EPD Average Aggregate – Holcim Romania

ISO 14020; ISO 14025; ISO 14040; ISO 14044; EN 15804; ISO 21930; UN CPC 15320

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
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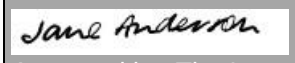
Product group classification: UN CPC 15320 Pebbles, gravel, broken or crushed stone, macadam, granules, chippings and powder of stone.
Product category rules (PCR): *CEN Standard EN 15804 served as the core PCR. PCR 2012:01 Construction Products and Construction Services Version 2.3 2028-11-15*
PCR review 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 aggregate production from the locations fully owned and operated by Holcim in Romania, as follows:

Stancesti Aggregate Plant
Targsoru Vechi Village,
Targsoru Vechi Perish,
107590, Prahova County,
Romania

Corbii Mari Aggregate Plant
Corbii Mari Village,
Corbii Mari Perish,
Dambovita County,
Romania

Gligoresti Aggregate Plant
Gligoresti Village,
Luna Perish ,
407360, Cluj County,
Romania

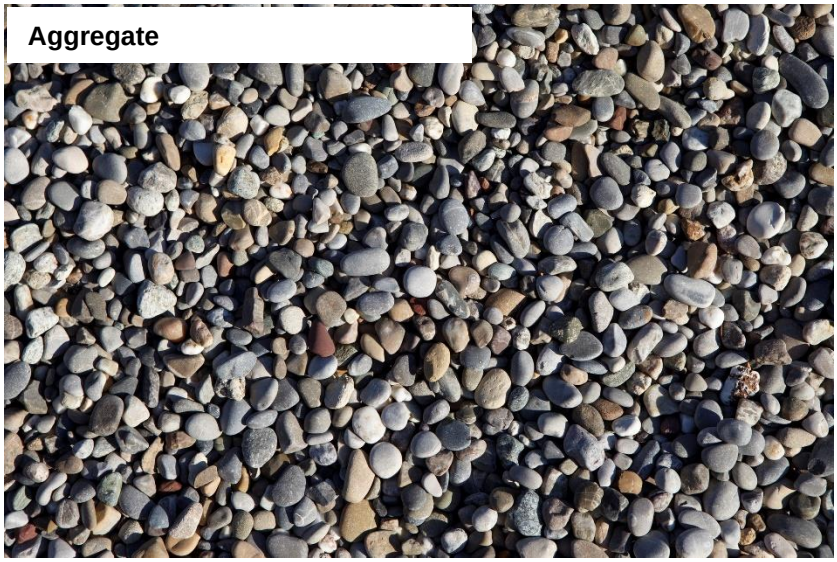
Holcim Romania is the study commissioner and EPD owner. In order to respect the principles of sustainable development, the company implemented, maintained and continuously improves an effective integrated management system, in accordance with the applicable reference standards: SR EN ISO 9001:2015, SR 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 aggregates produced by Holcim in Romania as detailed in Table 1.



Aggregates are mineral materials excavated from natural quarries, washed, sorted or crushed for distribution. They are used in the production of concrete or directly as a construction material.

Aggregates addressed in this EPD are produced by Holcim Romania according to Harmonised European Standards and according to Romanian Standards, as follows:

- SR EN 12620+A1:2008 “Aggregates for concrete”.
- SR EN 13242+A1:2008 “Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction”.
- SR EN 13043:2003/AC:2004 “Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas”.
- SR EN 13139:2003/C91:2009 “Aggregates for mortar”

The Harmonized European Standard mentioned-above address all of the Essential Requirements of the European Construction Products Regulation No. 305/2011 including the Essential Requirements on hygiene, Health and the Environment.

Aggregates are classified under the following UN CPC group and class/subclass: UN CPC 15320 Pebbles, gravel, broken or crushed stone, macadam, granules, chippings and powder of stone.

The geographical scope of this EPD is European.

Plant	Material Description	Material Size / Type	Application
Stancesti	Aggregates (natural, sorted)	0-4mm 4-8mm 8-16mm	Concrete, roads and civil engineering construction (SR EN 12620+A1:2018, Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas (SR EN 13043:2003/AC:2004) Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction (SR EN 13242+A1:2008)
	Aggregates (natural, crushed)	4-8mm 8-16mm 16-22.4mm 16-31.5mm	Concrete, roads and civil engineering construction (SR EN 12620+A1:2018, Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas (SR EN 13043:2003/AC:2004) Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction (SR EN 13242+A1:2008)
Gligoresti	Aggregates (natural, sorted)	0-4mm 4-8mm 8-16mm 16-22.4mm 16-31.5mm	Concrete, roads and civil engineering construction (SR EN 12620+A1:2018) Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas (SR EN 13043:2003/AC:2004)
	Aggregates (natural, sorted)	0-4mm 4-8mm 8-16mm 16-22.4mm 16-31.5mm 0-63mm 16-80mm	Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction (SR EN 13242+A1:2008)
	Aggregates (natural, sorted)	0-1mm 0-4mm	Aggregates for mortar (SR EN 13139:2003/C91:2009)

Plant	Material Description	Material Size / Type	Application
	Aggregates (natural, crushed)	0-63mm	Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction (SR EN 13242+A1:2008)
Corbii Mari	Aggregates (natural, sorted)	0-4mm 4-8mm 8-16mm 16-22.4mm 16-31.5mm 0-63mm	Concrete, roads and civil engineering construction (SR EN 12620+A1:2018) Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas (SR EN 13043:2003/AC:2004)
	Aggregates (natural, sorted)	0-4mm 4-8mm 8-16mm 16-22.4mm 16-31.5mm 0-63mm	Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction (SR EN 13242+A1:2008)
	Aggregates (natural, sorted)	0-1mm 0-4mm	Aggregates for mortar (SR EN 13139:2003/C91:2009)

Table 1: Product Identification and Usage

3.1 Technical Specification of Product

Aggregate properties vary by material type, grain size and regularity / shape, as reflected in the Technical Standards. The density of produced aggregates is > 1200 kg/m^3. All products are CE marked and have a declared performance in accordance with limits values stipulated in the EN harmonized product standards:

- SR EN 12620+A1:2008 Aggregates for concrete
- SR EN 13043:2003/AC:2004 Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas
- SR EN 13242+A1:2008 Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction
- SR EN 13139:2003/C91:2009 Aggregates for mortar.

The Harmonized European Standards mentioned above address all of the Essential Requirements of the European Construction Products Regulation No. 305/2011 including the Essential Requirements on Hygiene, Health and the Environment.

3.2 Content Declaration

The composition of the average product modelled in this project is obtained from the total raw material usages supplied by the sites. No substances that are listed in the 'Candidate List of Substances of very high concern for authorisation' are contained in the average aggregate.

Material	Percentage
Aggregates 0-4 (sand)	36%
Aggregates 4-8 (gravel)	18%
Aggregates 8-16 (gravel)	33%
Aggregates 16-22.5 (gravel)	12%
Other aggregates	2%

Table 2: Average aggregate composition

3.3 Manufacturing Process

Aggregate are extracted from the ground in quarries with machinery powered by diesel fuel. The quarried material is transported by truck (max. 2 km) to the processing area which also use diesel fuel.

The above-mentioned material is then transported via conveyer (that are using electricity) to the processing plant where it is crushed, washed and screening takes place to produce various graded aggregates for sale. For the processing, only electric energy is used. Groundwater and surface water are used for the washing, no mains water is used.

Waste generated during the production process (e.g. excavated soil, etc.) is reused within the aggregate production plants as backfill. No waste from the production process is sent to landfill. Aggregates are delivered in bulk. In all aggregate plants settling tanks are used for wastewater treatment. No chemicals are used.

The main steps in aggregate production are illustrated in the Figure 1.

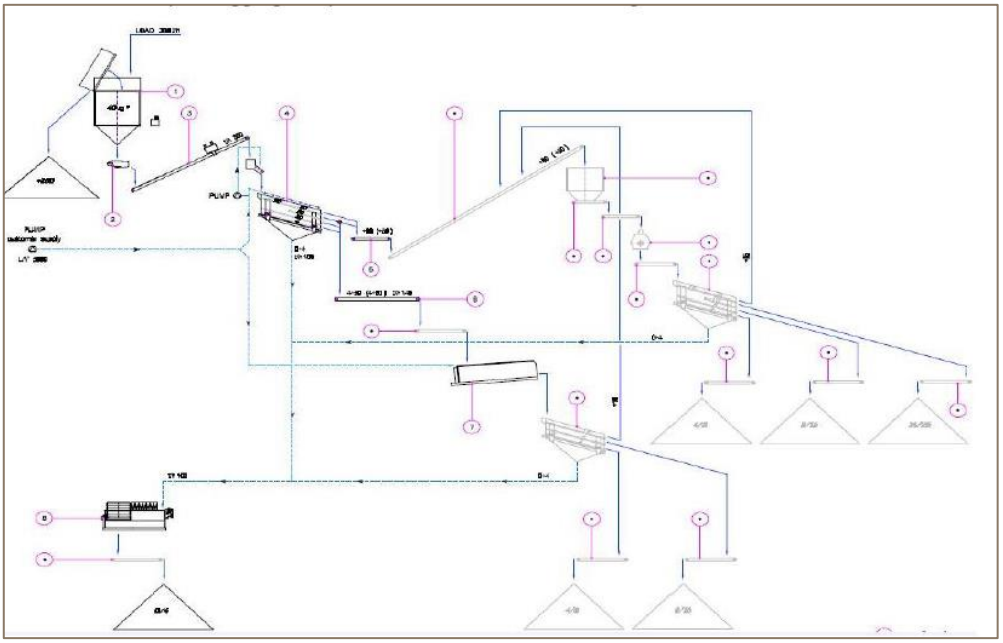


Figure 1: Aggregate process flow

3.4 Additional information

The production of aggregates is subject to Romanian and European legislation, which address all relevant environmental effects like the excavation of natural raw materials, the rehabilitation of quarries, water and waste management, he emission of noise, dust, energy consumption, etc.

4. LCA Information

4.1 Goal of Study

The goal of this study was to generate an environmental profile of average aggregates 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 aggregates 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 aggregate 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 aggregate 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 three aggregate plants account for 100% of total aggregate 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 aggregate 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 quantity of aggregates produced (sorted / crushed).

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

Plant	Percentage
Stancesti	40%
Gligoresti	37%
Corbii Mari	23%

Table 4 Holcim Romania - Aggregate 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

Site specific data collected from the three manufacturing sites was used. The inventory process in this LCA includes all data related to raw materials used within the production process.

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

- No packaging of the final product has been included as aaggregates are delivered in bulk.
- For each plant, total site production data for all aggregates produced at the plants has been modelled for mass of total aggregates produced – no distinction has been made between sorted and crushed aggregates. The resulting data is for an average aggregate produced from the sites.
- No mains water is used for the washing of the aggregates, only surface and groundwater.

- The materials re-used on site as backfill are reported as inert waste against the non-hazardous waste reporting parameter.

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 aggregate 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 CO_2 equiv.	1.83
Ozone Depletion Potential (ODP)	Kg CFC 11	2.11E-07
Acidification Potential for Soil and Water (AP)	kg SO_2 equiv.	0.0127
Eutrophication Potential (EP)	kg $(PO_4)^3$-equiv.	0.00681
Formation potential of tropospheric Ozone (POCP)	kg C_2H^4 equiv.	3.91E-04
Abiotic Depletion Potential (ADPE)	kg Sb equiv.	7.87E-07
Abiotic Depletion Potential (ADPF)	MJ, net calorific	23.2
Parameters describing resource use, primary energy		
Use of renewable primary energy excluding renewable primary energy used as raw materials (PERE)	MJ	3.24
Use of renewable primary energy resources used as raw materials (PERM)	MJ	0
Total use of renewable primary energy resources (PERT)	MJ	3.24
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (PENRE)	MJ	30.2
Use of non-renewable primary energy resources used as raw materials (PENRM)	MJ	0
Total use of non-renewable primary energy resources (PENRT)	MJ	30.2

Parameters describing resource use, secondary materials and fuels, use of water		
Use of secondary material (SM)	kg	0
Use of renewable secondary fuels (RSF)	MJ	0
Use of non-renewable secondary fuels (NRSF)	MJ	0
Net use of fresh water (FW)	m^3	2.26
Other environmental information describing waste categories		
Hazardous waste disposed (HWD)	kg	2.97E-04
Non-hazardous waste disposed (NHWD)	kg	92
Radioactive waste disposed (RWD)	kg	2.76E-04
Other environmental Information describing output flows		
Components for re-use (CRU)	kg	0
Materials for recycling (MRF)	kg	0.0166
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.

Reading tip:
2.11E-07 = 2.11 x 1^{-7} = 0,000000211

6. Range of Results

This EPD provides the results for the average (representative) product. The total output of production from each aggregate plant 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 aggregate produced at each site compared to the representative (average) product is higher than 10% for the some of the environmental impact indicator categories. The differences in indicator results for GWP, AP, EP, POCP, ADPE and ADPF 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)	Dominated by the supply and use of fossil fuels (diesel) and the indirect emission from electricity production used in processing.
Ozone Depletion Potential (ODP)	Dominated by the supply and use of fossil fuels (diesel) and the indirect emission from electricity production used in processing.
Acidification Potential for Soil and Water (AP)	Dominated by diesel combustion in quarrying and emissions from electricity production used in processing.
Eutrophication Potential (EP)	Dominated by indirect emissions from electricity production used in processing.
Formation potential of tropospheric Ozone (POCP)	Dominated by nitrous oxide and sulphur dioxide emissions from diesel combustion in quarrying and indirect emissions from electricity production used in processing.
Abiotic Depletion Potential (ADPE)	The contribution is dominated by the supply chain of electricity.
Abiotic Depletion Potential (ADPF)	Dominated by diesel combustion in quarrying and emissions from electricity production used in processing.
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 supply and use of fossil fuels (diesel) for the extraction of raw materials and the indirect emission from electricity production used in the processing of the aggregates dominate most parameters describing environmental impacts.

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)	3.1	1.83	-41
Ozone Depletion Potential (ODP)	5.04E-10	2.11E-07	41765
Acidification Potential for Soil and Water (AP)	0.0433	0.0127	-71
Eutrophication Potential (EP)	0.00367	0.00681	86
Formation potential of tropospheric Ozone (POCP)	0.0066	3.91E-04	-94
Abiotic Depletion Potential (ADPE)	2.11E-07	7.87E-07	273
Abiotic Depletion Potential (ADPF)	39.9	23.2	-42

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.

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 Milieuwetenschappen **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 14025:2006 Environmental labels and declarations — Type III environmental declarations — Principles and procedures

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.

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

SR EN 12620+A1:2008 Aggregates for concrete

SR EN 13242+A1:2008 Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction

SR EN 13043:2003/AC:2004 Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas.

SR EN 13139:2003/C91:2009 Aggregates for mortar