st marys cement

Environmental Product Declaration

St Marys Cement, Bowmanville Plant

NRMCA CERTIFIED EPD

VOTORANTIM cimentos

An Environmental Product Declaration
In accordance with ISO 14025 and 21930

About this EPD

This document is a Type III Environmental Product Declaration (EPD) describing various cements produced by Votorantim Cimentos North America (VCNA) - St Marys Cement at its Bowmanville, ON cement plant. The results of the underlying LCA are computed with the North American (N.A.) version of the Global Cement and Concrete Association (GCCA) Industry EPD tool for cement and concrete [1]. This tool and the underlying LCA model and database have been previously verified to conform to the prevailing sub-product category rule (PCR) [2], ISO 21930:2017 (the core PCR) [3] as well as ISO 14025:2006 [4] and ISO 14040/44:2006 LCA standards [5], [6].

General Summary

EPD Commissioner and Owner

VCNA - St Marys Cement
55 Industrial St.
Toronto, ON M4G 3W9
http://www.stmaryscement.com

St Marys provided both LCI and meta-data for clinker production and cement manufacture for reference year 2019. St Marys also completed the LCA modeling within the GCCA EPD tool. The owner of the declaration is liable for the underlying information and evidence.

Product Group and Name

Cement, UN CPC 3744.

Product Definition

Portland cement is defined as a hydraulic cement produced by pulverizing clinker, consisting essentially of crystalline hydraulic calcium silicates, and usually containing one or more of the following: water, calcium sulfate, up to 5% limestone, and processing additions (ASTM C150, AASTHO M 85, CSA A3001) [7].
Portland Cement *Type I GU*—For use when the special properties specified for any other type are not required.
Portland Cement *Type II MH, MS*—For general use, more especially when moderate heat or moderate sulfate resistance is desired.
Portland Cement Type III HE—For use when high early strength is desired.
Some cements are designated with a combined type classification, such as Type I/II, indicating that the cement meets the requirements of the indicated types and is being offered as suitable for use when either type is desired.

Blended cement is a hydraulic cement consisting of two or more inorganic constituents (at least one of which is not portland cement or portland cement clinker) which separately or in combination contribute to the strength gaining properties of the cement, (made with or without other constituents, processing additions and functional additions, by intergrinding or other blending) (ASTM C595, AASHTO M 240, CSA A3001) [8].

- Type IL GUL— is a Portland-limestone cement (PLC) and is a hydraulic cement in which the interground limestone content is more than 5% but less than or equal to 15% by mass of the blended cement.
- Type IL (HE) / HEL – is a hydraulic high early cement in which the interground limestone content is more than 5% but less than or equal to 15% by mass of the blended cement.

- GULb-S – is a blended hydraulic Portland-limestone cement in which the limestone content is more than 5% but less or equal to 15% by mass of the Portland-limestone constituent containing interground slag cement.
- Type IT (S) (L) - is a ternary blended hydraulic Portland-limestone cement in which the limestone content is more than 5% but less or equal to 15% by mass containing interground slag cement.

Product Category Rules (PCR)	NSF International, Product Category Rules for Preparing an Environmental Product Declaration for Portland, Blended Hydraulic, Masonry, Mortar, and Plastic (Stucco) Cements, V3.2, September 2021 [2].
Date of Issue & Validity Period	09/10/2021 (Revised February 2024) – 5 years
Declared Unit	1 metric ton of cement

EPD and Project Report Information

Program Operator	National Ready Mixed Concrete Association (NRMCA) 66 Canal Center Plaza, Suite 250 Alexandria, VA 22314 https://www.nrmca.org
Declaration Number	NRMCAEPD:20046
Declaration Type	Cradle-to-gate (modules A1 to A3). Facility and product-specific.
Applicable Countries	United States and Canada
Product Applicability	Portland cement is the basic ingredient of concrete. Concrete, one of the most widely used construction materials in the world, is formed when portland cement creates a paste with water that binds with sand and rock to harden.
Content of the Declaration	This declaration follows Section 9; Content of an EPD, NSF International, Product Category Rules for Preparing an Environmental Product Declaration for Portland, Blended Hydraulic, Masonry, Mortar, and Plastic (Stucco) Cements, V3.2, September 2021 [2].
This EPD was independently verified by NRMCA in accordance with ISO 14025 and the reference PCR: Internal __ External X	Thomas P. Gloria, PhD. t.gloria@industrial-ecology.com Industrial Ecology Consultants
EPD Prepared by:	Athena Sustainable Materials Institute 280 Albert Street, Suite 404 Ottawa, Ontario, Canada K1P 5G8 info@athenasmi.org www.athenasmi.org

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PCR Information

Program Operator	NSF International
Reference PCR	Product Category Rules for Preparing an Environmental Product Declaration for Portland, Blended Hydraulic, Masonry, Mortar, and Plastic (Stucco) Cements, V3.2, September 2021 [2].
PCR review was conducted by:	Thomas P. Gloria, PhD (Chair), Industrial Ecology Consultants, Mr. Jack Geibig, EcoForm Mr. Bill Stough, Sustainable Research Group

St Marys Cement & Production Facility

St Marys Cement is part of the North American operations of international building materials supplier, Votorantim Cimentos. As one of the top cement producers in the world, Votorantim Cimentos has 32 cement plants worldwide, with a combined capacity of 7.8 million metric tons per annum in North America. Votorantim Cimentos and St Marys Cement symbolize a long heritage of excellence and commitment to both the construction industry and to a sustainable future. St Marys Cement manufactures a variety of cement for different purposes - normal, high-early strength, low heat hydration, and sulphate-resisting as well as other supplementary cementitious products - in bulk and as bagged product. St Marys markets its portland limestone cement under the name envirocem™ and it is blended portland limestone/ slag cement under the name envirocem plus™. St Marys Cement supplies cement to customers across the Great Lakes region through an integrated, intermodal distribution network serviced by barge, rail and truck. Bowmanville Cement Plant recently added a wet scrubber to its operations that reduces its Sulphur Dioxide (SO_2) emissions by 90%. The plant is also undertaking efforts to use Alternative Low Carbon Fuels (ALCF) as an energy source which helps to reduce greenhouse gas emissions in Ontario while diverting materials from landfills.

Facility Name: Bowmanville Plant
400 Bowmanville Ave
Bowmanville, Ontario
L1C 3K3

envirocem™

envirocem plus™

Product Description

This EPD reports environmental transparency information for Ordinary Portland Cement, High Early Cement, Portland Limestone Cement, and Blended Cement produced by VCNA – St Marys Cement at its Bowmanville ON plant. Cements are hydraulic binders and are manufactured by grinding cement clinker and other main or minor constituents into a finely ground, usually grey colored mineral powder. When mixed with water, cement acts as a glue to bind together the sand, gravel or crushed stone to form concrete, one of the most durable, resilient and widely used construction materials in the world. The Table below sets out each cement type constituents and applicable standards.

Products and Standard

Inputs	Portland Type I/II GU, MH, MS	Portland Type III HE	Blended Type IL (8) (HE), HEL	PLC Type IL, GUL envirocem™	Blended Type IT(S15)(S10), GULb-15S envirocem plus™
Clinker	91%	93%	85%	85%	71%
Gypsum	5%	7%	7%	4%	4%
Limestone	4%	0%	8%	11%	10%
Slag	0%	0%	0%	0%	15%
Others	<1%	<1%	<1%	<1%	<1%
Total	100%	100%	100%	100%	100%

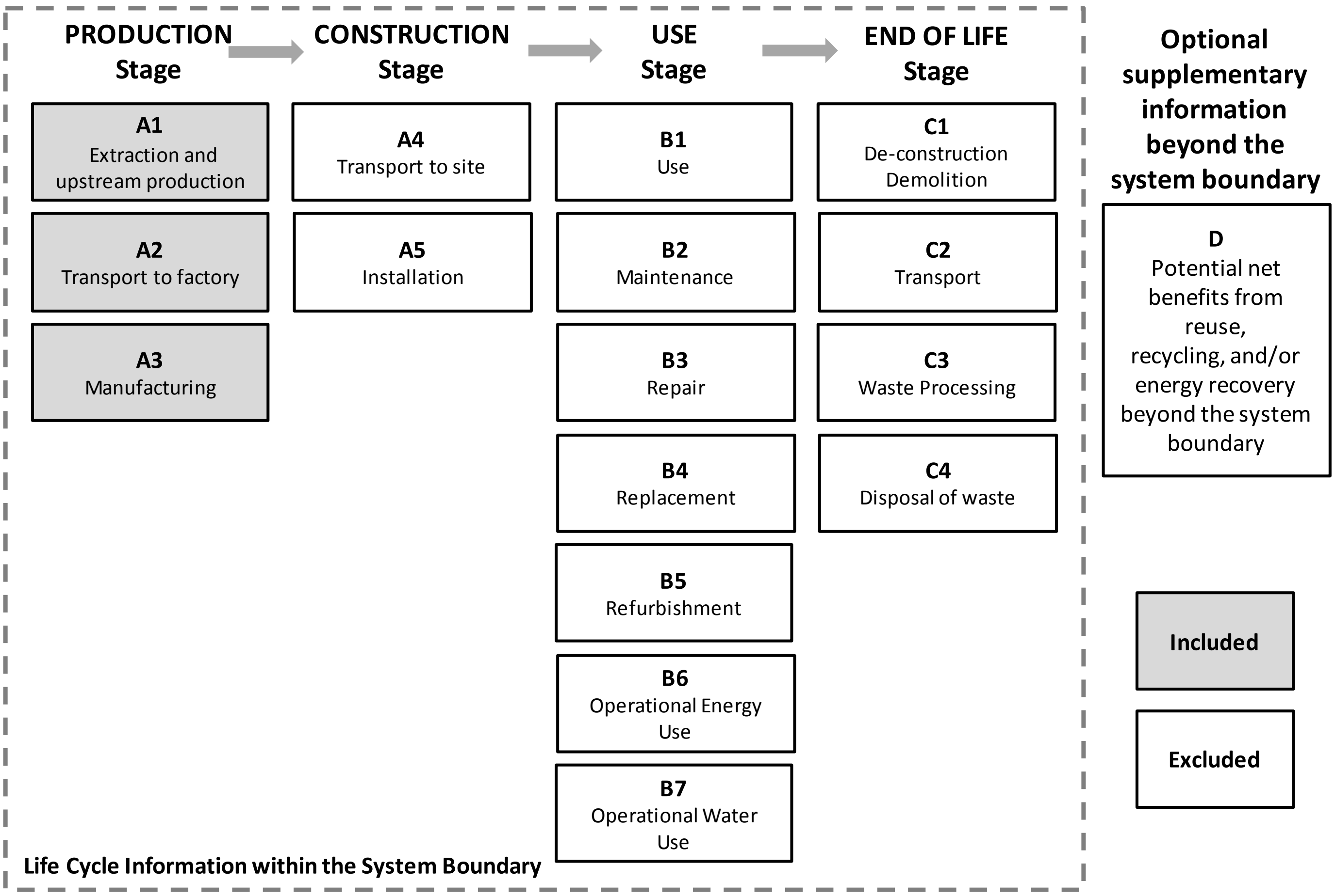
Applicable Standards:
ASTM C150 / C150M, AASHTO M 85, CSA A3001 –Standard Specification for Portland Cement.
ASTM C595 / C595M, AASHTO M 240, CSA A3001 – Standard Specification for Blended Hydraulic Cement.

Declared Unit

The declared unit is one metric tonne of cement.

System Boundary

This EPD is a cradle-to-gate EPD covering the production stage (A1-A3) as depicted in the figure below. The production stage includes extraction of raw materials (cradle) through the manufacture of cements ready for shipment (gate). The Bowmanville cement plant ships its cement products in bulk.



Items *excluded* from the system boundary include:

- Production, manufacture, and construction of manufacturing capital goods and infrastructure
- Production and manufacture of production equipment, delivery vehicles, and laboratory equipment
- Personnel-related activities (travel, furniture, and office supplies)
- Energy and water use related to company management and sales activities that may be located either within the factory site or at another location

Cut-off Criteria

The cut-off criteria as per NSF PCR, Section 7.1.8 [2] and ISO 21930, 7.1.8 [3] were followed. Per ISO 21930, 7.1.8, all input/output data required were collected and included in the LCI modelling. No substances with hazardous and toxic properties that pose a concern for human health and/or the environment were identified in the framework of this EPD.

Data Collection

Gate-to-gate input/output flow data were collected for the following processes for the reference year 2019:

- clinker production and cement manufacture – Bowmanville, ON.

Allocation Rules

Allocation of inventory flows and subsequently environmental impact is relevant when assets are shared between product systems. The allocation method prescribed by the PCR [2] is applied in the underlying LCA model. The sub-category PCR recognizes fly ash, furnace bottom ash, bypass dust, mill scale, polluted soils, spent catalyst, aluminum oxide waste, silica fume, granulated blast furnace slag, iron rich waste, cement kiln dust (CKD), flue gas desulfurization (FGD) gypsum, calcium fluoride rich waste and postconsumer gypsum as recovered materials and thus, the environmental impacts allocated to these materials are limited to the treatment and transportation required to use as a cement material input. Further, used tires, plastics, solvents, used oil and oily waste, coal/carbon waste, roofing asphalt, household refuse-derived waste, non-hazardous liquid waste, industrial sludge, and agricultural waste are considered non-renewable and/or renewable secondary fuels. Only the materials, water, energy, emissions, and other elemental flows associated with reprocessing, handling, sorting and transportation from the point of the generating industrial process to their use in the production process are considered. All emissions from combustion at the point of use are considered. For co-products, no credit is considered, and no allocation is applied. See the LCA model and LCA database reports of the N.A. version of GCCA's Industry Tool for EPDs of cement and concrete for more information [13 &14].

Data Quality Assessment

Data Quality Requirements	Description
Technology Coverage	LCI data represents the prevailing technology in use at the Bowmanville, ON facility. The Bowmanville, ON plant utilizes *a dry with preheater and precalciner kiln technology*. *Technological representativeness is characterized as "high".*
Geographic Coverage	The geographic region considered is the U.S and Canada. *Geographical representativeness is characterized as "high".*
Time Coverage	Activity (primary) data are representative of 2019 calendar year (12 months). - Bowmanville, ON clinker production, - Bowmanville, ON cement manufacturing, - In-bound/ out-bound transportation data - primary data collected for Bowmanville, ON cement manufacturing plant. *Temporal representativeness is characterized as "high".*
Completeness	All relevant, specific processes, including inputs (raw materials, energy and ancillary materials) and outputs (emissions and production volume) were considered and modeled in the GCCA Tool to complete production profile for Bowmanville, ON cement products. Bowmanville, ON operates an emissions monitoring system and reports emissions to the National Pollution Release Inventory. These data for 2019 were drawn on in the completion of this EPD. The completeness of the foreground process chain in terms of process steps is rigorously assessed.
Consistency	To ensure consistency, cross checks of the energy demand and the calculated raw meal to clinker ratio against ranges reported in the WBCSD Cement Sustainability Initiative, Cement CO2 and Energy Protocol, v3.1 December, 2013 were conducted [15]. The LCA team conducted mass and energy balances at the facility level and selected process levels to maintain a high level of consistency.

Reproducibility	External reproducibility is not possible as the background report is confidential.
Transparency	Activity datasets are disclosed in the project LCI compilation, and the background reports generated by the GCCA Tool.
Uncertainty	A *sensitivity check* was conducted relative to the PCA industry average. The variation across significant inputs were found to be well within the expected range and hence, there is high degree of confidence in the results.

Life Cycle Impact Assessment Results: Bowmanville, ON Cements

This section summarizes the production stage life cycle impact assessment (LCIA) results including resource use and waste generated metrics based on the cradle-to-gate life cycle inventory inputs and outputs analysis. The results are calculated based on 1 metric ton of each cement type as produced at the Bowmanville plant. *It should be noted that LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks [2], [3]. Further, a large number of LCA impact categories and inventory items are still emerging or under development and can have high levels of uncertainty that preclude international acceptance pending further development. Use caution when interpreting results for these categories – identified with an "*"* [2].

Only EPDs prepared from cradle-to-grave life-cycle results and based on the same function, quantified by the same functional unit, and taking account of replacement based on the product reference service life (RSL) relative to an assumed building service life, can be used to assist purchasers and users in making informed comparisons between products [3]. Environmental declarations from different programs may not be comparable [6]. EPDs are comparable only if they comply with ISO 21930, use the same, sub-category PCR where applicable, include all relevant information modules and are based on equivalent scenarios with respect to the context of construction works [2].

Production stage EPD Results: Bowmanville, ON – per Metric Ton

Impact category and inventory indicators	Unit	Portland Type I/II GU, MH, MS	Portland Type III HE	Blended Type IL (8) (HE), HEL	PLC Type IL, GUL envirocem™	Blended Type IT(S15)(S10), GULb-15S envirocem plus™
Global warming potential, GWP 100, IPCC 2013 (AR5)	kg CO_2 eq	**839.70**	**863.50**	**780.90**	**769.8**	**663.10**
Ozone depletion potential, ODP	kg CFC-11 eq	**1.67E-05**	**2.15E-05**	**1.77E-05**	**1.60E-05**	**1.56E-01**
Acidification potential, AP	kg SO_2 eq	**5.04**	**5.17**	**4.69**	**4.63**	**3.97**
Eutrophication potential, EP	kg N eq	**0.68**	**0.71**	**0.64**	**0.63**	**0.55**
Smog formation potential, SFP	kg O_3 eq	**41.66**	**42.69**	**38.93**	**38.43**	**33.14**
Abiotic depletion potential for non-fossil mineral resources, ADP elements*	kg Sb eq	**1.00E-04**	**1.39E-04**	**1.13E-04**	**9.50E-05**	**9.64E-05**
Abiotic depletion potential for fossil resources, ADP fossil*	MJ, net calorific value	**4048**	**4672**	**4023**	**3781**	**3411**
Renewable primary resources used as an energy carrier (fuel), RPR_E*	MJ, net calorific value	**196.9**	**283**	**221.7**	**192.9**	**184.3**

Renewable primary resources with energy content used as material, RPR_M*	MJ, net calorific value	0	0	0	0	0
Non-renewable primary resources used as an energy carrier (fuel), $NRPR_E$*	MJ, net calorific value	4048	4672	4023	3781	3411
Non-renewable primary resources with energy content used as material, $NRPR_M$*	MJ, net calorific value	0	0	0	0	0
Secondary materials, SM*	kg	54.21	55.47	55.19	49.67	192.20
Renewable secondary fuels, RSF*	MJ, net calorific value	0	0	0	0	0
Non-renewable secondary fuels, NRSF*	MJ, net calorific value	0	0	0	0	0
Net use of freshwater, NFW*	m^3	3.96	4.23	3.91	3.80	3.55
Hazardous waste disposed, HWD*	kg	0	0	0	0	0
Non-hazardous waste disposed, NHWD*	kg	1.92E-1	1.96E-1	1.18E-1	1.76E-1	1.49E-11
High-level radioactive waste, conditioned, to final repository, HLRW*	kg	x[1])	x[1])	x[1])	x[1])	x[1])
Intermediate- and low-level radioactive waste, conditioned, to final repository, ILLRW*	kg	x[1])	x[1])	x[1])	x[1])	x[1])
Components for re-use, CRU*	kg	0	0	0	0	0
Materials for recycling, MFR*	kg	9.13E-2	9.34E-2	8.45E-2	8.36E-2	7.10E-2
Materials for energy recovery, MER*	kg	0	0	0	0	0
Recovered energy exported from the product system, EE*	kg	0	0	0	0	0
Global warming potential - biogenic, GWP_{bio}*	kg CO_2 eq	2.68E-1	3.91E-1	3.05E-1	2.63E-1	2.44E-1
Emissions from calcination*	kg CO_2 eq	479.1	490.2	443.6	439.0	372.80
Emissions from combustion of waste from renewable sources*	kg CO_2 eq	0	0	0	0	0
Emissions from combustion of waste from non-renewable sources*	kg CO_2 eq	0	0	0	0	0

[1]) x – The GCCA EPD Tool does not support these indicators.

*) Use caution when interpreting results for these categories

LCA Interpretation

The Manufacturing module (A3) drives most of the potential environmental impacts. Manufacturing impacts are primarily driven by energy use (electricity and thermal fuels) used during the pyroprocessing of limestone in the production of clinker. Clinker content in cement similarly defines the relative environmental profile of the final cement product. Raw material extraction (A1) is the second largest contributor to the Production stage EPD results, followed by transportation (A2).

Additional Environmental Information

Recognizing that sustainability is a journey, we are taking another step toward building an increasingly sustainable company and thereby creating long-term value for our stakeholders. This important step is now encapsulated in the publication of our 2030 commitments. In addition to being aligned with our way of being, our 2030 commitments also encompass our climate ambition for 2050. Their development considered an in-depth assessment of megatrends such as demographic changes; globalization and future markets; climate change challenges; and innovation and technology dynamics and their impact on the building materials industry. These commitments aim to align our entire operation with the current and future needs of society, thereby generating shared value and producing a positive impact on the value chain. Please read more about our 2030 commitments at: https://www.votorantimcimentos.com.br/integrated-report/

Environmental Protection Manufacture and Equipment
St Marys manufacturing facilities comply with both U.S. and Canadian environmental regulations. The Bowmanville plant monitors its emission and report these emissions to the National Pollution Release Inventory managed by Environment and Climate Change Canada - https://www.canada.ca/en/environment-climate-change/services/national-pollutant-release-inventory/report.htmlair

ISO 9001 Certified. ISO 9001 certification means that this plant conforms to an international standard primarily concerned with Quality Management. The Bowmanville Plant adheres to these high standards with regard to fulfilling our customer's quality requirements, following applicable regulatory requirements, while aiming to enhance customer satisfaction and achieve continual improvement of its performance in pursuit of these objectives.

ISO 14001 Certified. ISO 14001 is the internationally recognized standard for environmental management of businesses. Certification to this system provides order and consistency for managing activities at the Bowmanville Plant that may have an impact on the environment. ISO 14001 ensures the effectiveness of prescribed controls; through the allocation of resources, assignment of responsibility and ongoing evaluation of environmental practices, procedures and processes.

ISO 45001 Certified. ISO 45001 is an Occupational Health and Safety Management System. Certification to this standard ensures that the Bowmanville Plant is able to control occupational health and safety risks which ensure the well-being of our most valuable asset – our people.

ISO 50001 Certified**.** The Bowmanville Cement Plant was the first in North America to receive certification for the newly developed ISO 50001 Energy Management Standard, thus underscoring its commitment towards energy conservation. This new standard is built on the same continual improvement model as the other high-profile ISO Systems. The Bowmanville Plant uses its certification to ISO 50001 as the framework for establishing the systems and processes necessary to improve energy performance and efficiency while reducing or optimizing energy consumption.

References

1. Global Cement and Concrete Association (GCCA) 2023. *N.A. version of Industry EPD tool for Cement and Concrete*. https://concrete-epd-tool.org/
2. NSF International, Product Category Rule Environmental Product Declarations, PCR for Portland, Blended, Masonry, Mortar, and Plastic (Stucco) Cements, V3.2, September 2021.
3. ISO 21930:2017 Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products and services.
4. ISO 14025:2006 Environmental labeling and declarations - Type III environmental declarations - Principles and procedures.
5. ISO 14040:2006/Amd1:2020 Environmental management - Life cycle assessment - Principles and framework.
6. ISO 14044:2006/Amd1:2017/Amd2:2020 Environmental management - Life cycle assessment - Requirements and guidelines.
7. ASTM C150 / C150M, AASHTO M 85, CSA A3001 –Standard Specification for Portland Cement.
8. ASTM C595 / C595M, AASHTO M 240, CSA A3001 – Standard Specification for Blended Hydraulic Cement.
9. NSF International, Product Category Rule Environmental Product Declarations, PCR for Concrete, February 2020.
10. ISO 14020:2000 Environmental labels and declarations – General Principles.
11. ISO 14021:2016 Environmental labels and declarations -- Self-declared environmental claims (Type II environmental labelling).
12. NRMCA, General Program Instructions for Environmental Product Declarations, v2.0 (June 2019-May 2024).
13. GCCA and PCA, *GCCA Industry EPD Tool for Cement and Concrete (v4.2), LCA Model, North American version*, Prepared by Quantis, December 2023.
14. Global Cement and Concrete Association (GCCA). *LCA Database, North American version*, Prepared by Quantis, December 2023.
15. WBCSD CSI 2013: CO_2 and Energy Protocol Version 3.1 of 9 December 2013. https://www.cement-co2-protocol.org/en/
16. GCCA and PCA, *GCCA Industry EPD Tool for Cement and Concrete (V3.0), Users Manual, North American version*, Prepared by Quantis, April 2021.
17. U.S. EPA, Emissions & Generation Resource Integrated Database (eGRID) https://www.epa.gov/egrid, accessed October 2020.