شركة أسمنت الاتحاد(ش.م.خ.)
UNION CEMENT COMPANY (Pr.J.S.C)

ZONAL ISOLATION

ENVIRONMENTAL PRODUCT DECLARATION

OIL WELL CEMENT (API HSR)

In accordance with ISO 14025 & EN 15804:2012+A2:2019/AC:2021

EPD Program	Title	Details
International Climate Intelligence System 71-75 Shelton Street Covent Garden, London, WC2H 9JQ United Kingdom office@climateintell.com	Registration Number	ICIS-202603-128
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INTERNATIONAL CLIMATE INTELLIGENCE SYSTEM EPD VERIFIED

Union Cement Company (Pr.J.S.C)
Khor Khwair Industrial Area,
Ras Al Khaimah, UAE
www.uccrak.com

INTERNATIONAL CLIMATE INTELLIGENCE SYSTEM EPD

For the most current version and to confirm the validity of an EPD within International Climate Intelligence System, please refer to www.climateintell.com. EPDs are subject to revision or removal if conditions vary.

With world-leading clinker capacity, Union Cement Company defines strength

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OVERVIEW

This Environmental Product Declaration (EPD) presents verified and transparent environmental performance data for Oil Well Cement (API HSR) manufactured by Union Cement Company at its production facility in Ras Al Khaimah, United Arab Emirates, for the reporting period April 2024 to March 2025. The declared unit for this assessment is 1 metric ton of Oil Well Cement (API HSR).

The Life Cycle Assessment (LCA) has been conducted in accordance with the requirements of ISO 14025 and EN 15804:2012 + A2:2019/AC:2021, covering all relevant life cycle stages within the defined system boundary. This EPD provides consistent, third-party-verified environmental information to support architects, engineers, developers, contractors, and sustainability professionals in embodied carbon assessment, green building certification schemes, and transparent procurement decision-making.

PRODUCT INFORMATION

Product Name

Oil Well Cement (API HSR)

Product Type

Hydraulic binder for oil and gas well cementing

Declared Unit

1 metric ton

PCR & Version

ICIS PCR 2026:18 v1.2.6 (EN 15804 + A2 aligned)

Scope

Cradle-to-Gate with options (A1-A4, C1-D)

Production Route

Dry process with preheater–precalciner kiln

Recycled Content

Not intentionally added (inherent recycled content only)

Electricity Mix

UAE grid mix from Ecoinvent 3.11 (cut-off). Natural Gas (89.42%), Nuclear (7.06%), Oil (0.60%), Solar (0.18%) and others.

LCA Tool and Database

Air.e.LCA v3.20.1.0 and Ecoinvent v3.11 (Cut-Off)

Geographical Scope

United Arab Emirates

PRODUCT INFORMATION

Verification

International Climate Intelligence System
71-75 Shelton Street, Covent Garden
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United Kingdom
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Product Group Classification

UN CPC 37440
(Portland Cement)

Environmental Performance Summary (A1-A3)

Indicator	Result	Unit
Climate change (GWP) - total	7.91E+02	Kg CO_2e
Climate change (GWP) - fossil	7.91E+02	Kg CO_2e
Ozone Depletion (ODP)	1.49E-05	Kg CFC-11e
Abiotic depletion of fossil resources	1.14E+03	MJ

Hotspot Summary

Process	Share of Total GWP (%)
Raw Material Supply (A1)	1.70
Raw Material Transportation (A2)	0.08
Manufacturing (A3)	95.58
Remaining Modules (A4, C1-C4)	2.64

PRODUCT INFORMATION

Where This Adds Value

Scheme / Area	Relevance to Oil Well Cement (API HSR)
LEED v4.1 (USGBC) – Material Disclosure & Whole-Building LCA	LEED projects prioritise product-specific EPDs to achieve MR credits and improve whole-project embodied carbon performance. Although Oil Well Cement is applied in energy and drilling infrastructure rather than building structures, this verified Type III EPD enables transparent cradle-to-gate modelling and strengthens sustainability submissions for industrial and energy-sector developments.
Estidama Pearl Rating System (Abu Dhabi)	Pearl-rated government and infrastructure projects require transparent environmental documentation for material approval. The availability of a verified EPD for Oil Well Cement enhances technical specification confidence and supports embodied carbon transparency within energy and associated infrastructure facilities.
Oman Green Building Guidelines (OGBG)	Sustainability-driven developments increasingly adopt material transparency practices across infrastructure and industrial sectors. This EPD provides quantifiable environmental performance data that supports consultant benchmarking and acceptance in projects requiring oilfield and drilling-related materials.
BREEAM International (UAE & GCC Projects)	BREEAM-aligned developments reward the use of products with verified environmental declarations. This EPD contributes to LCA-based assessments for industrial and energy-supporting infrastructure, enabling project teams to demonstrate responsible sourcing transparency.
Energy Infrastructure Embodied Carbon Assessment	Cement used in well construction contributes significantly to the embodied carbon profile of drilling and production systems. Providing product-specific LCA data allows engineers to refine modelling, support carbon management strategies, and differentiate bids in technically regulated energy projects.

PRODUCT INFORMATION

Government & Infrastructure Procurement	Major infrastructure and energy developments increasingly request product-specific EPDs during material prequalification. Availability of this EPD strengthens Union Cement Company's positioning in technically evaluated and sustainability-focused tenders.
Oilfield Service & Contractor Supply Chains	As environmental reporting becomes standard practice across the energy sector, drilling contractors and service providers benefit from access to verified OWC GWP values, supporting structured sustainability reporting and competitive differentiation within responsible energy supply chains.

ABOUT UNION CEMENT

Founded in 1972, Union Cement Company (UCC) is a pioneering cement manufacturer headquartered in Ras Al Khaimah. Operating one of the world's highest-capacity single clinker production lines, UCC produces over 13,500 tonnes per day. The company manufactures OPC, SRC, PLC, GGBFS, DrillWell cement, and clinker, supporting large-scale infrastructure, energy, transport, and industrial development projects with reliable, performance-driven manufacturing excellence.

UCC operates a fully integrated cement manufacturing facility in Ras Al Khaimah, covering:

- High-capacity dry-process clinker production with preheater–precalciner kiln technology.
- Large-scale cement grinding and dispatch operations serving UAE and Oman.
- Bulk and bagged cement supply to ready-mix, precast, and infrastructure sectors.
- Advanced laboratory testing and continuous process monitoring.
- Optimised fuel and raw material management systems.

UCC's production infrastructure is engineered for efficiency, consistency, and reliability — ensuring uninterrupted supply for major construction and infrastructure projects.

UCC maintains internationally recognised management systems and product compliance standards, including:

- ISO 9001 – Quality Management System.
- ISO 14001 – Environmental Management System.
- ISO 45001 – Occupational Health & Safety Management System.
- Compliance with EN standards and relevant GCC regulatory requirements.
- Product conformity aligned with regional construction specifications.

UCC continues to invest in operational excellence, sustainability performance, and technological optimisation to meet the evolving demands of large-scale construction and infrastructure development across the UAE and Northern Oman.

Through world-leading clinker capacity, disciplined quality control, and responsible manufacturing practices, UCC remains a cornerstone supplier to the region's structural growth.

PRODUCT DESCRIPTION

Oil Well Cement (API HSR) is a high-performance hydraulic binder manufactured through the controlled grinding of specially formulated Portland cement clinker with a regulated addition of gypsum to achieve required thickening time and strength development under well conditions, conforming to API Specification 10A Classes B, C (Grade 0) G, and H (High Sulfate Resistant). Supplied as a fine grey powder, it is mixed with water to form a pumpable slurry that sets and hardens to create a dense and stable cement sheath within the wellbore. Its composition is characterised by low tricalcium aluminate (C_3A) content together with calcium silicates formed during high-temperature clinker production, ensuring durability and stability under high-pressure and high-temperature downhole environments.

The product is designed for primary cementing operations in onshore and offshore oil and gas wells where zonal isolation and casing support are critical. Oil Well Cement (API HSR) provides reliable compressive strength development, controlled thickening behaviour, and long-term integrity within chemically aggressive subsurface conditions. Typical applications include casing cementation, liner cementing, plug setting, and well abandonment operations. The cement is supplied in bulk and jumbo bag formats, enabling efficient handling and controlled placement in drilling and production projects.

Sectors & Corresponding Uses

Sector	Application / Use Case
Onshore Oil & Gas Drilling	Cement slurry for primary casing cementation in land-based wells, providing zonal isolation, casing support, and pressure containment under high-temperature and high-pressure conditions
Offshore Drilling Operations	Well cementing for offshore platforms and subsea wells requiring stable cement sheath formation, resistance to saline formations, and long-term structural integrity
Well Completion & Liner Systems	Cementing of production liners and intermediate casings to ensure hydraulic isolation between formations and controlled strength development during drilling operations
Plugging & Well Abandonment	Placement of cement plugs for zonal isolation and permanent well barrier formation during suspension and abandonment procedures in accordance with industry standards
Energy Infrastructure & Production Systems	Cementing applications supporting drilling, workover, and remediation activities where reliable compressive strength and durability are required in aggressive subsurface environments

PRODUCT DESCRIPTION

Technical Specifications

Parameter	Details / Specification
Product Type	Hydraulic Binder (API High Sulfate Resistant Oil Well Cement)
Strength Class	Conforming to API Specification 10A (Classes B, C (Grade 0) G or H)
Form	Fine grey powder
Main Constituent	Low C_3A Portland clinker with regulated calcium sulfate addition
Compressive Strength	Conforming to API 10A compressive strength requirements
Thickening Behaviour	Controlled thickening time suitable for well conditions
Initial Setting Characteristics	In accordance with API Specification 10A performance criteria
Free Fluid & Stability	Within API specified limits for slurry performance
Density (True)	Approx. 3.10–3.15 g/cm³
Supply Format	Bulk tanker or 1,500 kg Jumbo Bags

MANUFACTURING DETAILS

The production of Oil Well Cement (API HSR) begins with the inspection and preparation of carefully proportioned calcareous and argillaceous raw materials formulated to achieve the required low C_3A clinker chemistry suitable for well cementing applications. All incoming materials undergo strict quality verification to ensure conformity with defined chemical and physical specifications prior to storage and processing. The prepared raw materials are subjected to raw grinding, where they are finely milled to produce a homogenised raw meal designed to support controlled clinker mineral formation for high-pressure and high-temperature well environments.

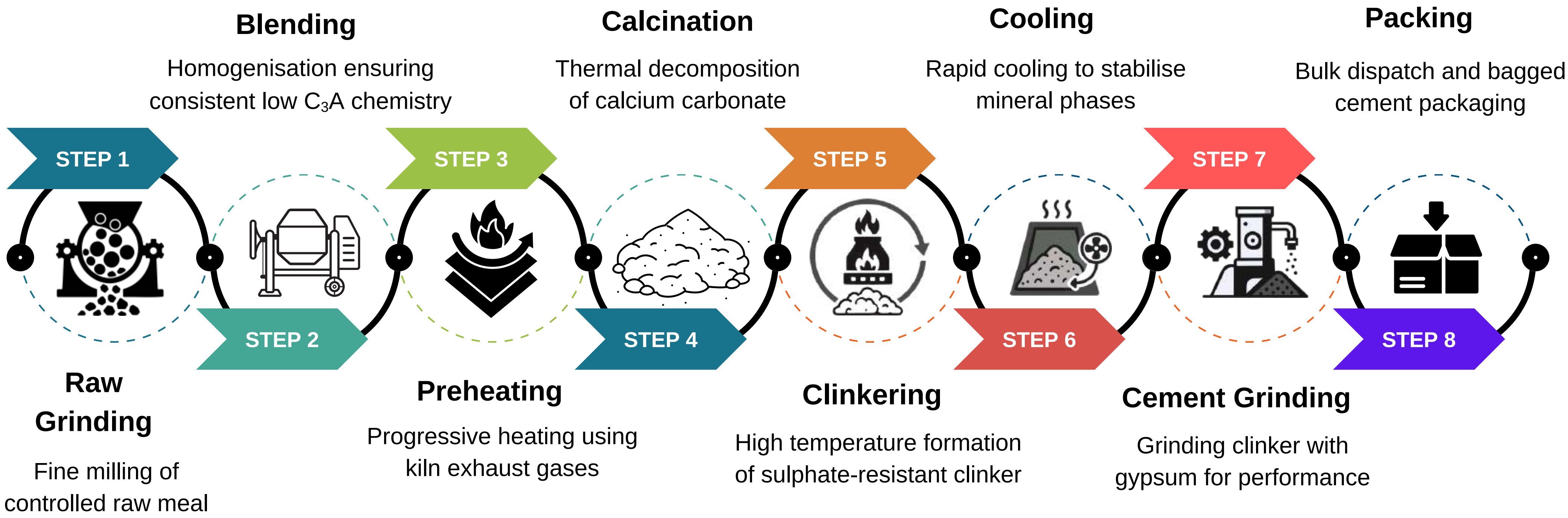
The homogenised raw meal is transferred to blending systems to ensure consistent chemical composition before entering the preheater. During preheating, the material is progressively heated by counter-current hot gases from the kiln. In the calcination stage, calcium carbonate decomposes into calcium oxide and carbon dioxide. The material then enters the rotary kiln for clinkering, where temperatures approaching 1450°C promote the formation of calcium silicate phases with controlled tricalcium aluminate content to ensure durability and performance under downhole conditions. The hot clinker is rapidly cooled to stabilise mineral phases and preserve reactivity.

After cooling, the clinker is stored and subsequently fed into the cement grinding stage, where it is interground with controlled quantities of gypsum (calcium sulfate) to regulate thickening time and achieve the required performance characteristics. No limestone or supplementary mineral additions are incorporated in order to maintain compliance with API cement specifications. The grinding process determines final fineness and slurry performance behaviour critical to zonal isolation. Finished cement undergoes comprehensive quality control testing to verify compliance with API Specification 10A performance requirements before being transferred to bulk silos for tanker dispatch or packed into jumbo bags (FIBC) for distribution to drilling and energy projects.

For a visual representation of the full manufacturing workflow, refer to the illustrated flow chart on the next page. A screenshot of the process flow as modeled in the LCA software is provided on the page that follows.

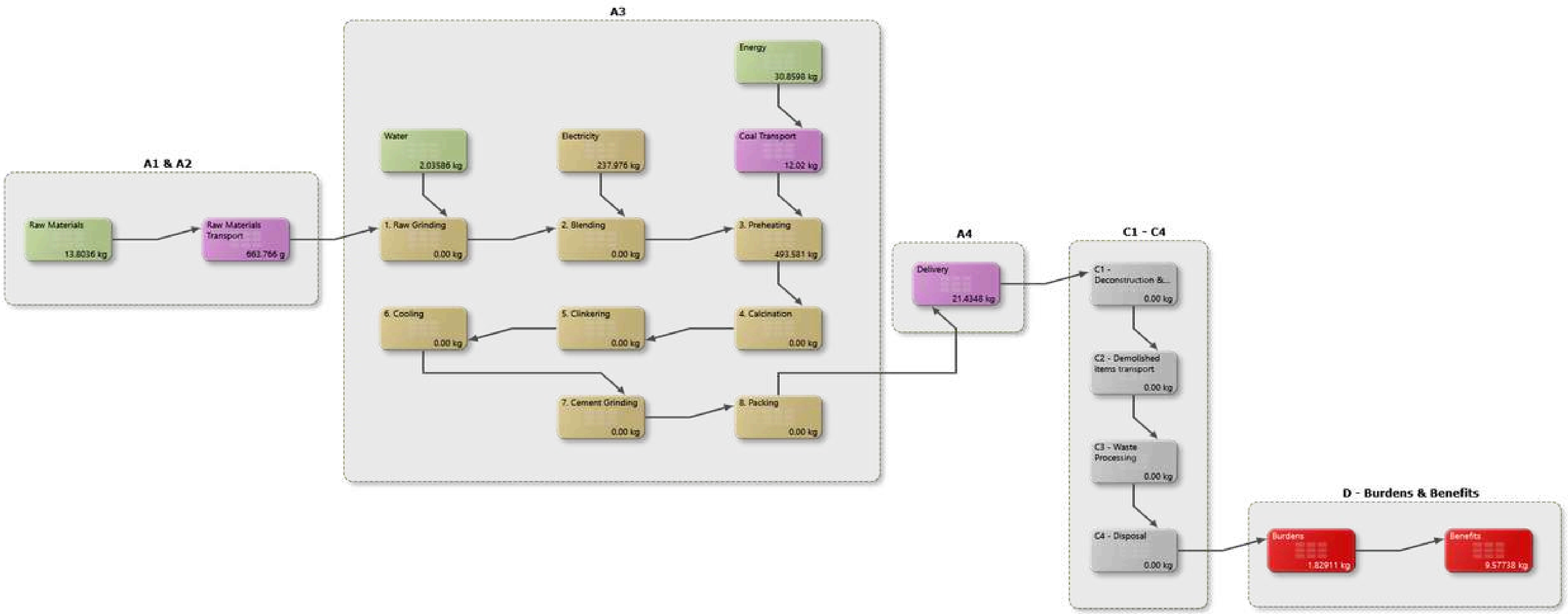
MANUFACTURING DETAILS

Schematic overview of Oil Well Cement (API HSR) manufacturing process



MANUFACTURING DETAILS

Screenshot of Oil Well Cement (API HSR) LCA model from LCA software



CONTENT DECLARATION

The content declaration provides a transparent breakdown of the constituent materials present in Oil Well Cement (API HSR), expressed per 1 metric ton of product. The cement is predominantly composed of specially formulated Portland clinker with controlled low C_3A content, interground with regulated quantities of gypsum to achieve specified thickening time and compressive strength performance under downhole conditions. The total of all listed constituents equals 1 metric ton, matching the declared unit and ensuring complete material accounting in accordance with EN 15804 and ISO 14025 requirements.

Component	Weight (kg/Declared unit)	Post-consumer recycled (%)	Pre-consumer recycled (%)	Biogenic Content (%)	Biogenic Carbon (kg C/DU)
Portland Clinker	948	0	0	0	0
Gypsum	50	0	0	0	0
Additives & Fillers	2	0	0	0	0
Total	**1000**	**0**	**0**	**0**	**0**

Substances of Very High Concern (SVHC)

According to the requirements of the ECHA Candidate List of Substances of Very High Concern (SVHC), Oil Well Cement (API HSR) contains no substances listed above the 0.1% (w/w) threshold in the final product.

All principal constituents of the cement—low C_3A Portland clinker, gypsum, and minor constituents where applicable—were reviewed against the latest published SVHC list at the time of reporting. Based on supplier declarations and available safety data sheets, no SVHCs are present in concentrations exceeding regulatory reporting thresholds.

Packaging Material Declaration

Packaging materials used for Oil Well Cement (API HSR) include jumbo bags (FIBCs), wooden pallets, pull tie cords, sling bag caps, PVC binding straps, and LDPE protective sheets. Each component performs a defined function within the supply chain—jumbo bags contain and protect the powder product, pallets enable stable stacking and mechanical handling, binding straps and LDPE sheets secure palletised loads during transport, and auxiliary components such as pull ties and caps ensure closure and lifting integrity.

All packaging materials are included in the life cycle assessment, as they contribute to upstream manufacturing impacts and form recoverable or disposable material streams at end-of-life in

CONTENT DECLARATION

accordance with EN 15804 requirements.

Packaging Material	Biogenic Content (%)	Biogenic Carbon Fraction (kg C/kg material)	Notes & References
Wooden Pallet	~100% (solid wood)	0.50 kg C/kg	IPCC (2006) Guidelines — wood contains ~50% carbon by dry mass.
Jumbo Bags (PP - FIBC)	0%	0 kg C/kg	Polypropylene is petroleum-based; contains no biogenic carbon.
Pull Tie Cord (PP)	0%	0 kg C/kg	Polypropylene accessory component; fossil-based polymer.
Sling Bag Caps (PP)	0%	0 kg C/kg	Injection-moulded polypropylene; fossil-based carbon.
Binding Strap (PVC)	0%	0 kg C/kg	PVC is petroleum-based; no biogenic carbon content.
LDPE Sheet	0%	0 kg C/kg	Low-density polyethylene is fossil-based; contains no biogenic carbon.

For Oil Well Cement (API HSR), wooden pallets contain significant biogenic carbon, as they originate from lignocellulosic biomass derived from solid wood. In contrast, jumbo bags (polypropylene), pull tie cords, sling bag caps, binding straps (PVC), and LDPE protective sheets are fossil-based polymer materials and therefore do not contain biogenic carbon.

These biogenic fractions are reported transparently to reflect the temporary storage of renewable carbon within the packaging system. Their modelling and reporting in the LCA follow EN 15804+A2 requirements, with biogenic carbon flows presented in the Packaging Composition and Biogenic Carbon table below.

Packaging Material	Weight (kg/Declared Unit)	Share of Packaging (%)	Biogenic Carbon (kg C/DU)	End-of-Life Handling
Wooden Pallet	5.93E-04	13.39	2.97E-04	Reuse / Recycle / Energy Recovery
Jumbo Bags (PP - FIBC)	3.83E-03	86.36	0.00E+00	Reuse / Recycle / Energy recovery

CONTENT DECLARATION

Pull Tie Cord (PP)	5.54E-07	0.01	0.00E+00	Energy recovery / Landfill
Sling Bag Caps (PP)	3.97E-07	0.01	0.00E+00	Energy recovery / Landfill
Binding Strap (PVC)	5.97E-07	0.01	0.00E+00	Recycle (limited) / Energy recovery
LDPE Sheet	9.69E-06	0.22	0.00E+00	Recycle / Energy recovery
Total	**4.43E-03**	**100**	**2.97E-04**	**-**

Note - Biogenic content in packaging materials **exceed the 5% threshold** of the total packaging weight as stated in **ICIS PCR 2026:18**. Hence, these biogenic emissions are added in **module A3 and balanced out in module A5**.

LCA KNOWLEDGE

Declared Unit

The declared unit for this EPD is 1 metric ton of Oil Well Cement (API HSR) at the factory gate. All material inputs, energy use, emissions, transportation, packaging, and end-of-life modelling are quantified relative to this unit. This ensures consistent comparison across life cycle stages and aligns with EN 15804+A2 requirements for construction products. No functional performance is assigned to the product in this declaration, as the EPD is based on a declared unit rather than a functional unit.

Temporal, Geographical and Technological Representativeness

Temporal Representativeness: Primary data for Oil Well Cement (API HSR) reflects the reporting period April 2024 to March 2025, in line with EN 15804+A2 requirements that primary manufacturing data must be no older than five years. All on-site information—including raw material consumption, energy use, water use, and waste generation—represents current operational conditions at the Ras Al Khaimah plant during the defined reporting year. Background data used in the study are consistent with the temporal validity provided in their respective datasets to ensure alignment with the modelling year.

Geographical Representativeness: The LCA model for Oil Well Cement (API HSR) reflects the actual manufacturing and supply conditions of Union Cement Company's Ras Al Khaimah facility in the United Arab Emirates, where all primary data was collected. The study represents production and operations within UAE, with UAE-specific or GCC-specific conditions applied wherever available—particularly for raw material sourcing patterns, electricity grid characteristics, water production, and end-of-life treatment routes.

Where UAE-specific datasets or regional factors were not available, GCC-appropriate or globally representative datasets were used. All transport distances, energy consumption figures, and end-of-life scenarios are based on realistic practices in the UAE, ensuring geographical relevance of the final results.

Technological Representativeness: The manufacturing process modelled for Oil Well Cement (API HSR) accurately reflects the integrated dry-process production technology used at Union Cement Company's facility. Production includes raw material preparation (crushing, raw grinding, and blending), preheating and calcination in a rotary kiln system, clinker formation at high temperature with controlled low C_3A chemistry suitable for well cementing applications, rapid clinker cooling, followed by finish grinding with regulated gypsum addition and final packing. The process involves high-temperature thermochemical reactions during calcination and clinkering, supported by controlled fuel combustion and kiln operation.

LCA KNOWLEDGE

The technological assumptions applied in the LCA represent a modern dry-process kiln with preheater and precalciner configuration, consistent with large-scale clinker manufacturing operations. Energy inputs, process emissions from calcination, fuel combustion, internal material handling, and cement grinding are included to reflect actual plant conditions. The modelling approach therefore represents real industrial sulphate-resisting cement production technology and ensures that the results are aligned with site-representative manufacturing practice.

LCA Software and Database

The life cycle model for Oil Well Cement (API HSR) was developed using Air.e.LCA v3.20.1.0, with all background inventory data sourced from Ecoinvent v3.11 (Allocation, cut-off by classification). The software was used to structure process flows, assign datasets, calculate environmental indicators, and perform all module-by-module inventory tracking. The database provides consistent, peer-reviewed life cycle inventories for raw materials, energy supply, transportation, and waste management processes. All datasets selected reflect technologies and supply chains relevant to the product and regional context, ensuring reliable integration of foreground data with established international life cycle inventories.

System Boundary

This EPD covers all product stages from "cradle to gate with options", i.e. this LCA covers Production stage A1-A3, Transportation A4, End-of-life stages C1-C4 and Resource recovery stage D according to EN 15804:2012 + A2:2019 / AC:2021.

The procedures that are not controlled by the company, but are included in this environmental study, are:

- The extraction and production of fuels and electricity.

All related direct and indirect environmental impacts related to these elements have been calculated and were included in the LCA and this EPD. Personnel-related processes, such as transportation of employees to and from work is excluded. Also, the production and end-of-life processes of infrastructure or capital goods used in the product system are excluded.

Module A1 - Raw Material Supply

Module A1 encompasses all upstream processes associated with the extraction, processing, and supply of raw materials used in the manufacture of Oil Well Cement (API HSR). The principal constituents—calcareous and argillaceous materials for clinker production together with gypsum for controlled addition—are sourced from suppliers within the United Arab Emirates, ensuring traceability and conformity with defined plant quality specifications. Packaging materials are procured from suppliers located in the UAE, Oman, and India and include jumbo bags (FIBC), wooden pallets, pull tie cords, sling bag caps, binding straps, and LDPE protective sheets.

LCA KNOWLEDGE

Activities included within this module comprise quarrying, raw material preparation, fuel production, electricity generation, packaging material production, and the manufacture of auxiliary inputs required for clinker and cement production.

Module A2 - Raw Material Transportation

Module A2 covers the transportation of all raw and packaging materials to the Union Cement Company facility in Ras Al Khaimah, United Arab Emirates. The principal raw materials for clinker production—calcareous and argillaceous constituents together with gypsum—are sourced within the UAE and transported to the Ras Al Khaimah plant using >32-ton Euro 6 lorry, representative of bulk mineral transport within the country. Packaging materials are sourced from a combination of the UAE, Oman, and India. Materials from the UAE and Oman are transported by >32-ton Euro 6 lorry, while packaging materials imported from India are transported via sea freight container ship to Mina Saqr port and subsequently delivered by >32-ton Euro 6 lorry to the Ras Al Khaimah facility.

Environmental impacts in this module arise from diesel combustion in heavy-duty road transport and marine fuel combustion in container shipping. Transport distances, load factors, and logistics modelling reflect realistic GCC supply chain conditions, ensuring representative accounting of both domestic and international inbound transport to the Ras Al Khaimah cement plant.

Module A3 - Manufacturing

Manufacturing impacts cover all processes required to convert raw materials into finished Oil Well Cement (API HSR) at the Union Cement Company production facility in Ras Al Khaimah. Production follows a continuous, integrated process comprising eight sequential stages: Raw Grinding, Blending, Preheating, Calcination, Clinkering, Cooling, Cement Grinding, and Packing. These stages ensure controlled raw meal preparation, stable kiln operation at high temperatures, formation of clinker minerals with controlled low C_3A chemistry suitable for well cementing applications, and final grinding to achieve the specified fineness and performance characteristics required under API standards.

Environmental loads in this module include electricity consumption for raw milling, kiln auxiliaries, clinker cooling, and cement grinding; thermal energy from fuel combustion in the preheater and rotary kiln; internal material transport via conveyors and mobile equipment; and process-related CO_2 emissions from limestone calcination. Additional impacts include minor solid waste generation from dust collection systems and routine maintenance activities. All direct emissions from fuel combustion, calcination, on-site equipment operation, and process-related releases are included within the A3 system boundary.

Module A4 - Delivery

Module A4 accounts for the transportation of finished Oil Well Cement (API HSR) from the Union Cement Company manufacturing facility in Ras Al Khaimah, United Arab Emirates, to customer locations. The product is supplied to construction and infrastructure projects across the UAE and Northern Oman, including Dubai, Abu Dhabi, Sharjah, Ajman, Fujairah, Umm Al Quwain, Al Ain, Sohar, and Musandam. Outbound transport is modelled using >32-ton Euro 6 lorry, representing typical bulk cement and palletised bag transport within the GCC regional road network.

Oil Well Cement is delivered primarily in bulk form or in jumbo bags for drilling operations and energy infrastructure applications. Transport modelling assumes high load utilisation consistent with industrial cement distribution practices in the region. Environmental impacts in this module include diesel consumption, tailpipe emissions, and distance-based fuel use associated with road transport from the Ras Al Khaimah facility to project sites across the UAE and Northern Oman corridor.

Scenario details	Description
Vehicle used for transport	Euro 6, >32 ton truck
Vehicle capacity	>32 tons
Fuel type and consumption	Diesel, 0.38 liters per km
Capacity utilization	100% as assumed in Ecoinvent v3.11
Bulk transportation	Mass of the transported product

Module C1 - Deconstruction and Demolition

Module C1 covers impacts from activities required to deconstruct or demolish the product at the end of its service life. Oil Well Cement (OWC) is used for primary cementing operations in onshore and offshore oil and gas wells, where it is pumped into the annular space between the casing and the geological formation. Upon hydration, the cement forms a hardened cement sheath that provides zonal isolation and structural support to the casing system in accordance with well integrity requirements defined under API Specification 10A.

Unlike cement used in building structures, Oil Well Cement is not incorporated into removable construction elements. Once placed and set, the cement sheath remains permanently in situ within the wellbore throughout the operational life of the well and during well abandonment.

LCA KNOWLEDGE

International petroleum engineering guidance and well integrity frameworks (e.g., American Petroleum Institute standards and International Association of Oil & Gas Producers well integrity guidelines) recognize that cement sheaths are not dismantled or demolished at end-of-life; rather, they remain underground as part of the permanent well barrier system. Consequently, no deconstruction, demolition, or material removal activities are attributable to Oil Well Cement as a standalone product.

Therefore, no environmental burdens are assigned to Module C1 for Oil Well Cement, as the product is neither dismantled nor subjected to demolition operations at the end of its service life.

Module C2 - Transport to Waste Processing

Module C2 accounts for transport of the product from the point of deconstruction to waste treatment or disposal facilities. For Oil Well Cement used in downhole oil and gas applications, no removal or excavation of the cement material occurs at end-of-life. Industry well abandonment practices defined under American Petroleum Institute guidance and aligned with International Association of Oil & Gas Producers frameworks do not require extraction or off-site transfer of the hardened cement sheath.

As the cement remains permanently in situ and is not transported to any waste processing or disposal facility, no transport activities are attributable to the product in Module C2. Therefore, environmental burdens for Module C2 are declared as zero.

Module C3 - Waste Processing

Module C3 includes impacts associated with waste processing operations carried out prior to final disposal or recovery. For Oil Well Cement used in oil and gas well cementing applications, no mechanical, thermal, or chemical waste processing operations occur at the end of the well's service life. Industry well closure practices established under American Petroleum Institute standards and supported by International Association of Oil & Gas Producers guidance do not involve crushing, treatment, or material recovery of the hardened cement sheath.

As no waste processing activities are performed and the cement material is not subjected to recycling or treatment operations, no environmental burdens are assigned to Module C3.

Module C4 - Disposal

Module C4 covers impacts associated with final disposal of the product at end-of-life. For Oil Well Cement used in oil and gas well cementing applications, the hardened cement sheath remains permanently in situ within the subsurface environment and is not removed for disposal in landfill or other waste facilities. Well abandonment and barrier management practices defined by the American Petroleum Institute and reflected in International Association of Oil & Gas Producers guidance do not involve excavation or external disposal of the cement material.

As no landfill or external disposal operations are attributable to the product, no environmental burdens are assigned to Module C4.

Module D - Reuse, Recovery and Recycling Potential

Module D reports the net environmental benefits and burdens resulting from material recovery processes that substitute primary production outside the system boundary, in accordance with EN 15804+A2.

Mineral Fraction (Oil Well Cement)

Oil Well Cement is used in downhole oil and gas applications where, following placement and hydration, the cement forms part of the permanent well barrier system. The hardened cement sheath remains in situ within the subsurface environment throughout the operational life of the well and during abandonment procedures conducted in accordance with industry guidance from the American Petroleum Institute and the International Association of Oil & Gas Producers. As the cement material is neither removed nor subjected to recycling or recovery operations, no substitution of primary materials occurs beyond the system boundary. Accordingly, no benefits or burdens are assigned in Module D for the mineral cement fraction.

Wooden Pallets – 95% Recovery

Wooden pallets are assumed to be reused or recycled at a rate of 95%, reflecting established industrial reuse markets and high recovery rates reported by pallet industry studies (National Wooden Pallet & Container Association, 2016). Regional segregation frameworks in the UAE support recyclable wood recovery through licensed waste operators (Dubai Municipality, 2022).

Jumbo Bags (FIBC – Polypropylene) – 75% Recovery

Flexible Intermediate Bulk Containers (FIBCs) are reusable industrial packaging products made of polypropylene fabric. A 75% recovery rate is assumed, reflecting industrial reuse practices and the recyclability of polypropylene materials (PlasticsEurope, 2023). Regional waste operators in the UAE and Oman maintain plastic recycling capacity for segregated industrial streams (BEEAH Group, 2023)

Pull Tie Cord (Polypropylene) – 10% Recovery

Small plastic accessory components such as pull tie cords are assigned a 10% recovery rate due to limited segregation in construction waste streams. International plastic packaging recycling statistics indicate lower capture rates for small plastic components compared to bulk packaging (Eurostat, 2023).

Sling Bag Caps (Polypropylene) – 5% Recovery
Detached plastic caps are assumed to have minimal recovery (5%) due to their small size and low likelihood of source separation within C&D waste management systems.

Binding Strap (PVC) – 15% Recovery
PVC binding straps are assigned a 15% recovery rate, reflecting limited recycling capture for flexible PVC packaging materials. International plastic recovery data indicate moderate-to-low recycling rates for such materials without dedicated take-back schemes (PlasticsEurope, 2023).

LDPE Sheet – 95% Recovery
LDPE sheets are assumed to be recovered at 95% under an industrial source-segregated collection scenario. The UAE maintains plastic recycling infrastructure capable of processing LDPE materials (BEEAH Group, 2023), and LDPE film exhibits high recycling potential when clean and segregated (PlasticsEurope, 2023).

Process	Unit (metric ton)
Collection process specified by type	
Oil Well Cement (API HSR) remaining in situ within wellbore	1
Recovery system specified by type	
Mineral fraction sent for reuse / recycling	Not applicable
Mineral fraction sent for energy recovery	Not applicable
Disposal specified by type	
Mineral fraction sent to landfill	Not applicable
Transportation assumptions	
Transport to recycling and landfill sites	Not applicable

System Boundaries Illustration

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction / installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction & Demolition	Transport	Waste Processing	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	UAE	UAE	UAE	GLO	-	-	-	-	-	-	-	-	GLO	GLO	GLO	GLO	GLO
Share of specific data	GWP > 90%			-		-	-	-	-	-	-	-	-	-	-	-	-
Variation - products	0%			-		-	-	-	-	-	-	-	-	-	-	-	-
Variation - sites	0%			-		-	-	-	-	-	-	-	-	-	-	-	-

X - Included, ND - Modules not declared.
**Module A5 is included to balance out biogenic emissions from packaging.*

LCA KNOWLEDGE

Cut-Off Rules

All relevant material and energy flows contributing to the manufacture of Oil Well Cement (API HSR) have been included in the LCA model. More than 99% of the total mass, energy use, and environmental relevance is captured. Negligible flows—those that do not influence the overall results—are excluded.

The Polluter Pays Principle and the Modularity Principle are applied to ensure that impacts are assigned to the processes where they occur and that each life cycle stage is reported independently. No known data gaps or exclusions are expected to influence the robustness of the results.

Allocation

Allocation was applied only where shared energy inputs were used across multiple cement product lines. Coal consumption, natural gas use, electricity consumption, water use, and diesel for internal handling were allocated using a mass-based approach, reflecting each product's proportional share of total annual production at the Ras Al Khaimah facility.

Raw materials—including low C_3A Portland clinker, gypsum, and associated constituents—and all related transport flows were modelled using product-specific primary data, as these inputs are directly proportioned for Oil Well Cement (API HSR) and do not require allocation. No economic allocation was applied, as the plant does not generate co-products within the cement manufacturing process.

Electricity

Electricity consumption in the LCA model is based on the UAE grid mix as represented in Ecoinvent v3.11 (Allocation, cut-off by classification). The UAE electricity supply is predominantly generated from natural gas, supplemented by nuclear power, oil, solar energy, and minor imports from neighbouring GCC countries. The modelled grid composition is as follows:

Energy Source	Share (%)
Natural Gas - Combined Cycle Power Plant	51.31%
Natural Gas - Conventional Power Plant	38.11%
Nuclear - Pressure Water Reactor	7.06%
Hard Coal	2.09%

LCA KNOWLEDGE

Oil	0.60%
Import from Saudi Arabia	0.44%
Import from Oman	0.20%
Solar Thermal (Parabolic Trough)	0.18%
Wind (<1 MW, Onshore)	0.00003%

The climate impact associated with this electricity mix is 5.81E-01 kg CO_2e per kWh, and this factor is applied consistently to all electricity use across modules A1–A3 and relevant downstream stages. This approach ensures that electricity-related impacts accurately reflect UAE operational conditions and the energy landscape relevant to Union Cement Company's Ras Al Khaimah facility.

Calculation Rules

The LCA model for Oil Well Cement (API HSR) uses foreground data collected directly from Union Cement Company's Ras Al Khaimah manufacturing facility, combined with background datasets sourced from Ecoinvent v3.11 (Allocation, cut-off by classification). These datasets provide emission factors for key inputs, including low C_3A Portland clinker, gypsum, minor constituents, fuel combustion (coal and natural gas), electricity generation, packaging materials, and transportation. Regionally representative conditions—such as UAE electricity mixes, supplier distances, and GCC end-of-life practices—were incorporated where relevant to ensure representativeness.

Transport activities for raw material supply, packaging procurement, and finished product delivery are included based on actual supplier-to-plant and plant-to-customer road distances. Road distances were measured using Google Maps, while sea freight distances for packaging imported from India were determined using portdistance.com. Exclusions are limited to items of negligible relevance (<1%), such as administrative activities, office utilities, and capital equipment maintenance. Transport flows are therefore fully represented within the defined geographical scope.

Byproducts Assignment

No by-products are generated during Oil Well Cement (API HSR) manufacturing. The only outputs are finished cement and process emissions from fuel combustion and calcination. Therefore, no allocation is required.

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ENVIRONMENTAL PERFORMANCE

In the following tables, the environmental performance of the declared unit "1 metric ton of Oil Well Cement (API HSR)" is presented for the Union Cement Company. Environmental impacts are calculated using EF-3.1, (ILCD).

ENVIRONMENTAL PERFORMANCE

Core Environmental impact indicators

The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding thresholds values, safety margins or risks.

Impact Category	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Climate change (GWP) - fossil	Kg CO_2e	1.37E+01	6.63E-01	7.76E+02	7.91E+02	2.14E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-7.70E+00
Climate change (GWP) - biogenic	Kg CO_2e	0.00E+00	0.00E+00	1.09E-03	1.09E-03	0.00E+00	-1.09E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Climate change (GWP) - LULUC	Kg CO_2e	1.72E-02	3.16E-04	3.52E-02	5.27E-02	1.03E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.25E-02
Climate change (GWP) - total	Kg CO_2e	1.38E+01	6.64E-01	7.76E+02	7.91E+02	2.14E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-7.75E+00
Ozone depletion	Kg CFC-11e	3.09E-07	8.60E-09	1.45E-05	1.49E-05	2.86E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.99E-07
Acidification	mol H+e	1.02E-01	3.32E-03	5.22E+00	5.33E+00	5.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-3.75E-02
Eutrophication, aquatic freshwater	kg PO_4^{3-} eq	7.00E-03	1.43E-04	4.92E-01	5.00E-01	5.01E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-3.06E-03
Eutrophication, aquatic freshwater	Kg P eq	2.28E-03	4.67E-05	1.60E-01	1.63E-01	1.63E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-9.96E-04
Eutrophication, aquatic marine	Kg N eq	3.16E-02	8.53E-04	6.48E-01	6.80E-01	1.36E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-9.97E-03
Eutrophication, terrestrial	mol N eq	3.98E-01	9.35E-03	6.81E+00	7.21E+00	1.46E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.09E-01
Photochemical ozone formation	Kg NMVOC eq	1.24E-01	3.67E-03	2.37E+00	2.50E+00	8.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-5.29E-02
Abiotic depletion, minerals & metals	Kg Sb eq	3.89E-05	1.81E-06	1.56E-04	1.96E-04	6.40E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.68E-05
Abiotic depletion of fossil resources	MJ	3.04E+02	8.81E+00	8.26E+02	1.14E+03	2.92E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.96E+02
Water use	m^3 depr.	3.62E+00	4.94E-02	2.31E+01	2.68E+01	1.73E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-2.45E+00

The results of the environmental impact indicators — Abiotic depletion, Water use, and all optional indicators except Particulate matter and Ionizing radiation, human health — shall be used with care, as the uncertainties on these results are high or there is limited experience with the indicator. Reading example: 1.57E-03 = 1.57 × 10^{-3} = 0.00157.

ENVIRONMENTAL PERFORMANCE

Additional environmental impact indicators

Impact Category	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Particulate matter	Incidence	2.15E-06	6.31E-08	6.00E-05	6.22E-05	2.19E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-7.83E-07
Ionizing radiation, human health	Kbq U-235 eq	3.51E-01	8.04E-03	2.27E+01	2.30E+01	2.80E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.56E-01
Ecotoxicity (freshwater)	CTUe	6.72E+01	1.16E+00	1.06E+03	1.13E+03	4.00E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-2.78E+01
Human toxicity, cancer effects	CTUh	2.99E-08	1.11E-10	7.20E-08	1.02E-07	3.58E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-2.71E-08
Human toxicity, non-cancer effects	CTUh	8.15E-08	6.13E-09	3.52E-06	3.61E-06	2.13E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-4.45E-08
Land use related impacts/soil quality	Dimensionless	2.62E+03	9.51E+00	6.68E+02	3.30E+03	3.36E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-2.51E+03

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, or radioactive waste disposal in underground facilities. Potential ionizing radiation from soil, radon, and some construction materials is also not measured by this indicator.

GWP-GHG Indicators

Impact Category	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-GHG	Kg CO_2e	1.38E+01	6.64E-01	7.76E+02	7.91E+02	2.14E+01	1.09E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-7.75E+00

This indicator includes all greenhouse gases, excluding biogenic carbon dioxide uptake and emissions, as well as biogenic carbon stored in the product, as defined by IPCC AR6 (2021). The indicator aligns closely with the Global Warming Potential (GWP) outlined in EN 15804:2012+A2:2019, incorporating updated characterization factors and environmental impact indicators.

Resource Use Indicators

Impact Category	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Renewable PER used as energy	MJ	3.68E+02	1.29E-01	6.02E+01	4.28E+02	4.51E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-3.44E+02
Renewable PER used as materials	MJ	3.10E-02	0.00E+00	2.82E-01	3.13E-01	0.00E+00	-3.13E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-9.70E-03

ENVIRONMENTAL PERFORMANCE

Total use of renewable PER	MJ	3.68E+02	1.29E-01	6.05E+01	4.29E+02	4.51E+00	-3.13E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-3.44E+02
Non-renewable PER used as energy	MJ	3.04E+02	8.81E+00	8.26E+03	8.57E+03	2.92E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.97E+02
Non-renewable PER used as materials	MJ	1.01E-03	0.00E+00	3.09E-05	1.04E-03	0.00E+00	-1.04E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-3.35E-06
Total use of non-renewable PER	MJ	3.04E+02	8.81E+00	8.26E+03	8.57E+03	2.92E+02	-1.04E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.97E+02
Use of secondary materials	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	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels	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	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	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	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water	m^3	0.00E+00	0.00E+00	4.53E-01	4.53E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Waste Indicators

Impact Category	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste	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	0.00E+00	0.00E+00	0.00E+00
Non-hazardous waste	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	0.00E+00	0.00E+00	0.00E+00
Radioactive waste	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	0.00E+00	0.00E+00	0.00E+00

Output Flow Indicators

Impact Category	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Components for reuse	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	0.00E+00	0.00E+00	3.44E+00
Materials for recycling	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	0.00E+00	0.00E+00	3.44E+00

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Materials for energy recovery	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	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	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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Biogenic carbon content

Details	Unit	A1-A3
Biogenic carbon content in product	Kg C	0.00E+00
Biogenic carbon content in accompanying packaging	Kg C	2.97E-04

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO2. "Reading example: 1.57E-03 = $1.57*10^{-3}$ = 0.00157"

Disclaimer: “According to the **EN 15804:2012+A2:2019** standard, the LCIA results are relative expressions translating impacts into environmental themes such as climate change, ozone depletion, etc. (midpoint impact categories). Thus, the LCIA results do not predict impacts on category endpoints such as impact on the extinction of species or human health. In addition, the results do not provide information about exceeding thresholds, safety margins or risks”.

ENVIRONMENTAL PERFORMANCE

Interpretation

The life cycle results for Oil Well Cement (API HSR) demonstrate a strongly production-stage–dominated environmental profile, with Module A3 accounting for 95.58% of total GWP. This distribution is technically consistent with oil well cement manufacturing, where impacts are inherently driven by high-temperature kiln operation and the calcination of carbonate raw materials during clinker production. The thermal energy demand of modern dry-process kilns (typically 3.0–3.6 GJ per ton of clinker) together with process-related CO_2 emissions from calcium carbonate decomposition concentrates environmental burdens within A3. Given that API HSR well cement maintains a high clinker factor (typically ≈95–97%) without limestone or supplementary mineral substitution in order to comply with performance specifications, the dominance of A3 reflects the clinker-intensive nature of the product and its chemistry-driven production profile.

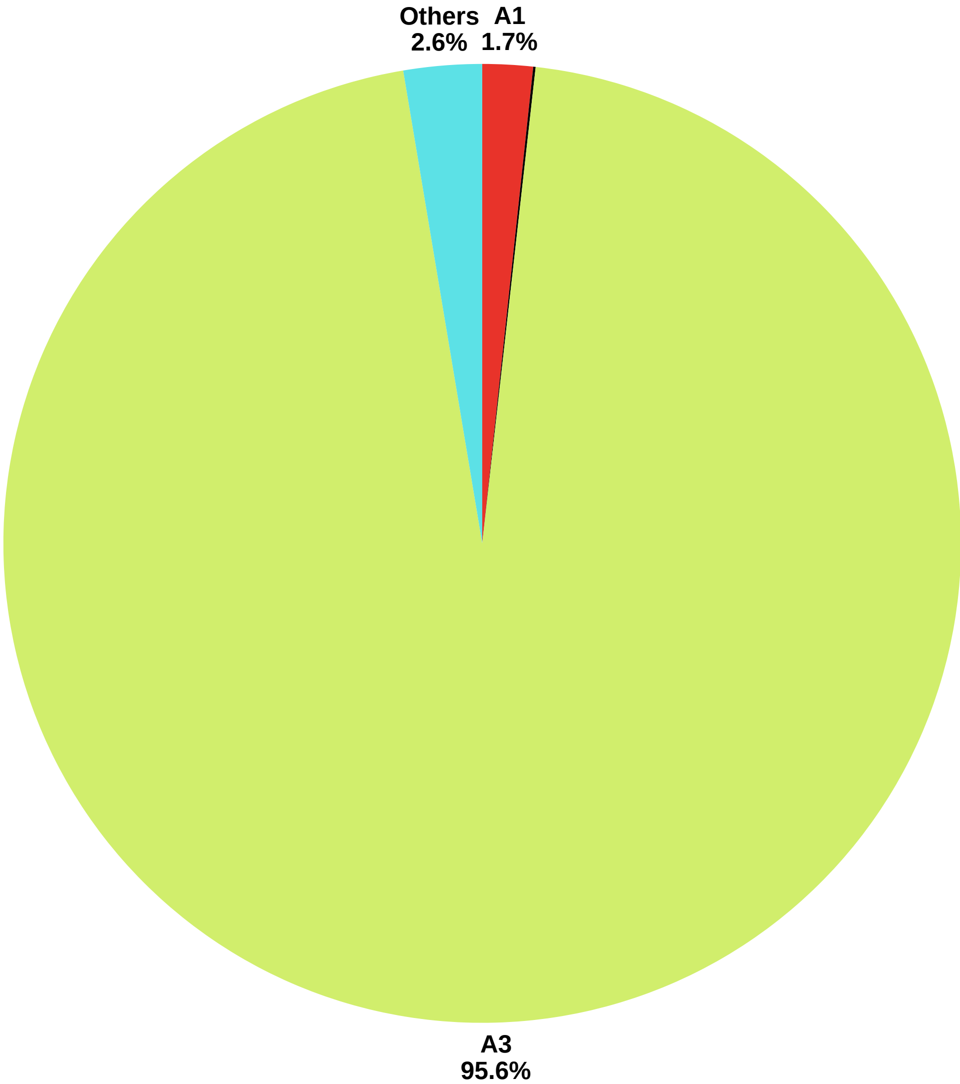
Module A1 (1.7%) and A2 (0.08%) remain comparatively low, reflecting the integrated sourcing structure of the Ras Al Khaimah production facility. Raw materials required for clinker production and gypsum addition are sourced within the United Arab Emirates, limiting upstream transport distances and associated burdens. The small A2 contribution confirms that inbound logistics are managed through short-haul heavy-duty road transport with efficient load utilisation within domestic industrial corridors. The A1 share primarily reflects quarrying operations, upstream energy production, and fuel supply chains associated with clinker manufacturing, while remaining minor relative to kiln-related emissions.

Module A4 (2.64%) represents outbound transport of finished Oil Well Cement to drilling and energy-sector markets across the UAE and Northern Oman. Distribution is modelled using >32-ton Euro 6 road freight vehicles, consistent with regional bulk and jumbo bag delivery practices. Although A4 contributes measurably to the overall footprint, its share remains modest compared to clinker production impacts, confirming that transport distance within the UAE–Northern Oman corridor does not materially alter the carbon-intensive profile driven by kiln operations.

End-of-life modules (C1–C4) are zero for Oil Well Cement, reflecting its downhole application pathway rather than a construction demolition scenario. Following placement and hydration, the cement forms a permanent well barrier and remains in situ within the subsurface environment, with no deconstruction, transport, waste processing, or landfill disposal attributable to the cement fraction. Consequently, the life cycle profile is governed almost entirely by upstream raw material supply and manufacturing energy and process emissions. The resulting impact distribution is technically robust and representative of API HSR well cement produced using integrated dry-process clinker technology and supplied within a defined regional logistics network.

ENVIRONMENTAL PERFORMANCE

Life Cycle Stage Contribution to GWP (kg CO_2e per 1 metric ton of Oil Well Cement – API HSR)



ENVIRONMENTAL PERFORMANCE

Mandatory Statements

Explanatory materials are available from the EPD Owner and/or LCA Author. The verifier and Program Operator make no claims and bear no responsibility regarding the legality of the study. Sole ownership, liability, and responsibility for the EPD lie with the EPD Owner. The LCA Author is not liable for manufacturer-provided information, life cycle data, or supporting evidence.

EPDs within the same product category, but issued by different EPD programs, may not be comparable. For valid comparison, both EPDs must be based on the same PCR (including version number), or on fully-aligned PCRs. Products must have identical function, technical performance, and use cases (e.g. the same declared or functional unit); share equivalent system boundaries, data descriptions, and data quality standards; use comparable collection methods and allocation rules; include matching content declarations; and be valid at the time of comparison.

Information related to EPD of multiple products

This is not an EPD of multiple products.

Information related to Sector EPD

This is not a sector EPD.

Differences vs previous versions

This is the first version of the EPD.

REVIEW AND VERIFICATION

Program Operator	International Climate Intelligence System 71-75 Shelton Street Covent Garden London, WC2H 9JQ United Kingdom
Registration Number	ICIS-202603-128
Publication Date	26-03-2026
Valid Until	25-03-2031
Geographical Scope	United Arab Emirates (UAE)
Product category rules (PCR): PCR 2026:18 Construction products (EN15804:2012+A2:2019/AC:2021) Version 1.2.6 dated 21-Jan-2026	
PCR review was conducted by: International Climate Intelligence System	
Independent verification of the declaration and data, according to ISO 14025:2006 and ISO 14040: EPD Process Certification (internal) ☑ EPD Verification (external)	
Third party verifier: Constantine Stephen, International Climate Intelligence System (ICIS)	

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ACRONYMS

Acronym	Meaning
kg CO_2e	Kilograms of carbon-dioxide equivalent
kg CFC-11e	Kilograms of Chlorofluorocarbon-11 equivalent
mol H+e	Moles of hydrogen ion equivalent
kg PO_4^{3-} eq	Kilograms of phosphate equivalent
kg P eq	Kilograms of phosphorus equivalent
kg N eq	Kilograms of nitrogen equivalent
mol N eq	Moles of nitrogen equivalent
kg NMVOC eq	Kilograms of non-methane volatile organic compound equivalent
kg Sb eq	Kilograms of antimony equivalent
MJ	Megajoules
m^3 depr.	Cubic meters of water deprived
incidence	Unit representing human health impact related to particulate matter exposure
Kbq U-235 eq	Kilo-becquerels of Uranium-235 equivalent
CTUe	Comparative Toxic Unit for ecosystems
CTUh	Comparative Toxic Unit for humans
dimensionless	Unitless characterization factor — used for land-use/soil quality impacts
kg C	Kilograms of biogenic carbon contained in product or packaging

STANDARDS AND REFERENCES

Standards & Methodological Frameworks

- EN 15804:2012 + A2:2019 / AC:2021 – Sustainability of construction works – Core rules for environmental product declarations of construction products.
- ISO 14025:2006 – Environmental labels and declarations – Type III environmental declarations – Principles and procedures.
- ISO 14040:2006 – Life cycle assessment – Principles and framework.
- ISO 14044:2006 – Life cycle assessment – Requirements and guidelines.

PCR & Program Documents

- PCR 2026:18 Construction Products, Version 1.2.6 – International Climate Intelligence System (EN 15804+A2 aligned).
- EPD General Program Instructions (GPI) of International Climate Intelligence System, v2.0, 2023.

Databases, Tools & Modelling Sources

- Ecoinvent v3.11, system model: Allocation, cut-off by classification.
- Air.e.LCA Software v3.20.1.0 by Solid Forest – Used for LCA modelling and impact calculations.
- IPCC AR6 (2021) Characterization Factors – Applied for GWP indicators (where relevant).
- EF 3.1 (Environmental Footprint 3.1 method) – Used for all midpoint impact indicators.

Transport Calculation Tools

- Google Maps – Road transport distance calculations.
- PortDistance.com – Maritime transport distance calculations.

End-of-Life & Recycling

- American Petroleum Institute (API) (2019). API Specification 10A – Specification for Cements and Materials for Well Cementing. American Petroleum Institute, Washington, D.C., United States.
- American Petroleum Institute (API) (2010). API Recommended Practice 65 – Cementing Shallow Water Flow Zones in Deepwater Wells. American Petroleum Institute, Washington, D.C., United States.
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- International Organization for Standardization (ISO) (2017). ISO 16530-1: Petroleum and Natural Gas Industries — Well Integrity — Part 1: Life Cycle Governance. ISO, Geneva, Switzerland.

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- National Wooden Pallet & Container Association (2016). U.S. Pallet Recycling Study. NWPCA / Virginia Tech Study, United States.
- PlasticsEurope (2023). Plastics – The Facts 2023: An Analysis of European Plastics Production, Demand and Waste Data. PlasticsEurope, Brussels, Belgium.
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- Dubai Municipality (2022). Waste Segregation and Construction & Demolition Waste Recycling Guidelines. Government of Dubai, United Arab Emirates.
- Tadweer (Abu Dhabi Waste Management Center) (2023). Construction and Demolition Waste Recycling Operations and Diversion Practices. Abu Dhabi, United Arab Emirates.


Raising standards with
Union Cement Company
strengthening every
stride.