Ready-mix Concrete

Environmental Product Declaration

30MPa 19mm Pump 30% Flyash - 3019PFA30 – Taupo

In accordance with ISO 14025 and EN15804:2012+A2:2019/AC:2021

Programme: The International EPD® System | www.environdec.com

Programme operator: EPD International AB

Regional Programme: EPD Australasia | www.epd-australasia.com

Managed by: Holcim NZ Ltd

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An EPD may be updated or depublished if conditions change. To find the latest version for the EPD and to confirm its validity, see www.environdec.com.

CONTENTS

Revision Number	Revision Date	Description of Changes
001	2026-03-13	N/A

INFORMATION ABOUT EPD OWNER

INTRODUCTION

Worldwide, there is a growing expectation for Governments and organizations to increase transparency and disclosure regarding environmental impacts, particularly greenhouse gas (GHG) emissions. This trend has gained momentum since the landmark COP 21 Paris Agreement in 2015, where nations collectively committed to ambitious efforts to combat climate change.

Simultaneously, the global demand for construction materials is on the rise due to population growth and increased urbanization. Concrete, the world's second most utilized commodity after water, significantly contributes to the embodied GHG emissions of infrastructure and property assets. In light of Aotearoa's commitment to achieving net zero by 2050, Holcim New Zealand is actively working towards a lower carbon footprint in the built environment.

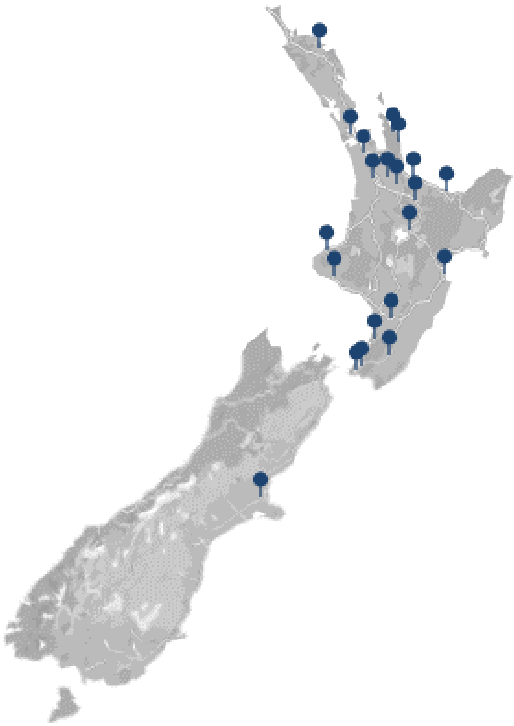
For Holcim, building progress entails offering a comprehensive range of low carbon, high-performance, and specialty concrete solutions tailored for Aotearoa's homes, buildings, and infrastructure. We provide guidance, tools, and resources to empower you to confidently specify your projects. Our commitment extends to delivering solutions that align with your needs consistently.

This underscores the urgent need for construction materials both now and in the future, emphasizing the construction materials industry's pivotal role in addressing climate change. At Holcim, we acknowledge our responsibility to contribute to global emissions reduction targets. To guide our efforts, we have developed a roadmap outlining specific actions to align with these objectives.

**Together, we can build better
to help decarbonise Aotearoa.**

HOLCIM NEW ZEALAND

Holcim New Zealand (NZ) is a leading solutions provider for your design and construction needs in New Zealand, dating back to 1888. Today, we supply essential construction materials from cement terminals & depots, quarries and ready-mix concrete sites to customers. Our ready-mix concrete solutions offer a comprehensive range of low carbon, high-performance, and specialty concrete solutions tailored for Aotearoa's homes, buildings, and infrastructure throughout the country.



Globally, Holcim employs more than 45,000 people who are passionate about building progress for people and the planet through four business segments: Cement, Ready-Mix Concrete, Aggregates and Solutions & Products.

Sustainability is at the core of our global strategy, with our industry's first 2030 and 2050 net-zero targets validated by the Science Based Targets initiative for all scopes. We are leading the transition towards low-carbon construction and driving a circular economy by providing materials and solutions that are re-shaping the way our industry builds. Holcim NZ has developed a range of low carbon solutions specifically for the New Zealand market.

This EPD provides our stakeholders with confidence about the environmental impact of our products.

PRODUCT INFORMATION

HOLCIM NZ READY-MIX CONCRETE

Holcim NZ is committed to delivering project-specific Environmental Product Declarations (EPDs) on demand, a significant stride in our sustainability journey. This approach reflects our comprehensive commitment to integrating sustainability throughout our organization and operations. Utilizing third-party verified data, our concrete solutions empower us to collaborate seamlessly with customers, optimizing sustainability performance from tender to design and construction.

Our concrete products from Holcim NZ come with the assurance of an EPD Process Certification. This certification signifies our ability to produce compliant EPDs in-house, providing substantial capability and flexibility in leveraging life cycle impact data for our operations and customer collaborations.

Obtaining our EPD Process Certification involved a strategic investment in integrating Life Cycle Assessment (LCA) into our systems and processes. We underwent a rigorous third-party evaluation adhering to relevant ISO standards and guidelines set by the International EPD Program and EPD Australasia. This ensures the credibility and reliability of the data supporting our commitment to sustainability.

This EPD has been developed using our EPD Process Certification for 30MPa 19mm Pump 30% Flyash - 3019PFA30 – Taupo with production occurring at HOLCIM RMX, TAUPO, NEW ZEALAND.

PRODUCT DESCRIPTION

30MPa 19mm Pump 30% Flyash Ready-mix concrete is produced at batching plants where controlled operations allow precise mix designs resulting in a product that is delivered to construction sites in a freshly mixed, plastic, or unhardened state.

Concretes categorised as Normal and Special are defined and made in accordance with NZS 3104:2003, to ensure that nominal strengths and performance requirements are achieved.

Concrete covered by this EPD are listed in Table 1.

Product Name	Strength	Plant	Mix Code	Description of Use
30MPa 19mm Pump 30% Flyash	30	Taupo	3019PFA30	General Use

Table 1. Concrete covered by this EPD

Manufacturing process and flow diagram

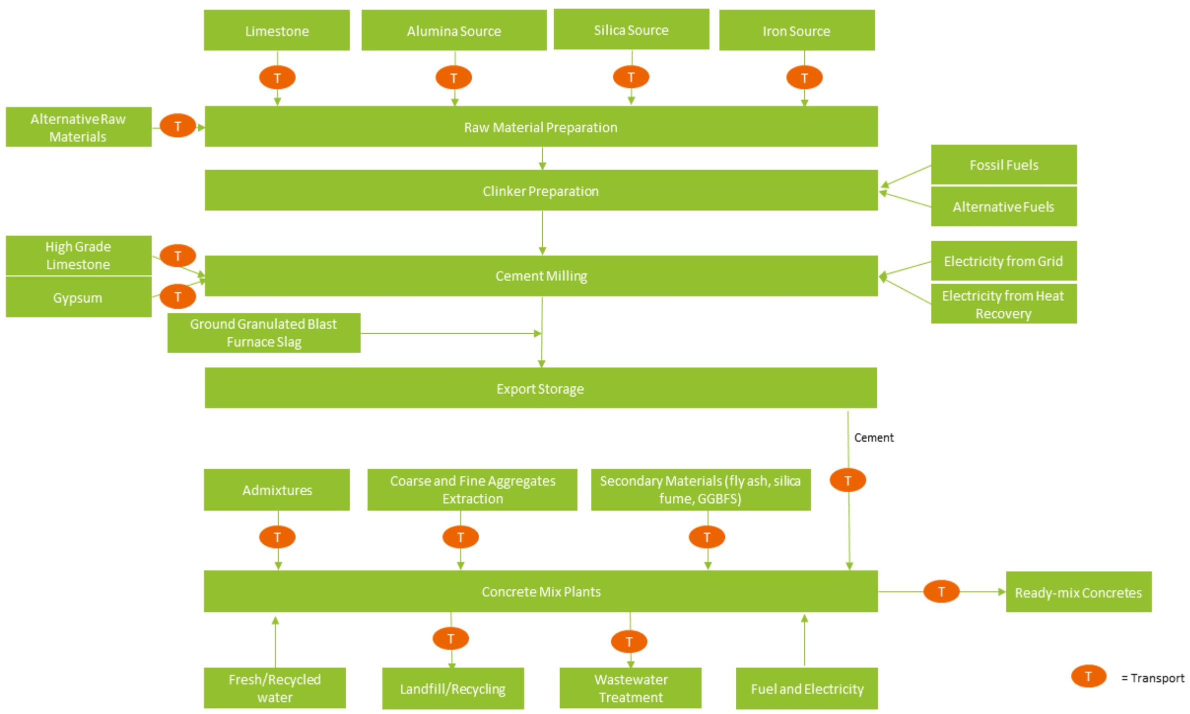


Figure 1. Manufacturing Process Flow

CONTENT DECLARATION

The following table provides a summary of the materials included in Holcim ready-mix concrete and their relative composition by weight.

There are no recycled materials used in producing the product.

Item	Mass (%)	Post-consumer recycled content (%)	Biogenic material (%)	Biogenic material (kg C/m^3 of product)
Portland Cement	5-21%	0	0	0
Aggregate	67-84%	0	0	0
Supplementary Cementitious materials	0-11%	0	0	0
Water	11.6-12%	0	0	0
Admixture	<1%	0	0	0

Table 2. Material Composition

The gross weight of the declared material is 2392 Kg per m^3, accounting for a minimum of 99% of the products covered by this EPD.

There is no recycled materials used in producing the product.

The product does not contain one or more substances that are listed in the "Candidate List of Substances of Very High Concern for authorisation".

Packaging

Holcim ready-mix concrete is delivered in bulk with no packaging.

LCA INFORMATION

Declared Unit

The declared unit adopted is 1m^3 of ready-mix concrete in use.

Manufacturing Location

Holcim RMX Taupo, Taupo, New Zealand.

Technical Lifetime

The Reference Service Life (RSL) is 50 years in accordance with NZS 3101. The actual technical service life is dependent on the final engineered application and exposure conditions.

Time Representativeness

The plant data for the LCA is based on 2022 calendar year production data. The mix data for the LCA is based on 2025 calendar year production data.

LCA Methodology

This EPD has been produced in conformance with the requirements of:

- c-PCR-003 Concrete and concrete element
- Product Category Rules (PCR) 2019:14 v2.0.1
- EN 15804+A2:2019/AC:2021
- General Program Instructions (GPI) v5.0.1
- Instructions of EPD Australasia v4.2
- ISO 14040 and ISO 14044

Databases and LCA Software Used

The software used was SimaPro Craft LCA software (v 10.2). The inventory data for the processes are entered in the LCA software and linked to the pre-existing background data for upstream feedstocks and services. Inventory data was selected per the standards, in the following order of preference:

- ecoinvent 3.11 database and its EN15804+A2 package database were used as the primary source for inventory data (Ecoinvent v3.11, 2024). At the time of this report, this ecoinvent database version is less than 1 year old.

- The Australian Life Cycle Inventory (AusLCI) v2.45 was compiled by the Australian Life Cycle Assessment Society (ALCAS) – this data will comply with the AusLCI Data Guidelines (Australian Life Cycle Inventory Database Initiative (AusLCI), 2025). At the time of this report, this AusLCI database version is less than 1 year old.
- The Environmental Footprint (EF) database v3.1 is facilitated by the European Commission and developed by ecoinvent, Sphera, Blonk, CEPE, and Pré Sustainability (Developer Environmental Footprint (EF), 2022). At the time of this report, this EF database version is around 3 years old.

The following impact categories were calculated manually for the foreground data:

- Use of renewable primary energy resources used as raw materials (PERM)
- Use of non-renewable primary energy resources used as raw materials (PENRM)
- Materials for recycling
- Non-hazardous waste disposed

Allocation

According to EN 15804+A2, in a process step where more than one type of product is generated, it is necessary to allocate the environmental stressors (inputs and outputs) from the process to the different products (functional outputs) in order to get product-based inventory data instead of process-based data. An allocation problem also occurs for multi-input processes. In an allocation procedure, the sum of the allocated inputs and outputs to the products shall be equal to the unallocated inputs and outputs of the unit process.

The following stepwise allocation principles shall be applied for multi-input/output allocations:

- The initial allocation step includes dividing up the system sub-processes and collecting the input and output data related to these sub-processes.
- The first (preferably) allocation procedure step for each sub-process is to partition the inputs and outputs of the system into their different products in a way that reflects the underlying physical relationships between them.
- The second (worst case) allocation is needed when physical relationship alone cannot be established or used as the basis for allocation. In this case, the remaining environmental inputs and outputs from a sub-process must be allocated between the products in a way that reflects other relationships between them, such as the economic values.

Holcim (NZ) produces a range of concrete mixes at each of their concrete batching plants, with the range dependent on customer demand. Due to the random nature of which mixes are produced and the large number of concrete mixes, allocation was required to determine the amount of site resource use, discharges and emissions associated with each mix. Annual consumption of energy and resource were collected at each site. Allocation was carried out based on physical relationships for annual production amount, by volume in m^3. It's assumed that all kinds of ready-mix concrete products consume the same amount of resource and energy during production.

One exception is the fuel consumption for mixing and loading in manufacturing plants. Holcim (NZ) performed a fuel burn diagnostic report on a typical mixing truck they owned. The fuel consumption for mixing and loading or loading only (for some plants) for 1 m^3 product was diagnosed, calculated, and directly used without any allocation since it's measured per declared unit covered in this EPD.

The impacts of fly ash, granulated blast furnace slag, and silica fume are allocated based on relative production volumes and market prices, from Holcim New Zealand's procurement records, with additional processing impacts included where applicable.

Recycled Material

BS EN 16757:2022 specifically lists the following materials relevant to the study as co-products:

- Fly ash;
- Ground granulated blast furnace slag; and
- Silica Fume

As such, the above materials are considered as co-products of their production process and the impacts for their production process are allocated according to PCR 2019:14 Construction Products and Construction Services (co-produced goods, multi-output allocation).

According to PCR 2019:14, economic allocation shall be used for processes producing co-products for use in cement and concrete. It should be based on market prices, preferably in long-term averages (≥3 years). While assessing the environmental burden of the high value co-products (e.g., steel, electricity, silicon), the environmental burden allocated to the low value co-products used in cement and concrete can be omitted as a conservative estimate. Therefore, the economic allocation method is applied to the below materials:

- Fly ash: It is sourced from coal-fired electricity generation. Depending on agreements, it may be purchased or collected at no cost. The environmental impact of fly ash is derived from coal-fired electricity, converted from the heating value of coal on a per-kWh basis.
- Ground granulated blast furnace slag: The environmental impact is allocated to blast furnace slag at the point of generation during pig iron production, based on both production volumes and market prices. The specific energy and processing impacts associated with grinding the blast furnace slag into GGBFS are also included in stage A1.
- Silica fume: It is sourced as a co-product of ferrosilicon production, with no further processing needed. The raw material impact of silica fume is allocated directly from ferrosilicon, considering the relative production volumes and market prices.

Cut-off Rules

It is common practice in LCA/LCI protocols to propose exclusion limits for inputs and outputs that fall below a threshold % of the total, but with the exception that where the input/output has a "significant" impact it should be included. According to the PCR 2019:14, v2.0.1, LCI data shall according to EN15804+A2 include a minimum of 99% of total inflows (mass and energy) per unit process and 95% of total inflows (mass and energy) per life-cycle stages A1-A3, A4-A5 and C1-C4, aggregated modules B1-B5 and B6-B7, and module D. In addition, this PCR applies the expanded 5% cut-off rule of ISO 21930, which says that at least 95% of the environmental impact per such aggregated module shall be included. Inflows not included in the LCA shall be documented in the EPD. Data gaps in included stages in the downstream modules shall be reported in the EPD, including an evaluation of their significance. In accordance with the PCR 2019:14, the following system boundaries are applied to manufacturing equipment and employees:

- Environmental impact from infrastructure, construction, production equipment, and tools that are not directly consumed in the production process are not accounted for in the LCI. Exceptions are made for the infrastructure associated with electricity and heating supply in Module A3 and infrastructure in the manufacturing site operated by Holcim, where impacts such as those from the construction of power plants and manufacturing plants, are included in accordance with PCR v2.0.1. Capital equipment and buildings typically account for less than a few percent of nearly all LCIs and this is usually smaller than the error in the inventory data itself. For this project, it is assumed that capital equipment makes a negligible contribution to the impacts as per Frischknecht et al. with no further investigation (Frischknecht, 2007).
- Personnel-related impacts, such as transportation to and from work, are also not accounted for in the LCI. The impacts of employees are also excluded from inventory impacts on the basis that if they were not employed for this production or service function, they would be employed for another. It is very hard to decide what proportion of the impacts from their whole lives should count towards their employment. For this project, the impacts of employees are excluded.

Based on this guidance, no energy or mass flows, except packaging of materials were excluded. All materials required for manufacturing are delivered via trucks and ships without packaging.

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SYSTEM BOUNDARY

The system boundary is shown in Figure 2 below. The scope of LCA for this EPD is cradle-to-gate with modules C1-C4, and module D. Emissions from construction installation (A5) was excluded as Holcim (NZ) does not have operational control over the installation of products at the construction site. In addition, the following life cycle stages were also excluded: distribution (A4) and use stages (B1-B7).

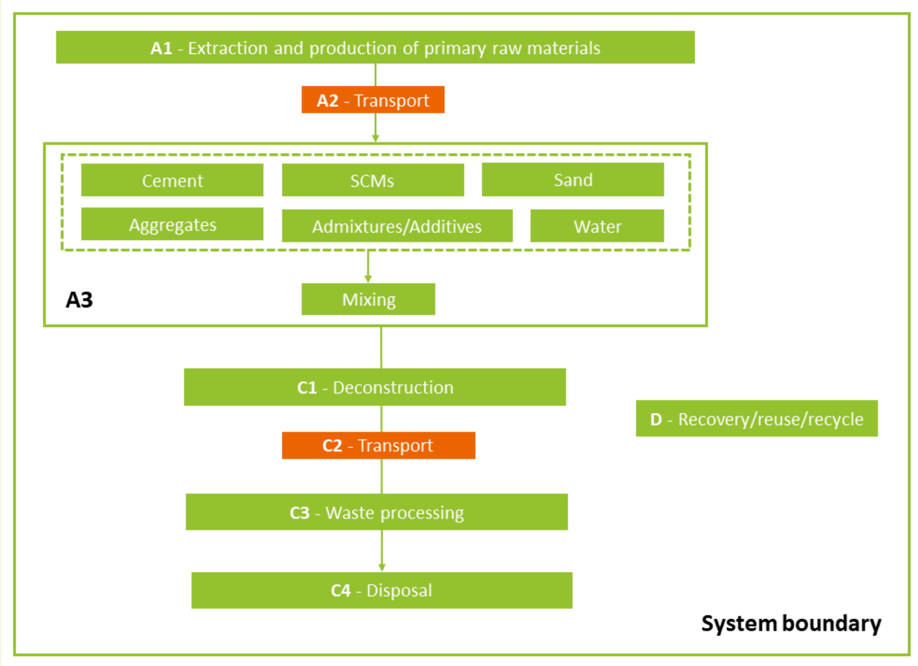

Figure 2. System Boundary

Cradle to Gate (Modules A1-A3)

Holcim NZ use cement, supplementary cementitious materials (SCMs), aggregates, admixtures, and other additives to manufacture concrete products.

Generic data from LCA databases were used to model all raw materials. A few exceptions apply where suppliers of raw materials publish product specific EPDs, which are incorporated in the background processes. Not all are fully aligned with PCR v2.0.1 or EN 15804+A2, but were developed under robust earlier standards and include product-specific data with valid indicators. Despite minor scope differences, they provide more representative results than generic datasets and improve the overall quality of this EPD.

The cellulose pulp is assumed to have 12.2 MJ/kg as renewable energy resource used as raw material, based on the energy density quoted for biomass municipal and industrial materials in the National Greenhouse Accounts Factors (Department of the Environment, 2021).

All the materials used for concrete mixes were transported via either truck or mix of truck and barge depending on the sources of raw materials. Holcim NZ transport all aggregates to the concrete plants on both the North and South islands. Additives and admixtures are transported via various external courier companies. Concrete manufacturing is undertaken at Holcim NZ branded concrete batching plants. All plants have the same or similar site resource use profile, management systems and operating systems. The process of manufacturing concrete involves the careful proportioning and mixing of cement, SCMs, aggregates, water, chemical admixtures and additives including colour oxides in some instances. These raw materials are mixed in batching plants according to the specific concrete mix designs.

Data for site resource use at Holcim NZ's concrete batching plants for fiscal year 2022 was provided separately. They are allocated to 1m^3 of ready-mix concrete product based on the annual production volume in each batching plant. Processes for concrete site resource use in each state were created and include:

- Site electricity use data is from the contract management and energy information service company.
- Site fuel use (diesel, gasoline, propane) information is from individual plant fuel data collection system. For plants (Queenstown and Gore) that don't have fuel data for 2022 due to different accounting systems, a monthly average estimated amount is provided by plant manager and supervisor based on experience.
- Site water use data is from invoices. Where invoices were unavailable, pro rate values were applied.
- Site waste is gathered through questionnaire filled out by plant staff or through waste management invoices.

Electricity used in the manufacturing process is modelled based on the electricity residual mix in 2023-2024, New Zealand, with primary source from hydro (61%), geothermal (20%), natural gas (9%), wind (7%), and other sources (3%). The electricity emission (GWP-GHG) is 9.1E-02 kg CO_2e/kWh.

Deconstruction and End of Life (Modules C1-C4)

Deconstruction has been modelled as the physical process of drilling and removing the concrete. Hydraulic excavator is assumed as the operating tool for deconstruction. The amount of diesel used is sourced from PCR that 10 kWh of diesel is used for per tonne of concrete deconstruction.

100% of the products are assumed to be separately collected during deconstruction. A transport distance of 50 km from the site to the landfill facility has been applied for waste transport.

No activities occur under Module C3 (waste processing), and therefore all impact results for C3 are reported as 0.

In Module C4, all products are assumed to be 100% landfilled. This assumption is based on the information from New Zealand's Greenhouse Gas Inventory (1990-2021), indicating that solid waste from household, industrial and commercial is almost exclusively disposed of via landfill.

No CO_2 uptake has taken place in any module declared.

Module	Parameter	Value	Unit
C1 – Deconstruction	Diesel	86.4	MJ
C2 – Transportation	Distance to landfill	50	km
C4 – Waste Disposal	Inert waste landfill	100	%

Vehicle	Fuel use (L/tkm)	Fuel type	Carrying capacity	Average load factor	Volume capacity utilization factor
Euro 5 Heavy Truck	4.41E-02	Diesel	16 t - 32 t	50%	<1

Table 3. End of life assumptions per 1 m³ of concrete in use

Recyclability Potentials (Module D)

During the product manufacturing (Module A3), there're cardboard, plastic, metal scrap and/or used oil to recycling at some sites, reaching their end-of-waste states, and benefits of the corresponding avoided virgin materials are claimed in Module D.

100% of the product goes to landfill when it reaches end-of-life (Module C), therefore no activities are included in Module D.

MODULES DECLARED IN THE EPD

	Product Stage			Construction Stage		Use Stage							End of Life Stage				Benefits & loads for the next product system
	Raw Material Supply	Transport	Manufacturing	Transport	Construction/Installation process	Use	Maintenance incl. transport	Repair incl. transport	Replacement incl. transport	Refurbishment incl. transport	Operational Energy Use	Operational Water Use	De-construction & Demolition	Transport	Re-use Recycling	Final Disposal	Reuse, Recovery Recycling potential
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Module Declared	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	NZ	NZ	NZ										NZ	NZ	NZ	NZ	NZ
Primary data used*	70-80%																
Variation – products	0%																
Variation - sites	0%																

Table 4. Modules declared in this EPD

ND: Module not declared

* The share of primary data is calculated based on GWP-GHG results. It is a simplified indicator for data quality that supports the use of more primary data, to increase the representativeness of and comparability between EPDs. Note that the indicator does not capture all relevant aspects of data quality and is not comparable across product categories.

* The reported share of primary data is associated with uncertainty, as several EPDs used as data source lack information on the share of primary data.

Data Quality

The EPD covers ready-mix concrete from the Holcim (NZ) manufacturing plant in New Zealand. The raw materials, transport, and site data provided are from the year January 2022 – December 2022. The EPD also covers end-of-life in New Zealand. Scheme for data quality assessment of UN Environment Global Guidance on LCA database development in line with Annex E of EN15804+A2 is used to perform this data quality assessment activity, as shown in Table 5. No data classified as fair, poor or very poor data were found among the processes contributing significantly (i.e. greater than 5% of the total impact for any reported indicator) during the assessment of relevant data.

Process	Source type	Source	Ref. year	Data category
Cementitious material	EPDs, Database	Suppliers ecoinvent v3.10.1 EN15804 package	2021-2024	Primary & Secondary data
Other raw materials	Database	ecoinvent v3.10.1 EN15804 package	2023	Secondary data
Raw material transport from suppliers	Database	ecoinvent v3.10.1 EN15804 package	2023	Secondary data
Manufacturing	Collected data	EPD owner	2022	Primary data
Other processes	Database	ecoinvent v3.10.1 EN15804 package	2023	Secondary data

Table 5. Data Quality Assessment

Key Assumptions

Module	Assumption or limitation	Impact on LCA results	Discussion
A1	Raw material packaging	Minor	For simplicity and lacking comprehensive data, all raw material packaging is excluded in this study.
A1	Most emission factors assigned to raw materials are generic	Significant	The emission factors assigned to most raw materials covered in this calculator are generic that are available in the LCA databases. They are the closest proxy based on the available raw material information. If more specific impacts available from suppliers in the future, they should replace the current ones to better reflect the impacts of the raw material.
A2	Transport distance from raw material supplier to Holcim (NZ) plants	Minor	Although transport distances are available for some raw materials, others that don't have the data are estimated and assumed to be the average distance of the corresponding material type.
A2	GreenStar and IS indicators for Holcim cement	Minor	The transport impacts in Holcim's published EPD about its cement product didn't include GreenStar and IS indicators. Thus, in the background calculation of these indicators, the tool uses the generic heavy truck dataset in ecoinvent 3.11 and made assumptions that transport from Holcim terminal Auckland and Timaru to depot are 200km 50km, respectively. Based on these assumptions, the tool calculated the GreenStar and IS indicators.
A3	Waste production	Minor	The amount of waste and wastewater produced are estimated by Holcim (NZ). If more specific data is available in the future, it could improve accuracy of the impacts for 1m^3 of product.
C1	Deconstruction	Minor	The deconstruction process is assumed to be the same for all products.
C2	Transport to landfill	Minor	It is assumed 50km distance to landfill based on the distance from likely construction sites within major cities to main landfill sites for the area.

Table 6. Assumptions, choices, and limitations

LIFE CYCLE IMPACT ASSESSMENT INDICATORS

The potential environmental impacts, use of resources and waste categories included in this EPD were calculated using the SimaPro Craft v10.2 tool and are listed in the table below. They are aligned to and adopted from Environmental Footprint 3.1. All tables from this point will contain abbreviations only. The potential environmental performance is calculated based on the input data and the emission factors from Ecoinvent v3.11. The LCA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds and safety margins or risks.

Long-term storage (>100 years) is not taken into consideration in the impact estimate.

The results generated by module A1-A3 should not be used in isolation. It is strongly advised that the outcomes produced by modules A1-A3 are considered alongside the results derived from module C to ensure comprehensiveness and accurate analysis.

Impact Category	Abbreviation	Measurement	Assessment Method & Implementation
Potential Environmental Impacts			
Global warming potential (fossil)	GWP-fossil	kg CO_2 equivalents (GWP100)	Baseline model of 100 years of the IPCC based on IPCC 2021
Global warming potential (biogenic)	GWP-biogenic	kg CO_2 equivalents (GWP100)	Baseline model of 100 years of the IPCC based on IPCC 2021
Galo warming potential (Land use/ land transformation)	GWP-luluc	kg CO_2 equivalents (GWP100)	Baseline model of 100 years of the IPCC based on IPCC 2021
Total global warming potential	GWP-total	kg CO_2 equivalents (GWP100)	Baseline model of 100 years of the IPCC based on IPCC 2021
Acidification potential	AP	mol H^+ eq.	Accumulated Exceedance, Seppälä et al. 2006, Posch et al., 2008
Eutrophication – aquatic freshwater	EP - freshwater	kg P equivalent	EUTREND model, Struijs et al., 2009b, as implemented in ReCiPe
Eutrophication – aquatic marine	EP - marine	kg N equivalent	EUTREND model, Struijs et al., 2009b, as implemented in ReCiPe
Eutrophication – terrestrial	EP – terrestrial	mol N equivalent	Accumulated Exceedance, Seppälä et al. 2006, Posch et al.
Photochemical ozone creation potential	POCP	kg NMVOC equivalents	LOTOS-EUROS, Van Zelm et al., 2008, as applied in ReCiPe
Abiotic depletion potential (elements)*	ADPE	kg Sb equivalents	CML (v4.8)
Abiotic depletion potential (fossil fuels)*	ADPF	MJ net calorific value	CML (v4.8)
Ozone depletion potential	ODP	kg CFC 11 equivalents	Steady-state ODPs, WMO 2014
Water Depletion Potential*	WDP	m^3 equivalent deprived	Available Water Remaining (AWARE) Boulay et al., 2016 (includes Australia flows calculated using 36 Australian catchments)
Resource use			
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	PERE	MJ, net calorific value	Manual for direct inputs
Use of renewable primary energy resources used as raw materials	PERM	MJ, net calorific value	Manual for direct inputs [1]
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	PERT	MJ, net calorific value	ecoinvent version 3.11 and expanded by PRé Consultants[2]
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	PENRE	MJ, net calorific value	Manual for direct inputs
Use of non- renewable primary energy resources used as raw materials	PENRM	MJ, net calorific value	Manual for direct inputs [3]
Total use of non- renewable primary energy resources (primary energy and primary energy resources used as raw materials)	PENRT	MJ, net calorific value	ecoinvent version 3.11 and expanded by PRé Consultants [4]
Use of secondary material	SM	kg	Manual for direct inputs
Use of renewable secondary fuels	RSF	MJ, net calorific value	Manual for direct inputs
Use of non-renewable secondary fuels	NRSF	MJ, net calorific value	Manual for direct inputs
Use of net fresh water	FW	m^3	ReCiPe 2016
Waste categories and Output flows			
Hazardous waste disposed	HWD	kg	EDIP 2003 (v1.05)

[1] Calculated based on the lower heating value (LHV) of renewable raw materials. LHV is taken from https://phyllis.nl/, as recommended by SimaPro in compliance with EN15804+A2: https://support.simapro.com/s/article/How-to-calculate-EN-15804-A2-indicators-in-desktop-SimaPro

[2] Calculated as sum of renewable, biomass; renewable, wind, solar and geothermal, and renewable, water.

[3] Calculated based on the lower heating value (LHV) of non-renewable raw materials. LHV is taken from https://phyllis.nl/, as recommended by SimaPro in compliance with EN15804+A2: https://support.simapro.com/s/article/How-to-calculate-EN-15804-A2-indicators-in-desktop-SimaPro

[4] Calculated as sum of non-renewable, fossil and non-renewable, nuclear.

Impact Category	Abbreviation	Measurement	Assessment Method & Implementation
Non-hazardous waste disposed	NHWD	kg	EDIP 2003 (v1.05) [5]
Radioactive waste disposed/stored	RWD	kg	EDIP 2003 (v1.05)
Components for re-use	CRU	Kg	Manual for direct inputs
Material for recycling	MFR	Kg	Manual for direct inputs
Materials for energy recovery	MERE	Kg	Manual for direct inputs
Exported energy, electricity	EE – e	MJ per energy carrier	Manual for direct inputs
Exported energy, thermal	EE – t	MJ per energy carrier	Manual for direct inputs
Additional environmental impacts			
Global warming potential, excluding biogenic uptake, emissions and storage	GWP-GHG	kg CO_2 equivalents (GWP100)	Baseline model of 100 years of the IPCC based on IPCC 2021 [6]
Particulate matter	Potential incidence of disease due to PM emissions (PM)	Disease incidence	SETAC-UNEP, Fantke et al. 2016
Ionising radiation - human health**	Potential Human exposure efficiency relative to U235 (IRP)	kBq U-235 eq.	Human Health Effect model
Eco-toxicity (freshwater)*	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	CTUe	USEtox
Human toxicity potential - cancer effects*	Potential Comparative Toxic Unit for humans (HTP-c)	CTUh	USEtox
Human toxicity potential - non cancer effects*	Potential Comparative Toxic Unit for humans (HTP-nc)	CTUh	USEtox
Soil quality*	Potential soil quality index (SQP)	dimensionless	Soil quality index (LANCA®)

Life cycle impact, measurement, and methods for Green Star and IS

Impact Indicators	Measurement Unit	Assessment Method and Implementation
Green Star		
Human toxicity cancer	CTUh	USEtox - cancer effect
Human toxicity non-cancer	CTUh	USEtox - noncancer effect
Land use	kg C deficit eq.	Soil Organic Matter method
Resource depletion – water	m^3	Water Stress Indicator
Ionising radiation	kBq U-235 eq.	Human Health Effect model
Particulate matter	kg PM2.5 eq.	RiskPoll
IS Rating		
Global Warming Potential	kg CO_2 eq.	CML (v4.02) based on IPCC AR4
Ozone Depletion Potential	kg CFC-11 eq.	CML (v4.02) based on WMO 1999
Acidification Potential	kg SO_2 eq.	CML (v4.02)
Eutrophication Potential	kg PO_4^{3-} eq.	CML (v4.02)
Photochemical Ozone Creation Potential	kg C_2H_4 eq.	CML (v4.2)
Abiotic Depletion Potential (Elements)	kg Sb eq.	CML (v4.2)
Abiotic Depletion Potential (Fossil Fuels)	MJ net calorific value	CML (v4.2)

5 Calculated as sum of *Bulk waste* and *Slags/ash*.

6 This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO2 is set to zero; calculated as the sum of *GWP-luluc* and *GWP-fossil* in the LCA model.

* Disclaimer 1 – The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

** Disclaimer 2 – This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

ENVIRONMENTAL PERFORMANCE

FOR 1M^3 - 30MPA 19MM PUMP 30% FLYASH - 3019PFA30 – TAUPO

The interpretation of results is presented in the following sections. Note that the use of results of modules A1-A3 or A1-A5, without considering the results of module C may mislead the communication and decision-making. The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

Potential Environmental Impact – Mandatory Indicators according to EN 15804+A2

Impact Indicators	Unit	A1-A3	C1	C2	C3	C4	D
GWP-fossil	kg CO_2 eq.	2.36E+02	8.11E+00	1.94E+01	0.00E+00	2.39E+01	0.00E+00
GWP-biogenic	kg CO_2 eq.	6.18E-02	3.49E-04	1.27E-03	0.00E+00	1.63E-01	0.00E+00
GWP-luluc	kg CO_2 eq.	1.23E-01	2.81E-04	9.88E-04	0.00E+00	1.14E-02	0.00E+00
GWP-total	kg CO_2 eq.	2.36E+02	8.11E+00	1.94E+01	0.00E+00	2.40E+01	0.00E+00
ODP	kg CFC-11 eq.	2.54E-07	1.28E-07	6.20E-09	0.00E+00	6.31E-07	0.00E+00
AP	mol H^+ eq.	8.02E-01	7.58E-02	5.47E-02	0.00E+00	2.72E-01	0.00E+00
EP-freshwater	kg P eq.	6.42E-03	7.67E-06	1.35E-04	0.00E+00	1.67E-03	0.00E+00
EP-marine	kg N eq.	3.01E-01	3.57E-02	1.89E-02	0.00E+00	6.78E-02	0.00E+00
EP-terrestrial	mol N eq	3.31E+00	3.91E-01	2.09E-01	0.00E+00	7.33E-01	0.00E+00
POCP	kg NMVOC eq.	8.73E-01	1.16E-01	7.79E-02	0.00E+00	2.57E-01	0.00E+00
ADP-minerals & metals	kg Sb eq.	1.34E-05	3.39E-07	1.58E-06	0.00E+00	9.18E-06	0.00E+00
ADP-fossil	MJ	1.02E+03	1.07E+02	2.53E+02	0.00E+00	5.52E+02	0.00E+00
WDP	m^3	-6.77E+00	1.39E-01	3.40E-01	0.00E+00	-3.82E+02	0.00E+00

Potential Environmental Impact – Additional mandatory & voluntary indicators

Impact Indicators	Unit	A1-A3	C1	C2	C3	C4	D
GWP-GHG	kg CO_2 eq.	2.36E+02	8.11E+00	1.94E+01	0.00E+00	2.40E+01	0.00E+00

Resource use

Impact Indicators	Unit	A1-A3	C1	C2	C3	C4	D
PERE	MJ	1.14E+02	2.39E-01	2.39E-01	5.13E-01	0.00E+00	5.05E+00
PERM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	1.14E+02	2.39E-01	2.39E-01	5.13E-01	0.00E+00	5.05E+00
PENRE	MJ	1.41E+03	1.07E+02	1.07E+02	2.53E+02	0.00E+00	5.52E+02
PENRM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	1.41E+03	1.07E+02	1.07E+02	2.53E+02	0.00E+00	5.52E+02
SM	kg	6.83E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	-1.99E-01	3.35E-03	3.35E-03	1.12E-02	0.00E+00	-8.88E+00

Waste Production

Impact Indicators	Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	4.29E+01	1.15E-02	2.07E-01	0.00E+00	5.80E-01	0.00E+00
Non-hazardous waste disposed	kg	2.71E+03	3.88E-01	3.25E-01	0.00E+00	2.39E+03	0.00E+00
Radioactive waste disposed	kg	1.19E-02	5.46E-06	0.00E+00	0.00E+00	8.77E-05	0.00E+00

Output Flows

Impact Indicators	Unit	A1-A3	C1	C2	C3	C4	D
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for recycling	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Additional environmental impact indicators

Impact Indicators	Unit	A1-A3	C1	C2	C3	C4	D
Particulate matter	disease incidence	8.28E-06	2.18E-06	1.24E-06	0.00E+00	4.01E-06	0.00E+00
Ionising radiation - human health	kBq U-235 eq.	2.16E-01	9.55E-03	1.97E-02	0.00E+00	1.44E-01	0.00E+00
Eco-toxicity (fresh-water)	CTUe	1.34E+02	3.70E+00	2.55E+01	0.00E+00	5.68E+02	0.00E+00
Human toxicity potential - cancer effects	CTUh	3.21E-08	5.70E-10	1.37E-09	0.00E+00	3.26E-08	0.00E+00
Human toxicity potential - non cancer effects	CTUh	1.10E-06	8.11E-09	1.24E-07	0.00E+00	7.14E-07	0.00E+00
Soil quality	dimensionless	2.28E+03	2.26E-01	2.67E+00	0.00E+00	1.31E+03	0.00E+00

GreenStar Indicators – Results are in Accordance with Greenstar V1.3

Impact Indicators	Unit	A1-A3	C1	C2	C3	C4	D
Human toxicity cancer	CTUh	7.27E-09	5.66E-11	7.56E-10	0.00E+00	1.61E-09	0.00E+00
Human toxicity noncancer	CTUh	1.13E-09	2.99E-12	1.67E-11	0.00E+00	2.92E-10	0.00E+00
Land use	kg C deficit eq.	1.43E+03	9.73E-02	1.21E+00	0.00E+00	3.05E+02	0.00E+00
Resource depletion - water	m^3	9.42E-03	4.66E-03	1.62E-02	0.00E+00	-1.23E+01	0.00E+00
Ionising radiation	kBq U-235 eq.	2.16E-01	9.55E-03	1.98E-02	0.00E+00	1.44E-01	0.00E+00
Particulate matter - Greenstar	kg PM2.5 eq.	1.77E-01	2.09E-02	1.18E-02	0.00E+00	4.98E-02	0.00E+00

IS (Infrastructure Sustainability) Indicator - Results are in accordance with EN15804+A1:2013

Impact Indicators	Unit	A1-A3	C1	C2	C3	C4	D
Global Warming Potential	kg CO_2 eq.	2.27E+02	8.12E+00	1.94E+01	0.00E+00	2.40E+01	0.00E+00
Ozone Depletion Potential	kg CFC-11 eq.	1.36E-07	1.01E-07	6.48E-09	0.00E+00	5.00E-07	0.00E+00
Acidification Potential	kg SO_2 eq.	5.60E-01	5.31E-02	4.13E-02	0.00E+00	2.18E-01	0.00E+00
Eutrophication Potential	kg PO_4^{3-} eq.	1.12E-01	1.20E-02	7.07E-03	0.00E+00	2.83E-02	0.00E+00
Photochemical Ozone Creation Potential	kg C_2H_4 eq.	3.53E-02	1.36E-03	2.36E-03	0.00E+00	9.16E-03	0.00E+00
Abiotic Depletion Potential (Elements)	kg Sb eq.	1.43E-05	3.39E-07	1.59E-06	0.00E+00	9.18E-06	0.00E+00
Abiotic Depletion Potential (Fossil Fuels)	MJ net calorific value	9.43E+02	8.08E-01	2.66E+01	0.00E+00	2.78E+01	0.00E+00

VERSION HISTORY

N/A

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GENERAL INFORMATION

Declaration Owner	HOLCIM	**Holcim (New Zealand) Ltd** 23 Plumer Street, Central Auckland 1010, New Zealand www.holcim.co.nz
Programme Operator	EPD® THE INTERNATIONAL EPD® SYSTEM	**EPD International AB,** EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden Web: www.environdec.com E-mail: support@environdec.com
Regional Programme Operator	AUSTRALASIA EPD® ENVIRONMENTAL PRODUCT DECLARATION	**EPD Australasia Limited** 6 Cube Court, Nelson 7020, New Zealand Web: www.epd-australasia.com Email: info@epd-australasia.com Phone: +61 2 8005 8206
Life Cycle Assessment (LCA)	edge impact	Pasindu Samarakkody & Weiqi Xing **Edge Impact** Level 3, Greenhouse, 180 George Street, Sydney NSW 2000 Australia Web: www.edgeimpact.global Phone: +61 2 9438 0100
EPD Process Certified by	epstengroup	**Epsten Group** Suite 2600, 101 Marietta St NW, Atlanta, Georgia 30303, USA www.epstengroup.com

CEN standard EN 15804:2012+A2:2019/AC:2021 served as the core Product Category Rules (PCR)

Product category rules	Product Category Rules (PCR) 2019:14 Construction products (EN 15804+A2), Version 2.0.1 c-PCR-003 Concrete and concrete elements (EN 16757), updated 2025-04-08
PCR review was conducted by	The Technical Committee of the International EPD System. See www.environdec.com for a list of members. The review panel may be contacted via support@environdec.com. Review chair: Rob Rouwette (chair), Noa Meron (co-chair).
Independent third-party verification of the declaration and data, according to ISO 14025:2006:	☒EPD process certification* without a pre-verified LCA/EPD tool * EPD process certification involves an accredited certification body certifying and periodically auditing the EPD process and conducting external and independent verification of EPDs that are regularly published. More information can be found in the General Programme Instructions on www.envrondec.com.
EPD Process Certified by	Epsten Group, Inc. Suite 2600, 101 Marietta St NW, Atlanta, Georgia 30303, USA Accredited by: A2LA, Certificate #3142.03
Procedure for follow-up of data during EPD validity involves third party verifier:	☐ Yes ☒ No

Programme-related information and verification

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

Contact your Holcim representative
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