Ratio 1000 and Ratio 1000L

Gypsum plasters
by BAUMIT Bulgaria EOOD

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1. General Information

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This declaration is the type III Environmental Product Declaration (EPD) based on EN 15804 and verified according to ISO 14025. It contains information about the impact of declared construction materials on environment and their aspects verified by the independent Advisory Board according to ISO 14025.

Basically, a comparison, or evaluation of EPD data is possible only if all the compared data were created according to EN 15804.

Life Cycle analysis (LCA): Modules A1-A3, C1-C4 and Module D in accordance with EN 15804 (Gradle-to-Gate with options)
Declared durability: 100 years under normal conditions of use
Product standard: BDS EN 13279
PCR: ITB-EPD General PCR v1.4/2014
Representativeness: BG, RER, GLO

Declared unit: 1 ton gypsum plaster dry mix
LCA scope: Product stage (modules A1-A3), End-of-life stage (modules C1-C4) and Benefits and loads beyond the system boundary (module D)
Year of preparing the characteristic: 2020

2. Product Description

BAUMIT RATIO 1000

BAUMIT Ratio 1000 is a factory-made dry mix for gypsum plaster. It consists of gypsum, hydrated lime, fine sands and additives. Ratio 1000 gypsum plaster covers the requirements for gypsum plasters of group B2/50/2 as per BDS EN 13279-1. Ratio 1000 is packed in bags with unit mass 30 kg. Figure 1 shows a picture of packed Ratio 1000 gypsum machine plaster dry mix.

The gypsum plaster BAUMIT Ratio 1000 is a single-layer gypsum machine plaster for indoor use in dwelling premises and in wet rooms (moisture groups W1, W2, W3). Ratio 1000 is used for achieving smooth surfaces of quality class “Q2-Q3 smooth surface for normal and higher visual requirements”, ready for placing thin-layer fine coatings, for installation of structural wall linings, on wallpapers or for painting with matt structural paints. To achieve quality class “Q4 smooth surface for high visual requirements” additional putty layer of BAUMIT FinoGrande (gypsum putty) is recommended. Gypsum plasters can be easily applied on ceramic masonry bricks, concrete and mixed masonry.

BAUMIT RATIO 1000 L

BAUMIT Ratio 1000 L is a factory-made dry mix for gypsum plaster. It consists of gypsum, hydrated lime, fine sands and additives. Ratio 1000 L gypsum plaster covers the requirements for gypsum plasters of group B2/50/2 as per BDS EN 13279-1. Ratio 1000 L is packed in bags with unit mass 30 kg. Figure 2 shows a picture of packed Ratio 1000 L gypsum machine plaster dry mix.

The gypsum plaster BAUMIT Ratio 1000 L is a single-layer gypsum machine plaster for indoor use in dwelling premises and in wet rooms (moisture groups W1, W2, W3). Ratio 1000 L is used for achieving smooth surfaces of quality class "Q2-Q3 smooth surface for normal and higher visual requirements", ready for placing thin-layer fine coatings, for installation of structural wall linings, on wallpapers or for painting with matt structural paints. To achieve quality class "Q4 smooth surface for high visual requirements" additional putty layer of BAUMIT FinoBello, resp. BAUMITT FinoGrande (gypsum putties) is recommended.

Figure 1: Ratio 1000 gypsum plaster dry mix

Figure 2: Ratio 1000 L gypsum plaster dry mix

Table 1 lists the essential characteristics of Ratio 1000 and Ratio 1000 L gypsum plasters as per the Product specification sheet.

Table 1: Technical characteristics of Ratio 1000 and Ratio 1000 L machine gypsum plasters manufactured by BAUMIT Bulgaria

Characteristics	**Value/Class**		**Units**	**Technical specification**
	Ratio 1000	**Ratio 1000L**		
Dry density	≈ 1200	≈ 950	kg/m^3	BDS EN 13279-1
Maximum grain size	0.06	0.06	mm	BDS EN 13279-1
Compressive strength (28 day)	> 2.5	> 2.0	N/mm²	BDS EN 13279-1
Tensile strength (28 day)	> 1.0	> 1.0	N/mm²	BDS EN 13279-1
Thermal conductivity, $\lambda_{10,\ dry}$	≈ 0.47	≈ 0.34	W/(m.K)	BDS EN 13279-1
Diffusion resistance factor μ	≈ 10	≈ 10		
Production rate	≈ 10	≈ 8	kg/m^2 for 10 mm thickness of the plaster	
Minimal thickness of the plaster	walls: 10 roof: 8	walls: 10 roof: 8	mm mm	
Maximal thickness of the plaster	25	25	mm in one working motion	

3. LCA Information

FUNCTIONAL UNIT	1 ton machine gypsum plaster dry mix
SYSTEM BOUNDARIES	Cradle to Gate+options: Modules A1-A3, C1-C4 and Module D
DECLARED DURABILITY	100 years under normal conditions of use
CUT-OFF CRITERIA	As per EN 15804, in the case that there is not enough information, the process energy and materials representing less than 1% of the energy and mass used per module can be excluded (if they do not cause significant impacts). The addition of all the inputs and outputs excluded is less than 5% of the whole mass and energy used, as well of the emissions to environment occurred. Flows related to human activities such as employee transport are excluded. In accordance with EN 15804 the construction of plants, production of machines and transportation systems are excluded. Environmental burden of the administrative building is partly considered. Some additives in very small amounts (less than 0.3 %) are excluded due to lack of enough data and negligible potential environmental impacts. The total sum of omitted processes does not exceed 5% of the whole mass of inputs and outputs.
ASSUMPTIONS AND LIMITATIONS	Generic data from ecoinvent v.3.6 database is used to model the gypsum plaster components that are delivered by external suppliers and the manufacturer does not have influence on their production processes. Packaging materials and packaging waste are considered in the assessment of all components of Ratio 1000 and Ratio 1000 L.
GEOGRAPHICAL COVERAGE AND TIME PERIOD	All data related to the gypsum plasters is collected from BAUMIT Bulgaria EOOD and represents the manufacturing process in 2018. Assessment of transport of all components covers all used transport types, external and internal transport activities.
DATA QUALITY	The information on the production process of the plasters is collected from BAUMIT Bulgaria EOOD. Information on the transport and composition of components is provided by BAUMIT Bulgaria EOOD. Information on the production process of additives is accounted as presented in ecoinvent v.3.6 database.
ALLOCATION	The factory of BAUMIT Bulgaria EOOD in Elin Pelin produces various construction products for external and internal finishing layers of buildings. The manufacturing processes for both gypsum plasters are equivalent with slight variance in terms of working regime of drying and mixing stations. Even though, allocation is done regarding energy and fuel use, and generated waste. Environmental impacts, resource use and waste generation are calculated based on yearly data about the inputs/outputs and the yearly production of gypsum plasters for 2018.

4. Manufacturing process

The received fraction of crushed stone is 20/60 mm and it is dried in an oven, if necessary. This fraction is then crushed in a coarse crusher and subsequently sieved into seven smaller fractions. The smaller fractions are fed into pipelines and then carried to silos.

The other ingredients – gypsum, cement, hydrated lime and additives are delivered as dry substances. Gypsum, cement, hydrated lime and expanded perlite for Ratio 1000 L are delivered in mobile (transportable silos) and are discharged into the factory silos (in the factory tower) through pneumatic compressed air pipe system. The additives are delivered in paper bags or big bags and are also discharged into smaller silos in the factory tower.

The additives are delivered in paper bags or big bags and are also discharged into smaller silos in the factory tower.

After the predefined quantity of each material is set, the materials are dosed and released on gravity pipelines that take them to a mixing facility. The ready mix is then transported to a machine for bag-filling. Both Ratio 1000 and Ratio 1000 L are packed in bags with mass 30 kg. The sealed bags are transported to the palletizing station through conveying belt. The bags are arranged on the pallets and covered by elastic polyethylene film. The pallets are transported by forklifts to an outside storage space.

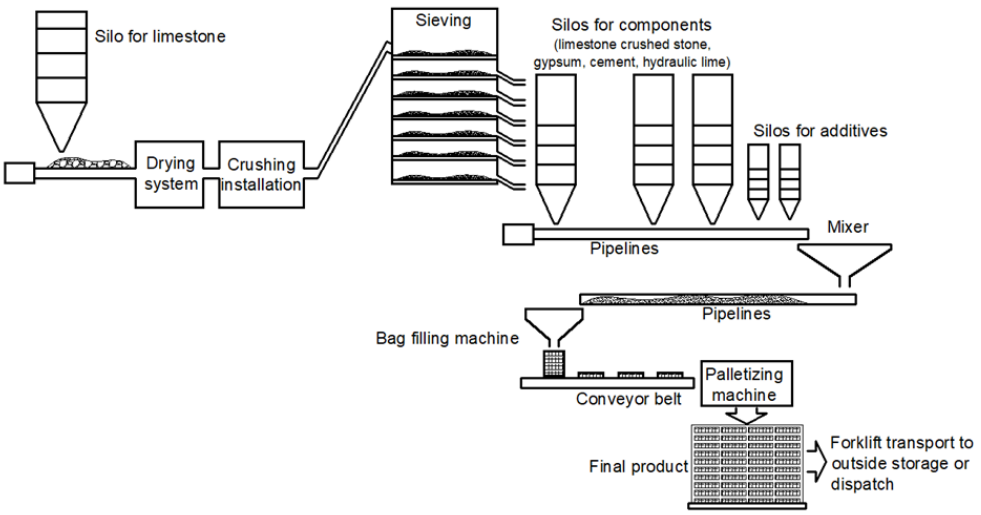

Figure 3: Production process of Ratio 1000 and Ratio 1000 L gypsum plasters

5. System boundaries

Module A1: Raw materials supply and transport
Module A1 describes the acquisition of raw materials and manufacturing of pre-products. The production processes of the limestone crushed stone, Portland cement, hydrated lime, expanded perlite and additives are considered using referent data for the ecoinvent database. Production of packaging materials is also considered using referent data from the ecoinvent database.

Module A2: Transport of raw materials to the production site
The transport to the factory of the FGD gypsum, Portland cement, hydrated lime, limestone crushed stone, expanded perlite, additives and packaging materials is considered using real data from the manufacturer.

Module A3: Manufacturing
Module A3 considers the actual production process. This includes the process of crushing, drying, sieving, dosing, packaging and palletizing. Energy and fuel consumption are considered in full based on 1-year consumption data provided by the manufacturer.

Module C1: Deconstruction/Demolition of the building
Module C1 describes processing of plastered building elements with gypsum mortar during the deconstruction/demolition as part of the deconstruction/demolition process of the entire building.

The deconstruction/demolition of the plastered/rendered walls with gypsum plaster is considered as a part of the entire demolition process of the whole building. There are no specific demolition/deconstruction methods, applied in Bulgaria, with regards to gypsum plasters, because during the demolition process the major share of plaster (estimated as 70% to 80%) is detached by wet method (usually manually) and the rest (20% to 30%) contribute to the C&DW coming from of the substrate material. When the plasters are wetted and detached, they are collected separately as waste code 17 08 02 (as per the European Waste Catalogue EWC) and transported to a special purpose storage site because gypsum is non-inert material. There are no requirements in the national legislation for the material recovery degree of that C&DW code. When the plaster is part of the debris attached to the substrate, they form waste code 17 01 01 (concrete) and 17 01 02 (bricks) and are transported to a treatment plant for recovery operations.

Module C2: Transport to waste recovery facility
Module C2 refers to the transport of the C&D waste containing gypsum plaster to a facility for waste recovery or storage depot. Data is assembled based on a developed scenario.

The transport of waste containing gypsum plasters is transported to a special facility (landfill) for storage of gypsum waste or recovery facility (recycling plant).
The following assumptions are made to calculate the impacts of this module:

- 75% is transported to a landfill as waste code 17 08 02;
- 25% is transported to a recycling plant as part of waste 17 01 01 or 17 01 02.

Table 2: Information on assumed transport for module C2

Parameter	Data
Transport of waste by	Lorry of the size class 7.5-16 tons, Euro IV emissions class.
Distance of transportation	25 km

Module C3: Waste processing
Module C3 accounts for the environmental impacts during the processing of C&D waste containing gypsum plaster at the waste recovery facility. Data is assembled based on a developed scenario.

The gypsum plaster-containing waste for recovery operations is classified as ‘non-hazardous waste’ of code 17 01 01 when the substrate is concrete element) or code 17 01 02 when the substrate is masonry wall.

In order to recover materials for reuse from both waste streams, gypsum content must be separated because of its non-inert nature. To achieve this, the recycling process includes crushing, screening and separating of the gypsum particles (fraction <4 mm) from the substrate. No preliminary treatment,

additional sieving to fractions or post-treatment (washing, air cyclone) are applied. In Bulgaria, the recycling is usually performed in a treatment plant, but the main recycling equipment is mobile. After the gypsum is separated, it is stored at a special storage site because there is no established practice yet for the use of this material.

Taking into consideration that the gypsum plaster is only about 1.6% of the waste code 17 01 01, subject to that recycling and it is a friable material, its contribution to the recycling-related impacts is to be neglected

Module C4: Disposal
Module C4 considers the effects from gypsum plaster containing C&D waste that is disposed. Data is assembled based on developed scenario.

When the gypsum plaster is collected as a waste code 17 08 02 it is transported to special landfill, receiving non-inert gypsum waste. At the landfill, the waste is unloaded by a loader. When collected as waste code 17 01 01 or 17 01 02, after the separation of gypsum fraction, this material is classified also as 17 08 02 and is transported and unloaded following the same procedure.

Module D: Benefits and loads beyond the system boundary
Module D regards the effects and impact of the secondary material derived from recycling of C&D waste containing gypsum plaster.

The recycled crushed stone fraction of concrete C&DW code 17 01 01, containing gypsum plaster contributes to the saving of natural materials and to the decrease of landfilling but only in terms of recovery of concrete. However, the positive impacts from this recycling can hardly be associated with the content of gypsum plaster in the total fraction because of the small content and because gypsum itself is currently not recycled in Bulgaria.

6. LCA Results

Declared unit
The declaration refers to 1 ton of gypsum plaster dry mix.

Table 3: Description of the system boundary

Environmental assessment information (☒ – Included in LCA, MNA – Module not assessed)															
Product stage			Construction process		Use stage							End of life				Benefits and loads beyond the system boundary
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Raw material supply	Transport	Manufacturing	Transport to construction site	Construction – assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction/ demolition	Transport	Waste processing	Disposal	Reuse- Recovery- Recycling potential
☒	☒	☒	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	☒	☒	☒	☒	☒

The following tables provide the LCA results on the evaluated environmental categories. A list of the used abbreviations is given below:

GWP-total	Global warming potential total (sum of GWP-fossil, GWP-biogenic and GWP-luluc)
GWP-fossil	Global warming potential fossil fuels
GWP-biogenic	Global warming potential biogenic
GWP-luluc	Global warming potential land use and land use change
ODP	Ozone depletion potential
AP	Acidification potential
EP-freshwater	Eutrophication potential, fraction of nutrients reaching freshwater end compartment
EP-marine	Eutrophication potential, fraction of nutrients reaching marine end compartment
EP-terrestrial	Eutrophication potential, Accumulated Exceedance
POCP	Photochemical ozone creation potential
ADP-minerals & metals	Abiotic depletion potential for non-fossil resources
ADP-fossil fuels	Abiotic depletion potential of fossil resources
RPER	Renewable primary energy resources
NRPER	Non-renewable primary energy resources
ETP-fw	Eco-toxilcity freshwater (Potential Comparative Toxic Unit for ecosystems)
HTP-c	Human toxicity, cancer effects (Potential Comparative Toxic Unit for humans)
HTP-nc	Human toxicity, non-cancer effects (Potential Comparative Toxic Unit for humans)
IRP	Ionizing radiation, human health (Potential Human exposure efficiency relative to U-235)
SQP	Land use related impacts/ Soil quality (Potential soil quality index)
PM	Particulate Matter emissions (Potential incidence of disease due to PM emissions)

Table 4: Environmental information about 1 ton Ratio 1000 gypsum plaster

Environmental impacts for 1 ton Ratio 1000									
Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D
GWP-total	kg CO_2–eq.	3.67E+01	2.32E+01	1.76E+01	0.00E+00	7.81E+00	7.50E+00	1.11E+00	0.00E+00
GWP-fossil	kg CO_2–eq.	3.77E+01	2.32E+01	1.76E+01	0.00E+00	7.81E+00	7.49E+00	1.11E+00	0.00E+00
GWP-biogenic	kg CO_2–eq.	-9.88E-01	0.00E+00	1.33E-02	0.00E+00	0.00E+00	9.00E-04	7.52E-05	0.00E+00
GWP-luluc	kg CO_2–eq.	3.04E-03	1.90E-04	1.35E-05	0.00E+00	5.73E-05	1.79E-05	2.59E-06	0.00E+00
ODP	kg CFC 11–eq.	3.24E-06	5.34E-06	8.35E-07	0.00E+00	1.72E-06	1.60E-06	2.38E-07	0.00E+00
AP	mol H^+–eq.	1.10E-01	5.40E-02	1.25E-01	0.00E+00	1.69E-02	1.30E-02	1.89E-03	0.00E+00
EP-freshwater	kg PO_4–eq.	6.01E-03	1.72E-03	3.96E-02	0.00E+00	5.50E-04	3.40E-04	4.01E-05	0.00E+00
EP-marine	kg N–eq.	2.56E-02	7.45E-03	1.84E-02	0.00E+00	2.31E-03	1.76E-03	2.50E-04	0.00E+00
EP-terrestrial	mol N–eq.	2.89E-01	7.92E-02	1.10E-01	0.00E+00	2.45E-02	1.88E-02	2.72E-03	0.00E+00
POCP	kg NMVOC–eq.	7.64E-02	4.00E-02	3.25E-02	0.00E+00	1.23E-02	1.03E-02	1.51E-03	0.00E+00
ADP-minerals & metals	kg Sb–eq.	2.20E-04	6.00E-04	4.80E-05	0.00E+00	2.00E-04	1.15E-05	1.69E-06	0.00E+00
ADP-fossil	MJ	3.21E+02	3.50E+02	2.76E+02	0.00E+00	1.12E+02	1.01E+02	1.50E+01	0.00E+00
WDP	m^3	9.09E+02	3.28E+02	3.86E+03	0.00E+00	1.03E+02	4.47E+01	3.22E+00	0.00E+00

Additional environmental impacts for 1 ton Ratio 1000									
Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D
ETP-fw	CTUe	7.69E+00	1.21E+01	4.13E-01	0.00E+00	2.47E+00	6.05E-01	8.99E-02	0.00E+00
HTP-c	CTUh	7.60E-09	7.16E-09	1.68E-09	0.00E+00	3.47E-09	4.73E-09	7.02E-10	0.00E+00
HTP-nc	CTUh	5.85E-07	4.47E-07	8.14E-08	0.00E+00	1.29E-07	5.05E-08	6.82E-09	0.00E+00
IRP	kBq U-235-eq.	2.32E+00	1.82E+00	3.59E-01	0.00E+00	5.78E-01	5.02E-01	6.90E-02	0.00E+00
SQP	-	8.63E+02	3.93E+02	4.28E+01	0.00E+00	6.94E+01	5.90E+00	7.76E-01	0.00E+00
PM	Disease incidence	1.16E-06	1.60E-06	8.79E-07	0.00E+00	4.25E-07	3.52E-07	5.26E-08	0.00E+00

Resource use for 1 ton Ratio 1000									
Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D
RPER excluding RPER used as raw materials	MJ	5.51E+01	4.92E+00	2.12E+01	0.00E+00	1.54E+00	8.14E-01	8.22E-02	0.00E+00
RPER used as raw materials	MJ	2.39E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	7.89E+01	4.92E+00	2.12E+01	0.00E+00	1.54E+00	8.14E-01	8.22E-02	0.00E+00
NRPER excluding NRPER used as raw materials	MJ	3.52E+02	3.57E+02	4.26E+02	0.00E+00	1.15E+02	1.03E+02	1.51E+01	0.00E+00
NRPER used as raw materials	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	3.52E+02	3.57E+02	4.26E+02	0.00E+00	1.15E+02	1.03E+02	1.51E+01	0.00E+00
Use of secondary material	kg	3.10E+00	1.40E-01	2.97E-02	0.00E+00	5.59E-02	5.11E-02	7.46E-03	0.00E+00
Use of renewable secondary fuels	MJ	9.19E-01	1.76E-01	8.62E-01	0.00E+00	5.36E-02	3.61E-02	2.02E-03	0.00E+00
Use of non-renewable secondary fuels	MJ	1.24E-01	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	m^3	2.04E-01	2.55E-02	1.22E-01	0.00E+00	7.75E-03	4.07E-03	4.20E-04	0.00E+00

Output flows and waste categories for 1 ton Ratio 1000									
Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	8.29E-01	3.57E-01	2.26E-01	0.00E+00	1.31E-01	1.15E-01	1.64E-02	0.00E+00
Non-hazardous waste disposed	kg	2.74E+01	2.67E+01	0.00E+00	0.00E+00	5.62E+00	1.53E+00	1.75E-01	0.00E+00
Radioactive waste disposed	kg	1.34E-03	2.44E-03	2.13E-03	0.00E+00	7.80E-04	7.20E-04	1.10E-04	0.00E+00
Components for re-use	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
Materials for recycling	kg	2.58E+00	1.16E-01	1.84E+01	0.00E+00	4.83E-02	4.97E-02	7.33E-03	0.00E+00
Materials for energy recovery	kg	1.32E-02	1.94E-03	8.48E-03	0.00E+00	6.00E-04	3.70E-04	2.27E-05	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Biogenic carbon content	Unit	
Biogenic carbon content in product	kg C	1.60E+00
Biogenic carbon content in accompanying packaging	kg C	3.62E+01

Table 5: Environmental information about 1 ton Ratio 1000 L gypsum plaster

Environmental impacts for 1 ton Ratio 1000 L									
Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D
GWP-total	kg CO_2–eq.	7.88E+01	2.79E+01	1.49E+01	0.00E+00	7.81E+00	7.50E+00	1.11E+00	0.00E+00
GWP-fossil	kg CO_2–eq.	7.93E+01	2.79E+01	1.49E+01	0.00E+00	7.81E+00	7.49E+00	1.11E+00	0.00E+00
GWP-biogenic	kg CO_2–eq.	-5.08E-01	0.00E+00	1.13E-02	0.00E+00	0.00E+00	9.00E-04	7.52E-05	0.00E+00
GWP-luluc	kg CO_2–eq.	3.60E-03	2.30E-04	1.14E-05	0.00E+00	5.73E-05	1.79E-05	2.59E-06	0.00E+00
ODP	kg CFC 11–eq.	6.63E-06	6.41E-06	7.08E-07	0.00E+00	1.72E-06	1.60E-06	2.38E-07	0.00E+00
AP	mol H^+–eq.	3.93E-01	6.49E-02	1.06E-01	0.00E+00	1.69E-02	1.30E-02	1.89E-03	0.00E+00
EP-freshwater	kg PO_4–eq.	1.74E-02	2.07E-03	3.36E-02	0.00E+00	5.50E-04	3.40E-04	4.01E-05	0.00E+00
EP-marine	kg N–eq.	6.52E-02	8.93E-03	1.56E-02	0.00E+00	2.31E-03	1.76E-03	2.50E-04	0.00E+00
EP-terrestrial	mol N–eq.	6.96E-01	9.49E-02	9.33E-02	0.00E+00	2.45E-02	1.88E-02	2.72E-03	0.00E+00
POCP	kg NMVOC–eq.	1.97E-01	4.77E-02	2.76E-02	0.00E+00	1.23E-02	1.03E-02	1.51E-03	0.00E+00
ADP-minerals & metals	kg Sb–eq.	4.00E-04	7.40E-04	4.07E-05	0.00E+00	2.00E-04	1.15E-05	1.69E-06	0.00E+00
ADP-fossil	MJ	8.19E+02	4.20E+02	2.34E+02	0.00E+00	1.12E+02	1.01E+02	1.50E+01	0.00E+00
WDP	m^3	1.31E+03	3.99E+02	3.28E+03	0.00E+00	1.03E+02	4.47E+01	3.22E+00	0.00E+00

Additional environmental impacts for 1 ton Ratio 1000 L									
Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D
ETP-fw	CTUe	1.06E+01	1.43E+01	7.66E-01	0.00E+00	2.47E+00	6.05E-01	8.99E-02	0.00E+00
HTP-c	CTUh	2.20E-08	8.67E-09	4.59E-09	0.00E+00	3.47E-09	4.73E-09	7.02E-10	0.00E+00
HTP-nc	CTUh	1.42E-06	5.39E-07	8.81E-07	0.00E+00	1.29E-07	5.05E-08	6.82E-09	0.00E+00
IRP	kBq U-235-eq.	3.63E+00	2.19E+00	7.29E+00	0.00E+00	5.78E-01	5.02E-01	6.90E-02	0.00E+00
SQP	-	1.37E+03	4.52E+02	1.50E+01	0.00E+00	6.94E+01	5.90E+00	7.76E-01	0.00E+00
PM	Disease incidence	4.95E-06	1.90E-06	1.69E-07	0.00E+00	4.25E-07	3.52E-07	5.26E-08	0.00E+00

Resource use for 1 ton Ratio 1000 L									
Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D
RPER excluding RPER used as raw materials	MJ	9.08E+01	5.95E+00	1.80E+01	0.00E+00	1.54E+00	8.14E-01	8.22E-02	0.00E+00
RPER used as raw materials	MJ	3.31E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	1.24E+02	5.95E+00	1.80E+01	0.00E+00	1.54E+00	8.14E-01	8.22E-02	0.00E+00
NRPER excluding NRPER used as raw materials	MJ	8.70E+02	4.29E+02	3.62E+02	0.00E+00	1.15E+02	1.03E+02	1.51E+01	0.00E+00
NRPER used as raw materials	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	8.70E+02	4.29E+02	3.62E+02	0.00E+00	1.15E+02	1.03E+02	1.51E+01	0.00E+00
Use of secondary material	kg	3.56E+00	1.69E-01	2.52E-02	0.00E+00	5.59E-02	5.11E-02	7.46E-03	0.00E+00
Use of renewable secondary fuels	MJ	1.27E+00	2.13E-01	7.32E-01	0.00E+00	5.36E-02	3.61E-02	2.02E-03	0.00E+00
Use of non-renewable secondary fuels	MJ	1.40E-01	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	m^3	4.08E-01	3.06E-02	1.03E-01	0.00E+00	7.75E-03	4.07E-03	4.20E-04	0.00E+00

Output flows and waste categories for 1 ton Ratio 1000 L									
Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	3.01E+00	4.30E-01	1.92E-01	0.00E+00	1.31E-01	1.15E-01	1.64E-02	0.00E+00
Non-hazardous waste disposed	kg	8.38E+01	3.11E+01	0.00E+00	0.00E+00	5.62E+00	1.53E+00	1.75E-01	0.00E+00
Radioactive waste disposed	kg	2.06E-03	2.93E-03	1.81E-03	0.00E+00	7.80E-04	7.20E-04	1.10E-04	0.00E+00
Components for re-use	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
Materials for recycling	kg	2.87E+00	1.41E-01	1.84E+01	0.00E+00	4.83E-02	4.97E-02	7.33E-03	0.00E+00
Materials for energy recovery	kg	1.69E-02	2.35E-03	7.19E-03	0.00E+00	6.00E-04	3.70E-04	2.27E-05	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Biogenic carbon content	**Unit**	
Biogenic carbon content in product	kg C	2.00E+00
Biogenic carbon content in accompanying packaging	kg C	3.63E+01

7. Interpretation

Production processes of both Ratio 1000 and Ratio 1000 L use the same technology and production facilities. Comparing the results for the product stage (modules A1-A3) of the two plasters, it can be noticed that the environmental impacts of Ratio 1000 L are higher. The increase varies per indicator and is around 35-40% for ADPE, PERT; 50% for GWP, ODP, ADPF, PENRT and FW; 75-85% for POCP, EP-marine and EP-terrestrial, and almost 100% for AP. Indicators assessing water use (FW) and water deprivation (WDP) are identical. The main source of the higher results for Ratio 1000 L comes from the use of expanded perlite which appears to be a significant contributor. Difference in proportions of the components also take effect on the environmental footprint. For example, even small increase in the amount of cement in Ratio 1000 L leads to increase in almost all environmental indicator, because the production process of cement is very energy intensive. On the other hand, this material is used in relatively small quantities, so the overall effect is small. For all indicators between 30-50% of the total product stage values for Ratio 1000 are formed in module A1 (raw materials production and processing). For Ratio 1000 L the range is higher because of the perlite- 50-75%. Packaging materials form small contributions (less than 3%) on almost all indicators.

Transport (module A2) and electricity (module A3) are significant for all assessed indicators. The contribution from transport can be mostly noticed at GWP, ODP, EP, POCP, ADPE, ADPF and use of non-renewable energy resources.

Electricity production forms big shares in the indicators assessing GWP, AP, all EP indicators, ADPF, use of non-renewable energy resources and both water use indicators. The values on the total use energy resourced for both renewables and non-renewables are by 40% higher for Ratio 1000 L mainly because of perlite and different proportion of ingredients.

Fuels (natural gas, LPG) used during in the plasters production altogether form negligible shares (less than 1%) in the environmental indicators. They are also insignificant in terms of energy and water use.

The environmental impact of modules C1-C4 is comparatively small. The indicators of importance are the abiotic depletion potential for fossil resources (ADPF) and the use of non-renewable resources (PENRT) and, to a smaller extent, the carbon footprint (GWP), i.e. indicators related to fuels use.

8. EPD verification

The process of verification of an EPD is in accordance with ISO 14025, clause 8.1.3 and ISO 21930, clause 9. After verification this EPD is valid for a 5 years period. EPD does not have to be recalculated after 5 years if the underlying data has not changed significantly.

CEN standard EN 15804 serves as the core PCR along with ITB PCR A
Independent verification corresponding to ISO 14025 (subclause 8.1.3) ☒ external ☐ internal
Verification of EPD: PhD Eng. Halina Prejzner, PhD Eng. Justyna Tomaszewska LCI audit and input data verification: PhD Eng. Roumiana Zaharieva, PhD Eng. Yana Kancheva, PhD Eng. Justyna Tomaszewska LCA auditor: PhD Eng. Roumiana Zaharieva, PhD Eng. Yana Kancheva Verification of procedures and declaration: PhD Eng. Justyna Tomaszewska

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образците, по които се предоставя информация за дейностите по отпадъците, както и реда за водене на публични регистри)

Signature Not Verified
Dokument podpisany przez Agnieszka Winkler-Skalna; ITB
Data: 2021.09.10 13:50:39 CEST

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dr inż. Agnieszka Winkler-Skalna

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