EPD Grey Cements – Holcim Romania

ISO 14020; ISO 14025; ISO 14040; ISO 14044; EN 15804; EN 16908; ISO 21930:

Edition 1; Revision 1: June 2020

1. Programme information

Programme Operator:	The International EPD® System EPD International AB Box 210 60 SE-100 31 Stockholm Sweden www.environdec.com info@environdec.com
Declaration Holder	Holcim Romania 169 A Calea Floreasca Street Building B Floor 7, District 1, RO 014459, Bucharest, Romania Phone: +4021 231 77 14/15 Contact person: Mihaela Odangiu Email: Mihaela.Odangiu@lafargeholcim.com Company identification information: Trade Register No: J40/399/2002 VAT number: RO 12253732 Subscribed and paid-in capital: LEI 205,268,057
LCA Consultant	Intertek Health, Environmental & Regulatory Services 33 Cavendish Square London W1G 0PS www.intertek.com Contact person: Kim Allbury Email: kim.allbury@intertek.com
EPD Registration number	S-P-00527
Publication Date	2014-05-16
Version Date	2020-06-03
Valid Until	2025-06-04

Product group classification: UN CPC 3744 CEMENT

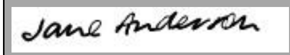
Product category rules (PCR): *CEN Standard EN 15804 served as the core PCR. PCR 2012:01 Construction Products and Construction Services Version 2.3 2028-11-15, Sub-PCR-H Cement and building limes 2018-11-22*

PCR review was conducted by: *The Technical Committee of the International EPD System. Chair: Massimo Marino. Contact via info@environdec.com*

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

☐ EPD process certification ☒ EPD verification

Third party verifier: *Jane Anderson, ConstructionLCA Ltd*



Approved by: The International EPD® System

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

☐ Yes ☒ No

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

2. Company Information

This cradle-to gate environmental product declaration is for 1000 kg of average grey cement production from the locations fully owned and operated by Holcim in Romania, as follows:

Alesd Cement Plant
Street Viitorului, No.2, Postal code 417022
Chistag Village, Bihor County, Romania

Campulung Cement Plant
Postal code 117805 Valea Mare Pravat
Village, Arges County, Romania

Holcim Romania is the study commissioner and EPD owner. In order to respect the principles of sustainable development, the company implemented, maintained and continuously improves an effective integrated management system, in accordance with the applicable reference standards: SR EN ISO 9001:2015, SR EN ISO 14001:2015, SR ISO 45001:2018; BES 6001:2016. Our aim is to make a positive contribution to the built environment now and for future generations, thus we commit to spearhead the transition towards low-carbon construction and be the leader in promoting a circular economy, from alternative fuels to recycling

Sustainable development
We, Holcim Romania are committed to health and safety as our overarching value, thus we conduct our business with a goal of zero harm to people. We provide high quality products and services, through our manufacturing excellence strategy. We strive to minimize our impact on the environment and in particular on the limited natural resources. We ensure that all constituent materials used within our products are responsibly sourced and used in the most appropriate and sustainable manner.

Further information regarding Holcim Romania and its sustainability strategy can be accessed from www.holcim.ro/en/sustainable-development.

3. Product Information

This EPD provides information concerning all types of grey cements (Portland cements, Portland-composite cements, Portland-limestone cements and Masonry cement) produced by Holcim in Romania as detailed in Table 1.

Cement is a hydraulic binder which sets after a few hours when mixed with water, and then hardens in a few days into a solid, strong construction material. Therefore, it is used for the production of concrete, mortars, grouts, etc. Cement is classified under the following UN CPC group and class/subclass: UN CPC 3744 CEMENT.

The geographical scope of this EPD is European.

Cement type (product standard)	Significant characteristic	Recommended use	
		Application domain	Market segment
1. Portland cement with high initial strength type **CEM I 52.5R** (SR EN 197-1:2011)	high early strength	reinforced or pre-stressed concrete elements, casted in situ or precast; AAC; sprayed concrete; injections	RMX (special technologies), precast elements and AAC (gasbeton)
2. Portland cement with high initial strength type **CEM I 42.5R** (SR EN 197-1:2011)	very good strengths; short setting time.	reinforced or pre-stressed concrete elements, casted in situ or precast ; infrastructure works (concrete pavements). Adhesives and dry mortars	RMX (especially for concrete pavements), precast concrete products, dry mortars and adhesives
3. Portland-limestone Cement with high initial strength, type **CEM II/A-LL 42,5 R** (SR EN 197-1:2011)	good strengths; significant fineness (improving workability)	Reinforced concrete	RMX – civil and industrial buildings
4. Portland-composite cement with high initial strength, type **CEM II/B-M(S-LL) 42,5 R**	resistance to aggressive environments	reinforced concrete	lower evolution of strength and good final strength; significant

Cement type (product standard)	Significant characteristic	Recommended use	
		Application domain	Market segment
(SR EN 197-1:2011)			fineness (improving workability)
5. Portland-composite cement with high initial strength, type **CEM II/B-M(S-V- LL) 42,5 R** (SR EN 197-1:2011)	resistance to aggressive environments	reinforced concrete	lower evolution of strength and good final strength; significant fineness (improving workability)
6 . Portland-composite cement with ordinary initial strength and low hydration heat, type **CEM II/B-M(S-V) 42,5 N-LH**, (SR EN 197-1:2011)	low hydration heat	reinforced concrete	resistance to aggressive environments
7. Portland-composite cement with ordinary initial strength and low hydration heat, type **CEM II/B-M(S-LL) 42,5 N L-H** (SR EN 197-1:2011)	low hydration heat	massive construction	RMX - civil and industrial buildings; work of arts
8. Portland-composite cement with high initial strength, type **CEM II/ B-M(S-LL) 32,5 R** (SR EN 197-1:2011)	lower evolution of strength and good final strength; significant fineness (improving workability)	reinforced concrete	lower evolution of strength and good final strength; significant fineness (improving workability)
9. Portland-composite cement with high initial strength, type **CEM II/B-M(S-V) 32,5 R** (SR EN 197-1:2011)	low hydration heat	massive construction	RMX - civil and industrial buildings; work of arts
10. Portland-composite cement with high initial strength, type **CEM II/B-LL 32,5 R** (SR EN 197-1:2011)	lower evolution of strength and good final strength; significant fineness (improving workability)	reinforced concrete	lower evolution of strength and good final strength; significant fineness (improving workability)
11. Masonry cement type **MC 12,5**, trade name TENCO (SR EN 413-1:2011)	water retaining; air content (ensuring good workability and adhesion)	masonry and plastering/rendering works; usual screeds	Individual users; local works

Table 1: Product Identification and Usage

3.1 Technical Specification of Product

The basic mechanical, physical and chemical requirements of the grey cements are as specified in EN 197-1:2011 and are shown in Table 2a and Table 2b.

Strength class	Compressive strength MPa				Initial setting time	Soundness (expansion)
	Early strength		Standard strength			
	2 days	7 days	28 days		min	mm
32,5 L[a]	-	≥ 12,0	≥ 32,5	≤ 52,5	≥ 75	≤ 10
32,5 N	-	≥ 16,0				
32,5 R	≥ 10,0	-				
42,5 L[a]	-	≥16,0	≥ 42,5	≤ 62,5	≥ 60	
42,5 N	≥ 10,0	-				
42,5 R	≥ 20,0	-				
52,5 L[a]	≥ 10,0	-	≥ 52,5	-	≥ 45	
52,5 N	≥ 20,0	-				
52,5 R	≥ 30,0	-				

a Strength class only defined for CEM III cements.

Table 2a: Mechanical and physical requirements given as characteristic values

1	2	3	4	5
Property	**Test reference**	**Cement type**	**Strength class**	**Requirements[a]**
Loss on ignition	EN 196-2	CEM I CEM III	All	≤ 5,0 %
Insoluble residue	EN 196-2 [b]	CEM I CEM III	All	≤ 5,0 %
Sulfate content (as SO_3)	EN 196-2	CEM I CEM II[c] CEM IV CEM V	32,5 N 32,5 R 42,5 N	≤ 3,5 %
			42,5 R 52,5 N 52,5 R	≤ 4,0 %
		CEM III[d]	All	
Chloride content	EN 196-2	all [e]	All	≤ 0,10 %[f]
Pozzolanicity	EN 196-5	CEM IV	All	Satisfies the test

a Requirements are given as percentage by mass of the final cement.

b Determination of residue insoluble in hydrochloric acid and sodium carbonate.

c Cement types CEM II/B-T and CEM II/B-M with a T content > 20 % may contain up to 4,5 % sulfate (as SO_3) for all strength classes.

d Cement type CEM III/C may contain up to 4,5 % sulfate.

e Cement type CEM III may contain more than 0,10 % chloride but in that case the maximum chloride content shall be stated on the packaging and/or the delivery note.

f For pre-stressing applications cements may be produced according to a lower requirement. If so, the value of 0,10 % shall be replaced by this lower value which shall be stated in the delivery note.

Table 2b: Chemical requirements given as characteristic values

3.2 Content Declaration

The composition of grey cements manufactured by Holcim Romania is in accordance with cement standard SR EN 197-1:2011 (see Table 3a), and SR EN 413-1:2011 (see Table 3b).

Table 3a: Cement composition as stipulated in SR EN 197-1:2011

Main types	Notation of the 27 products (types of common cement)		Composition (percentage by mass[a])										
			Main constituents										Minor additional constituents
			Clinker	Blast-furnace slag	Silica fume	Pozzolana		Fly ash		Burnt shale	Limestone		
						natural	natural calcined	siliceous	calca-reous				
			K	S	D[b]	P	Q	V	W	T	L	LL	
CEM I	Portland cement	CEM I	95-100	–	–	–	–	–	–	–	–	–	0-5
CEM II	Portland-slag cement	CEM II/A-S	80-94	6-20	–	–	–	–	–	–	–	–	0-5
		CEM II/B-S	65-79	21-35	–	–	–	–	–	–	–	–	0-5
	Portland-silica fume cement	CEM II/A-D	90-94	–	6-10	–	–	–	–	–	–	–	0-5
	Portland-pozzolana cement	CEM II/A-P	80-94	–	–	6-20	–	–	–	–	–	–	0-5
		CEM II/B-P	65-79	–	–	21-35	–	–	–	–	–	–	0-5
		CEM II/A-Q	80-94	–	–	–	6-20	–	–	–	–	–	0-5
		CEM II/B-Q	65-79	–	–	–	21-35	–	–	–	–	–	0-5
	Portland-fly ash cement	CEM II/A-V	80-94	–	–	–	–	6-20	–	–	–	–	0-5
		CEM II/B-V	65-79	–	–	–	–	21-35	–	–	–	–	0-5
		CEM II/A-W	80-94	–	–	–	–	–	6-20	–	–	–	0-5
		CEM II/B-W	65-79	–	–	–	–	–	21-35	–	–	–	0-5
	Portland-burnt shale cement	CEM II/A-T	80-94	–	–	–	–	–	–	6-20	–	–	0-5
		CEM II/B-T	65-79	–	–	–	–	–	–	21-35	–	–	0-5
	Portland-limestone cement	CEM II/A-L	80-94	–	–	–	–	–	–	–	6-20	–	0-5
		CEM II/B-L	65-79	–	–	–	–	–	–	–	21-35	–	0-5
		CEM II/A-LL	80-94	–	–	–	–	–	–	–	–	6-20	0-5
		CEM II/B-LL	65-79	–	–	–	–	–	–	–	–	21-35	0-5
	Portland-composite cement[c]	CEM II/A-M	80-88	<------------------------- 12-20 ------------------------->									0-5
		CEM II/B-M	65-79	<------------------------- 21-35 ------------------------->									0-5
CEM III	Blast furnace cement	CEM III/A	35-64	36-65	–	–	–	–	–	–	–	–	0-5
		CEM III/B	20-34	66-80	–	–	–	–	–	–	–	–	0-5
		CEM III/C	5-19	81-95	–	–	–	–	–	–	–	–	0-5
CEM IV	Pozzolanic cement[c]	CEM IV/A	65-89	–	<------------ 11-35 ------------>					–	–	–	0-5
		CEM IV/B	45-64	–	<------------ 36-55 ------------>					–	–	–	0-5
CEM V	Composite cement[c]	CEM V/A	40-64	18-30	–	<-------- 18-30 -------->			–	–	–	–	0-5
		CEM V/B	20-38	31-49	–	<-------- 31-49 -------->			–	–	–	–	0-5

a The values in the table refer to the sum of the main and minor additional constituents.

b The proportion of silica fume is limited to 10 %.

c In Portland-composite cements CEM II/A-M and CEM II/B-M, in pozzolanic cements CEM IV/A and CEM IV/B and in composite cements CEM V/A and CEM V/B the main constituents other than clinker shall be declared by designation of the cement (for examples, see Clause 8).

Type of masonry cement	Material	Percentage
MC 12.5	Portland cement clinker	≥40
	Natural crushed limestone	≤60
	Additives	≤1

Table 3b: Cement composition as stipulated in SR EN 413-1:2011

Cement does not meet the criteria for PBT (Persistent, Bio-accumulative and Toxic) or vPvV (very Persistent and very Bio-accumulative) in accordance with Annex XIII of Regulation (EC) No. 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Furthermore, cement is a mixture and it is exempted from REACH registration.

3.3 Manufacturing Process

The main steps in the cement manufacturing process are as follows, and illustrated in Figure 1:

- Quarrying and raw material preparation
- Clinker production
- Cement grinding and distribution

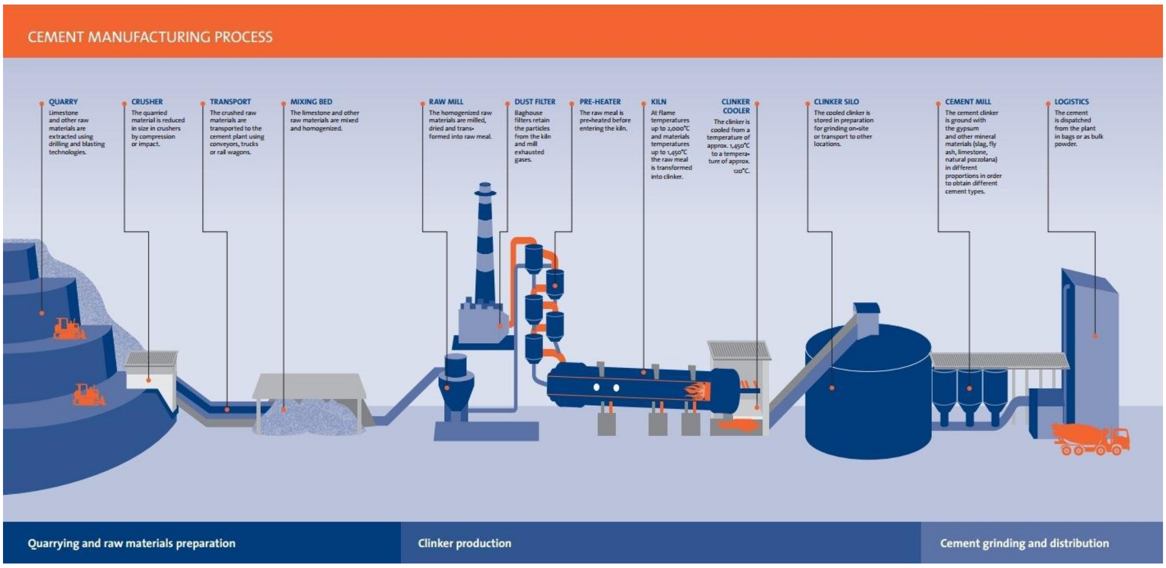


Figure 1: Cement process flow

3.3.1 Quarrying

Natural raw materials used for the clinker manufacture are calcareous materials like limestone or marl, and argillaceous materials like clay. These materials are extracted using drilling and blasting techniques.

3.3.2 Crusher

The quarried material is then reduced in size by compression and / or impact in various mechanical crushers.

3.3.3 Conveyor

Raw material is then transported from the quarry to the plant using conveyors.

3.3.4 Mixing bed

The crushed limestone and clay is homogenized by stacking and reclaiming in a long layered stockpile. This material is then ready for milling and drying in the kiln.

3.3.5 Raw Mill

The raw materials are milled and dried in a vertical roller mill in Campulung Plant and in a horizontal ball mill in the Alesd Plant. In the case of the vertical roller mill, heavy rollers are held over a rotating table, and in the horizontal ball mill, balls are rolled over until the coarse material is milled fine enough to be carried by air to a homogenizing silo.

3.3.6 Preheater

Cyclone preheaters enable the raw material of cement production to be preheated before entry into the kiln. This increases the energy efficiency of the kiln as the material is about 20-40% calcined at the point of entry into the kiln. Additionally, calciners are integrated in both plants kiln systems, further increasing the efficiency of the process.

3.3.7 Kiln
The kiln is designed to maximise the efficiency of heat transfer from fuel burning to the raw material. In the preheater tower the raw materials are heated rapidly to a temperature of about 1000ºC, where the limestone forms burnt lime. In the rotating kiln, the temperature reaches up to 2000ºC. At this high temperature, minerals fuse together to form predominantly calcium silicate crystals – cement clinker.

3.3.8 Cement mill
Finish milling is done in ball mills and consist of grinding together of cement clinker, with around 5% of natural or synthetic gypsum. Other cementitious materials such as slag and fly ash are also incorporated in the final cement powder. Cement is either packaged in paper bags and delivered on pallets or delivered in bulk.

3.4 Additional information

More information about cement's environmental stewardship and occupational health and safety aspects are detailed within the SDS made publicly available on Holcim Romania portal https://www.holcim.ro/ro/produse-si-servicii/produse. All SDS have been developed by Holcim Romania in compliance with the requirements of Commission Regulation (EU) No 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

4. LCA Information

4.1 Goal of Study

The goal of this study was to generate an environmental profile of average grey cement produced and delivered from the locations fully owned and operated by Holcim Romania, to better understand the associated lifecycle environmental impacts and to allow a Type III EPD to be generated and made public via the International EPD System.

4.2 Declared Unit

The declared unit of the EPD is 1000 kg of grey cement produced and delivered from the locations fully owned and operated by Holcim Romania. This EPD is established for the weighted average product of theses manufacturing plants. The average is based on the mass of cement produced at each plant.

4.3 System Boundary

System boundaries determine the unit processes to be included in the LCA study and which data as “input” and/or “output” to/from the system can be omitted.

This EPD covers the cradle to gate stage (A1 to A3), because other life cycle stages are dependent on particular scenarios and are better developed for specific building or construction works.

System boundaries are according to the modular approach and the cradle to gate stage is divided into the upstream (A1) and core (A2 and A3) phases, as outlined in Figure 2. Life cycle stage that are not covered by the EPD are indicated as MND (Module Not Declared).

Upstream	Core		Downstream														Other environmental information
Product Stage			Construction process stage		Use Stage							End of Life stage				Benefits and loads beyond the system boundary
Raw material supply	Transport	Manufacturing	Transport	Construction	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Demolition	Transport	Waste processing	Disposal	Future reuse, recycling or energy recovery potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

Figure 2: Modules included in the grey cement LCA: A1 (Raw material supply), A2 (Transport), A3 (Manufacturing)

4.4 Data sources and quality

The geographical system boundary of the LCA is Romania. All processes (including energy mix) are valid for the production sites in Romania. The two cement plants account for 100% of total grey cement produced by Holcim in Romania.

All material flows of the processes are based on company and site-specific data gathered for one year of operation, for the period 1st January 2018 – 31st December 2018.

Modelling of the life cycle of Holcim Romania grey cement was performed using SimaPro8 LCA software from PRé.

All relevant background LCI datasets are taken from the ecoinvent database v3.4 (cut-off) released in 2017.

The foreground data has been collected on site and validated based on mass balances. The background data is based on reviewed data from life cycle inventories. As all datasets are validated, the data quality for the entire study can be judged as very good.

4.5 Allocation

The foreground data has been collected on site and validated based on mass balances. The All allocation is performed according to the basic rules from EN15804:2012+A1:2013. As no co-products are produced, the flow of materials and energy and also the associated release of substances and energy into the environment is therefore related exclusively to the cement produced.

All data is included based on measured data for each plant. To ensure high representativeness for calculation of the grey cement this specific data has been weighted based on the production mass of each plant, as follows:

Plant	Percentage
Campulung	52%
Alesd	48%

Table 4 Holcim Romania - Grey Cement Production (Percentage / Plant) 2018

4.6 Cut-off Criteria and assumptions

The cut-off criteria adopted is as stated in EN 15804:2012+A1:2013. Where there is insufficient data or data gaps for a unit process, the cut-off criteria is 1% of the total mass of input of that process. The total of neglected input flows per module is a maximum of 5% of energy usage and mass. The exception is if they have any of the following, in which case they have to be included:

- Significant effects of or energy use in their extraction, use or disposal
- Are classed as hazardous waste

The production of the materials that have been excluded from the product system under study are listed in Table 5. These materials are either waste derived or excluded due to their low economic value. While the production of these materials are excluded the material masses are part of the calculation and they are considered as secondary materials.

Material	Considered as
Alternative Raw Material (slag / fly ash)	Secondary Material
Pyrite ash	Secondary Material
By-bass dust	Secondary Material
Fly ash / acidic fly ash (ARSN)	Secondary Material
Granulated blast furnace slag	Secondary Material

Table 5: Secondary materials excluded from the product system

The clinker production process uses non-renewable secondary fuels (Table 6). According to the PCR, secondary fuels are modelled to enter the studied system free of environmental loads. They are displayed as a resource use and all emissions occurring during the production process are allocated to the produced products.

Fuel	Considered as
Used tires	Partially Non-Renewable Secondary fuel (27% biomass content)
Rubber	Partially Non-Renewable Secondary fuel (27% biomass content)
Sawdust / paper	Renewable Secondary fuel
Mixed industrial waste (including sorted household waste)	Partially Non-Renewable Secondary fuel (44% biomass content)
Petroleum sludge	Non-Renewable Secondary fuel
Other recovered fuel	Non-Renewable Secondary fuel

Table 6: Secondary fuels excluded from the product system

In addition to the above, during the LCA a number of assumptions were made, which have been documented below for transparency:

- No waste is produced during the clinker production process.
- There is a difference between the mass of the raw meal consumed and the clinker produced which is due to the water (remaining humidity of raw materials) that evaporates and mainly CO_2 that is released from decarbonation.

4.7 Comparability

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.

5. Environmental Performance

The environmental impacts are declared and reported using the parameters and units shown in the Tables below. Baseline characterisation factors are taken from CML – IA version 4.1 (dated October 2012).

The impact categories presented in the following table refer to 1000 kg of average cement produced from the locations fully owned and operated by Holcim in Romania.

Parameter	Unit	A1-A3
Parameters describing environmental impacts		
Global Warming Potential (GWP)	Kg CO2 equiv.	504
Ozone Depletion Potential (ODP)	Kg CFC 11	7.69E-06
Acidification Potential for Soil and Water (AP)	kg SO2 equiv.	0.368
Eutrophication Potential (EP)	kg (PO4)3-equiv.	0.303
Formation potential of tropospheric Ozone (POCP)	kg C2H4 equiv.	0.0404
Abiotic Depletion Potential (ADPE)	kg Sb equiv.	5.38E-05
Abiotic Depletion Potential (ADPF)	MJ, net calorific	1194
Parameters describing resource use, primary energy		
Use of renewable primary energy excluding renewable primary energy used as raw materials (PERE)	MJ	216
Use of renewable primary energy resources used as raw materials (PERM)	MJ	32.5
Total use of renewable primary energy resources (PERT)	MJ	248
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (PENRE)	MJ	1712
Use of non-renewable primary energy resources used as raw materials (PENRM)	MJ	0
Total use of non-renewable primary energy resources (PENRT)	MJ	1712

Reading tip:
7,69E-06 = 7,69 x 1^{-6} = 0,00000769

Parameters describing resource use, secondary materials and fuels, use of water		
Use of secondary material (SM)	kg	85.6
Use of renewable secondary fuels (RSF)	MJ	0.349
Use of non-renewable secondary fuels (NRSF)	MJ	0.503
Net use of fresh water (FW)	m^3	1.26
Other environmental information describing waste categories		
Hazardous waste disposed (HWD)	kg	0.0138
Non-hazardous waste disposed (NHWD)	kg	8.943
Radioactive waste disposed (RWD)	kg	0.0128
Other environmental Information describing output flows		
Components for re-use (CRU)	kg	0
Materials for recycling (MRF)	kg	0.347
Materials for energy recovery (MER)	kg	0
Exported Energy (EE)	MJ per energy carrier	0

NOTE: The LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

6. Range of Results

The EPD provides the results for the average (representative) product. Each individual cement type (from both sites) has been modelled and then combined on a mass weighted average of production to calculate the results for the average product.

The difference in results for the average cement product produced at each site compared to the representative (average) product is lower than 10% for the majority of the environmental impact indicator categories. The differences in indicator results for ODP and POCP are slightly more.

7. Interpretation

The following table provides an identification of the most significant contributors to parameters describing environmental impacts.

Parameter	Most significant contributor
Global Warming Potential (GWP)	The use of clinker in the cement is the main cause for overall global warming potential. Emissions in the kiln result from both decarbonation of limestone as well as burning of fuel.
Ozone Depletion Potential (ODP)	Dominated by the use of petcoke in the clinker production and by indirect emission from electricity production.
Acidification Potential for Soil and Water (AP)	Dominated by the indirect emissions from electricity production, both used during the cement plant and during the clinker production process.
Eutrophication Potential (EP)	Dominated by the indirect emissions from electricity production, both used during the cement plant and during the clinker production process.
Formation potential of tropospheric Ozone (POCP)	Dominated by emissions from the kiln as well as from fuel production for the burning of clinker.
Abiotic Depletion Potential (ADPE)	Highest contribution from the quarry of minerals (gypsum / limestone) and from the use of electricity.
Abiotic Depletion Potential (ADPF)	Dominated by the use of fossil fuels in the clinker production (petcoke and bituminous coal) and indirect emissions from electricity production.
Hazardous waste disposed (HWD)	Generated from electricity production in Romania.
Non-hazardous waste disposed (NHWD)	Generated from electricity production in Romania.
Radioactive waste disposed (RWD)	Generated from electricity production in Romania.

Concluding, the use of energy is the most significant contributor to environmental impacts associated with cement production. Energy is used as electricity and fuel, by far dominated by the kiln. Also contributing is the energy demand related to the excavation of raw materials. The contribution to global warming (carbon emissions) is dominated by the decarbonation of limestone – a process necessary to produce cement.

8. Differences Versus Previous Versions

The table below reports the differences in indicator results compared to the previously published version of this EPD.

Environmental Indicator	Previous Version (2012 production data)	Current version (2018 production data)	Percentage Change (%)
Global Warming Potential (GWP)	706	504	-29
Ozone Depletion Potential (ODP)	1.88E-08	7.69E-06	40804
Acidification Potential for Soil and Water (AP)	1.68	0.368	-78
Eutrophication Potential (EP)	0.155	0.303	95
Formation potential of tropospheric Ozone (POCP)	0.0915	0.0404	-56
Abiotic Depletion Potential (ADPE)	2.09E-03	5.38E-05	-97
Abiotic Depletion Potential (ADPF)	3400	1194	-65

The main reason for the change in indicator results is updated production data and to a lesser extent differences in generic datasets.

9. Other Environmental Information

Holcim Romania, being aware of its responsibility as cement, concrete and aggregate manufacturer towards the environment, and in particular on the limited natural resources has implemented as part of integrated management system, an environmental management system. Thus, all the activities that could have a significant impact on the environment are kept under control. Also, we ensure that the constituent materials used within our products are responsibly sourced and we apply the principles of Sustainable Development, Circular Economy and of Environmental Stewardship as a standard business practice in our operations. Moreover, we encourage the adoption of the responsible sourcing practices throughout our supply chain.

In this sense, we measure, monitor, assess and continuously improve our environmental performance. We prevent environmental pollution by implementing in our operations the best available technology and by maintaining and operating our installations in optimum ways. Protecting the environment by preserving non-renewable natural resources, increasing energy efficiency, reducing the environmental emissions, limiting the impact of materials transportation to and from our operations is part of our way in doing business. Holcim is promoting in Romania the reduction, recycling and recovering of waste and the optimization of water consumption in all processes.

Nevertheless, we develop and launch innovative products and solutions with enhanced environmental or social performance.

More information regarding our environmental and responsibly sourcing objectives and activities are available on http://www.holcim.ro/en/sustainable-development.html

10. References

Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products, BS EN 15804:2012+A1:2013. BSI Standards Limited.

PCR 2012:01 Construction products and construction services version 2.3, The International EPD System.

Sub-PCR to PCR 2012:01 (v2.3) PCR 2012:01- sub-PCR-H, Cement and Building Lime (EN 16908:2017), The International EPD System.

Life-cycle assessment software and database:

- SimaPro8 LCA software from PRé.
- ECOINVENT database v3.4 - released in 2017, contains life cycle inventory datasets
- CML-IA database version 4.1 – released in 2012, The **C**entrum voor **M**ilieuwetenschappen **L**eiden **I**mpact **A**ssessment (CML-IA), contains characterisation factors for life cycle impact assessment (LCIA)

ISO 14020:2000 Environmental labels and declarations — General principles

ISO 14044:2006+A1:2018. Environmental management – life cycle assessment – requirements and guidelines, International Organisation for Standardisation (ISO), Geneva.

ISO 14040:2008. Environmental management – Life cycle assessment – principles and framework, International Organisation for Standardisation (ISO), Geneva.

EN16908:2017 Cement and building lime – Environmental product declarations – Product category rules complementary to EN 15804. BSI Standards Limited

ISO 21930:2017 Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services

SR EN 197-1:2011 “Cement. Composition, specifications and conformity criteria for common cements.” Romanian version of European Standard EN 197-1:2011, published by National Standardization Body – ASRO

SR EN 413-1:2011. Masonry cement. Composition, specifications and conformity criteria. Romanian version of European Standard EN 413-1:2011, published by National Standardization Body – ASRO

Commission Regulation (EU) 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)

