Environmental Product Declaration

Adbri Concrete EPD—VS804B180 Victoria

Programme: The International EPD® System, www.environdec.com
Programme operator: EPD International AB
Regional programme: EPD Australasia Ltd
EPD registration number: EPD-IES-0026832:001
Publication Date: 03-03-2026 | Version Date: 03-03-2026 | Valid until: 03-03-2031
Geographical scope: Australia

In accordance with ISO 14025:2016 and EN15804+A2:2019/AC:2021

This EPD covers multiple products and/or plants, based on the average results of the products or plants group. An EPD may be updated or depublished if conditions change.
To find the latest version of the EPD and to confirm its validity, see www.environdec.com.

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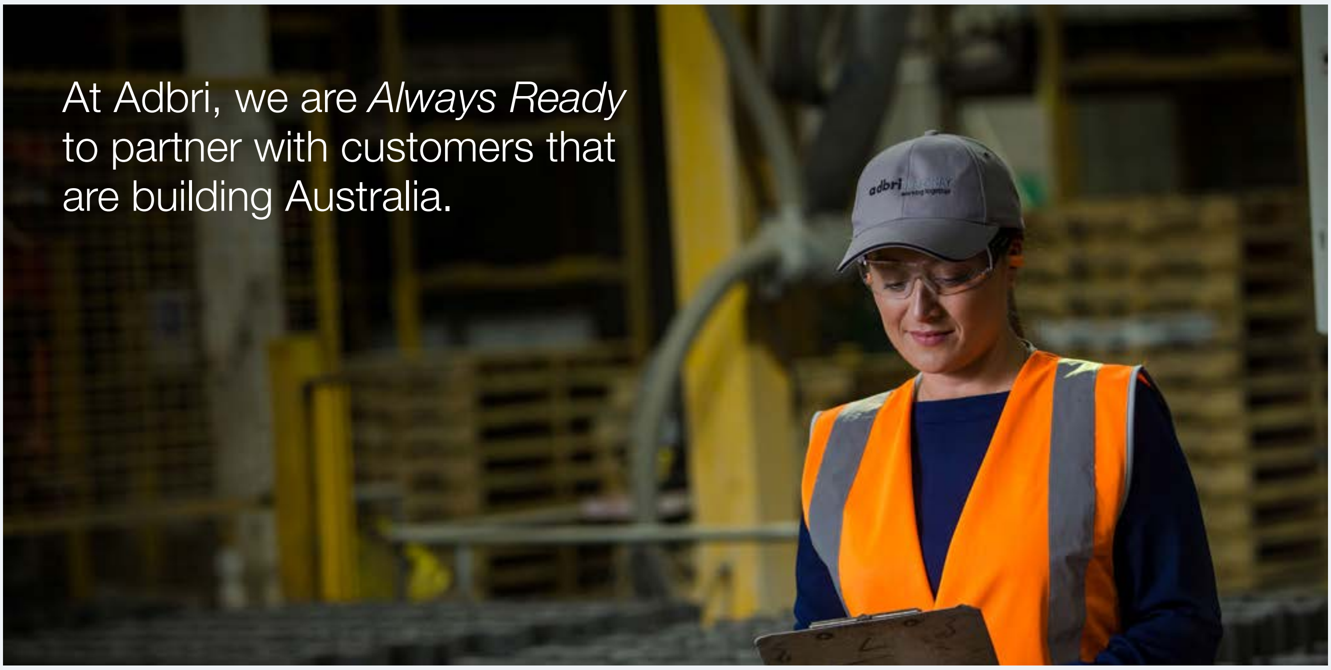
Adbri is *Building a Better Australia* with its locally manufactured cement, lime, concrete, aggregates, industrial minerals and concrete products.

Information about EPD Owner

We believe in doing business responsibly; keeping our people and communities safe; meeting the needs of our customers; and creating long-term value for our shareholders.

We contribute to a sustainable future. Since our origins in 1882, we have focused on building long-term partnerships that add value. We are a proud Australian company with an extensive local manufacturing presence which allows us to be agile in meeting customer needs.



A proud Australian manufacturer and supplier

As one of Australia's most experienced construction materials companies, we have helped build the foundations of our communities.

Today our 1500+ strong team located across 200 locations, continue to work closely with our customers, partners and communities to develop solutions that enhance the quality of lives of Australians.

Technical expertise you can rely on.

We are committed to supplying innovative and quality products, supported by our leading technical advice. Our in-house technical experts are highly experienced in developing and managing quality control and assurance systems for our industry.

Adbri operates a centralised laboratory complex in Birkenhead (South Australia) that provides leading capability in the Australian heavy construction materials industry.

We were the first Australasian laboratory to commission a robotic quality control cement testing facility which improves testing accuracy and efficiencies.

Our customers are also supported by a national team of in-field technical specialists who work closely with our laboratory-based experts. All our laboratories have achieved ISO 9001 endorsement for Quality Management Systems and our centralised Birkenhead laboratory is also NATA accredited to ISO/IEC 17025 for a range of cementitious, lime, concrete and aggregate test methods.

Sustainability at Adbri

Contributing to a safe, healthy and sustainable future for Australians, our communities and the environment is a fundamental part of Adbri's culture.

Our sustainability approach is built on strong relationships with our people, customers, suppliers, partners, shareholders and the communities in which we operate, coupled with continuous improvement across our value chains.

Cement, lime, concrete, aggregates, and masonry are essential materials to the global economy. Our products will play a critical role in the transition to a lower carbon environment, supplying key industries including construction, infrastructure, energy, mining, and agriculture.

Our goal at Adbri is to be net zero emissions by 2050.

We operate two emissions-intensive and hard-to-abate processes – the integrated manufacture of clinker and lime production. Our key decarbonisation challenge is associated with unavoidable process emissions that are chemically liberated from the high-temperature processing of limestone, which accounts for approximately 60% of Adbri's Scope 1 and Scope 2 greenhouse gas emissions.

In 2022 we released our Net Zero Emissions Roadmap which sets out the steps we will take to achieve our goal of net zero emissions by 2050, based on the three key actions of reducing emissions, creating new lower carbon products, and collaborating with key partners.

Refuse Derived Fuel

At our Adbri Cement Birkenhead plant where we manufacture clinker, Adbri pioneered in the use of refuse derived fuel (RDF) in Australia in 2003. Since then, we've used over 1.5 million tonnes of RDF which has significantly reduced the Group's GHG emissions and reduced our GWP in states where the Birkenhead cement is used.

RDF is produced by a third party who processes industrial waste products to produce an alternative fuel source. As well as reducing demand for fossil fuels, it diverts waste from landfill.

Our Environmental Product Declarations

Adbri is committed to a sustainable future and this includes providing transparency about our products' environmental credentials via an Environmental Product Declaration (EPD).

Underpinning our EPDs is a Life Cycle Assessment (LCA) which identifies the environmental footprint throughout the life cycle of a product and is compliant with the ISO standards 14040 and 14044.

Having an EPD allows Adbri to understand the roles and contributions of different materials to the total environmental impacts, thus, meeting market demand for science-based, transparent, and verified environmental product information.

This report presents the methodology, data, results, and interpretation of the LCA. The LCA has been through several iterations of internal review to refine the life cycle data and assumptions.

Version No.	Version Date	Summary
1	03-03-2026	EPD for VS804B180

General Information

EPDs are independently verified documents that include information about the environmental impact of products throughout their life cycle.

EPDs require the completion of a Life Cycle Inventory (LCI), LCA and verification to best practice international and Australian standards.

— Life Cycle Inventory (LCI) is the collection of data on the inputs, processes and outputs within a defined system boundary. Data quality is in accordance with ISO 15941 standard.
— Life Cycle Assessment (LCA) is the modelling of LCI in accordance with ISO 14040, ISO 14044 and ISO 14025 standards
— EN 15804+A2:2019: Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products.
— General Programme Instructions (GPI) for the International EPD System V5.01 – containing instructions regarding methodology and the content that must be included in EPDs registered under the International EPD System.
— Instructions of EPD Australasia v4.2 – a regional annex to the general programme instructions of the International EPD System.
— Product Category Rules (PCR) 2019:14, v2.0.1 – Construction products.
— Complementary Product Category Rules (c-PCR-003) to PCR 2019:14 concrete and concrete elements (EN 16757), Version 2025-04-08.
— Third party verification of the output of the LCA in the format of an EPD.

EPDs are not always comparable

When comparing EPDs it is important to recognise:

— EPDs within the same product category from different programmes may not be comparable.
— EPDs of construction products may not be comparable if they do not comply with ISO 14025:2006 or if they are produced using different PCRs.
— Understanding the detail is important in comparisons. Expert analysis is required to ensure data is truly comparable to avoid unintended distortions.

Benefits of using this EPD

Results derived from this EPD can be used as a component for customers, for the purpose of compiling their own LCA calculation and modelling for EPDs. The 37 environmental impact indicators align with EN15804 +A2 and are used to support lower carbon concrete initiatives, and to establish the global warming potential of materials used for material selection or decision making.

Programme Information

EPD Owner:	Zoe Schmidt **Adbri Limited** Level 4, 151 Pirie Street Adelaide SA 5000 +61 2 8248 9999	ADBRI
Programme Operator:	**EPD International AB** Box 210 60, SE-100 31 Stockholm, Sweden W: www.environdec.com E: support@environdec.com	EPD INTERNATIONAL EPD SYSTEM
Regional Programme Operator:	**EPD Australasia Limited** 6 Cube Court, Richmond, Nelson 7020, New Zealand W: www.epd-australasia.com E: info@epd-australasia.com	AUSTRALASIA EPD® INTERNATIONAL EPD SYSTEM
Life Cycle Assessment (LCA):	Jonas Bengtsson, Pasindu Samarakkody & Weiqi Xing **Edge Environment Pty Limited** Level 3 Greenhouse, 180 George Street, Sydney NSW 2000 Australia W: www.edgeimpact.global E: info@edgeimpact.global	edge impact
Third-party verifier:	**Epsten Group, Inc.** 101 Marietta St. NW, Suite 2600, Atlanta, Georgia 30303, USA W: www.epstengroup.com Approved by: EPD Australasia	epstengroup

PCR and verification

CEN standard EN 15804:2012+A2:2019/AC:2021 serves as the Core Product Category Rules (PCR)	
Product Category Rules (PCR):	PCR 2019:14 Construction Products, Version 2.0.1, 2025-04-07 c-PCR-003 Concrete and Concrete Elements, 2025-04-08 Product Group Classification: UN CPC 375
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.
Process certification:	Megan Blizzard, Epsten Group, Inc. 101 Marietta St. NW, Suite 2600, 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

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

EPDs within the same product category but published in different EPD programmes, may not be comparable. For two EPDs to be comparable, they shall be based on the same PCR (including the same first-digit 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 identical scope in terms of included life-cycle stages (unless the excluded life-cycle stage is demonstrated to be insignificant); apply identical impact assessment methods (including the same version of characterisation factors); and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.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Ownership and Limitations on use

Owner of the EPD

Adbri Limited
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Description of the organisation

Adbri is a leading Australian construction and building materials company that manufactures and distributes cement, lime, concrete, aggregates, masonry products and industrial minerals. With its origins dating back to 1882, Adbri is a vertically integrated business with operations spanning Australia. The Group employs more than 1,500 people and serves customers in the residential and non-residential construction, engineering construction, infrastructure, alumina production and mining markets through its portfolio of respected brands.

Name and location of production

Manufacturing and distribution of Adbri concrete is undertaken in the states of Queensland (QLD), New South Wales (NSW), Victoria (VIC), South Australia (SA), and Northern Territory (NT). This EPD report presents the methodology, data, results, and interpretation for concrete produced in Victoria. Table 1 below shows all concrete manufacturing sites across Victoria.

Table 1 | Concrete sites in Victoria

Concrete sites in Victoria	
1	Central Campbellfield
2	Central Deerpark
3	Central Gisborne
4	Central Hallam
5	Central pt Melbourne
6	Dandenong
7	Kilsyth
8	Laverton
9	Mitcham
10	Pakenham
11	Somerton
12	Southwharf

Product Information

Adbri manufactures premixed concrete from over 90 strategically located concrete batching plants throughout Queensland, New South Wales and Victoria through our Hy-Tec and Central Premix Concrete brands, and throughout South Australia and Northern Territory through our Adbri Concrete brand.

The process of manufacturing concrete involves the careful proportioning and mixing of cement, supplementary cementitious materials (SCMs), aggregates, water, chemical admixtures and additives including colour oxides in some instances. As owners and operators of large parts of our supply chain, raw materials are sourced from within the Adbri supply chain where possible.

These raw materials are mixed in batching plants according to specific concrete product mix designs which have been created to satisfy a range of project requirements. In most instances, when the concrete mix required for a specific customer project is selected, materials are batched using calibrated weight scales before being mixed and transferred to a concrete agitator which continually mixes the product during the delivery process to a customer worksite. In some other instances, mobile wet batch plants can be set up at a project site where mixing occurs, removing the need for concrete agitator trucks.

The products covered in this EPD reflect concrete supplied in accordance with AS1379 – Specification and supply of concrete, for normal class and special class concrete. Normal class concrete specifies nominated characteristics where concrete is designed to meet slump and compressive strength parameters at the point of delivery, and where additional characteristics such as air content may be specified. Special class concretes have characteristics that include additional fresh and hardened properties specified outside of the normal class range.

Futurecrete®

Adbri's lower carbon concrete

The Futurecrete® range reduces the embodied carbon of concrete by a minimum of 30% when compared to the AusLCI baseline for straight GP cement, no SCMs (v1.42).

EvoCem™ by ADBRI

In 2023, Futurecrete® concrete was redesigned, following the launch of Adbri EvoCem™ Type GL cement. EvoCem has been pioneered by Adbri, as Australia's first Type GL cement. EvoCem™ lower carbon cement has a minimum of 8% less carbon than conventional Type GP and SL cement. EvoCem™ cement is available in New South Wales, Victoria, South Australia and Northern Territory.

In addition to lower carbon cement, Futurecrete® concrete replaces 25-40% cement content with SCMs, and Futurecrete Ultra replaces upwards of 40% cement content for more significant carbon savings.

Futurecrete® lower carbon concrete is available through our Hy-Tec, Adbri Concrete and Central Premix brands so you can join us to *Build a Better Australia*.

Product Identification

Normal class concrete, Futurecrete® and Futurecrete® Ultra lower carbon concrete, and special class concrete are manufactured to comply with AS 1379.

The products considered for the EPD are categorised as follows: lower carbon concretes which are promoted by Adbri under the Futurecrete® and Futurecrete® Ultra range names, normal class concrete products and special class concrete products.

To help customers understand the differences, a basic description for each concrete type has been provided below.

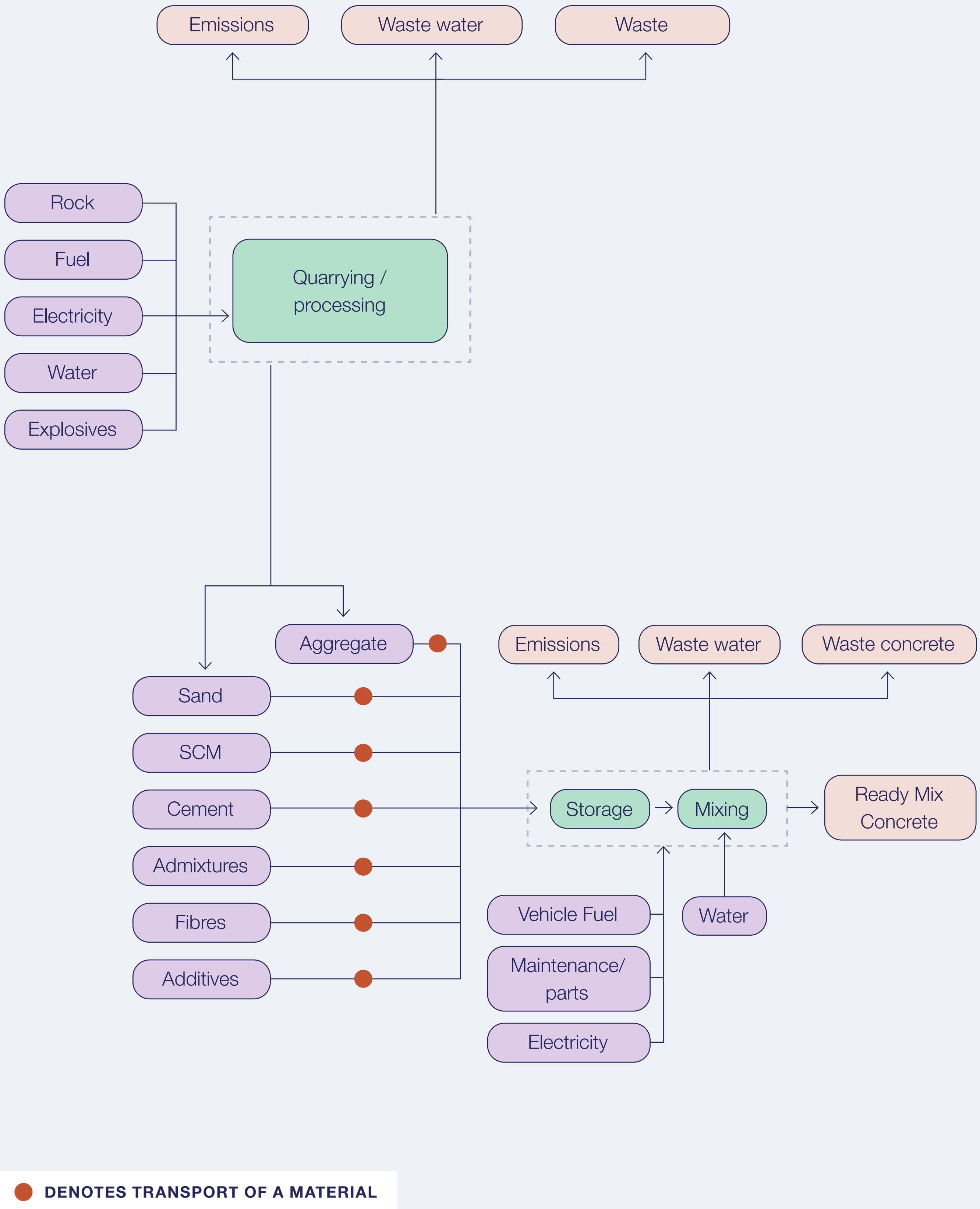
Futurecrete®	Futurecrete® lower carbon concrete relate to concrete mixes that lower carbon by a minimum of 30% when compared to the AusLCI baseline for straight GP cement, no SCMs. Futurecrete® concrete replaces 25 – 40% of the cement content with SCMs. The SCMs used include fly ash and slag and vary according to the state and plant of manufacture. The increased use of SCMs assists in reducing embodied carbon in the concrete mix by reducing the volume of cement. In New South Wales, Victoria, South Australia and Northern Territory, Futurecrete® concrete uses Adbri EvoCem™ low carbon cement which further reduces embodied carbon by a minimum of 8% when compared to conventional Type GP cement.
Futurecrete® Ultra	Futurecrete® Ultra lower carbon concrete mixes are further optimised Futurecrete® mixes, replacing over 41% of cement with SCMs. The SCMs used include fly ash and slag and vary according to the state and plant of manufacture. The increased use of SCMs assists in reducing embodied carbon in the concrete mix by reducing the volume of cement. Likewise to Futurecrete® mixes, Futurecrete® Ultra uses Adbri EvoCem™ low carbon cement in New South Wales, Victoria, South Australia and Northern Territory.
Normal class concretes	Designed to meet the requirements of AS 1379 Specification and supply of concrete, these concrete mixes are suitable for general applications.
Special class concretes	Adbri's special class concrete mixes satisfy the requirements of AS 1379, and meet specific project requirements which may include additional requirements for early strength, low shrinkage, high flexural strength, etc. These products are designed to meet strict engineering requirements for civil works, commercial and multi-residential buildings and infrastructure projects.

Use of SCMs in concrete

For decades, SCMs have been used in the production of concrete as a supplementary binder for use with cement. SCMs are used as a supplement to traditional cement which can result in reduced carbon intensity of the concrete mix as a result of the reduced Portland cement content. The use of SCMs may also improve the fresh properties of concrete and if incorporated optimally, increase the overall durability of in-situ concrete, provided due care is taken during the early stages of placing and curing. SCMs are traditionally derived from by-products of processing plants and conform to the requirements of AS3582.

The presence of strong and sustainable local manufacturing of key materials, such as cement and concrete, is closely linked to the economic prosperity of Australia and its regional communities.

Figure 1 | Typical Concrete Process Flow



The environmental impacts of Adbri's products listed in this EPD may be grouped for multiple plants under the Futurecrete® and Futurecrete® Ultra range names, normal class concrete products and special class concrete products by cementitious type and compressive strength. The impact of variance in nominal aggregate size and slump class have been modelled to ensure the grouping of similar mix designs and plants that do not vary by more than +/-10% in terms of Global Warming Potential (GWP).

Table 2 | Concrete assessed in this study

CONCRETE PRODUCTION SITES	Available Constituents		
	GL	GP	Slag
Central Campbellfield	X	X	X
Central Deerpark	X	X	X
Central Gisborne	X	X	X
Central Hallam	X	X	X
Central pt Melbourne	X	X	X
Dandenong	X	X	X
Kilsyth	X	X	X
Laverton	X	X	X
Mitcham	X	X	X
Pakenham	X	X	X
Somerton	X	X	X
Southwharf	X	X	X

LCA information

Declared unit and Reference Service Life (RSL)

The declared unit adopted is one cubic metre ($1m^3$) of manufactured concrete.

Databases and LCA software used

The software used was SimaPro® 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:

1. For Australia, the Australian Life Cycle Inventory (AusLCI) v2.45 compiled by the Australian Life Cycle Assessment Society ((ALCAS), Australian Life Cycle Inventory (AusLCI) – v2.45, 2025) is applied. The AusLCI database at the time of this report update was less than 1 year old.
2. Other authoritative sources (e.g., ecoinvent v3.11 and ecoinvent EN15804+A2 package, (ecoinvent, 2024), and Environmental Footprint (EF) v3.1 (Developer Environmental Footprint, 2022) are used when the process is not available at the AusLCI, where necessary adapted for relevance to Australian conditions (energy sources, transport distances and modes and so on, and documented to show how the data is adapted for national relevance). At the time of reporting updates, the ecoinvent database was less than 1 year old and EF v3.1 database was less than 3 years old.
3. Other sources with sensitivity analysis reported to show the significance of this data for the results and conclusions drawn.

Description of system boundaries and excluded life cycle stages

The scope of LCA for this EPD is cradle-to-gate with options for modules A4, A5, C1 – C4 and D. Emissions from the use stages (B1 – B7) were excluded as the assumption is different in each project archetype.

All modules included in this EPD are marked as X in the table below and those excluded are marked as 'module not declared' (MND). The system boundary for this EPD is depicted in the figure below.

Table 3 | Life Cycle of building products: stages and modules included in this EPD

	Product Stage			Construction Stage		Usage 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**
Modules declared	X	X	X	X	X	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	GLO	GLO	AU	AU	AU	-	-	-	-	-	-	-	AU	AU	AU	AU	AU
Share of specific data*	<10%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation - Products	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation - Sites	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

ND = Not Declared

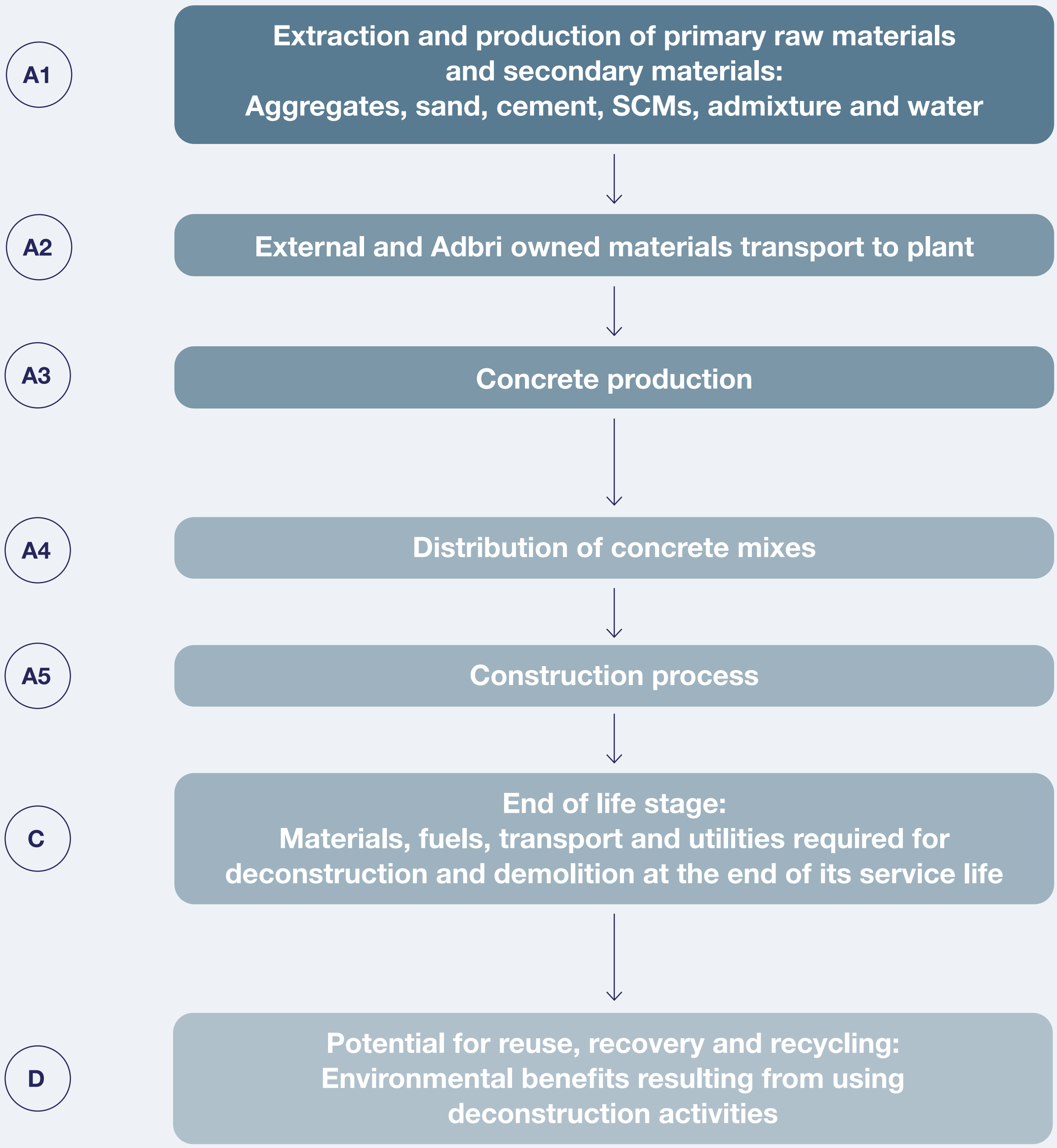
* The share of primary data is calculated based on GWP-GHG results. It is a simplified indicator for data quality that supports the use of more primary data, to increase the representativeness of and comparability between EPDs. Note that the indicator does not capture all relevant aspects of data quality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

Process diagram

The processes included in the LCA are presented in a process diagram in the figure below:

Figure 2 | System diagram



Upstream processes

The upstream processes include those involved in Module A1 – Raw material supply.
This module includes:

- Extraction, transport and manufacturing of raw materials.
- Generation of electricity from primary and secondary energy resources, also including their extraction, refining and transport for Modules A1 and A3.

Electricity inputs in foreground processes based in Australia were modelled based on the state-specific grid. The AusLCI database was used to model electricity in the foreground processes. The AusLCI dataset was updated using state specific grid data sourced from the Department of the Environment and Energy, December 2020.

Core processes

The core processes include those involved in Module A2 and Module A3, including:

- External transportation of materials to the core processes and internal transport.
- Manufacturing of the concrete mixes.
- Treatment of external recycled materials for reuse.

Data quality

Foreground data on raw material requirements, manufacture, construction, use and end of life inputs is for FY2020-2021. The data sources and their assessed quality are detailed in Table 4. Overall, the data quality for this LCA was considered Good.

Table 4 | Data quality

Module	Process	Source type	Source	Ref. year	Data category	Geographical coverage	Time period coverage	Technology coverage
A1	Internal aggregate	Collected data	EPD owner	2020	Primary data, Secondary data	Very good	Good	Very good
A1	Internal cement	Collected data	EPD owner	2020	Primary data, Secondary data	Very good	Good	Very good
A1	External aggregate	Database	AusLCI v2.45, Ecoinvent v3.11	2022-2023	Secondary data	Good	Very good	Good
A1	External cement	Database	AusLCI v2.45, Ecoinvent v3.11	2022-2023	Secondary data	Good	Very good	Good
A1	Fly ash	Database	AusLCI v2.45, Ecoinvent v3.11	2022-2023	Secondary data	Good	Very good	Good
A1	Slag	Database	AusLCI v2.45, Ecoinvent v3.11	2022-2023	Secondary data	Good	Very good	Good
A1	Silica fume	Database	AusLCI v2.45, Ecoinvent v3.11	2022-2023	Secondary data	Good	Very good	Good
A1	Admixtures	Database	AusLCI v2.45, Ecoinvent v3.11	2022-2023	Secondary data	Good	Very good	Good
A1	Oxides - yellow, black, red	EPD	EPD-LAN-20250011-IBC1-EN EPD-LAN-20250013-IBC1-EN EPD-LAN-20250012-IBC1-EN	2025	Primary data	Very good	Very good	Very good
A1	Oxides - others	Database	AusLCI v2.45, Ecoinvent v3.11	2022-2023	Secondary data	Good	Very good	Good
A1	Steel fibre	Database	AusLCI v2.45, Ecoinvent v3.11	2022-2023	Secondary data	Good	Very good	Good
A1	Plastic fibre, recycled	EPD	S-P-10247	2023	Primary data	Very good	Very good	Very good
A1	Plastic fibre, virgin	Database	AusLCI v2.45, Ecoinvent v3.11	2022-2023	Secondary data	Good	Very good	Good
A2	Transport of raw materials	Database	AusLCI v2.45, Ecoinvent v3.11	2022-2023	Primary data, Secondary data	Good	Very good	Good
A3	Manufacturing of concrete	Collected data	AusLCI v2.45, Ecoinvent v3.11	2020	Secondary data	Very good	Good	Very good
A4	Concrete truck	Database	AusLCI v2.45, Ecoinvent v3.11	2022-2023	Secondary data	Good	Very good	Good
A5	Installation of concrete	Database	AusLCI v2.45, Ecoinvent v3.11	2022-2023	Secondary data	Good	Very good	Good
C1	Diesel	Database	AusLCI v2.45, Ecoinvent v3.11	2022-2023	Secondary data	Good	Very good	Good
C2	Truck	Database	AusLCI v2.45, Ecoinvent v3.11	2022-2023	Secondary data	Good	Very good	Good
C3	Concrete recycling	Database	AusLCI v2.45, Ecoinvent v3.11	2022-2023	Secondary data	Good	Very good	Good
C4	Inert waste landfill	Database	AusLCI v2.45, Ecoinvent v3.11	2022-2023	Secondary data	Good	Very good	Good
D	Benefits of recycling - Gravel	Database	AusLCI v2.45, Ecoinvent v3.11	2022-2023	Secondary data	Good	Very good	Good

The EPD will be updated if changes in its lifecycle inventory lead to a variation of 10% or more in any of the included environmental indicators during its validity period.

Cut-off rules and exclusion of small amounts

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 EN 15804 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 v2.0.1, 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 Adbri, where impacts such as those from the construction of power plants and manufacturing plants, are included in accordance with PCR v2.0.1 ch 4.3.6. 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. (Frischknecht, 2007) with no further investigation.
- 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.
- Transport for raw materials accounting for less than 1% of the feed mix was excluded. This is because the impact contribution is considerably small.

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.

Key assumptions

1. All foreground data used for the manufacturing processes (up to factory gate), transportation to the concrete plant, distribution in Australia, via a ‘Request for Information’ spreadsheet. This data was collected for the period September 2020 to September 2021 referred as financial year 2020 -2021 (FY20-21).
2. The assumptions for construction and construction waste were made based on the GCCA tool.
3. Recycling and reuse of concrete can provide economic benefits along with environmental benefits compared to manufacture from raw materials. Concrete is durable and lasts long term. As a result, it can be reused or recycled for aggregate production without exploiting from natural resources. The distance for waste collecting from construction site to landfill/ recycling plant is assumed 50km.
4. The information in Module D may contain technical information as well as LCA results from post-consumer recycling, i.e., environmental benefits or loads resulting from reusable products, recyclable materials and/or useful energy carriers leaving a product system e.g., as secondary materials or fuels. Avoided impacts from co-products from Module A to C shall not be included in Module D. The benefit in this case is the avoided production of gravel from natural source. The recycling process is modelled as using the rock crusher to produce recycled aggregate. The recycling rate for concrete is assumed 72%.

Content declaration

EPD product description

Product stage (A1 – A3)

Table 5 | Recycled and biogenic material

Product components	Weight (%)	Post-consumer recycled content (%)	Biogenic material (%)	Biogenic material (kg C/tonne of product)
Cement	17-22%	0	0	0
Coarse aggregate	37-43%	0	0	0
Sand	32-38%	0	0	0
Supplementary cementitious materials	0-2%	0	0	0
Admixtures	<1%	0	0	0
Water	5-9%	0	0	0

Specific data for module A2 was obtained for Adbri operated processes. All the materials used for concrete mixes were transported in bulk via trucks.

Adbri operates and manages the transport of aggregate and sand from its quarries to its concrete batching plants. Data for the quantity (i.e. load), number of trips and transport distance between every origin quarry and destination concrete plant was provided by Adbri. This data was converted to a kg.km transport unit.

The transport of all other raw materials to the concrete batching plants was modelled using actual transport distances, based on the transport modes for each raw material ingredient (provided by Adbri) and the supplier origin information.

Electricity inputs in foreground processes were modelled based on the state-specific residual mix. The AusLCI database was used to model electricity in the foreground processes. The AusLCI dataset was last updated in 2025 to reflect the latest residual electricity mix source from the financial year 2023. Below presents the primary energy sources of low voltage residual electricity mix and the emissions.

— The primary energy sources of energy in the VIC region are brown coal: 64%, wind: 15%, photovoltaic: 8%, hydro: 7%, and other sources: 6%
— 1.03E+00 kg CO_2eq/kWh (GWP-GHG)

The electricity used for concrete production in Victoria is modelled based on the state-specific grid.
The AusLCI database was used to model electricity in the foreground processes. The AusLCI dataset was last updated in 2021. To assess whether an average of the manufacturing sites can be applied without justification, it's necessary to ensure that the variation in the GWP- GHG impact between sites isn't higher than 10% in modules A1-A3.

Concrete manufacturing is undertaken primarily at Adbri branded concrete batching plants. All plants have the same site resource use profile, management systems and operating systems. In addition, concrete batching plant resource use constitutes less than 1% of impact in each impact category.

Allocation

According to EN 15804 A2:2019, 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 allocation procedure criteria are as follows in Table 6.

Table 6 | Allocation procedure criteria

Revenue Classification	Revenue Contribution	Allocation Type
Very Low	Processes generating overall revenue of the order of 1% or less	The process may be neglected
High	A difference in revenue of more than 25%	Allocation shall be based on economic values
Low	A difference in revenue of less than 25%	Allocation shall be based on physical properties, e.g. mass, volume.

Material flow carrying specific inherent properties, e.g. energy content, elementary composition, shall always be allocated reflecting the physical flows, irrespective of the allocation chosen for the process.

In the case of combined heat and power production, a distribution based on the best efficiency for the (potential) separate generation of electricity or heat shall be considered.

Data provided by Adbri for this assessment includes both product (recycled content in mixes) and production site (energy use) specific data.

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

All waste generated at Adbri sites is non-hazardous. Washout bay waste is sent for recycling. Waste concrete is either re-used directly, or recycled, and plant materials are disposal to landfill.

Allocation of recycled content

Adbri's concrete mixes incorporate varying levels of SCMs, i.e., granulated blast furnace slag and fly ash. BS EN 16757:2017 specifically lists these materials relevant to the study as co-products. 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 (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, conservative estimates are applied to the below SCMs in this LCA:

— Fly ash: It is sourced from coal-fired electricity generation. 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.

Since SCM market price fluctuate and full datasets are often confidential and not disclosed by upstream suppliers, economic allocation has been based on either the AusLCI default ratios or values reported in a peer-reviewed Australian LCA study.[1]

Allocation in background data

The allocation approach for the generic databases utilised in this LCA is also compliant with the PCR. More specifically, the burden of primary production of materials is always allocated to the primary user of a material, while secondary (recycled) materials bear only the impacts of the recycling processes.

The allocation approach of the AusLCI LCA database was adopted as a default for secondary data and processes (e.g., secondary materials in concrete production). The AusLCI dataset conforms to EN 15804 when applying allocation to its various processes and sub-processes.

Adbri quarry data

Adbri produce three main types of aggregate for concrete:

- Coarse aggregate;
- Manufactured sand (a type of fine aggregate); and
- Natural sand (a type of fine aggregate).

Coarse aggregate and manufactured sand are produced at the same sites in a combined process. Manufactured sand is produced from a process of further crushing coarse aggregate until it is sufficiently sized to be used as a substitute for natural sand. Natural sand is quarried and processed at specific sites via a different production process. At all aggregate sites, the resource use and discharge data (e.g. energy, water, wastewater, waste and air emissions) describe inputs and outputs that are shared with other product systems (i.e. aggregates produced for road base etc.). Allocation was thus required to determine the site resource use and discharge amounts that is allocated to each product.

The mass allocation was undertaken following the guidelines in the relevant PCR (2019:14, outlined above). The inputs and outputs to the various aggregate manufacturing sites were first identified and collected. The basis of allocation differed between the inputs and outputs based on their properties: all inputs and outputs were partitioned for the sub-systems based on their underlying physical relationships (i.e. the proportion of total production at each site, by weight).

Averaging production site data

Adbri 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.

Allocation was simply carried out based on physical relationships (i.e., production amount, by volume). It was assumed that all mixes require or result in an equal amount of site resources, discharges, and emissions (per m^3). Therefore, each site's total production volume could be used to perform the calculation of inputs and outputs per m^3 – i.e., physical allocation.

Adbri's ready-mixed concrete production operations span many states. The allocated inputs and outputs of each site (concrete batching plant) were averaged to create state average input and output values and modelled using state-specific electricity processes from AusLCI. This approach applies only to site resource data for concrete batching (A3). Product specific data (e.g., cement, fly ash, slag, aggregates, admixtures etc.) was treated at the product grouping stage.

Approach to product grouping

In Victoria, Adbri produces normal class, lower carbon and special class concrete mixes that fall within the scope of the LCA study. As such, mixes were grouped into discrete groups based on a range of variables that are highly correlated to their environmental impact and easily interpreted by customers. The approach to determining the variables for grouping mixes was iterative and involved close collaboration with the Adbri Victoria project team. The variables considered included:

- State: VIC
- Strength properties (MPa),
- Blend (referring to the type and number of SCMs included in the mix design),

The process of grouping the normal-class mixes involved the following aims and considerations:

- **Provide a simple and readable EPD:** minimise the number and complexity of product groups presented within the EPD to ensure the EPD is reasonably aggregated and summarised for practical use by EPD users.
- **Offer certainty to EPD users:** to provide reliable figures for Adbri customers and industry practitioners, with sufficient specificity as to offer more representative and specific data compared to current average life cycle assessment data for concrete.
- **Future-proof the EPD:** to keep product category groupings consistent over time.

The final variables chosen to group the products are:

- **State:** VIC
- **Strength (MPa):** 20, 25, 32, 40, 50
- **Blend:** GP cement or GL cement, fly ash, slag, ternary

The selected special class concrete mixes included in the LCA study were grouped using the same approach as normal class concrete and declared for specific mix code.

Table 7 | Assumptions on fuel use and load factors of all transport in modules A4

Vehicle	Fuel use (L/tkm)	Fuel type	Carrying capacity	Average load factor	Volume capacity utilization factor
Concrete Truck	2.32E-02	Diesel	Agv. 28 t	50%	<1

Distribution - A4

Data regarding distribution of concrete ready-mix was calculated based on annual figures provided by Adbri, including transport modes and distance. Distances were calculated using Google Maps (road transport) and the weighted average transport from each plant and cement type to consumers was calculated. Tables below summarise the data provided for weighted average distance between manufacture site and consumers, and modelled data for assessment.

Construction (Module A5)

As Adbri does not have operational control over the installation of the products at the construction site, assumptions for construction inputs and installation waste were made based on outputs from the GCCA tool. The table below summarises these assumptions. These inputs account for the pouring of concrete from a ready-mix truck, excluding any pre-installation activities such as site work and forms. The concrete slabs are then manually finished and no additional inputs are required to be modelled. There are no direct emissions to ambient air, soil and water.

Table 8 | Construction inputs per 1 m³ of concrete

Construction Inputs	Unit	Quantity
Concrete losses	%	3.00E+00
Water use	kg	6.69E+02
Electricity use (Australian grid mix)	kWh	2.78E+00
Diesel, in building machine	L	1.67E+00
Wastewater	kg	6.69E-01

According to EN 15804, the impacts of production (impacts from modules A1-A3), distribution (impacts from module A4), and landfill due to concrete loss during the installation stage are assigned to module A5.

Since Adbri produces the dry mix of concrete, with water added at the distribution and installation stage, the density cannot be precisely determined at this point.

For this reason, a concrete density of 2400 kg/m^3 is used, as it is both realistic and commonly accepted density in concrete industry. Therefore, the density is applied across modules A5, C and D. Adjusting the density of concrete in these modules would have a minimal impact on the modules declared.

Deconstruction and End of Life (Module C1 - 4)

Recycling and reuse of concrete products can provide economic benefits along with environmental benefits compared to manufacture from raw materials. Concrete products are durable and last long time. As the results, they can be reused or recycled for aggregate production without exploiting from natural resources.

The following assumptions have been used in this study to model deconstruction and end of life scenarios of Adbri's ready-mix concrete:

- 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 GCCA tool.
- 100% of the products are assumed to be separately collected during deconstruction.
- 50 km delivery distance to landfilling as well as reprocessing facility is assumed for waste collection process since there was no primary data available. The transportation is constrained by the concrete volume.
- The recycling rate for concrete is assumed 72% with the remainder sent to landfill. This is based on the recycling rate for cement-based products from the National Waste Report 2020 (Blue Environment, 2020). Note no waste materials generated that are listed in the “Candidate List of Substances of Very High Concern for authorisation” and no specialized waste treatment procedures are required.
- The remaining waste concrete undergoes inert waste landfill as Module C4.
- There is no carbonation counted at the end of life.

Table 9 | End of Life Assumptions

Product components	Parameter	Unit	Value
C1 – Deconstruction	Diesel	L	2.67E+00
C2 – Transportation	Distance to landfill/ recycling plant	km	5.00E+01
C3 – Waste Processing	Concrete to proceeding	t	1.73E+00
	Lubricating oil	L	2.50E-06
	Diesel, in building machine	L	3.80E-02
	Electricity	kWh	4.00E-03
	Water	m^3	1.22E-02
C4 – Waste Disposal	Inert waste treatment	t	6.72E-01

Vehicle	Fuel use (L/tkm)	Fuel type	Carrying capacity	Average load factor	Volume capacity utilization factor
Truck	2.21E-02	Diesel	40 t	50%	<1

Benefits and loads beyond the system boundary (Module D)

The benefit in this case comes from Modules A3, A5, and C3, as the avoided production of gravel from natural source. The recycling process is modelled as using the rock crusher to produce recycled aggregate.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7 Environmental performance

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 Table 7. All tables from this point will contain the abbreviation only. They are aligned to and adopted from EN 15804+A2 version of Environmental Footprint 3.1.

The LCA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds and safety margins or risks. The impact assessment results are presented in the next sections.

Table 10 | Life Cycle Impact, Resource and Waste Assessment Categories, Measurements and Methods

Impact category	Abbreviation	Measurement unit	Assessment method and implementation	Disclaimer
POTENTIAL ENVIRONMENTAL IMPACTS				
Global warming potential (fossil)	GWPF	kg CO_2equivalents (GWP100)	Baseline model of 100 years of the IPCC based on IPCC 2021	None
Global warming potential (biogenic)	GWPB	kg CO_2equivalents (GWP100)	Baseline model of 100 years of the IPCC based on IPCC 2021	None
Global warming potential (land use/ land transformation)	GWPL	kg CO_2equivalents (GWP100)	Baseline model of 100 years of the IPCC based on IPCC 2021	None
Total global warming potential	GWPT	kg CO_2equivalents (GWP100)	Baseline model of 100 years of the IPCC based on IPCC 2021	None
Acidification potential	AP	mol H+ eq.	Accumulated Exceedance, Seppälä et al. 2006, Posch et al., 2008	None
Eutrophication – aquatic freshwater	EP - freshwater	kg P equivalent	EUTREND model, Struijs et al., 2009b, as implemented in ReCiPe[1]	None
Eutrophication – aquatic marine	EP - marine	kg N equivalent	EUTREND model, Struijs et al., 2009b, as implemented in ReCiPe	None
Eutrophication – terrestrial	EP – terrestrial	mol N equlivalent	Accumulated Exceedance, Seppälä et al. 2006, Posch et al.	None
Photochemical ozone creation potential	POCP	kg NMVOC equivalents	LOTOS-EUROS ,Van Zelm et al., 2008, as applied in ReCiPe	None
Abiotic depletion potential (elements)	ADPE	kg Sb equivalents	CML (v4.8)	2
Abiotic depletion potential (fossil fuels)	ADPF	MJ net calorific value	CML (v4.8)	2
Ozone depletion potential	ODP	kg CFC 11 equivalents	Steady-state ODPs, WMO 2014	None
Water Depletion Potential	WDP	m^3 equivalent deprived	Available WAter REmaining (AWARE) Boulay et al., 2016 (including Australia flows calculated using 36 Australian catchments)	2

Table 10 (Cont.) | Life Cycle Impact, Resource and Waste Assessment Categories, Measurements and Methods

Impact category	Abbreviation	Measurement unit	Assessment method and implementation	Disclaimer
ADDITIONAL ENVIRONMENTAL IMPACTS				
Global warming potential, excluding biogenic uptake, emissions and storage	GWP-GHG	kg CO_2equivalents (GWP100)	Baseline model of 100 years of the IPCC based on IPCC 2021[2]	None
Particulate matter	PM	disease incidence	SETAC-UNEP, Fantke et al. 2016[3]	None
Ionising radiation - human health	IRP	kBq U-235 eq	Human health effect model as developed by Dreicer et al.[4] 1995 update by Frischknecht et al., 2000[5]	1 (Refer to the bottom of the table)
Eco-toxicity (freshwater)	ETP-fw	CTUe	Usetox version 2 until the modified USEtox model is available from EC-JRC	2 (Refer to the bottom of the table)
Human toxicity potential - cancer effects	HTP-c	CTUh	Usetox version 2 until the modified USEtox model is available from EC-JRC	2 (Refer to the bottom of the table)
Human toxicity potential - non cancer effects	HTP-nc	CTUh	Usetox version 2 until the modified Usetox model is available from EC-JRC	2 (Refer to the bottom of the table)
Soil quality	SQP	dimensionless	Soil quality index based on LANCA	2 (Refer to the bottom of the table)
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[6]	None
Use of renewable primary energy resources used as raw materials	PERM	MJ, net calorific value	Manual for direct inputs[7]	None
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	PERT	MJ, net calorific value	ecoinvent version 3.8 and expanded by PRé Consultants[8]	None
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[9]	None
Use of non- renewable primary energy resources used as raw materials	PENRM	MJ, net calorific value	Manual for direct inputs[10]	None
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 3.8 and expanded by PRé Consultants[11]	None
Use of secondary material	SM	kg	Manual for direct inputs	None
Use of renewable secondary fuels	RSF	MJ, net calorific value	Manual for direct inputs	None
Use of non-renewable secondary fuels	NRSF	MJ, net calorific value	Manual for direct inputs	None
Use of net fresh water	FW	m^3	ReCiPe 2016	None

Table 10 (Cont.) | Life Cycle Impact, Resource and Waste Assessment Categories, Measurements and Methods

Impact category	Abbreviation	Measurement unit	Assessment method and implementation	Disclaimer
WASTE CATEGORIES				
Hazardous waste disposed	HWD	kg	EDIP 2003 (v1.05)	None
Non-hazardous waste disposed	NHWD	kg	EDIP 2003 (v1.05)[12]	None
Radioactive waste disposed/stored	RWD	kg	EDIP 2003 (v1.05)	None
OUTPUT FLOWS				
Components for reuse	CRU	kg	Manual for direct inputs	None
Materials for recycling	MFR	kg	Manual for direct inputs	None
Materials for energy recovery	MFRE	kg	Manual for direct inputs	None
Exported energy	EE - e	MJ per energy carrier	Manual for direct inputs	None
Exported energy, thermal	EE – t	MJ per energy carrier	Manual for direct inputs	None

Disclaimer 1 – 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 ionising radiation from the soil, from radon and from some construction materials is also not measured by this indicator. [13]

Disclaimer 2 – 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 experienced with the indicator.

[1] EN 15804:2012+A2:2019 specifies that the unit for the indicator for Eutrophication aquatic freshwater shall be kg PO43- eq, although the reference given ("EUTREND model, Struijs et al., 2009b, as implemented in ReCiPe") uses the unit kg P eq. This is likely a typographical error in EN 15804+A2, which is expected to be corrected in a future revision. Until this has been corrected, results for Eutrophication aquatic freshwater shall be given in both kg PO4 eq and kg P eq. in the EPD.

[2] 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.

[3] Fantke et al., Global Guidance for Life Cycle Impact Assessment Indicators: Volume 1. UNEP/SETAC Life Cycle Initiative, Paris, pp. 76-99

[4] Dreicer et al., 1995. ExternE, Externalities of Energy, Vol. 5. Nuclear, Science, Research and Development JOULE, Luxembourg.

[5] Frischknecht et al., R., 2000. Environmental impact assessment Review, 20, pp.159-189.

[6] PERE = PERT - PERM

[7] 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

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

[9] PENRE = PENRT - PENRM

[10] 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

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

[12] Calculated as sum of Bulk waste and Slags/ash.

[13] Aligned with PCR 2019:14

Environmental performance results

Table 11 | Environmental impacts per m³ of VS804B180 (results are in accordance with EN15804+A2:2019)

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-Total	kg CO_2 eq.	4.13E+02	2.65E+00	8.64E+00	7.75E+00	1.55E+00	7.72E+00	2.81E+00	-1.51E+01
GWP-Fossil	kg CO_2 eq.	4.13E+02	2.65E+00	8.63E+00	7.75E+00	1.55E+00	7.71E+00	2.81E+00	-1.51E+01
GWP-Biogenic	kg CO_2 eq.	6.11E-02	9.20E-05	1.30E-02	3.46E-04	5.38E-05	6.47E-03	8.25E-04	-1.16E-02
GWP-Luluc	kg CO_2 eq.	1.09E-01	6.80E-05	9.53E-04	2.57E-04	3.97E-05	6.22E-03	1.74E-03	-1.32E-02
ODP	kg CFC 11 eq.	9.77E-07	3.49E-08	9.80E-08	1.06E-07	2.04E-08	9.82E-08	3.83E-08	-1.10E-07
AP	mol H+ eq.	1.84E+00	1.37E-02	2.31E-02	1.11E-02	8.03E-03	6.82E-02	2.55E-02	-8.37E-02
EP-F	kg P eq.	2.64E-03	1.96E-06	4.39E-04	8.79E-05	1.15E-06	1.66E-05	2.39E-06	-7.41E-04
EP-M	kg N eq.	7.31E-01	3.61E-03	6.80E-03	3.02E-03	2.11E-03	2.88E-02	1.11E-02	-2.11E-02
EP-T	mol N eq.	8.33E+00	4.02E-02	6.05E-02	3.26E-02	2.35E-02	3.15E-01	1.22E-01	-2.32E-01
POCP	kg NMVOC eq.	2.05E+00	1.52E-02	2.50E-02	2.01E-02	8.88E-03	9.33E-02	3.61E-02	-7.36E-02
ADPE	kg Sb eq.	1.22E-04	8.90E-08	1.28E-06	3.45E-07	5.20E-08	1.26E-06	1.03E-07	-1.67E-06
ADPF	MJ	2.91E+03	3.44E+01	1.08E+02	1.05E+02	2.01E+01	8.99E+01	3.39E+01	-1.91E+02
WDP	m^3 eq deprived	3.90E+01	1.74E-02	1.39E+01	7.79E-02	1.02E-02	1.84E+00	1.40E-01	-2.66E+01

Acronyms: GWP-F = Global Warming Potential fossil fuels; GWP-B = Global Warming Potential biogenic; GWP-Luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-F = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-M = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-T = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP = Abiotic depletion potential - minerals and metals; ADPF = Abiotic depletion potential - fossil fuels; WDP = Water (user) deprivation potential, deprivation-weighted water consumption

Table 12 | Resource use per m³ of VS804B180 (results are in accordance with EN15804+A2:2019)

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ_{NCV}	2.03E+02	5.76E-02	4.21E+00	2.23E-01	3.37E-02	2.67E+00	7.21E-01	-1.83E+01
PERM	MJ_{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ_{NCV}	2.03E+02	5.76E-02	4.21E+00	2.23E-01	3.37E-02	2.67E+00	7.21E-01	-1.83E+01
PENRE	MJ_{NCV}	2.31E+03	3.44E+01	1.08E+02	1.05E+02	2.01E+01	8.99E+01	3.39E+01	-1.91E+02
PENRM	MJ_{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ_{NCV}	2.31E+03	3.44E+01	1.08E+02	1.05E+02	2.01E+01	8.99E+01	3.39E+01	-1.91E+02
SM	kg	3.32E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ_{NCV}	3.35E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ_{NCV}	1.38E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	8.88E-01	4.38E-04	-2.00E-02	1.94E-03	2.56E-04	3.09E-02	2.91E-03	-6.29E-01

Acronyms: PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

Table 13 | Waste generated per m³ of VS804B180 (results are in accordance with EN15804+A2:2019)

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	kg	1.43E+00	3.19E-03	1.98E-01	2.17E-02	1.86E-03	8.01E-02	3.50E-03	-2.91E+00
NHWD	kg	4.72E+01	1.01E-01	6.88E+02	4.07E-01	5.91E-02	1.48E+00	6.72E+02	-5.99E+01
RWD	kg	3.58E-04	1.30E-06	6.25E-06	4.83E-06	7.61E-07	5.54E-06	1.64E-06	-1.05E-03

Acronyms: HWD = Hazardous waste disposed, NHWD = Non-hazardous waste disposed, RWD = Radioactive waste disposed.

Table 14 | Output flows per m³ of VS804B180 (results are in accordance with EN15804+A2:2019)

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	5.74E+01	0.00E+00	7.20E+01	0.00E+00	0.00E+00	1.73E+03	0.00E+00	0.00E+00
MFRE	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE - e	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE - t	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Acronyms: CRU = Components for re-use, MFR = Material for recycling, MFRE = Materials for energy recovery, EE - c = Exported energy - electricity, EE - t = Exported energy - thermal.

Table 15 | Additional environmental impacts per m³ of VS804B180 (results are in accordance with EN15804+A2:2019)

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-GHG	kg CO_2 eq.	4.13E+02	2.65E+00	8.64E+00	7.75E+00	1.55E+00	7.72E+00	2.81E+00	-1.51E+01
PM	disease incidence	1.02E-05	2.40E-07	7.16E-07	9.32E-08	1.40E-07	1.76E-06	6.78E-07	-1.27E-06
IRP	kBq U-235 eq	7.17E-01	2.51E-03	1.15E-02	2.02E-02	1.47E-03	9.38E-03	2.88E-03	-6.94E-01
ETP-fw	CTUe	1.34E+02	1.29E+00	1.61E+01	5.27E+00	7.54E-01	9.48E+00	1.22E+00	-3.29E+01
HTP-c	CTUh	6.78E-08	1.29E-10	1.86E-09	5.90E-10	7.55E-11	1.93E-08	1.88E-10	-2.62E-08
HTP-nc	CTUh	3.72E-07	5.37E-09	4.27E-08	2.31E-08	3.14E-09	1.45E-08	3.64E-09	-6.68E-08
SQP	dimensionless	2.79E+02	5.12E-02	2.61E+00	2.38E-01	2.99E-02	1.92E+04	1.17E+00	-1.24E+02

Acronyms: GWP-GHG = Global warming potential, excluding biogenic uptake, emissions and storage; PM = Particulate matter; IRP = Ionising radiation - human health; ETP-fw = Ecotoxicity - freshwater; HTP-c = Human toxicity potential - cancer effects; HTP-nc = Human toxicity potential - non cancer effects; SQP = Soil quality.

Additional Environmental Information

In addition, the latest standard requires reporting additional environmental information for two boundary scenarios, 100% recycling (Scenario 1) and 100% landfill (Scenario 2), whenever the declared end-of-life scenario is a mix of multiple alternatives. In such cases, only the results for Modules C3, C4, and D are adjusted, while the impacts associated with all other modules remain unchanged.

Indicator	Unit	Scenario 1: 100% recycling			Scenario 2: 100% landfill		
		C3	C4	D	C3	C4	D
GWP-Total	kg CO_2 eq.	1.07E+01	0.00E+00	-2.13E+01	0.00E+00	1.00E+01	-1.39E+00
GWP-Fossil	kg CO_2 eq.	1.07E+01	0.00E+00	-2.13E+01	0.00E+00	1.00E+01	-1.39E+00
GWP-Biogenic	kg CO_2 eq.	8.99E-03	0.00E+00	-1.64E-02	0.00E+00	2.95E-03	-1.07E-03
GWP-Luluc	kg CO_2 eq.	8.64E-03	0.00E+00	-1.86E-02	0.00E+00	6.21E-03	-1.21E-03
ODP	kg CFC 11 eq.	1.36E-07	0.00E+00	-1.55E-07	0.00E+00	1.37E-07	-1.01E-08
AP	mol H+ eq.	9.47E-02	0.00E+00	-1.18E-01	0.00E+00	9.11E-02	-7.73E-03
EP-F	kg P eq.	1.85E-04	0.00E+00	-1.13E-03	0.00E+00	7.67E-05	-4.34E-04
EP-M	kg N eq.	4.00E-02	0.00E+00	-2.98E-02	0.00E+00	3.97E-02	-2.04E-03
EP-T	mol N eq.	4.37E-01	0.00E+00	-3.27E-01	0.00E+00	4.35E-01	-2.14E-02
POCP	kg NMVOC eq.	1.30E-01	0.00E+00	-1.04E-01	0.00E+00	1.29E-01	-6.80E-03
ADPE	kg Sb eq.	1.75E-06	0.00E+00	-2.36E-06	0.00E+00	3.67E-07	-1.55E-07
ADPF	MJ	1.25E+02	0.00E+00	-2.70E+02	0.00E+00	1.21E+02	-1.77E+01
WDP	m^3 eq deprived	2.56E+00	0.00E+00	-3.75E+01	0.00E+00	4.98E-01	-2.45E+00

Indicator	Unit	Scenario 1: 100% recycling			Scenario 2: 100% landfill		
		C3	C4	D	C3	C4	D
PERE	MJ_{ncv}	3.71E+00	0.00E+00	-2.58E+01	0.00E+00	2.58E+00	-1.69E+00
PERM	MJ_{ncv}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ_{ncv}	3.71E+00	0.00E+00	-2.58E+01	0.00E+00	2.58E+00	-1.69E+00
PENRE	MJ_{ncv}	1.25E+02	0.00E+00	-2.70E+02	0.00E+00	1.21E+02	-1.77E+01
PENRM	MJ_{ncv}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ_{ncv}	1.25E+02	0.00E+00	-2.70E+02	0.00E+00	1.21E+02	-1.77E+01
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ_{ncv}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ_{ncv}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	4.29E-02	0.00E+00	-8.88E-01	0.00E+00	1.04E-02	-5.81E-02

Indicator	Unit	Scenario 1: 100% recycling			Scenario 2: 100% landfill		
		C3	C4	D	C3	C4	D
HWD	kg	1.11E-01	0.00E+00	-6.37E+00	0.00E+00	1.25E-02	-6.37E+00
NHWD	kg	2.06E+00	0.00E+00	-1.31E+02	0.00E+00	2.40E+03	-1.31E+02
RWD	kg	7.69E-06	0.00E+00	-2.29E-03	0.00E+00	5.87E-06	-2.29E-03

Indicator	Unit	Scenario 1: 100% recycling			Scenario 2: 100% landfill		
		C3	C4	D	C3	C4	D
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00
MFR	kg	2.40E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFRE	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE - e	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE - t	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Indicator	Unit	Scenario 1: 100% recycling			Scenario 2: 100% landfill		
		C3	C4	D	C3	C4	D
GWP-GHG	kg CO_2 eq.	1.07E+01	0.00E+00	-2.13E+01	0.00E+00	1.00E+01	-1.39E+00
PM	disease incidence	2.44E-06	0.00E+00	-1.80E-06	0.00E+00	2.42E-06	-1.18E-07
IRP	kBq U-235 eq	3.17E-02	0.00E+00	-1.00E+00	0.00E+00	2.44E-02	-1.57E-01
ETP-fw	CTUe	1.32E+01	0.00E+00	-4.65E+01	0.00E+00	4.34E+00	-3.04E+00
HTP-c	CTUh	2.68E-08	0.00E+00	-3.70E-08	0.00E+00	6.70E-10	-2.42E-09
HTP-nc	CTUh	2.01E-08	0.00E+00	-9.42E-08	0.00E+00	1.30E-08	-6.17E-09
SQP	dimensionless	2.67E+04	0.00E+00	-1.75E+02	0.00E+00	4.16E+00	-1.14E+01

For Adbri concrete's environmental GWP, it is typical to identify the product you are seeking for its normal versus special class, SCM replacement levels which Adbri have branded as Adbri, Futurecrete® and Futurecrete® Ultra concrete and use the Cradle to Gate (A1-A3) GWP total number expressed as kgCO_2eq. For additional information pertaining to the transport to site component, for your convenience, Adbri have calculated the data and therefore the GWP number for transport A4 should be added to the A1-A3 GWP value.

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