production data is recorded with a high degree of accuracy and precision. Given the consistency of the production process across all products manufactured at the site, energy consumption, ancillary materials, and production waste are allocated to the declared unit based on production and consumption volumes over a 12-month period.

Waste generated during plant operations is properly managed – stored in suitable containers and routinely transported for further processing or disposal. As a result, no significant negative impact on the environment is expected.

3 Calculation rules

Production waste typically consists of off-specification products (mortar that does not meet quality standards and cannot be reintegrated into the production process), dust (fine particles generated during the grinding or mixing process) and cleaning waste (waste generated from cleaning equipment, mixers or storage areas that may contain small amounts of product or raw materials). The waste is collected separately, stored and disposed of in accordance with environmental and regulatory standards. Production waste is classified as construction waste and sent for recycling. In line with waste management practices in Latvia, it is estimated that approximately 99% of production waste is recycled, while the remaining 1% is sent to landfill.

Water use is not declared, as it is not utilized in any technological processes.

Masonry mortar products must be protected from moisture during storage and transportation. They are packaged in 25 kg industrial paper bags, stacked on wooden pallets with cardboard layers in between, and wrapped with plastic film for protection. All packaging materials are suitable for external recovery or appropriate disposal.

Packaging materials are not modeled in Modules C–D, as they are assumed to be disposed of in Module A5, which is not declared. Wooden pallets, in particular, contribute to biogenic carbon uptake, however, since Module A5 is excluded, their inclusion would distort the results. As a conservative approach, wooden pallets are excluded from the system boundaries. This modeling strategy has been adopted to ensure transparency and prevent any potential misinterpretation by users.

Construction process stage (A4-A5): not declared.

Use stage (B1-B7): not declared.

End of life stage (C1-C4) and Module D

Since the products are marketed internationally, no country-specific waste scenario was considered. As a result, the waste scenarios from NMD (2022) have been adopted.

Module C1: This module covers the demolition of cement-based mortars as part of the overall demolition of the entire building or structure. The demolition process (C1) consumes energy in the form of diesel fuel used by building machines (e.g. lifting cranes, mobile rough terrain crane, forklift). According to Erlandsson, M. and Pettersson D. (2015) energy consumption of a demolition process is on average 10 kWh/t.

At the end-of-life, in the demolition phase 100% of the waste is assumed to be collected as separate construction waste.

It is assumed that all embedded mortar is collected as separated construction waste during the demolition phase at the end of its service life.

Modules C2 to C4 and D: A waste scenario for construction waste based on the Dutch National Environmental Database (NMD) is used:

- concrete (i.a. elements, brickwork, reinforced concrete): 99% of material is recycled and 1% landfilled.

All of end-of-life product is assumed to be sent to the closest facilities (C2).

In general, the inputs and outputs were attributed to the process/module in which they occur. That means:

- Environmental impacts caused by manufacturing or production waste (transport, incineration, waste processing, landfill and benefits through material and energy recovery) are assigned to module A3.
- Environmental impacts caused in the end-of-life stage are assigned to module C2 (transport), C3 (waste processing), C4 (disposal) and D (benefits through material and energy recovery).

Carbonation

During and after the lifetime of cement- and lime-containing products, the hydrated cement and lime within these products react with CO_2 from the air. This process, known as carbonation (or cement/lime carbonation), allows part of the CO_2 emitted during cement or lime production to be reabsorbed. The amount of CO_2 uptake depends on the type of application and its treatment at the end of its life cycle.

Since SAKRET produces dry-mixed products and has no control or information regarding their specific application, carbonation during the use phase (Modules B) is not considered. The same applies to the end-of-life phase (Modules C and D) due to the lack of precise data.

Overall, carbonation reduces the global warming potential (GWP) of cement and lime-based products throughout their life cycle, meaning that, theoretically, the GWP results for the end-of-life stage could be lower.

3.9 DATA QUALITY

All relevant process data was collected in the operational data survey. The data relating to the production stage of the product was determined by SIA SAKRET and refers to the production site in "Ritvari", Rumbula, Stopiņu pagasts, Ropažu novads, LV-2121, Latvia. Data for processes beyond the manufacturer's control were assigned from available EPD or generic data from databases (since suppliers' EPDs were not available for every material or were not developed according to EN 15804+A2).

3 Calculation rules

To ensure the comparability of the results, only consistent background data from the Ecoinvent database version 3.9.1, released in 2022, was used in the LCA (e.g. data records on energy, transport, auxiliary and operating materials).

The database is regularly checked and thus complies with the requirements of ISO 14040/44 (background data not older than 10 years). The background data meets the requirements of EN 15804. The quantities of raw materials, consumables and supplies used as well as the energy consumption have been recorded and averaged over the entire year of manufacturing operation.

The cut-off on the background is according to the background processes documentation (information on cut-off within the background data can be found in the Ecoinvent database version 3.9.1 (2022) document).

The general rule – that specific data from specific production processes or average data derived from specific processes must be given priority when calculating an EPD or Life Cycle Assessment – has been followed. Data for processes that the manufacturer cannot influence or choose, were backed up with generic data.

The data used in this EPD demonstrates good overall quality, supported by solid geographical coverage, appropriate technical detail, and relevant temporal alignment with the reference period. The geographical representativeness of the data is assessed as very good, while both technical and temporal representativeness are considered good. Data quality was calculated using the Data Quality level and criteria according to the PEF approach (Annex E.2 of EN 15804+A2). The DQRs range from 1,67 to 2,67 for the most abundant inputs in terms of mass. Therefore, overall the data quality is consistent and robust across all categories and is deemed to be good.

3.10 POWER MIX

No Guarantees of Origin are included. Electricity consumption is based on the residual national electricity grid mix of Latvia and electricity generated by the solar panel system owned by SIA SAKRET.

The process model used is “1kWh Electricity, low voltage {LV}| electricity, low voltage, residual mix | Cut-off, U”, with a global warming potential (GWP) of 0.454 kg CO_2 eq. per kWh, sourced from the Ecoinvent database version 3.9.1.

The residual mix is calculated using the domestic residual mix, which accounts for total domestic electricity production, including imports and exports beyond the calculation area, as well as issued and expired energy attribute certificates. The calculation is based on statistics from AIB (2022) and follows the methodology developed by Grexel (2020).

4 Scenarios and additional technical information

4.1 DE-CONSTRUCTION, DEMOLITION (C1)

The following information describes the scenario for demolition at end of life.

Description	Amount	Unit
(ei3.9.1) Diesel, burned in machine (incl. emissions)	1.009	l

4.2 TRANSPORT END-OF-LIFE (C2)

The following distances and transport conveyance are assumed for transportation during end of life for the different types of waste processing.

Waste Scenario	Transport conveyance	Not removed (stays in work) [km]	Landfill [km]	Incineration [km]	Recycling [km]	Re-use [km]
(ei3.9.1) concrete (i.a. elements, brickwork, reinforced concrete) (NMD ID 9)	(ei3.9.1) Lorry (Truck), unspecified (default) | market group for (GLO)	0	100	150	50	0

The transport conveyance(s) used in the scenario(s) for transport during end of life has the following characteristics.

	Value and unit
Vehicle type used for transport	(ei3.9.1) Lorry (Truck), unspecified (default) | market group for (GLO)
Fuel type and consumption of vehicle	not available
Capacity utilisation (including empty returns)	50 % (loaded up and return empty)
Bulk density of transported products	inapplicable
Volume capacity utilisation factor	1

4.3 END OF LIFE (C3, C4)

The scenario(s) assumed for end of life of the product are given in the following tables. First the assumed percentages per type of waste processing are displayed, followed by the assumed amounts.

Waste Scenario	Region	Not removed (stays in work) [%]	Landfill [%]	Incineration [%]	Recycling [%]	Re-use [%]
(ei3.9.1) concrete (i.a. elements, brickwork, reinforced concrete) (NMD ID 9)	NL	0	1	0	99	0

4 Scenarios and additional technical information

Waste Scenario	Not removed (stays in work) [kg]	Landfill [kg]	Incineration [kg]	Recycling [kg]	Re-use [kg]
(ei3.9.1) concrete (i.a. elements, brickwork, reinforced concrete) (NMD ID 9)	0.000	10.000	0.000	990.000	0.000
Total	**0.000**	**10.000**	**0.000**	**990.000**	**0.000**

4.4 BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY (D)

The presented Benefits and loads beyond the system boundary in this EPD are based on the following calculated Net output flows in kilograms and Energy recovery displayed in MJ Lower Heating Value.

Waste Scenario	Net output flow [kg]	Energy recovery [MJ]
(ei3.9.1) concrete (i.a. elements, brickwork, reinforced concrete) (NMD ID 9)	990.000	0.000
Total	**990.000**	**0.000**

5 Results

For the impact assessment long-term emissions (>100 years) are not considered. The results of the impact assessment are only relative statements that do not make any statements about end-points of the impact categories, exceedance of threshold values, safety margins or risks. The following tables show the results of the indicators of the impact assessment, of the use of resources as well as of waste and other output flows.

5.1 ENVIRONMENTAL IMPACT INDICATORS PER TON

CORE ENVIRONMENTAL IMPACT INDICATORS EN 15804+A2

Abbr.	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq.	1.35E+2	1.97E+1	1.63E+1	1.71E+2	3.59E+0	7.52E+0	1.47E+0	6.08E-2	-4.23E+0
GWP-f	kg CO_2 eq.	1.53E+1	1.97E+1	2.11E+1	5.62E+1	3.58E+0	7.50E+0	1.47E+0	6.08E-2	-4.21E+0
GWP-b	kg CO_2 eq.	1.19E+2	6.30E-3	-4.84E+0	1.15E+2	4.98E-4	2.44E-3	1.34E-3	2.65E-5	-8.11E-3
GWP-luluc	kg CO_2 eq.	4.08E-2	9.66E-3	1.74E-2	6.79E-2	4.03E-4	2.67E-2	3.32E-4	3.67E-5	-5.01E-3
ODP	kg CFC 11 eq.	5.15E-6	4.29E-7	7.04E-7	6.28E-6	5.70E-8	1.33E-7	3.31E-8	1.76E-9	-4.45E-8
AP	mol H+ eq.	4.25E-1	5.89E-2	9.43E-2	5.78E-1	3.32E-2	3.59E-2	9.29E-3	4.58E-4	-2.90E-2
EP-fw	kg P eq.	1.44E-3	1.59E-4	5.31E-4	2.13E-3	1.29E-5	7.46E-5	2.91E-5	5.93E-7	-1.42E-4
EP-m	kg N eq.	1.46E-1	1.84E-2	3.59E-2	2.01E-1	1.54E-2	1.36E-2	3.94E-3	1.75E-4	-8.68E-3
EP-T	mol N eq.	1.65E+0	1.96E-1	3.80E-1	2.22E+0	1.67E-1	1.45E-1	4.31E-2	1.88E-3	-9.98E-2
POCP	kg NMVOC eq.	4.13E-1	8.72E-2	1.24E-1	6.24E-1	4.96E-2	4.97E-2	1.28E-2	6.56E-4	-2.98E-2
ADP-mm	kg Sb-eq.	3.22E-4	6.37E-5	6.72E-5	4.53E-4	1.25E-6	2.35E-5	5.96E-6	8.44E-8	-2.06E-5
ADP-f	MJ	5.66E+2	2.80E+2	3.32E+2	1.18E+3	4.69E+1	1.07E+2	2.01E+1	1.51E+0	-5.21E+1
WDP	m3 world eq.	1.45E+4	1.14E+0	3.41E+1	1.45E+4	1.01E-1	5.86E-1	1.11E-1	6.69E-2	-5.96E+1

GWP-total=Global Warming Potential total (GWP-total) | **GWP-f**=Global Warming Potential fossil fuels (GWP-fossil) | **GWP-b**=Global Warming Potential biogenic (GWP-biogenic) | **GWP-luluc**=Global Warming Potential land use and land use change (GWP-luluc) | **ODP**=Depletion potential of the stratospheric ozon layer (ODP) | **AP**=Acidification potential, Accumulated Exceedance (AP) | **EP-fw**=Eutrophication potential, fraction of nutrients reaching freshwater end compartment (EP-freshwater) | **EP-m**=Eutrophication potential, fraction of nutrients reaching marine end compartment (EP-marine) | **EP-T**=Eutrophication potential, Accumulated Exceedance (EP-terrestrial) | **POCP**=Formation potential of tropospheric ozone (POCP) | **ADP-mm**=Abiotic depletion potential for non fossil resources (ADP mm) | **ADP-f**=Abiotic depletion for fossil resources potential (ADP fossil) | **WDP**=Water (user) deprecation potential, deprivation-weighted water consumption (WDP)

5 Results

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS EN 15804+A2

Abbr.	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
PM	disease incidence	2.69E-6	1.53E-6	1.10E-6	5.31E-6	9.26E-7	7.40E-7	2.25E-7	1.00E-8	-5.40E-7
IR	kBq U235 eq.	1.98E+0	1.41E-1	3.36E-1	2.46E+0	9.60E-3	4.19E-2	2.30E-2	4.00E-4	-1.15E-1
ETP-fw	CTUe	4.78E+2	1.38E+2	7.00E+1	6.86E+2	2.24E+1	7.92E+1	6.77E+0	7.11E-1	-1.94E+1
HTP-c	CTUh	1.99E-8	8.99E-9	6.62E-9	3.55E-8	1.10E-9	3.97E-9	4.67E-10	2.59E-11	-3.32E-9
HTP-nc	CTUh	3.46E-7	1.97E-7	1.17E-7	6.60E-7	7.63E-9	8.62E-8	9.39E-9	3.24E-10	-4.25E-8
SQP	Pt	2.92E+2	1.67E+2	6.82E+2	1.14E+3	3.16E+0	8.47E+1	2.71E+0	3.01E+0	-6.52E+1

PM=Potential incidence of disease due to PM emissions (PM) | **IR**=Potential Human exposure efficiency relative to U235 (IRP) | **ETP-fw**=Potential Comparative Toxic Unit for ecosystems (ETP-fw) | **HTP-c**=Potential Comparative Toxic Unit for humans (HTP-c) | **HTP-nc**=Potential Comparative Toxic Unit for humans (HTP-nc) | **SQP**=Potential soil quality idex (SQP)

CLASSIFICATION OF DISCLAIMERS TO THE DECLARATION OF CORE AND ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS

ILCD classification	Indicator	Disclaimer
ILCD type / level 1	Global warming potential (GWP)	None
	Depletion potential of the stratospheric ozone layer (ODP)	None
	Potential incidence of disease due to PM emissions (PM)	None
ILCD type / level 2	Acidification potential, Accumulated Exceedance (AP)	None
	Eutrophication potential, Fraction of nutrients reaching freshwater end compartment (EP-freshwater)	None
	Eutrophication potential, Fraction of nutrients reaching marine end compartment (EP-marine)	None
	Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	None
	Formation potential of tropospheric ozone (POCP)	None
	Potential Human exposure efficiency relative to U235 (IRP)	1
ILCD type / level 3	Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	2
	Abiotic depletion potential for fossil resources (ADP-fossil)	2
	Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	2
	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	2
	Potential Comparative Toxic Unit for humans (HTP-c)	2
	Potential Comparative Toxic Unit for humans (HTP-nc)	2

5 Results

ILCD classification	Indicator	Disclaimer
	Potential Soil quality index (SQP)	2

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. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

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.

5.2 INDICATORS DESCRIBING RESOURCE USE AND ENVIRONMENTAL INFORMATION BASED ON LIFE CYCLE INVENTORY (LCI)

PARAMETERS DESCRIBING RESOURCE USE

Abbr.	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
PERE	MJ	9.41E+1	4.35E+0	8.77E+1	1.86E+2	2.67E-1	1.52E+0	1.68E+0	1.28E-2	-3.86E+0
PERM	MJ	0.00E+0	0.00E+0	5.29E+1	5.29E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	MJ	9.41E+1	4.35E+0	1.41E+2	2.39E+2	2.67E-1	1.52E+0	1.68E+0	1.28E-2	-3.86E+0
PENRE	MJ	5.68E+2	2.80E+2	3.01E+2	1.15E+3	4.69E+1	1.08E+2	2.01E+1	1.51E+0	-5.21E+1
PENRM	MJ	0.00E+0	0.00E+0	3.11E+1	3.11E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PENRT	MJ	5.68E+2	2.80E+2	3.32E+2	1.18E+3	4.69E+1	1.08E+2	2.01E+1	1.51E+0	-5.21E+1
SM	Kg	1.60E+1	0.00E+0	3.40E-2	1.61E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
RSF	MJ	7.28E+1	0.00E+0	1.55E-1	7.29E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
NRSF	MJ	4.36E+2	0.00E+0	9.27E-1	4.37E+2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	m^3	1.44E+0	4.00E-2	9.57E-2	1.58E+0	3.69E-3	2.59E-2	5.56E-3	1.61E-3	-1.39E+0

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**=Net use of fresh water

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OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES

Abbr.	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
HWD	Kg	2.79E-2	1.78E-3	1.93E-3	3.16E-2	3.16E-4	6.85E-4	1.04E-4	8.02E-6	-2.24E-4
NHWD	Kg	3.67E+0	1.37E+1	1.87E+0	1.92E+1	6.72E-2	7.10E+0	3.02E+0	1.00E+1	-5.87E-1
RWD	Kg	1.76E-3	9.11E-5	2.56E-4	2.11E-3	5.14E-6	2.46E-5	1.94E-5	2.24E-7	-7.36E-5

HWD=Hazardous waste disposed | **NHWD**=Non-hazardous waste disposed | **RWD**=Radioactive waste disposed

ENVIRONMENTAL INFORMATION DESCRIBING OUTPUT FLOWS

Abbr.	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
CRU	Kg	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	Kg	1.11E-3	0.00E+0	2.08E+0	2.08E+0	0.00E+0	0.00E+0	9.90E+2	0.00E+0	0.00E+0
MER	Kg	2.16E-3	0.00E+0	4.59E-6	2.17E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EET	MJ	7.51E-3	0.00E+0	1.59E-5	7.53E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EEE	MJ	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0

CRU=Components for re-use | **MFR**=Materials for recycling | **MER**=Materials for energy recovery | **EET**=Exported Energy, Thermic | **EEE**=Exported Energy, Electric

5 Results

5.3 INFORMATION ON BIOGENIC CARBON CONTENT PER TON

BIOGENIC CARBON CONTENT

The following Information describes the biogenic carbon content in (the main parts of) the product at the factory gate per ton:

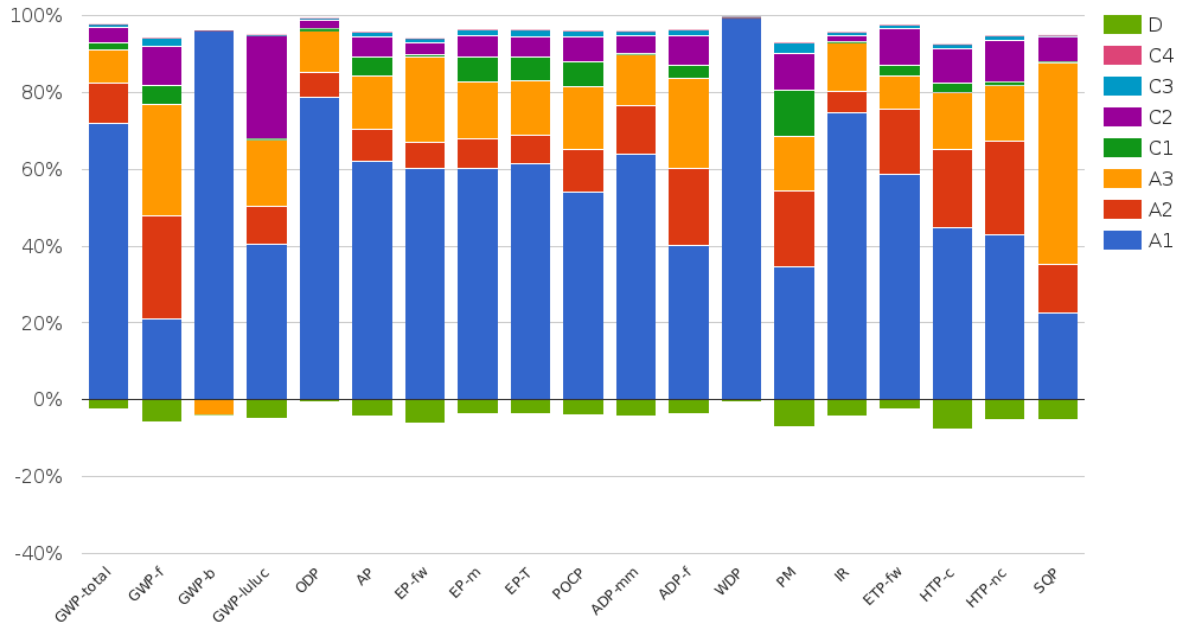
Biogenic carbon content	Amount	Unit
Biogenic carbon content in the product	0	kg C
Biogenic carbon content in accompanying packaging	1.425	kg C

UPTAKE OF BIOGENIC CARBON DIOXIDE

The following amount of carbon dioxide uptake is taken into account. Related uptake and release of carbon dioxide in downstream processes are not taken into account in this number although they do appear in the presented results. One kilogram of biogenic Carbon content is equivalent to 44/12 kg of biogenic carbon dioxide uptake.

Uptake Biogenic Carbon dioxide	Amount	Unit
Packaging	5.227	kg CO2 (biogenic)

6 Interpretation of results



Contribution analysis of the modules

The graph illustrates the impact of various factors, with the x-axis representing different indicator factors and the legends indicating the modules on the y-axis. Module A, particularly A1 (Raw Materials) and A3 (Production Phase), emerges as the primary contributor, highlighting the significant influence of raw materials, energy use, and other ancillary materials in the calculations. Module D, which focuses on product recycling and reuse, also plays a key role, with potential credits primarily coming from material recovery.

Energy-intensive cement production in A1 (Raw Materials) is a major contributor to environmental impacts, an area where the manufacturer has limited control.

6 Interpretation of results

Carbonation during the use phase (Module B) and the end-of-life phase (Modules C and D) is not considered in this assessment. However, it is important to note that, in general, carbonation contributes to a reduction in the global warming potential (GWP) of cement- and lime-based products over their full life cycle. As a result, the GWP values for the end-of-life stage could theoretically be lower than reported.

Variation of environmental performance indicators

The following table presents the deviations between the representative product ZF M20 (selected based on a worst-case approach) and other products within the masonry mortar family Group MM G. The variation has been calculated for the core environmental impact indicators across the aggregated modules (A1–A3).

Core environmental impact indicators (EN 15804+A2), A1-A3

Abbr.	Unit	ZF M20	ZM M10	ZF M10	ZM M15	ZF M15	ZM M 20	PM SUPER	MULTIMIX
GWP-total	kg CO_2 eqv.	1.71E+02	-22%	-16,2%	-12%	-5%	-6%	-21%	-6%
GWP-f	kg CO_2 eqv.	5.62E+01	-1%	-5,0%	-5%	16%	-8%	22%	56%
GWP-b	kg CO_2 eqv.	1.15E+02	-33%	-21,6%	-15%	-15%	-5%	-42%	-37%
GWP-luluc	kg CO_2 eqv.	6.79E-02	-40%	-11,5%	-36%	-6%	-34%	-34%	-35%
ODP	kg CFC 11 eqv.	6.28E-06	-50%	-16,2%	-43%	-10%	-39%	-51%	-48%
AP	mol H+ eqv.	5.78E-01	-25%	-14,4%	-16%	-6%	-12%	-28%	-20%
EP-fw	kg P eqv.	2.13E-03	-40%	-13,0%	-35%	-8%	-32%	-36%	-37%
EP-m	kg N eqv.	2.01E-01	-23%	-14,2%	-13%	-7%	-7%	-27%	-20%
EP-T	mol N eqv.	2.22E+00	-23%	-14,4%	-13%	-7%	-8%	-27%	-21%
POCP	kg NMVOC eqv.	6.24E-01	-22%	-12,8%	-13%	-6%	-8%	-21%	-14%
ADP-mm	kg Sb-eqv.	4.53E-04	-36%	-13,9%	-29%	-8%	-25%	-35%	-33%
ADP-f	MJ	1.18E+03	-20%	-9,3%	-16%	1%	-15%	-14%	-4%
WDP	m3 world eqv.	1.45E+04	-32%	-20,7%	-15%	-14%	-5%	-40%	-35%

GWP-total=Global Warming Potential total (GWP-total) | **GWP-f**=Global Warming Potential fossil fuels (GWP-fossil) | **GWP-b**=Global Warming Potential biogenic (GWP-biogenic) | **GWP-luluc**=Global Warming Potential land use and land use change (GWP-luluc) | **ODP**=Depletion potential of the stratospheric ozone layer (ODP) | **AP**=Acidification potential, Accumulated Exceedance (AP) | **EP-fw**=Eutrophication potential, fraction of nutrients reaching freshwater end compartment (EP-freshwater) | **EP-m**=Eutrophication potential, fraction of nutrients reaching marine end compartment (EP-marine) | **EP-T**=Eutrophication potential, Accumulated Exceedance (EP-terrestrial) | **POCP**=Formation

6 Interpretation of results

potential of tropospheric ozone (POCP) | **ADP-mm**=Abiotic depletion potential for non fossil resources (ADP mm) | **ADP-f**=Abiotic depletion for fossil resources potential (ADP fossil) | **WDP**=Water (user) deprecation potential, deprivation-weighted water consumption (WDP)

The EPD data highlights areas for enhancing manufacturing processes, focusing on optimizing the use of raw materials, improving energy efficiency, and maximizing the utilization of ancillary materials. These efforts contribute to fostering a more sustainable product life cycle, promoting both resource conservation and reduced environmental impact.

7 References

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