ENVIRONMENTAL PRODUCT DECLARATION

Environmental Product Declaration for cement products produced by Holcim Nicaragua at their Planta Nagarote in Nagarote, Nicaragua.

HOLCIM

TABLE OF CONTENTS

ADMINISTRATIVE INFORMATION

International Certified Environmental Product Declaration

Declared Product:	This Environmental Product Declaration (EPD) covers cement products produced by Holcim Nicaragua. Declared unit: 1 tonne of cement
Declaration Owner:	**Holcim Nicaragua** Km 34.5 Carretera Nueva a Leon-Nagarote-Leon Nagarote, Nicaragua https://www.holcim.com.ni
Program Operator:	Labeling Sustainability 11670 W Sunset Blvd. Los Angeles, CA http://labelinsustainability.com/
Product Category Rule:	Core PCR: ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services SubPCR: NSF International (March2020). Product Category Rules (PCR) for ISO 14025 Type III Environmental Product Declarations (EPD) of Portland, Blended, Mansory, Mortar and Plastic (stucco) Cements, Valid through March 31, 2025. Sub PCR Program Operator: NSF International Sub-category PCR review was conducted by: Thomas P. Gloria, Ph. D. of Industrial Ecology Consultants: 35 Bracebridge, Rd., Newton, MA 02459-1728, t.gloria@industrial-ecology.com. Mr. Bill Stough, Sustainable Research Group: PO Box 1684, Grand Rapids, MI 49501-1684, bstough@sustainableresearchgroup.com. Mr. Jack Geilbig, EcoForm: 2624 Abelia War, Suite 611, Knoxville, TN 37931, jgeilbig@ecoform.com
Independent LCA Reviewer and EPD Verifier:	This EPD was independently verified in accordance with ISO 14025. The life cycle assessment was independently reviewed in accordance ISO 14044 and the referenced PCR. Independent verification of the declaration, according to ISO 14025:2006 Internal ☐ ; External ☐ X Third Party Verifier Geoffrey Guest, Certified 3rd Party Verifier under the CSA group (www.csaregistries.ca), Labeling Sustainability (www.labelingsustainability.com), P3Optima (www.P3Optima.com)
Date of Issue:	22 November 2022
Period of Validity:	5 years; valid until 23 November 2027
EPD Number:	97ab2eb4-3d78-4698-88e3-eeed39f62acd

COMPANY DESCRIPTION

Holcim (Nicaragua) S.A. was born in 1997 as a result of the union of a group of distinguished Nicaraguan investors and Holcim Ltd. The Company is part of the Holcim Group, formerly the Lafarge Holcim Group created in July 2015, as a result of the merger of Holcim and Lafarge.

Two Companies with more than 180 years of combined experience, the unified group has now ushered in a new era of cutting-edge technology and innovation in the building materials industry, focused to meet the challenges of the 21st century. As the company becomes a world leader in innovative and sustainable building solutions, the Global Board of Directors recommended simplifying the Group's name to achieve greater impact and efficiency while building its legacy. Our shareholders voted unanimously in favor of the proposed Group name change from LafargeHolcim Ltd to Holcim Ltd on May 4, 2021. Holcim Group launched a new corporate identity on July 8, 2021 and in Latin America it was implemented as of May 1. July 2022. Holcim operates under that name in 70 countries around the world, with a team of more than 70,000 partners worldwide - Builders of Progress with more than 2,300 Work Centers around the world.

Currently, Holcim (Nicaragua) S.A. with a cement production capacity of more than 400 million tons per year, it occupies a preferential place among consumers, an achievement obtained from product quality, technical support and excellence in customer service.

In 2006, the Cement Plant, located in Nagarote, was certified by INCOTEC under the International Standard Organization (ISO) in ISO 9001 (Quality); ISO 14001 (Environment). Additionally, it has been recognized, once a year, as a Leading Company in Health and Safety, an award granted by the National Council of Occupational Hygiene and Safety; and for five consecutive years it has received the National Quality Award from the Ministry of Development, Industry and Commerce, MIFIC.

In 2008, Holcim (Nicaragua) S.A entered the ready-mix concrete business, demonstrating once again its trust in Nicaragua and its people. This Plant, for its part, has received the Leading Company in Occupational Hygiene, Health and Safety award three times.
In 2009, the Company founded the Construmás Hardware Franchise network, with the purpose of strengthening its distribution channel and providing a better value offer, both to its distributor clients and to end users. This network evolved and in 2018 it became Disensa, the largest hardware store network in Latin America, they are the retail service stores of the LafargeHolcim group.
Disensa is currently the largest hardware store network in the country, demonstrating value to the owners of more than 70 points of sale and their customers with a presence in 15 departments in Nicaragua. Disensa meets the significant growth in demand in the Nicaraguan market, with advice on construction and an innovative value offer that accompanies the franchise.

STUDY GOAL

The intended application of this life cycle assessment (LCA) is to comply with the procedures for creating a Type III environmental product declaration (EPD) and publish the EPD for public review on the website, http://labelingsustainability.com/ . This level of study is in accordance with EPD Product Category Rule (PCR) for Cement published by NSF (2020) and is a PCR in accordance with ISO 21930 for Preparing an Environmental Product Declaration for Portland, Blended Hydraulic, Masonry, Mortar, and Plastic (Stucco) Cements. EPDs for cements that follow other PCRs may not be

comparable.; International Standards Organization (ISO) 14025:2006 Environmental labels and declarations, Type III environmental declarations-Principles and procedures; ISO 14044:2006 Environmental management, Life cycle assessment- Requirements and guidelines; and ISO 14040:2006 Environmental management, Life cycle assessment-Principles and framework. The performance of this study and its subsequent publishing is in alignment with the business-to-business (B2B) communication requirements for the environmental assessment of building products. The study does not intend to support comparative assertions and is intended to be disclosed to the public.

This project report was commissioned to differentiate Holcim Nicaragua from their competition for the following reasons: generate an advantage for the organization; offer customers information to help them make informed product decisions; improve the environmental performance of Holcim Nicaragua by continuously measuring, controlling and reducing the environmental impacts of their products; help project facilitators working on Leadership in Energy and Environmental Design (LEED) projects achieve their credit goal; and to strengthen Holcim Nicaragua's license to operate in the community. The intended audience for this LCA report is Holcim Nicaragua's employees, their suppliers, project specifiers of their products, architects, and engineers. The EPD report is also available for policy makers, government officials interested in sustainability, academic professors, and LCA professionals. This LCA report does not include product comparisons from other facilities. Only EPDs prepared from cradle-to-grave life-cycle results and based on the same function, reference service life, and quantified by the same functional unit, can be used to assist purchasers and users in making informed comparisons between products. Since EPDs developed under these PCR only cover the cradle-to-gate impacts of portland, blended hydraulic, masonry, mortar, or plastic (stucco) cements, using a declared unit, the results cannot be used to compare products used in different mixtures and construction products. The results from a portland, blended hydraulic, masonry, mortar, or plastic (stucco) cements EPD must be integrated into a comprehensive cradle-to-grave, ISO 14044-compliant LCA in order to compare between different products. The basis of a comparison, where applicable, shall include the product application in accordance with ISO 21930 ASTM (2014).

DESCRIPTION OF PRODUCT AND SCOPE

This EPD is prepared for products classified as UN CPC Group 3744-Cement or CSI MasterFormat Division 03 30 00 Cast-in-Place Concrete

This EPD is primary reported Holcim data from the reference year 2021. It reports on the three cement mixes produced at the Nagarote grinding plant, made from primarily clinker, natural gypsum and pozzolana. Clinker is transported from six different cement plant: Holcim Costa Rica (CR), Holcim El Salvador (ES), CEMEX Nicaragua (NC), Holcim Mexico (MX), Holcim Ecuador (EC) and imported clinker from Japan. The imported clinker is used for the cement reported in this EPD. This plant is a grinding operation and does not operate a kiln.

This LCA assumes the impacts from products manufactured in accordance with the standards outlined in this report. This LCA is a cradle-to-gate study, and therefore, stages extending beyond the plant gate are not included in this LCA. Excluded stages include transportation of the manufactured material to the construction site; on-site construction processes and components; building (infrastructure) use and maintenance; and "end-of-life" effects.

CEMENT DESIGN SUMMARY

The following tables provide a list of the cement products considered in this EPD along with key performance parameters.

Table 1: **Declared products with all declared products considered in this environmental product declaration**

Mix#	Unique name/ID	Short description	Product type	Clinker content, wt%	Resistance @3 Days (MPa)	Resistance @28 Days (MPa)
1	Fuerte GU (CR)	Fuerte Eco Planet	Ordinary Portland	62.2	14.8	27.90
2	Fuerte GU (ES)	Fuerte Eco Planet	Ordinary Portland	62.2	14.8	27.90
3	Fuerte GU (MX)	Fuerte Eco Planet	Ordinary Portland	63.9	14.8	27.90
4	Fuerte GU (JP)	Fuerte Eco Planet	Ordinary Portland	73.5	14.8	27.90
5	Fuerte GU (NC)	Fuerte Eco Planet	Ordinary Portland	68.3	14.8	27.90
6	Fuerte GU (EC)	Fuerte Eco Planet	Ordinary Portland	65.6	14.8	27.90
7	Industrial HE (CR)	Cemento Industrial TIP HE	High Strength	80.4	27.1	40.63
8	Industrial HE (ES)	Cemento Industrial TIP HE	High Strength	82.9	27.1	40.63
9	Industrial HE (MX)	Cemento Industrial TIP HE	High Strength	82.4	27.1	40.63
10	Industrial HE (JP)	Cemento Industrial TIP HE	High Strength	88.5	27.1	40.63
11	Industrial HE (NC)	Cemento Industrial TIP HE	High Strength	82.5	27.1	40.63
12	Industrial HE (EC)	Cemento Industrial TIP HE	High Strength	83.0	27.1	40.63
13	Super Bloque(CR)	Cemento Súper Bloque TIP HE	High Resistance	73.6	28.9	41.70
14	Super Bloque(ES)	Súper Bloque Cemento TIP HE	High Resistance	73.6	28.9	41.70

CEMENT DESIGN COMPOSITION

The following figures provide mass breakdown (kg per functional unit) of the material composition of each cement design considered. Please note that the presented breakdown has been randomly altered by +/-10% and is therefore only an approximation; this manipulation is to ensure confidentiality.

Table 2 **Cement composition**

Product Components	Raw Material, weight%
Clinker	Proprietary
Mineral Additions (limestone and Pozzolana)	30-60.00
Others	0.01-5.00
Total	100.00

SYSTEM BOUNDARIES

The following figure depicts the cradle-to-gate system boundary considered in this study:

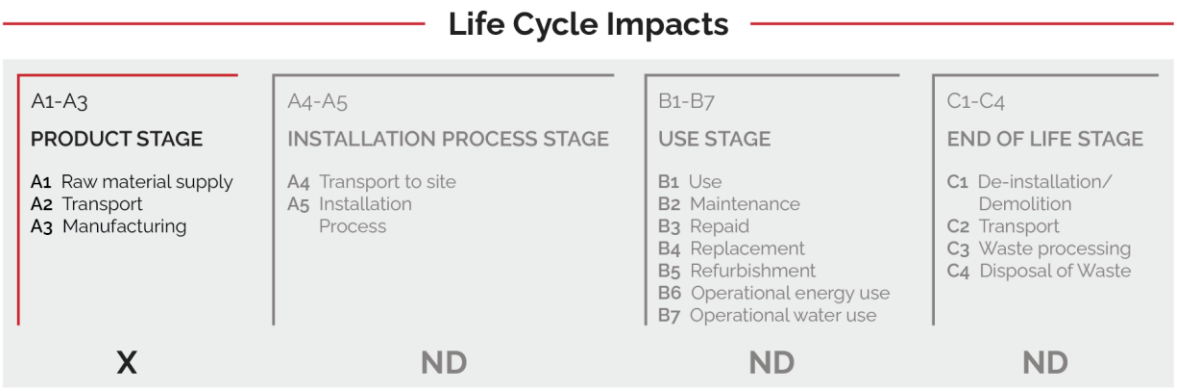

Figure 1: **General life cycle phases for consideration in a construction works system**

This is a Cradle-to-gate life cycle assessment and the following life cycle stages are included in the study:

- A1: Raw material supply (upstream processes) - Extraction, handling, and processing of the materials used in manufacturing the declared products in this LCA.
- A2: Transportation - Transportation of A1 materials from the supplier to the "gate" of the manufacturing facility (i.e. A3).
- A3: Manufacturing (core processes)- The energy and other utility inputs used to store, move, and manufacturer the declared products and to operate the facility.

As according to the PCR, the following figure illustrates the general activities and input requirements for producing cement products and is not necessarily exhaustive.

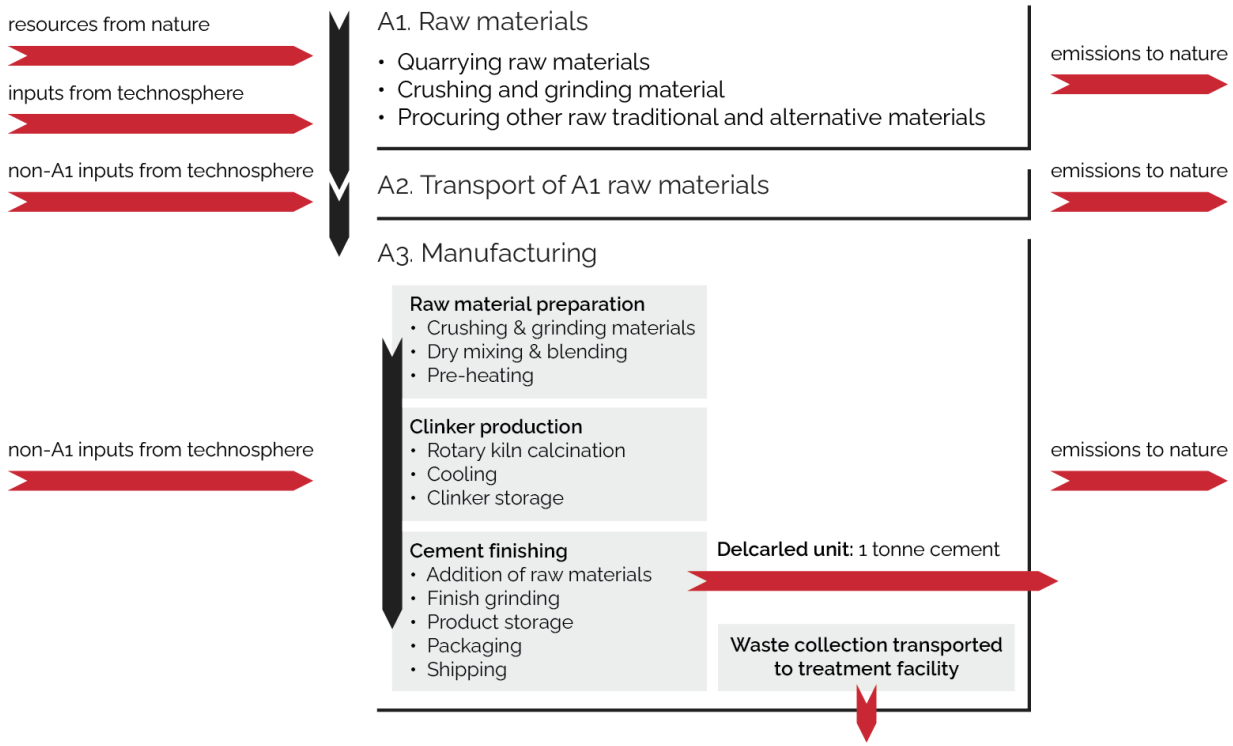

Figure 2: **General system inputs considered in the product system and categorized by modules in scope**

In addition, as according to the relevant PCR, the following requirements are excluded from this study:

- Production, manufacture and construction of A3 building/capital goods and infrastructure;
- Production and manufacture of steel production equipment, steel delivery vehicles, earthmoving equipment, and laboratory equipment;
- Personnel-related activities (travel, furniture, office supplies);
- Energy use related to company management and sales activities.

For this LCA the manufacturing plant, owned and operated by Holcim Nicaragua, is located at their Nagarote facility in Nicaragua. All operating data is formulated using the actual data from Holcim Nicaragua's plant at the above location, including water, energy consumption and waste generation. All inputs for this system boundary are calculated for the plant.

This life cycle inventory was organized in a spreadsheet and was then input into an RStudio environment where pre-calculated LCIA results for relevant products/activities stemming from the ecoinvent v3.8 database and a local EPD database in combination with primary data from Holcim Nicaragua were utilized. Explanations of the contribution of each data source to this study are outlined in the section 'Data Sources and Quality'. Further LCI details for each declared product are provided in the sections 'Detailed LCI tables' and 'Transport tables' of the detailed LCA report. A parameter uncertainty analysis was also performed where key statistical results (e.g. min/mean/max etc.) are provided in the detailed LCA report.

CUT-OFF CRITERIA

ISO 14044:2006 and the focus PCR requires the LCA model to contain a minimum of 95% of the total inflows (mass and energy) to the upstream and core modules be included in this study. The cut-off criteria were applied to all other processes unless otherwise noted above as follows. A 1% cut-off is considered for all renewable and non-renewable primary energy consumption and the total mass of inputs within a unit process where the total of the neglected inputs does not exceed 5%.

DATA SOURCES AND DATA QUALITY ASSESSMENT

Raw material transport: A combination of actual mode/distance combinations were assumed for key bulk materials whereas ecoinvent default multi-modal market mix distances were assumed for other inputs where no original data could be provided.

Electricity: Electricity consumption values are for Holcim Nicaragua in calendar year 2021. These values were direct reported from Holcim Nicaragua records. The unit process "market for electricity, medium voltage/electricity, medium voltage/NI/kWh" was used to represent the Nicaragua grid electricity used by the Nagarote plant.

Process/space heating: All process and space heating values were determined from Holcim Nicaragua reporting. Ecoinvent 3.8 unit processes were used to convert recoded fuel usage into amount burned in MJ. The conversion factor 1 kg of oil= 41.868 MJ was used for the heavy fuel oil.

Fuel required for machinery: Machinery-related fuel requirements were determined from direct Holcim information for propane use outside the kiln. Propane is used for moving vehicles for raw materials. Direct emission calculations for propane were calculated with ecoinvent 3.8 unit processes normalized to the amount of fuel used per ton of cement.

Waste generation: Waste generation values are directly reported from Holcim operations for both bulk waste and hazardous waste. No High-level radioactive waste is generated on-site at this facility

Recovered energy: Not applicable

Recycled/reused material/components: Not applicable.

Module A1 material losses: Due to lack of data, default loss factors were assumed.

Direct A3 emissions accounting: This plant is a grinding plant and does not have a kiln; therefore, the direct emissions are for moving vehicles and dryers for the pozzolana. All direct emissions data were calculated from Holcim Nicaragua's direct reporting of fuel usage and Ecoinvent default processes for burning those fuels. Holcim Nicaragua does not directly report its emissions.

Waste transport requirements: Transportation distances are using estimated values. The waste hauler cannot guarantee the exact distances traveled due to the variation of route and actual location of disposal. Most hazardous waste disposal sites are near the plant therefore the 25 km distance is a representative estimate.

The following tables depict a list of assumed life cycle inventory utilized in the LCA modeling to generate the impact results across the life cycle modules in scope. An assessment of the quality of each LCI activities utilized from various sources is also provided.

Table 3: **LCI inputs assumed for module A1 (i.e. raw material supply)**

Input	LCI.activity	Data.source	Geo	Year	Technology	Time	Geography	Reliability	Completeness
Clinker Costa Rica	clinker production/clinker/RoW/kg	ecoinvent v3.8	Multiple Regions	v3.8 in 2021	2	3	2	3	3
Clinker Guyaquil Ecuador	production of Cement, Clinker for export	Progam Operator: Labeling Sustainability- EPD ID: 0e44bbfa-7b2d-4980-b537-f19062453e5e	Guayaquil	31 October 2022	2	3	2	3	3
Clinker Ronco El Salvador	Clinker for Export-Planta.Ronco-Holcim.El.Salvador	Progam Operator: Labeling Sustainability- EPD ID: 053556cb-5702-43d6-8e07-235705681593	Metapan	17 November 2022	2	3	2	3	3
Clinker Tecoman Mexico	Cement production, Clinker for Export, Tecoman.Cement.Plant, Holcim.Apasco.SA.de.CV/Tecoman, MX/1 tonne of cement	Progam Operator: Labeling Sustainability- EPD ID: 38726011-b5d2-40ea-93f5-7352f727ef0e	Estado de México	28 September 2021	2	3	2	3	3
Pozzolana	market for lignite ash/lignite ash/RoW/kg	ecoinvent v3.8	Leon	v3.8 in 2021	2	3	1	3	3
Natural gypsum	gypsum quarry operation/gypsum, mineral/RoW/kg	ecoinvent v3.8	Leon	v3.8 in 2021	2	3	1	3	3

DATA QUALITY ASSESSMENT

Data quality/variability requirements, as specified in the PCR, are applied. This section describes the achieved data quality relative to the ISO 14044:2006 requirements. Data quality is judged based on its

precision (measured, calculated, or estimated), completeness (e.g., unreported emissions), consistency (degree of uniformity of the methodology applied within a study serving as a data source) and representativeness (geographical, temporal, and technological).

Precision: Through measurement and calculation, the manufacturers collected and provided primary data on their annual production. For accuracy, the LCA practitioner and 3rd Party Verifier validated the plant gate-to-gate data.

Completeness: All relevant specific processes, including inputs (raw materials, energy, and ancillary materials) and outputs (emissions and production volume) were considered and modeled to represent the specified and declared products. Most relevant background materials and processes were taken from ecoinvent v3.6 LCI datasets where relatively recent region-specific electricity inputs were utilized. The most relevant EPDs requiring key A1 inputs were also utilized where readily available.

Consistency: To ensure consistency, the same modeling structure across the respective product systems was utilized for all inputs, which consisted of raw material inputs and ancillary material, energy flows, water resource inputs, product, and co-products outputs, returned and recovered Cement materials, emissions to air, water and soil, and waste recycling and treatment. The same background LCI datasets from the ecoinvent v3.6 database were used across all product systems. Crosschecks concerning the plausibility of mass and energy flows were continuously conducted. The LCA team conducted mass and energy balances at the plant and selected process level to maintain a high level of consistency.

Reproducibility: Internal reproducibility is possible since the data and the models are stored and available in a machine-readable project file for all foreground and background processes, and in Eco-Purpose's proprietary Cement LCA calculator* for all production facility and product-specific calculations. A considerable level of transparency is provided throughout the detailed LCA report as the specifications and material quantity make-up for the declared products are presented and key primary and secondary LCI data sources are summarized. The provision of more detailed publicly accessible data to allow full external reproducibility was not possible due to reasons of confidentiality.

Label Sustainability has developed a proprietary tool that allows the calculation of PCR-compliant LCA results for Cement product designs. The tool auto-calculates results by scaling base-unit Technosphere inputs (i.e., 1 kg sand, 1 kWh electricity, etc.) to replicate the reference flow conversions that take place in any typical LCA software like openLCA or SimaPro. The tool was tested against several LCAs performed in openLCA and the tool generated identical results to those realized in openLCA across every impact category and inventory metric (where comparisons could be readily made).

Representativeness: The representativeness of the data is summarized as follows.

- Time related coverage of the manufacturing processes' primary collected data from 2020-01-01 to 2020-12-31.
- Upstream (background) LCI data was either the PCR specified default (if applicable) or more appropriate LCI datasets as found in the country-adjusted ecoinvent v3.6 database.
- Geographical coverage for inputs required by the A3 facility(ies) is representative of its region of focus; other upstream and background processes are based on US, North American, or global average data and adjusted to regional electricity mixes when relevant.

- Technological coverage is typical or average and specific to the participating facilities for all primary data.

ENVIRONMENTAL INDICATORS AND INVENTORY METRICS

Per the PCR, this EPD supports the life cycle impact assessment indicators and inventory metrics as listed in the tables below. As specified in the PCR, the most recent US EPA Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI), impact categories were utilized as they provide a North American context for the mandatory category indicators to be included in the EPD. Additionally, the PCR requires a set of inventory metrics to be reported with the LCIA indicators (see tables below).

It should be noted that emerging LCA impact categories and inventory items are still under development and can have high levels of uncertainty that preclude international acceptance pending further development. Use caution when interpreting data in any of the following categories.

LIMITATIONS

This EPD is a declaration of potential environmental impact and does not support or provide definitive comparisons of the environmental performance of specific products. Only EPDs prepared from cradle-to-grave life cycle results and based on the same function and reference service life and quantified by the same functional unit can be used to assist purchasers and users in making informed comparisons between products.

LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks. Further, LCA offers a wide array of environmental impact indicators, and this EPD reports a collection of those, as specified by the PCR.

In addition to the impact results, this EPD provides several metrics related to resource consumption and waste generation. While these data may be informational in other ways, they do not provide a measure of impact on the environment.

TOTAL IMPACT SUMMARY

The following table reports the total LCA results for each product produced at the given cement facility on a per 1 tonne of cement basis.

Table 4: **Total life cycle (across modules in scope) impact results for All declared products, assuming the geometric mean point values on a per 1 tonne of cement basis**

a) Midpoint Impact Categories:

Indicator/LCI Metric	AP	EP	GWP	ODP	PCOP	ADPe	ADPf
Unit	**kg SO2eq**	**kg N**	**kg CO2-Eq**	**kg CFC-11.**	**kg O3eq**	**kg Sbeq**	**kg Sbeq**
Minimum	88.1	0.0989	625	2e-05	1.22	0.00161	2490
Maximum	150	0.226	1070	9.71e-05	2.08	0.00409	6900
Mean	113	0.141	827	4.83e-05	1.65	0.00296	4300

Median	112	0.128	806	4.52e-05	1.62	0.0033	4010
Fuerte GU (CR)	98.8	0.129	715	4.53e-05	1.46	0.00336	4360
Fuerte GU (ES)	115	0.172	808	7.4e-05	1.58	0.00305	5250
Fuerte GU (MX)	88.1	0.116	792	4.51e-05	1.22	0.00167	3260
Fuerte GU (JP)	96.3	0.107	719	2.77e-05	1.48	0.00337	3280
Fuerte GU (NC)	90	0.1	670	2.6e-05	1.38	0.00301	3060
Fuerte GU (EC)	103	0.0989	625	2e-05	1.54	0.00161	2490
Industrial HE (CR)	125	0.163	918	5.73e-05	1.86	0.00409	5560
Industrial HE (ES)	150	0.226	1070	9.71e-05	2.08	0.00369	6900
Industrial HE (MX)	111	0.146	1010	5.69e-05	1.55	0.00181	4130
Industrial HE (JP)	114	0.127	862	3.25e-05	1.76	0.00373	3890
Industrial HE (NC)	107	0.119	805	3.06e-05	1.65	0.0035	3650
Industrial HE (EC)	129	0.122	786	2.43e-05	1.93	0.00173	3080
Super Bloque(CR)	115	0.15	842	5.28e-05	1.71	0.00359	5110
Super Bloque(ES)	134	0.202	952	8.68e-05	1.85	0.00323	6160

b) Inventory Metrics:

Indicator/LCI Metric	**TPE**	**RE**	**NRE**	**NRR**	**RR**	**WDP**	**LFW**	**LFHW**	**bioC**
Unit	**MJ-Eq**	**MJ-Eq**	**MJ-Eq**	**kg**	**kg**	**m3 water-.**	**kg waste**	**kg waste**	**kg**
Minimum	2960	148	2620	95.8	0.000887	0.273	27.2	0.0016	-2.32
Maximum	7880	497	7360	246	0.00466	1.14	176	0.00975	0.119
Mean	4880	313	4550	150	0.00301	0.741	76.9	0.00474	-1.09
Median	4480	301	4280	138	0.00338	0.77	39.7	0.00322	-1.02
Fuerte GU (CR)	4880	270	4600	144	0.00362	0.885	105	0.00606	-1.66
Fuerte GU (ES)	6000	407	5600	186	0.00281	0.527	138	0.00738	-0.291
Fuerte GU (MX)	3640	148	3460	95.8	0.000887	0.273	37.1	0.00283	-0.23
Fuerte GU (JP)	3740	273	3430	119	0.00347	0.909	27.8	0.00226	-1.93
Fuerte GU (NC)	3520	262	3210	112	0.00329	0.847	27.2	0.0021	-1.8
Fuerte GU (EC)	2960	323	2620	99.7	0.00125	0.435	27.5	0.0016	0.091
Industrial HE (CR)	6220	311	5890	183	0.00466	1.14	129	0.00778	-2.14
Industrial HE (ES)	7880	497	7360	246	0.0038	0.693	176	0.00975	-0.383
Industrial HE (MX)	4570	157	4420	122	0.00113	0.345	42.3	0.0036	-0.293
Industrial HE (JP)	4400	303	4130	142	0.00422	1.09	29.5	0.00268	-2.32

Industrial HE (NC)	4130	291	3830	133	0.00389	1.02	28.9	0.00251	-2.17
Industrial HE (EC)	3630	383	3250	124	0.00151	0.545	29.8	0.00198	0.119
Super Bloque(CR)	5700	299	5400	170	0.00427	1.04	120	0.00713	-1.96
Super Bloque(ES)	7020	456	6560	219	0.00329	0.619	159	0.0087	-0.342

REFERENCES

ASTM Standards:

- ASTM C150/C150M Standard Specification for Portland Cement
- ASTM C260/C260M Standard Specification for Air-Entraining Admixtures for Concrete
- ASTM C595 Standard Specification for Blended Hydraulic Cements
- ASTM C618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
- ASTM C979/C979M Standard Specification for Pigments for Integrally Colored Concrete
- ASTM C989/C989M Standard Specification for Slag Cement for Use in Concrete and Mortars
- ASTM C1017/C1017M Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
- ASTM C1116/C1116M Standard Specification for Fiber-Reinforced Concrete
- ASTM C1157/C1157M Standard Performance Specification for Hydraulic Cement
- ASTM C1240 Standard Specification for Silica Fume Used in Cementitious Mixtures
- ASTM C1602/C1602M Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
- ASTM G109 Standard Test Method for Determining Effects of Chemical Admixtures on Corrosion of Embedded Steel Reinforcement in Concrete Exposed to Chloride Environments

CSA Standards:

- CAN/CSA A3000 Cementitious Materials Compendium
- CAN/CSA G40.20/G40.21 General requirements for rolled or welded structural quality steel / Structural quality steel

ISO Standards:

- ISO 6707-1: 2014 Buildings and Civil Engineering Works - Vocabulary - Part 1: General Terms
- ISO 14021:1999 Environmental Labels and Declarations - Self-declared Environmental Claims (Type II Environmental Labeling)
- 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 14067:2018 Greenhouse Gases - Carbon Footprint of Products - Requirements and Guidelines for Quantification
- ISO 14050:2009 Environmental Management - Vocabulary
- ISO 21930:2017 Sustainability in Building Construction - Environmental Declaration of Building Products

EN Standards:

- EN 16757 Sustainability of construction works - Environmental product declarations - Product Category Rules for concrete and concrete elements
- EN 15804 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products

Other References:

- US EPA Waste Reduction Model (WARM), Fly Ash Chapter: http://epa.gov/climatechange/wycd/waste/downloads/fly-ash-chapter10-28-10.pdf
- USGBC LEED v4 for Building Design and Construction, 11 Jan 2019 available at https://www.usgbc.org/resources/pcr-committee-process-resources-part-b
- USGBC PCR Committee Process & Resources: Part B, USGBC, 7 July 2017 available at https://www.usgbc.org/resources/pcr-committee-process-resources-part-b.