EPD of Grey Cements

ISO 14020:2000, IS0 14025:2006, ISO 14040:2006, ISO 21930:2007, EN 15804:2012, UN CPC 3744: 2013

Romania
Edition 1, Revision 0: April 2014

Content

Environmental Product Declaration (EPD) of Grey Cements

1. Aim and Scope

The current document is developed for providing a measurable and verifiable input for the environmental assessment of construction works done with the Grey Cements manufactured and delivered from the locations of Holcim in Romania:

1. CEM I 52,5 R
2. CEM I 42,5 R
3. CEM II/ B-M(S-LL) 32,5 R (trade name STRUCTO)
4. CEM II/ B-M(S-LL) 42,5 N (trade name STRUCTO Plus)
5. CEM II/ BM(S-V) 42,5 N
6. CEM II/A-LL 42,5 R
7. CEM II/ A-M(S-LL) 32,5 R
8. CEM II/ B-M(S-V) 42,5 N L-H
9. CEM II/ AS 32,5N - LH
10. MC 12,5 (Masonry Cement, trade name TENCO).

The declaration is established for the average product of these manufacturing plants. The average is based on the accounted production volume of each plant. As the applications of cement as an intermediate material are numerous, a unique functional unit cannot be defined and therefore this EPD is based on a declared unit = 1000 kg of cement.

2. General information

2.1 EPD, PCR, LCA information

EPD Information		
Program operator	The international EPD System	The International EPD System Vasagatan 15-17 SE-111 20 Stockholm Sweden Email: info@environdec.com Web: www.environdec.com
Declaration holder	Holcim Romania	Address: 169 A Calea Floreasca Street Building B, Floor 7, Sector 1, RO 014459, Bucharest, Romania Phone: +4021.231.77.08/09 Fax +4021.231.77.14/15 Contact person: Mihaela Odangiu Email: Mihaela.Odangiu@holcim.com Mobile: +40742.358.943 Web: www.holcim.ro Company identification information: Trade Register No: J40/399/2002 Fiscal Registration Code: RO 12253732 Subscribed and paid-in capital: LEI 205,268,05
Product	Grey Cements	
Declaration number	S-P-00527	
Date of Issue:	2014-04-01	
Period of Validity:	2019-04-01	
Reference standards:	IS0 14020:2000, ISO 14025:2006, ISO 21930:2007	

Table 1: EPD Information

Reference PCR	UN CPC 3744 Cement
Date of issue	2013-05-16
Valid until	2018-05-16
Appointed PCR moderator	Carlo Strazza, CE.Si.S.P., carlo.strazza@cesisp.unige.it
Independent verification of the EPD	External, according to ISO 14025
Third party verifier	Carl-Otto Nevén Independent verifier approved by the International EPD System

Table 2: PCR Information

LCA Information	
Title	Life Cycle Assessment of cement production of Holcim Romania 1000 kg average cement
Date of Issue:	2014-04-01
Preparer:	Ingenieurbüro Trinius GmbH Barmbeker Str. 9A. 22303 Hamburg, Germany Phone: +49 40 2841 788 00 Fax +49 40 2841 788 29 Contact person: Wolfram Trinius Email: trinius@trinius.de Mobile +49 172 425 5657
Reference standards:	ISO 14040:2006, ISO 14044:2006, EN 15804:2012

Table 3: LCA Information

2.2 Reference period of EPD data

The reference period for the data used within this EPD is the year 2012.

2.3 Geographical scope of EPD application

The geographical scope of this EPD is international.

2.4 Additional information about EPD

This EPD provides information concerning the production of cement only. This information can be used as an input for an assessment of a specific application of cements with regard to its entire life cycle, which also takes into account the beneficial contribution of cement to construction.

The production of cement is subject to Romanian and European legislation, which address all relevant environmental effects like the excavation of natural raw materials, the rehabilitation of quarries, the recovery of energy and material from wastes and the emission of noise, dust and hazardous substances (NO_x, SO_2, heavy metals, etc.).

Cement addressed in this EPD is manufactured by Holcim in Romania according to harmonized European Standards:

- EN 197-1:2011 CEMENT-Composition, specifications and conformity criteria for common cements,
- respectively EN 413-1:2011 Masonry cement -Composition, specifications and conformity criteria.

Harmonized European standards address all of the Essential Requirements of the European Construction Products Regulation No. 305/2011 including the Essential Requirement on Hygiene, Health and the Environment. Also the use of cement in mortar and concrete is specified in corresponding national and/or European standards, which also take into account existing relevant National Regulations and European Directives addressing "Regulated Substances" in construction products.

3. Product description and system boundaries

3.1 Product identification and usage

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.

This EPD covers all types of grey cements (Portland cements, Portland-composite cements, Portland-limestone cements and Masonry cement) produced by Holcim in Romania with care for sustainable development principles:

Sustainable development
In order to respect the principles of sustainable development, HOLCIM implements, maintains and continuously improves the integrated management system, in accordance with the applicable reference documentation: SR EN ISO 9001:2008, SR EN ISO 14001:2005, SR OHSAS 18001:2008, BES 6001: 2009.

Cement type (product standard)	Significant characteristic	Recommended use		Location
		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)	Alesd, Campulung
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-composite cement with high initial strength, type **CEM II/B-M(S-LL) 32,5 R** trade name STRUCTO (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)	
4. Portland-composite cement with ordinary initial strength, type **CEM II/B-M(S-LL) 42,5 N**, trade name STRUCTO Plus (SR EN 197-1:2011)	resistance to aggressive environments	reinforced concrete	resistance to aggressive environments	Alesd, Campulung, Turda

5. Portland-composite cement with ordinary initial strength, type **CEM II/ BM(S-V) 42,5 N** (SR EN 197-1:2011)	low hydration heat	massive construction	RMX - civil and industrial buildings; work of arts	Alesd, Campulung
6. 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	Alesd, Campulung
7. Portland-composite cement with ordinary initial strength, type **CEM II A-M (S-LL) 32,5 R** (SR EN 197-1:2011)	good strengths	Reinforced concrete (no restriction for application)	RMX – civil and industrial buildings, smaller concrete classes	Alesd, Campulung
8. Portland-composite cement with ordinary initial strength and low hydration heat, type **CEM II/B-M(S-V) 42,5 N L-H** (SR EN 197-1:2011)	low hydration heat	massive construction	RMX - civil and industrial buildings; work of arts	Pitesti
9. Portland-slag cement with ordinary initial strength and low hydration heat, type **CEM II/AS 32,5N – LH** (SR EN 197-1:2011)	low hydration heat	massive construction	RMX - civil and industrial buildings; work of arts	Turda
10. 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	Campulung, Turda

Table 4: Cement identification and usage

The composition of cements manufactured by Holcim Romania is in accordance with cement standard SR EN 197-1:2011 (see Table 5), respectively SR EN 413-1:2011 (see Table 6), below.

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 ----------›									
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).

Table 5: Cement composition as stipulated in SR EN 197-1:2011

Type of masonry cement	Main constituents	Content (% by mass)
MC 12,5	Portland cement clinker	≥ 40
	Natural crushed limestone	≤ 60
	Additives	≤ 1

Table 6: Masonry cement composition as stipulated in SR EN 413-1:2011

Cement does not meet the criteria for PBT (Persistent, Bio-accumulative and Toxic) or vPvB (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)

Moreover, cement is a mixture and it is exempted from REACH registration. However, certain substances in the cement mixture may require registration and an exposure scenario. Exposure scenarios are added to the Annex to the Safety Data Sheets(SDS) – both documents being posted on http://www.holcim.ro/produse-si-servicii/produse.html

Marketing and use of cement content is restricted to soluble Cr VI as defined by REACH Regulation under Annex XVII Section 47 Cr VI compounds:

> "*1. Cement and cement-containing mixtures shall not be placed on the market, or used, if they contain, when hydrated, more than 2 mg/kg (0,0002 %) soluble chromium VI of the total dry weight of the cement.*
> *2. If reducing agents are used, then without prejudice to the application of other Community provisions on the classification, packaging and labelling of substances and mixtures, suppliers shall ensure before the placing on the market that the packaging of cement or cement-containing mixtures is visibly, legibly and indelibly marked with information on the packing date, as well as on the storage conditions and the storage period appropriate to maintaining the activity of the reducing agent and to keeping the content of soluble chromium VI below the limit indicated in paragraph 1.*
> *3. By way of derogation, paragraphs 1 and 2 shall not apply to the placing on the market for, and use in, controlled closed and totally automated processes in which cement and cement-containing mixtures are handled solely by machines and in which there is no possibility of contact with the skin*".

Holcim Romania reduces chromium VI in cement delivered in bags by treating it with reducing agents to maintain the level of hexavalent chromium below 0.0002 % during the whole period of validity for cement - according to Romanian Government Decision 932/2004 (amending and supplementing Romanian Government Decision 347/2003 on restrictions on the marketing and use of certain dangerous substances and preparations).

Bulk cement, being the result of "*controlled closed and totally automated processes"* according to Romanian Government Decision 932/2004, Annex 1, section 47.3 does not require the reduction of hexavalent chromium.

Much 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 http://www.holcim.ro/produse-si-servicii/produse.html. 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)

3.2 Product manufacturing

The composition of the cement (presented in Table 5) determines the technical properties of the product. Most important factor for the environmental performance is the fraction of clinker. Therefore a range is given on the content of clinker of the specific products that were used to calculate the average cement. To ensure highest possible representativeness of the average cement the weighted average has been used for the calculation.

The main steps in cement manufacturing process are:

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

as illustrated in the figure presented below:

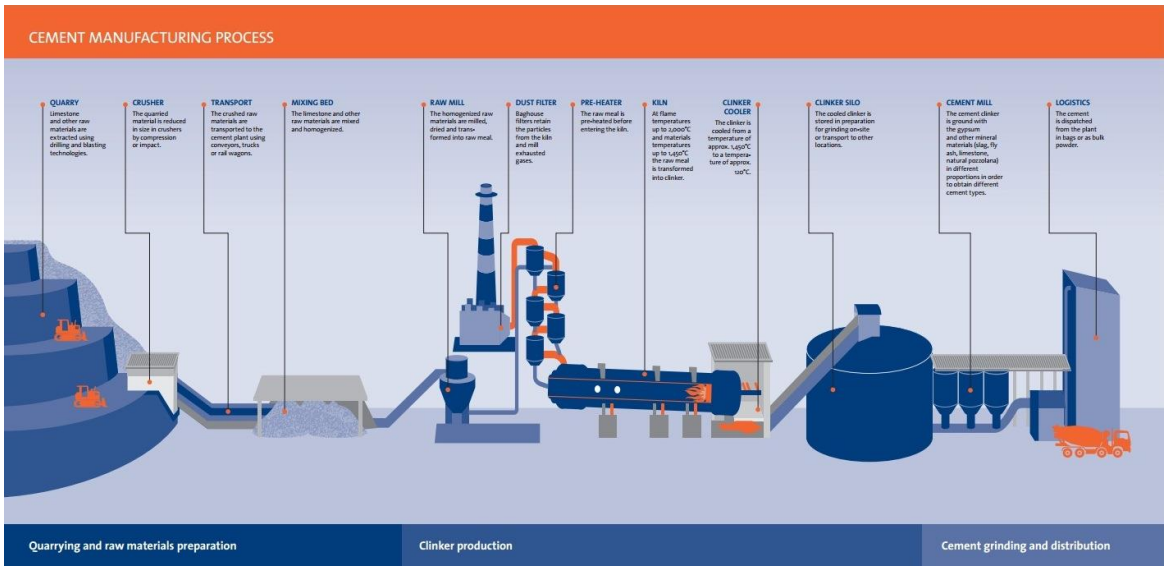

Figure 1: Cement production flow

3.2.1 Quarrying and raw material preparation

Natural raw materials used for the clinker manufacture are calcareous materials like limestone or marl, and argillaceous materials like clay, which are abundantly present in the earth. Alternative raw materials such as fly ash, blast furnace slag and other secondary materials are also used as partial replacement for the natural raw materials.
The homogenized raw materials are milled, dried and transformed into raw meal, that is pre-heated before entering the kiln. The residual heat of the flue gases of the kiln is utilised for drying. This can be considered as a further utilisation, rather than a recovery of energy.

3.2.2 Clinker production

The raw meal is preheated using the residual heat of the flue gases and is transformed into clinker within the rotary kiln at about 1450^{o}C.
For partially replacing the natural fuels, traditionally used for clinker production (coal, lignite and natural gas), Holcim developed and implemented in Romania a waste co-processing solution, by using alternative fuels. More information is available at www.holcim.ro.

3.2.3 Cement grinding and distribution

The cement clinker is ground together with gypsum and other constituents (slag, fly ash, limestone, natural puzzolana) in different proportion in order to produce different types of cement. Afterwards, the cement is delivered in bags or as bulk powder.

3.3 System boundaries

The system boundaries are cradle to gate as shown in the figure below (PCR for Cement).

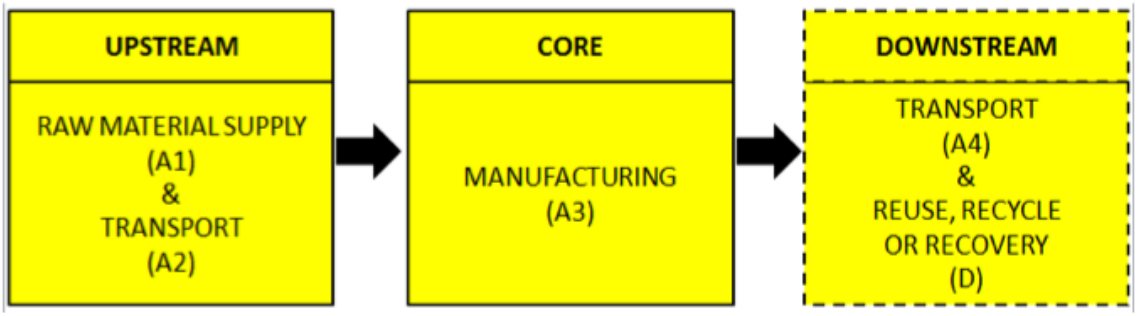

Figure 2: Illustration of the life cycle structure and rough system boundaries

Squares with unbroken edge line indicate processes that shall be included, dashed edge line indicate processes that are option (Figure and explanatory line copied without change from UN CPC 3744)

This EPD is established for the modules A1, A2 and A3.

4. LCA

4.1 Information sources and data quality

All core data required for this EPD has been collected from the HOLCIM plants for the year 2012. Company and production specific data is applied in the foreground system of the LCA.
The foreground data has been collected on site and validated based on mass balances. Data collection was performed iteratively to ensure high quality of data.

4.2 Estimations and methodology

4.2.1 Allocation Procedures

All allocation is performed according to the PCR. 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 average cement this specific data has been weighted based on the accounted production volume of each plant.

4.2.2 Average cement

The inventory data of the different cements produced at the Holcim Romania plants is used to calculate the declared average cement. The average is determined based on the produced amounts by weight in 2012.

4.2.3 Declared unit

The declared unit for the EPD is 1000kg average cement leaving the factory gate.

4.2.4 Impact Assessment

The impact assessment is carried out applying the established CML method (Guinée et al, 2001). The applied categories and characterization factors are provided in the CML version published in November 2010. Additionally, selected results from the inventory analysis are displayed. The selection of displayed indicators follows the provisions in the PCR document.

4.3 Cut off rules

The PCR states that the production of granulated blast furnace slag (GBFS) and fly ash can be excluded from the analysis when the origin of the materials is from Europe. When specific production data for materials that contribute less than 1% to a module are not available and those materials are not expected to have a major environmental impact, those materials can be excluded from the study. Therefore the production of the following materials is not included in the product system under study. The production of the first materials are excluded in line with the cut-off rules. In total 1.54 % of materials are excluded due to cut-off. This is less than 5 % which is the total threshold defined by the underlying PCR. Fly ash and blast furnace slag are excluded due to specific statements in the PCR. While the production of these materials is excluded the materials themselves are part of the calculation.

Material	Reason for exclusion	Module
iron correction	Cut-off, waste input	Raw meal preparation
Pyrit ash	Cut-off	Raw meal preparation
Sand	Cut-off	Raw meal preparation
Bottom ash	Cut-off	Raw meal preparation
SiO_2	Cut-off	Raw meal preparation
Cr 6+ reducer agent	Cut-off	Cement production
Fly ash	PCR rules, waste input	Cement production
Granulated blast furnace slag	PCR rules, waste input	Cement production

Table 7: Materials excluded from product system

The production process uses secondary fuels. 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.

Material	Considered as	Module
Used tires	secondary fuel	Clinker production
Mixed biomass	secondary fuel	Clinker production
Mixed industrial waste	secondary fuel	Clinker production
Petroleum sludge	secondary fuel	Clinker production
Solid recovered fuel	secondary fuel	Clinker production

Table 8: Secondary fuels excluded from the product system

4.4 Background data

Background data is included based on generic datasets from the GABI 6 Database of PE International in the version of 2012. 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 System boundaries

4.5.1 Technical system boundaries

The technical system boundaries are defined according to the provisions of the PCR. Primary raw material is accounted from the quarry, including all processes including transportation to the production facilities. Secondary raw materials enter the system boundary when reaching the end-of-waste status, as defined in the EU Council Directive on Waste. In the situation where a secondary raw material technically reaches its end-of-waste status during the co-processing of the materials, they are modelled to enter the system at the input boundary of the co-processing chamber. Consequently the co-processing processes including all related emissions is allocated to the production process. Wastes used as fuels are considered from the boundary of the

production site. Processes for preparation of the co-processing and treatment of the secondary raw materials, such as drying, are included. All emissions from the co-processing processes have been allocated to the produced products, no environmental loads have been allocated to co-burned wastes.

Material flows and emissions not associated with the production process, such as energy used for personal transportation or waste water treatment, are not included in this study.

4.5.2 Geographical system boundaries

The geographical system boundary is Romania. All processes are valid for the production sites in Romania. Waste treatment processes are included based on average data valid for the European Union (EU-27). All three cement producing plants of HOLCIM Romania are included: Campulung, Alesd and Turda.

All production volumes of cement plants from Holcim Romania as recorded for 2012 have been used for the calculation of the current EPD.

4.5.3 Temporal system boundaries

All material flows of the processes are based on company and site specific data gathered for the year 2012. All background data originates from the GaBi database version of 2012 with validity until 2016

4.6 Comparability

The EPD is established on the basis of the product category rules (PCR) for cement published by The International EPD® System. The LCAs follow the standards ISO 14040:2006 and ISO 14044:2006, as well as the provisions for environmental product declarations in the construction sector established in EN 15804:2012. According to these standards, environmental product declarations do not compare the environmental performance of products in the construction sector. Any comparison of the declared environmental performance of products lies outside the scope of these standards, and is suggested to be feasible only if all compared declarations follow equal standard provisions. Further, any comparative interpretation of the declaration shall reflect the product's application context in a building.

To be able to compare EPDs within this product category, they have to be based on this particular PCR. EPDs from different programs may not be comparable. EPD of construction products may not be comparable if they do not comply with the requirements of comparability set in EN 15804.

4.7 Results

Based on data from all HOLCIM cement plants in Romania from the year 2012, the following results have been obtained for the average cement produced in the Holcim Romania plants. The declared unit is 1000kg of the average cement.

Parameter	Unit	A1-A3
Global warming potential	kg CO_2-eq	7,06E+02
Depletion potential of the stratospheric ozone layer	kg R11-eq	1,88E-08
Acidification potential of land and water	kg SO_2-eq	1,68E+00
Eutrophication potential	kg PO_4^{3-}eq	1,55E-01
Formation potential of tropospheric ozone photochemical oxidants	kg ethene-eq	9,15E-02
Abiotic depletion potential for non fossil resources	kg Sb-eq	2,09E-03

Table 9: Summary of life cycle impact analysis for 1000 kg average cement

Parameter	Unit	A1-A3
Abiotic depletion potential for fossil resources	MJ	3,40E+03
Renewable primary energy as energy carrier	MJ	0
Renewable primary energy resources as material utilization [MJ]	MJ	0
Total use of renewable primary energy resources	MJ	0
Non renewable primary energy as energy carrier	MJ	3,40E+03
Non renewable primary energy as material utilization	MJ	0
Total use of non renewable primary energy resources	MJ	3,40E+03
Use of secondary material [kg]	kg	9,21E+01
Use of renewable secondary fuels [MJ]	MJ	0
Use of non renewable secondary fuels [MJ]	MJ	9,77E+02
Use of net fresh water	m3	2,47E-03

Table 10: Summary of life cycle inventory indicators for 1000 kg average cement

Parameter	Unit	A1-A3
Components for reuse	kg	0
Materials for recycling	kg	0
Exported energy	MJ	0
Dust: PM10-equivalents	kg	0,474
Risk poll: PM2,5-equivalents	kg	0,1003
Total dust per declared unit	kg	0,474

Table 11: Other indicators for 1000 kg average cement

Parameter	Unit	A1-A3
Non-hazardous waste	kg	0,768
Hazardous waste	kg	0,011
Radioactive waste	kg	0,00

Table 12: Supplementary indicators for 1000 kg average cement

Reading tip:

- *7,06E+02= 7,06 x 10^{2} = 706*
- *1,88E-08= 1,88x 1^{-8} = 0,0000000188*

4.8 Interpretation

The following table provides an identification of the most significant contributors to a selection of the parameters presented above:

Parameter	Most significant contributor
Primary energy demand	Dominated by the use of non-renewable energy and the corresponding supply chains. The most significant process using energy is the kiln.
Water demand	Dominated by the use of surface water related to the generation of electricity. The water use on site is less than 1% of the total freshwater use.
Waste generation	Waste in terms of material waste is generated in upstream processes of electricity production and fuel supply.
Global warming potential	The kiln causes about 89% of the greenhouse gas emissions. 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 the burning of fuel.
Acidification potential	Dominated by sulphur dioxide emissions from the kiln and emissions from electricity production.
Eutrophication potential	The kiln is the major source for emission of nitrous oxides. Lignite production is another significant contributor.
Ozone depletion potential	Dominated by emissions from electricity production.
Photochemical ozone creation potential	Dominated by nitrous oxide and sulphur dioxide emissions from the kiln as well as from fuel production for the burning of clinker. Emissions from electricity production as further significant contributor.
ADP elements	Highest contribution associated with the quarry of gypsum
ADP fossil	Fossil fuel consumption is dominated by the supply and use of fossil fuels (diesel). Second largest contribution through the supply chain of electricity. Considered electricity mix for Romania.
Dust: PM10-equivalents	Generated by emissions from electricity production. PM 10 is the fraction of particulates in air of very small size (<10 µm)
Risk poll: PM2,5-equivalents	Generated by emissions from electricity production in Romania. PM 2,5 is the fraction of particulates in air of very small size (<2,5µm)
Non-hazardous waste	Generated from electricity production in Romania.
Hazardous waste	Generated from electricity production in Romania.
Radioactive waste	Generated from electricity production in Romania.

Table 13: Most significant contributors to life cycle parameters

Concluding, the use of energy is the most significant contributor to environmental impacts associated with cement. 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 clinker – a process necessary to produce cement.

5. 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 its 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 and of Environmental Stewardship as a standard business practice in our operations.

In this sense, we measure, monitor, assess and continuously improve our environmental performances. 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.

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

6. References

Council Directive 2008/98/EC on waste, The European Parliament and the Council, November 2008, Official Journal of the European Union, L 312/3, November 2008

EN 15804: 2012, Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products

Gabi 6 2013: Software und Datenbank zur Ganzheitlichen Bilanzierung. LBP, Universität Stuttgart und PE International, 2012

Gabi 6 2013: Dokumentation der GaBi-Datensätze der Datenbank zur Ganzheitlichen Bilanzierung. LBP, Universität Stuttgart und PE International, 2012.

Guinée J B, Gorrée M, Heijungs R, Huppes G, Kleijn R, de Koning A, van Oers L, Sleeswijk A W, Suh S, Udo de Haes H A, de Bruijn H, van Duin R, Huijbregts M A J, Lindeijer E, Roorda A A H, van der Ven B L, Weidema B P. (2001). Life cycle assessment- an operational guide to the ISO standards. Leiden: CML, Leiden University.

ISO 14020:2000 Environmental labels and declarations – General principles

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

ISO 14040:2006 Environmental management – Life cycle assessment – Principles and framework

ISO 14044:2006 Environmental management – Life cycle assessment – Requirements and guidelines

ISO 21930:2007 Sustainability in building construction – Environmental declaration of building products

Product Category Rules for Cement (UN CPC 3744) 2013-05-16, The International EPD System

Satterthwaite, Kerry (2013): Petroleum coke economics in cement kilns to 2016, Roskill

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)

Holcim Romania
169 A Calea Floreasca Street Building B, Floor 7, District 1
Bucharest, Postal Code RO 014459
Romania
Mihaela.Odangiu@holcim.com
www.holcim.ro
Phone +4021 231 77 08/09
Fax +4021 231 77 14/15