XTRA-CEM
High Strength, Fast Set

By: HR CEMENT limited

Environmental Product Declaration

In accordance with ISO 14025 and EN 15804+A1

AUSTRALASIA EPD®
ENVIRONMENTAL PRODUCT DECLARATION

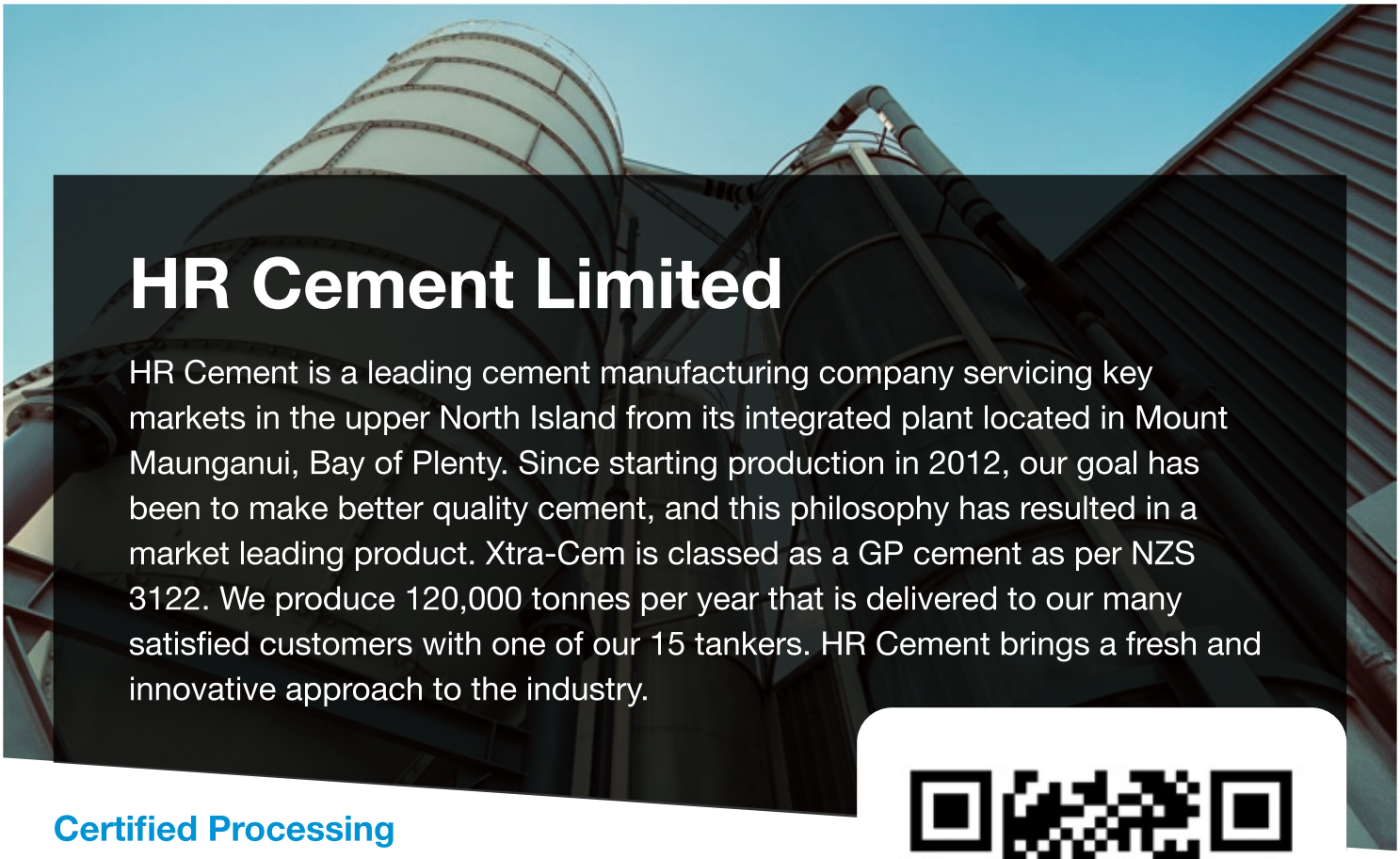
ECO PLATFORM EPD
EN 15804 VERIFIED

Programme: The International EPD® System EPD registration number: S-P-04653
Programme operator: EPD Australasia Limited Website : www.epd-australasia.com
Geographical scope of EPD: New Zealand Publication date: 30/11/2021 Valid until: 29/11/2026

This Environmental Product Declaration, or EPD, is a standardised and verified way of quantifying the environmental impacts of our product based on a consistent set of rules known as a PCR (Product Category Rules).

Contents

HR Cement Limited has the sole ownership, liability, and responsibility for this EPD. EPD's within the same product category but from different programmes may not be comparable. EPD's of construction products may not be comparable if they do not comply with EN 15804.



HR Cement Limited

HR Cement is a leading cement manufacturing company servicing key markets in the upper North Island from its integrated plant located in Mount Maunganui, Bay of Plenty. Since starting production in 2012, our goal has been to make better quality cement, and this philosophy has resulted in a market leading product. Xtra-Cem is classed as a GP cement as per NZS 3122. We produce 120,000 tonnes per year that is delivered to our many satisfied customers with one of our 15 tankers. HR Cement brings a fresh and innovative approach to the industry.

Certified Processing

HR Cement is ISO 9001 certified for the entire production process. Cement produced by HR Cement is tested in independent IANZ / NATA certified laboratories to ensure our products always conform with NZS 3122. HR Cement continually test our products on a 24/7 and year round basis, and publish weekly results.

New Zealand Owned and Operated

HR Cement was born of a desire to provide a better cement to the New Zealand market by Managing Director Chris Hall. The concept is simple - to provide a superior and reliable alternative cement supply at a competitive rate.

Satisfied Customers

Our customer base has grown as our reputation has spread and we look forward to continuing growth with new products and new markets.

A Culture of Environmental Responsibility

A formal Environmental Management System is used to ensure all facets are well managed. The company is working towards getting this system validated to meet ISO 14001 standards.

Production Information

Product covered by EPD

This EPD is for Xtra-Cem, a GP Cement manufactured by HR Cement in Mount Maunganui. All HR Cement products are manufactured according to strict quality control levels to ensure product performance and uniformity.

For more general product information...

Table 1: Industry Classification

	Classification	Code	Category
Product Name / Type	UN CPC Ver.2.1 ANZSIC 2006	3744 2031	Portland cement, aluminous cement, slag cement and similar hydraulic cements, except in the form of clinkers Cement and Lime Manufacturing

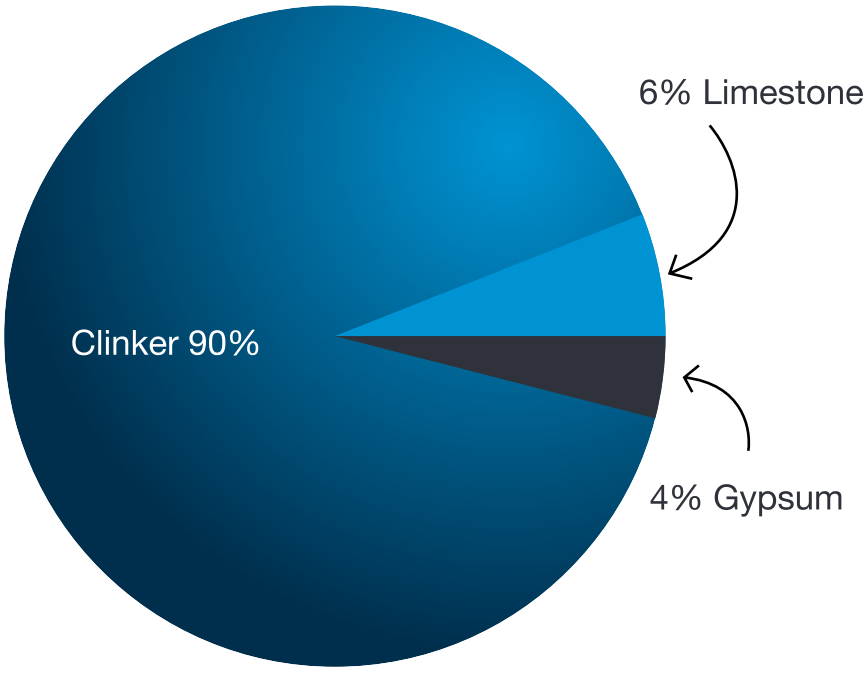
Declared Unit

The declared unit for the EPD is 1 tonne of cement distributed in bulk.

Composition and Content Declaration

Content Declaration

- 6% Limestone
- 90% Clinker
- 4% Gypsum



Application

Xtra-Cem can be used in commercial and domestic concrete, precast, and masonry products. Xtra-Cem is manufactured to provide a consistent strength, durability, workability and finished appearance.

Standards

Xtra-Cem complies with the requirements specified in New Zealand Standard NZS 3122:2009 “Specification for Portland and blended cements (General and special purpose).”

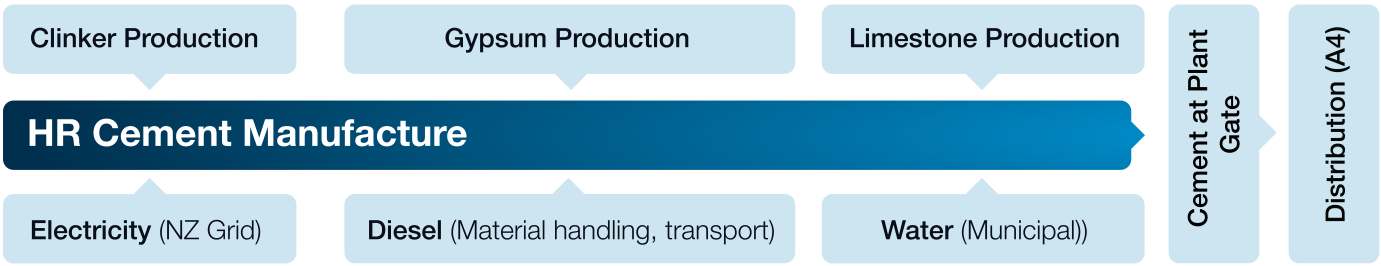
Material Safety

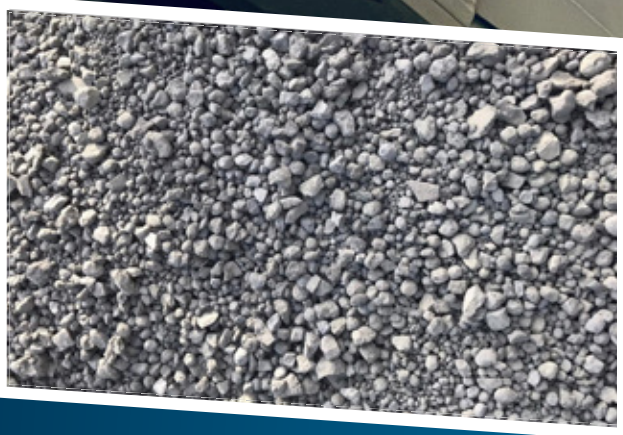
HR Cement Xtra-Cem does not contain — or release during use — any of the hazardous materials identified in the ‘Candidate List of Substances of Very High Concern’ (SVHC) (European Chemical Agency, 2020) at a concentration of greater than 0.1% of the mass. For more information, including safe handling, view our Material Safety Data Sheet.

Regular Testing

Xtra-Cem is tested regularly in accordance with the relevant sections of NZS 3122:2009 and AS/NZS 2350:2006: Methods of testing Portland, blended and masonry cements. Sample testing is performed utilising both our internal QC laboratory and external IANZ / NATA approved laboratories. Our weekly cement certificate results can be viewed online.

Cement Manufacture and Distribution Process





Manufacturing Cement is a 2 Stage Process:

1. Manufacture Clinker
2. Grind Clinker, Gypsum and Limestone

Clinker is manufactured using a thermal process that chemically converts a mix of minerals in a rotary kiln. Limestone is the main constituent, along with marl and sources of iron. This mineral mix is very closely managed as it is primarily the mineralogy of the constituent materials that determines the chemistry of the final cement.

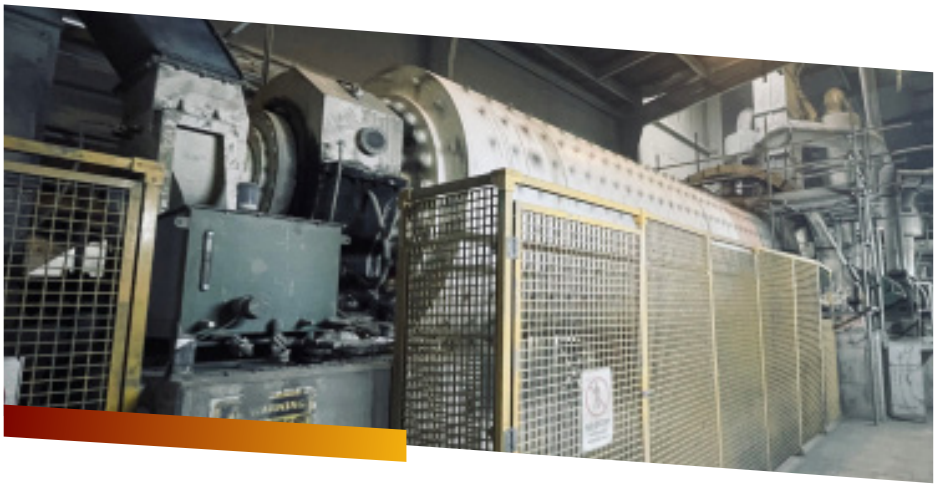
The kilns are fired primarily with coal but many combustible waste products are used also with the double benefit of substituting coal and also providing for a safe and efficient method of disposal for other waste streams.

Our clinker is manufactured in Japan and fully meets NZ Standards. The clinker is shipped to NZ in bulk carriers of 30,000 - 35,000 tonne capacity.

It is the combination of excellent raw material chemistry together with local NZ processing and quality assurance that has helped grow the HR Cement customer base. The ships are unloaded at the Port of Tauranga using two Enviro Hoppers to control dust.

Our Manufacturing Process

Firstly, the clinker is stored in one of two storage sheds along with gypsum and limestone. We use the high-calcium limestone product from Graymont in Te Kuiti that averages 95% purity.



Grinding media
used in the milling process

Cement is produced by milling clinker, gypsum, limestone and grinding aid in a tightly controlled and managed way. The control system is state of the art, ensuring a consistent and reliable final product.

Quality Control

Ensuring consistent high quality cement is what we must do to satisfy the needs of our customers. We have three 100 tonne silos that are used for Quality Assurance. Before being released into the bulk storage, all product is held in these QC silos (see above) until it is shown through two hourly compliance testing, to meet the standards required.

Our Laboratory is IANZ Certified, plus we use Verum in Wellington and Cement Australia to ensure independent validity as well.

System Boundaries

As shown in the table below, this EPD is of the 'cradle-to-gate' (Modules A1-A3) type with options. The option includes transport to customer (Module A4). Other life cycle stages (Modules A5, B1-B7, C1-C4, and D) are dependent on particular scenarios and best modelled at the building level.

Table 2 : Modules included in the scope of the EPD

Product stage	Raw material supply	A1	X
	Transport of raw materials	A2	X
	Manufacturing	A3	X
Construction process stage	Transport to customer	A4	X
	Construction / Installation	A5	MND
Use stage	Use	B1	MND
	Maintenance	B2	MND
	Repair	B3	MND
	Replacement	B4	MND
	Refurbishment	B5	MND
	Operational energy use	B6	MND
	Operational water use	B7	MND
End of life stage	Deconstruction / demolition	C1	MND
	Transport to waste processing	C2	MND
	Waste processing	C3	MND
	Disposal	C4	MND
Benefits and load beyond the system boundary	Reuse, Recovery, Recycling potential	D	MND

X = included in the EPD
MND = Module not declared (such a declaration shall not be regarded as an indicator result of zero)

Production (Module A1-A3)

The production stage includes the environmental impacts associated with mining of natural resources, such as gypsum and limestone, transport to and within the manufacturing site, clinker manufacture at site, ancillary service operations and cement production, ready for dispatch to customers at the exit gate. Xtra-Cem is distributed in bulk and therefore does not include any packaging.

Life Cycle Inventory (LCI) Data and Assumptions

This EPD has been produced in conformance with the requirements of EN 15804:2012 +A1:2013 (CEN, 2013) and PCR 2012-01 Construction products and construction services (v2.33) of the International EPD® System (2020-09-18) (EPD International, 2020).

Data for Core Processes

Primary data

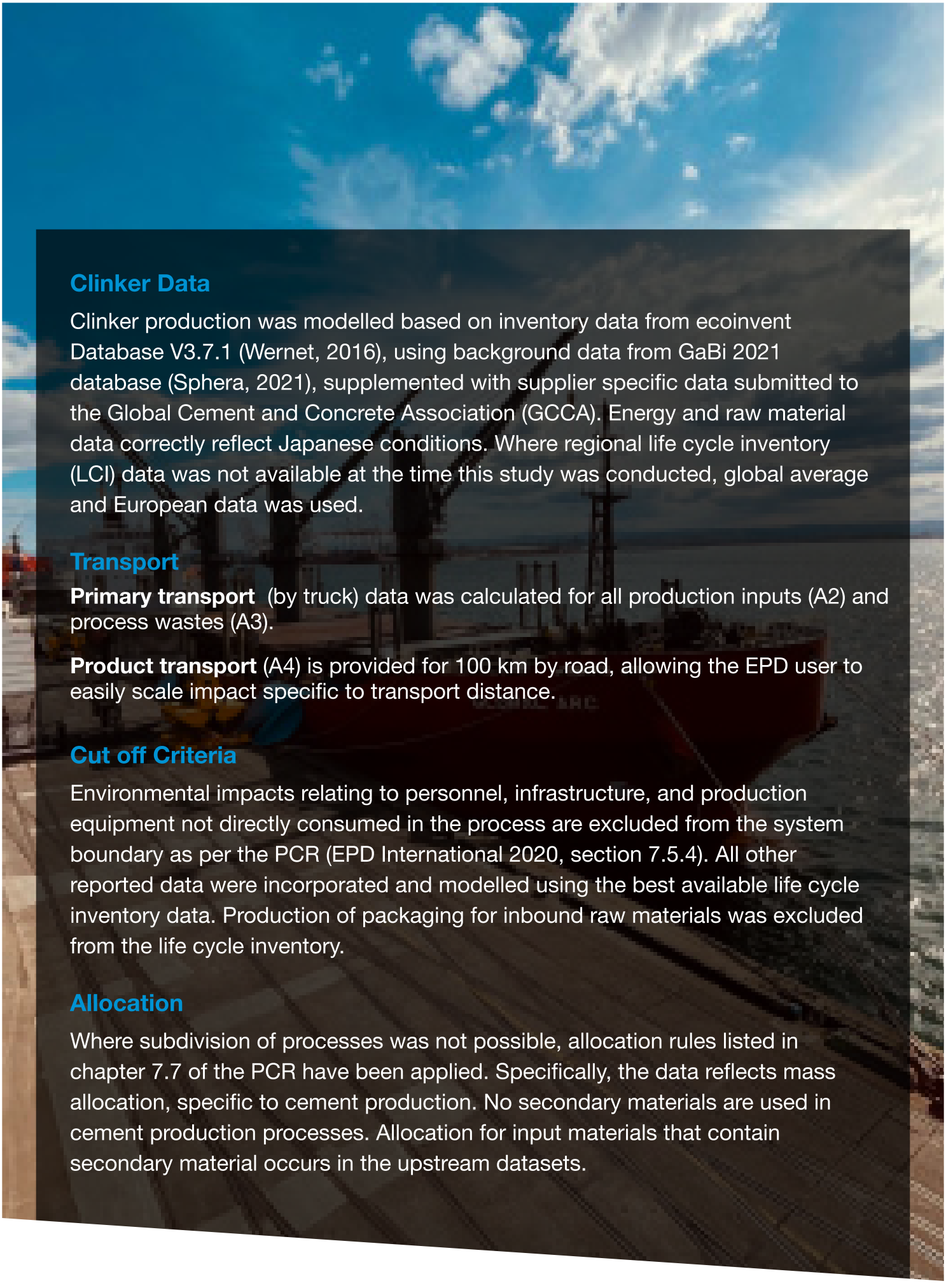
Primary data were used for all HR Cement manufacturing operations up to the factory gate. Primary data for cement manufacturing operations was sourced from the period between April 2019 and March 2020.

Background data

All data in the background system were from the GaBi Life Cycle Inventory Database 2021 (Sphera, 2021). Most datasets have a reference year between 2017 and 2020 and all fall within the 10-year limit allowable for generic data under EN 15804.

Electricity

Specific electricity mixes per region were used for production (New Zealand and Japan). NZ electricity is based on the 2017 national average consumption mix with a Global Warming Potential of 142 g CO2e/kWh made up of 81% renewable (57.02% hydro, 17.9% geothermal, 4.85% wind, 0.74% biomass, 0.59% biogas) and 19% fossil fuels (16% natural gas, 1.26% hard coal, 1.44% coal gases, 0.05% lignite and 0.01% fuel oil) (Sphera, 2021).
Japanese electricity is based on the 2017 national average consumption mix with a 612g CO2e/kWh, made up of 16.9% renewable (8.6% hydro, 5.26% solar, 0.62% wind, 0.23% geothermal, 1.86% biomass, 0.01% biogas) and 78.23% fossil fuels (37.99% natural gas, 30.5% hard coal, 3.04% coal gases and 6.67% fuel oil), 3.14 % nuclear and 2.03% waste-to-energy.



Clinker Data

Clinker production was modelled based on inventory data from ecoinvent Database V3.7.1 (Wernet, 2016), using background data from GaBi 2021 database (Sphera, 2021), supplemented with supplier specific data submitted to the Global Cement and Concrete Association (GCCA). Energy and raw material data correctly reflect Japanese conditions. Where regional life cycle inventory (LCI) data was not available at the time this study was conducted, global average and European data was used.

Transport

Primary transport (by truck) data was calculated for all production inputs (A2) and process wastes (A3).

Product transport (A4) is provided for 100 km by road, allowing the EPD user to easily scale impact specific to transport distance.

Cut off Criteria

Environmental impacts relating to personnel, infrastructure, and production equipment not directly consumed in the process are excluded from the system boundary as per the PCR (EPD International 2020, section 7.5.4). All other reported data were incorporated and modelled using the best available life cycle inventory data. Production of packaging for inbound raw materials was excluded from the life cycle inventory.

Allocation

Where subdivision of processes was not possible, allocation rules listed in chapter 7.7 of the PCR have been applied. Specifically, the data reflects mass allocation, specific to cement production. No secondary materials are used in cement production processes. Allocation for input materials that contain secondary material occurs in the upstream datasets.

Assessment Indicators

The results tables describe the different environmental indicators per declared unit, for each declared module. The first table contains the environmental impact indicators, describing the potential environmental impacts of the product as shown in Table 4. The second table shows the resource indicators, describing the use of renewable and non-renewable material resources, renewable and non renewable primary energy and water, as shown in Table 5. The final table displays indicators for waste and other outputs (Table 6).

Table 4: Indicators for Life Cycle Impact Assessment

Abbreviation	Unit	Indicator
GWP	kg CO_2-eq.	Global Warming Potential
ODP	kg CFC 11-eq.	Ozone Depletion Potential
AP	kg SO_2-eq.	Acidification Potential
EP	kg PO_4^3 -eq.	Eutrophication Potential
POCP	kg C_2H_4-eq.	Photochemical Ozone Creation Potential
ADPE	kg Sb-eq.	Abiotic Depletion Potential for Non-Fossil Resources
ADPF	MJ	Abiotic Depletion Potential for Fossil Resources

Table 5: Life Cycle Inventory Indicators on Use of Resources

Abbreviation	Unit	Indicator
PERE	MJ, net calorific value	Use of renewable primary energy excluding renewable primary energy resources used as raw materials
PERM	MJ, net calorific value	Use of renewable primary energy resources used as raw materials
PERT	MJ, net calorific value	Total use of renewable primary energy resources
PENRE	MJ, net calorific value	Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials
PENRM	MJ, net calorific value	Use of non-renewable primary energy resources used as raw materials
PENRT	MJ, net calorific value	Total use of non-renewable primary energy resources
SM	kg	Use of secondary material
RSF	MJ, net calorific value	Use of renewable secondary fuels
NRSF	MJ, net calorific value	Use of non-renewable secondary fuels
FWT	m^3	Total use of net fresh water

Table 6: Life Cycle Inventory Indicators on Waste Categories and Output Flows

Abbreviation	Unit	Indicator
HWD	kg	Hazardous waste disposed
NHWD	kg	Non-hazardous waste disposed
RWD	kg	Radioactive waste disposed
CRU	kg	Components for reuse
MER	kg	Materials for energy recovery
MFR	kg	Materials for recycling
EEE	MJ	Exported electrical energy
EET	MJ	Exported thermal energy

Environmental Performance

EN 15804 + A1 results for 1 tonne of HR Cement

Potential Environmental Impact

Parameter	Unit	TOTAL	
		A1 -A3	A4
Global Warming Potential (GWP)	kg CO_2-eq.	811	7.16
Depletion Potential of the Stratospheric Ozone Layer (ODP)	kg CFC 11 eq.	5.07E-13	1.42E-15
Acidification Potential (AP)	kg SO_2-eq.	1.81	0.0111
Eutrophication Potential (EP)	kg PO_4^3 -eq.	0.310	0.00230
Photochemical Ozone Creation Potential (POCP)	kg C_2H_4 -eq.	0.127	-0.00246*
Abiotic Depletion Potential – Elements	kg Sb-eq.	8.38E-06	1.12E-07
Abiotic Depletion Potential – Fossil Resources	MJ, net calorific value	3,530	95.7

** Nitrogen monoxide, an inorganic emission to air, is responsible for the negative impact contribution owing to diesel combustion in truck transport. The negative impact is due to the splitting of nitrogen oxides (NOx) into nitrogen dioxide (NO2) and nitrogen monoxide (NO) within GaBi Databases (Sphera, 2021).*

Use of Resources

Parameter		Abb	Unit	TOTAL	
				A1 -A3	A4
Primary Energy Resources Renewable	Use as energy carrier	PERE	MJ	412	0.467
	Used as raw materials	PERM	MJ	0	0
	Renewable TOTAL	PERT	MJ	412	0.467
Primary Energy Resources Non- Renewable	Use as energy carrier	PENRE	MJ	3,600	95.8
	Used as raw materials	PENRM	MJ	0	0
	Renewable TOTAL	PENRT	MJ	3,600	95.8
Secondary Material		SM	kg	0.571	0
Renewable Secondary Fuels		RSF	MJ	0	0
Non-Renewable Secondary Fuels		NRSF	MJ	0	0
Net Use of Fresh Water		FW	m^3	1.25	9.28E-04

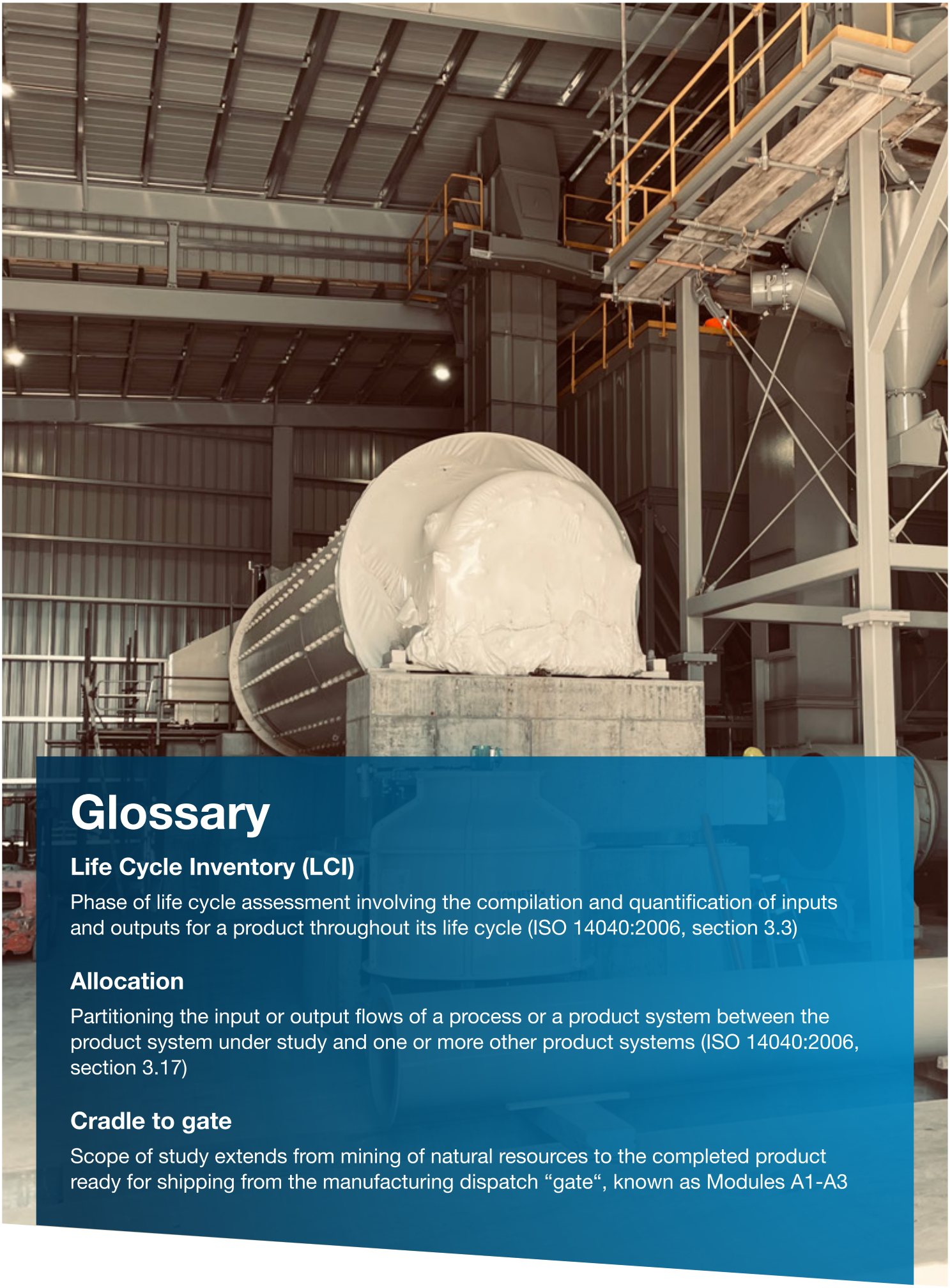
Waste Production and Output Flows

Parameter	Abb	Unit	TOTAL	
			A1 -A3	A4
Hazardous Waste Disposed	HWD	kg	2.34E-04	3.46E-10
Non-Hazardous Waste Disposed	NHWD	kg	0.971	0.00229
Radioactive Waste Disposed	RWD	kg	0.0172	1.32E-05
Components for Re-Use	CRU*	kg	0	0
Materials for Recycling	MFR*	kg	0	0
Materials for Energy Recovery	MER*	kg	0	0
Exported Electrical Energy	EEE*	MJ	0	0
Exported Thermal Energy	EET*	MJ	0	0

** For cement, the following Indicators are not relevant, hence result in zero values: CRU, MFR, EEE and EET are zero since there are none produced. MER is zero since the cut-off approach is applied, hence credits are not claimed.*

Additional
Environmental Information

- All products comply with NZS 3122: Specification for Portland and blended cements (General and special purpose)
- Our manufacturing site is certified to ISO 9001
- HR Cement is working toward getting ISO 14001 Certification for the existing Environmental Management System.



Glossary

Life Cycle Inventory (LCI)

Phase of life cycle assessment involving the compilation and quantification of inputs and outputs for a product throughout its life cycle (ISO 14040:2006, section 3.3)

Allocation

Partitioning the input or output flows of a process or a product system between the product system under study and one or more other product systems (ISO 14040:2006, section 3.17)

Cradle to gate

Scope of study extends from mining of natural resources to the completed product ready for shipping from the manufacturing dispatch “gate“, known as Modules A1-A3

References

- **AS 1478:2005:** Chemical admixtures for concrete, Standards Australia
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- **NZS 3104;** Specifications for concrete production, Standards New Zealand
- **NZS 3113:1979;** Specification for chemical admixtures for concrete, Standards New Zealand
- **NZS 3121;** Water and aggregate for concrete, Standards New Zealand
- **NZS 3122:2009 A2:** Specification for Portland and blended cements (General and special purpose): Amendment 2:2014, Wellington, Standards New Zealand.
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- **Wernet, G. B.-R. (2016).** The ecoinvent database version 3 (part I): overview and methodology. The International Journal of Life Cycle Assessment [online], 21(9), pp.1218–1230.

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CEN Standard EN 15804+A1 Served as the Core PCR

PCR:
PCR 2012:01 Construction Products and Construction Services, Version 2.33, 2020-09-16

PCR Review was Conducted by:
The Technical Committee of the International EPD® System

Chair:
Massimo Marino. Contact via info@environdec.com

Independent Verification of the Declaration and Data, according to ISO 14025:

- [ ] EPD process certification (Internal)
- [x] EPD verification (External)

Verifier Approved by:

EPD Australasia

Procedure for Follow-up of Data during EPD Validity involved Third-Party Verifier

- [ ] Yes
- [x] No

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For more information visit : **hrcl.co.nz**