

S-P-00499 **EPD**<sup>®</sup>

## EPD - Environmental Product Declaration



**i.idro**



**DRAIN**



## i.idro DRAIN

Air content	>15% and < 25%
Draining capacity (aggregates size Xlarge 6-11mm)	>1000 mm/min
Draining capacity (aggregates size Large 2-6mm)	>300 mm/min
Use of secondary materials (Grey i.idro DRAIN)	17.00 kg/m <sup>3</sup>

EPD type	Cradle-to-gate (LCA stages A1 to A3)
Certification No.	P2065
Validity	18/10/2021

## Declaration of general information

### Manufacturer information

The history of Italcementi is the history of the cement industry in Italy. The company was founded over 150 years ago in Bergamo, when the first cement was ground in a watermill in 1864. Italcementi has since become a leader in Italy, both from the industrial and market perspective. The current Italcementi industrial structure for cement production in Italy consists of six full-cycle cement plants, a site for special products and eight grinding centers. The overall industrial network boasts also a relevant presence in the concrete sector, through 124 ready-mixed concrete plants and 17 quarries for aggregates. Italcementi is a market leader in Italy, both in the cement and ready-mixed concrete business. The company has actively participated in the development of the Country, by contributing to important infrastructures. With a strong vocation for innovation, Italcementi has been a partner of great engineers and architects for major works. A special relationship connects Italcementi to the world of Universal Expositions. The first experience dates back to 1867, when the Company was awarded with the silver medal at the Universal Exposition in Paris. More recently, Italcementi played an active role in Expo 2010 Shanghai, by developing i.light, the transparent cement used for the Italian Pavilion, a masterpiece among 2010's best inventions, kept as a permanent structure. Last but not least, the company was engaged in the development of a new and truly innovative material - i.active BIODYNAMIC -, allowing for the creation of the extremely complex shapes of Palazzo Italia, the iconic place of Expo 2015 Milano. Among the most recent achievements, i.lab deserves a special mention. Located at the Kilometro Rosso scientific and technologic park in Bergamo, the building hosts the Product Innovation Centre of HeidelbergCement Group, as well as the Italian Headquarter of Italcementi. It is the synthesis of the Company's commitment towards innovative and sustainable technologies and materials. Italcementi is strongly engaged in anticipating market trends and requirements, promoting the concept of sustainable construction. In this perspective, the Company approaches the market with i.nova, the innovative market approach aiming at offering its leadership in innovation to the building community.

Further information on HeidelbergCement and Italcementi can be accessed at the official websites

<http://www.heidelbergcement.com/en> and <http://www.italcementi.it>

### Product description

**i.idro DRAIN** is an innovative concrete with high water drainage capacities and a compressive strength of more than 10MPa. There are two types of **i.idro DRAIN** depending on the type of cement used. White **i.idro DRAIN** is made up of white cement while Grey **i.idro DRAIN** contains grey cement; both the products are available in plastic bags of 25 kg.



Tests carried out according to the Standard EN 206 establishes the compressive strength of **i.idro DRAIN** at a minimum of 10 MPa. The use of **i.idro DRAIN** does not require particular performance as regards environmental exposure class and workability. There is therefore no defined exposure class nor slump class.

**i.idro DRAIN** combines the strength of concrete with a drainage capacity of 100 times more than that of silt and clay, thanks to a special selection of aggregate size and the choice of air entrainment agent which both increase the percentage of air content.

As demonstrated through comparative tests performed by Politecnico di Milano, the excellent drainage capacity of **i.idro DRAIN** equals or even exceeds that of naturally-available loose materials like sand, clay and silt, and that of traditional water-draining asphalt pavements. The European Standard, EN 12697-40:2012, describes a method to determine the in-situ relative hydraulic conductivity, at specific locations, of a road surfacing that is designed to be permeable. The test measures the ability of a surfacing to drain water achieved in-situ.



In the case of **i.idro DRAIN**, results obtained according to the particle size distribution of aggregates used are reported in the table below.

### Draining capacity of i.idro DRAIN

i.idro DRAIN drainability		
Aggregates size	Draining capacity (UNI 12697-40)	Classification
XLarge (2mm<15%, 6,3mm<95%)	>1000 mm/min (2.69*10 <sup>-2</sup> m/s)	VERY HIGH
Large (6,3mm<25%, 10mm<75%)	>300 mm/min (5.78*10 <sup>-3</sup> m/s)	HIGH

Source: DIIAR, Politecnico di Milano (Milan University of Science and Technology)

The high draining capacity of **i.idro DRAIN** promotes water drainage thus reducing surface runoff and hydro-planing effect. It also guarantees groundwater recharge (deep drainage) and is therefore particularly suitable for application within environmentally protected areas where water is to be returned to the ground.

The use of **i.idro DRAIN** also allows harvesting and reuse of stormwater, as this can be adequately conveyed through suitable collection systems. **i.idro DRAIN** do not contain oils which usually lead to contaminated stormwater. Moreover, the relatively white surface compared to traditional pavements reduces the ground temperature significantly (down to 30° C) due to the albedo effect, thus providing more comfortable conditions for pedestrians. See section on Additional Information.

The composition, structure and technical properties of **i.idro DRAIN** makes it suitable for pavement applications in:

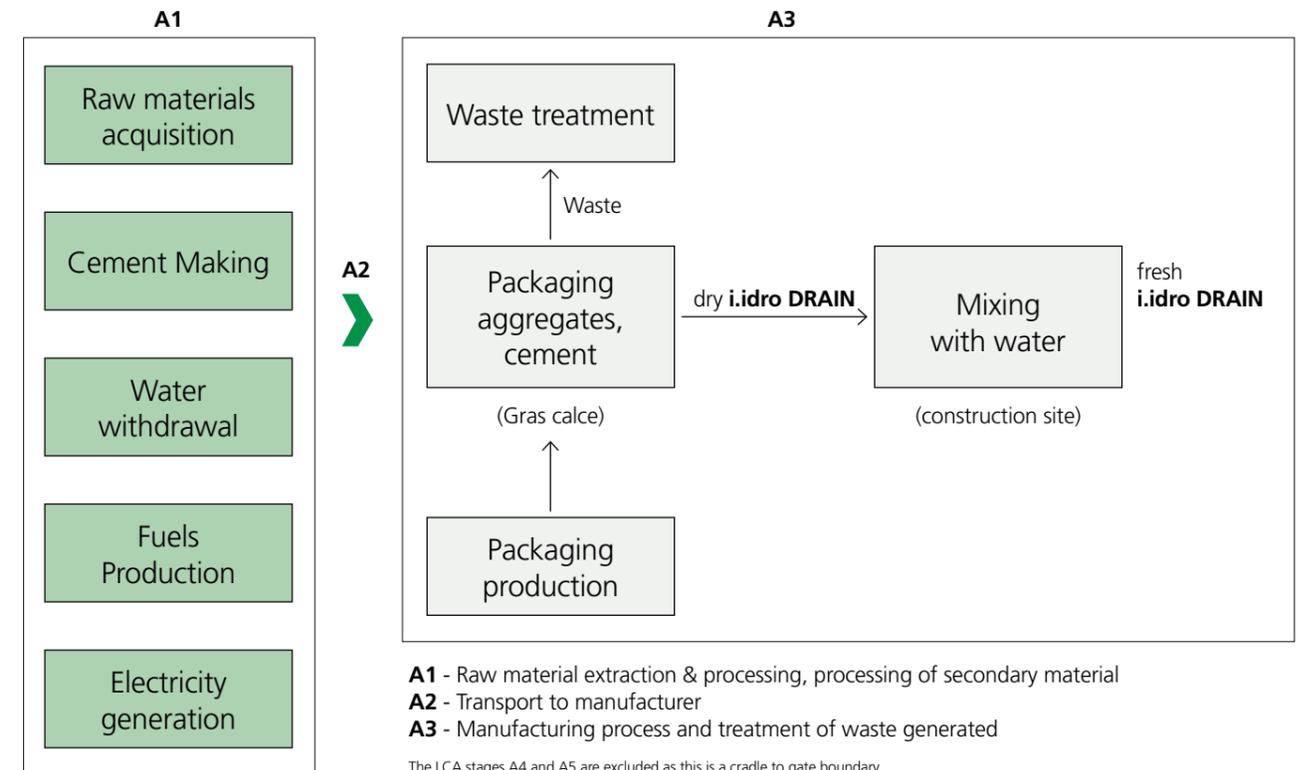
- › Sidewalks
- › Trails
- › Parking lots
- › Cycle lanes
- › Low-volume roadways
- › Walkways and alleys
- › Environmentally protected roads and areas subject to fire hazards.

### Production process

The innovative nature of **i.idro DRAIN** is also linked to its production process. Dry **i.idro DRAIN** is distributed in double compartment bags containing cement and additive coated aggregates in the right mix proportion. The use onsite of i.dro DRAIN involves the addition of water and application on a surface through vibrating road pavers or manually resorting to special building site equipment. During this operation no toxic emissions occur and no safety risks for the operators are involved.

Italcementi outsources the packaging of **i.idro DRAIN** to Gras Calce which also involves the additive coating process of aggregates. While the cement is supplied by Italcementi from Rezzato plant (white cement) and Calusco Plant (grey cement), aggregates and the additive are purchased from other suppliers and delivered to Gras Calce. In the case of aggregates, the objective to achieve specific draining capacities requires a careful selection of the type of aggregates which are supplied from the quarry located in Cassano d'Adda - Milan.

### Process flow diagram



The overall composition of white and grey **i.idro DRAIN** and the energy input by energy source is provided below.

i.idro DRAIN material content declaration		
i.idro DRAIN white	1 m <sup>3</sup> i.idro DRAIN Composition (%)	i.idro DRAIN grey
Cement (i.design ROCCABIANCA)	15.1	Cement (i.work TECNOCEM)
Aggregates (natural)	79.2	Aggregates (natural)
Additive (air entrainment agent)	0.0	Additive (air entrainment agent)
Water	5.7	Water

i.idro DRAIN energy use	
Energy per m <sup>3</sup> i.idro DRAIN	
Electricity (kWh)	15.50
Diesel (l)	0.26

No substance in the "Candidate List of Substances of Very High Concern (SVHC) for authorisation" exceeds 0.1 weight-% of **i.idro DRAIN**.



## EPD type and programme operator

This is an Environmental Product Declaration (EPD) compliant to a Type III environmental declaration as defined by ISO 14025:2006. The EPD is subject to the International EPD System (IES) for which EPD International AB acts as Programme Operator and it is aligned to the Product Category Rules (PCR) for the assessment of the environmental performance of UN CPC 375 relative to concrete (PCR Concrete 2013:02 VERSION 1.02). The General Programme Instructions (version 2.5 dated 2015-05-11) of the IES have been implemented. Details on IES are provided on the official website [www.environdec.com](http://www.environdec.com).

The EPD refers to a cradle to gate with options boundary so as to meet the following goals:

- Provide relevant information and data for business-to-business communication.
- Investigate environmental performance related to various choices of raw materials and inform decision making on future production.

This EPD refers to the production of **i.idro DRAIN** during the year 2016 in Italy and applies life cycle assessment study carried out following the principles contained in the ISO 14040 series of standards and EN 15804 specific for construction products. It therefore follows that, EPDs of construction products may not be comparable if they do not comply with EN 15804. The comparison of products on the basis of their EPD is defined by the contribution they make to the environmental performance of the building. Consequently, comparison of the environmental performance of construction products using this EPD information shall be based on the product's use in and its impacts on the building, and shall consider the complete life cycle of the product within the building or construction works.

## Declaration of environmental parameters derived from LCA

### Scope

<b>Declared unit (as of reference PCR)</b>	1 m <sup>3</sup> <b>i.idro DRAIN</b>
<b>Temporary boundary</b>	2016 production
<b>System boundary</b>	From cradle to gate <b>A1</b> - Raw material and fuel acquisition, Electricity generation & distribution <b>A2</b> - transportation to plant. <b>A3</b> - Manufacturing processes at plant, mixing with water at construction site, treatment of waste from manufacturing processes.

The results in terms of environmental impacts, resource use and other environmental information are based on this declared unit. They are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

The EPD Tool for Cement and Concrete (EPD Tool), pre-verified against requirements of the reference cement PCR, was used in computing Life cycle impacts of **i.idro DRAIN**. The Tool applies specific datasets of the cement and concrete production process together with representative datasets in Ecoinvent version 2.2 to compute environmental parameters of the product under study.

The use of the EPD Tool and the frequent changes in the Ecoinvent database makes it difficult to directly compare 2016 against 2015 EPDs of **i.idro DRAIN**. However there is an overall improvement of results in 2016 which is mainly due to the different and closer quarry providing the aggregates to the production site.

## Parameters describing environmental impacts

The following information on environmental impacts is expressed with the impact category parameters of LCIA using characterisation factors.

1 m <sup>3</sup> White i.idro DRAIN		
Environmental Impacts	Units	A1-A3 (Share from wastes used as alternative fuels)
Global warming (GWP100)	kg CO <sub>2</sub> eq	3,47E2 (0,00)
Ozone layer depletion (ODP)	kg CFC-11 eq	1,27E-5 (0,00)
Photochemical oxidation	kg C <sub>2</sub> H <sub>4</sub> eq	3,75E-2 (0,00)
Acidification	kg SO <sub>2</sub> eq	1,15E0 (0,00)
Eutrophication	PO <sub>4</sub> <sup>---</sup> eq	4,14E-1 (0,00)
Depletion of abiotic resources-elements	kg Sb eq	3,56E-04 (0,00)
Depletion of abiotic resources-fossil fuels	MJ eq	1,75E3 (0,00)

1 m <sup>3</sup> Grey i.idro DRAIN		
Environmental Impacts	Units	A1-A3 (Share from wastes used as alternative fuels)
Global warming (GWP100)	kg CO <sub>2</sub> eq	2,65E2 (6,97)
Ozone layer depletion (ODP)	kg CFC-11 eq	8,01E-6 (0,00)
Photochemical oxidation	kg C <sub>2</sub> H <sub>4</sub> eq	3,42E-2 (9,95E-4)
Acidification	kg SO <sub>2</sub> eq	6,05E-1 (1,24E-2)
Eutrophication	kg PO <sub>4</sub> <sup>---</sup> eq	1,77E-1 (3,02E-3)
Depletion of abiotic resources-elements	kg Sb eq	2,80E-4 (0,00)
Depletion of abiotic resources-fossil fuels	MJ eq	1,86E3 (0,00)



### Parameters describing resource use

The following environmental parameters apply data based on the LCI. They describe the use of renewable and non-renewable material resources, renewable and non-renewable primary energy, water use and electricity use during manufacturing.

1 m³ White i.idro DRAIN			
Resource use	Units	Cradle to gate (A1-A3)	
Use of renewable energy not as raw material	MJ	3,46E2	
Use of renewable energy as raw materials	MJ	0,00	
<b>Total renewable energy</b>	<b>MJ</b>	<b>3,46E2</b>	
Use of non renewable energy not as raw materials	MJ	2,02E3	
Use of non renewable energy as raw materials	MJ	0,00	
<b>Total non renewable energy</b>	<b>MJ</b>	<b>2,02E3</b>	
Net fresh water	m³	7,24	

For white **i.idro DRAIN** the parameters Use of secondary material, Use of renewable secondary fuels and Use of non-renewable secondary fuels are zero. The very nature and colour of white **i.idro DRAIN** prevents the use of secondary materials or fuels which bring in impurities.

1 m³ Grey i.idro DRAIN			
Resource use	Units	Cradle to gate (A1-A3)	
Use of renewable energy not as raw material	MJ	2,07E2	
Use of renewable energy as raw materials	MJ	0,00	
<b>Total renewable energy</b>	<b>MJ</b>	<b>2,07E2</b>	
Use of non renewable energy not as raw materials	MJ	2,15E3	
Use of non renewable energy as raw materials	MJ	0,00	
<b>Total non renewable energy</b>	<b>MJ</b>	<b>2,15E3</b>	
Use of secondary material	kg	1,7E1	
Use of renewable secondary fuels	MJ	2,28E1	
Use of non-renewable secondary fuels	MJ	3,78E1	
Net fresh water	m³	7,26	

### Other environmental information describing different waste categories and output flows

1 m³ White i.idro DRAIN			
Waste	Units	Cradle to gate	
Hazardous waste	kg	2,60E-2	
Non-hazardous waste	kg	1,22	

Radioactive waste, Components for re-use, Materials for recycling, Materials for energy recover and Exported energy are zero.

1 m³ Grey i.idro DRAIN			
Waste	Units	Cradle to gate	
Hazardous waste	kg	8,32E-3	
Non-hazardous waste	kg	1,11	

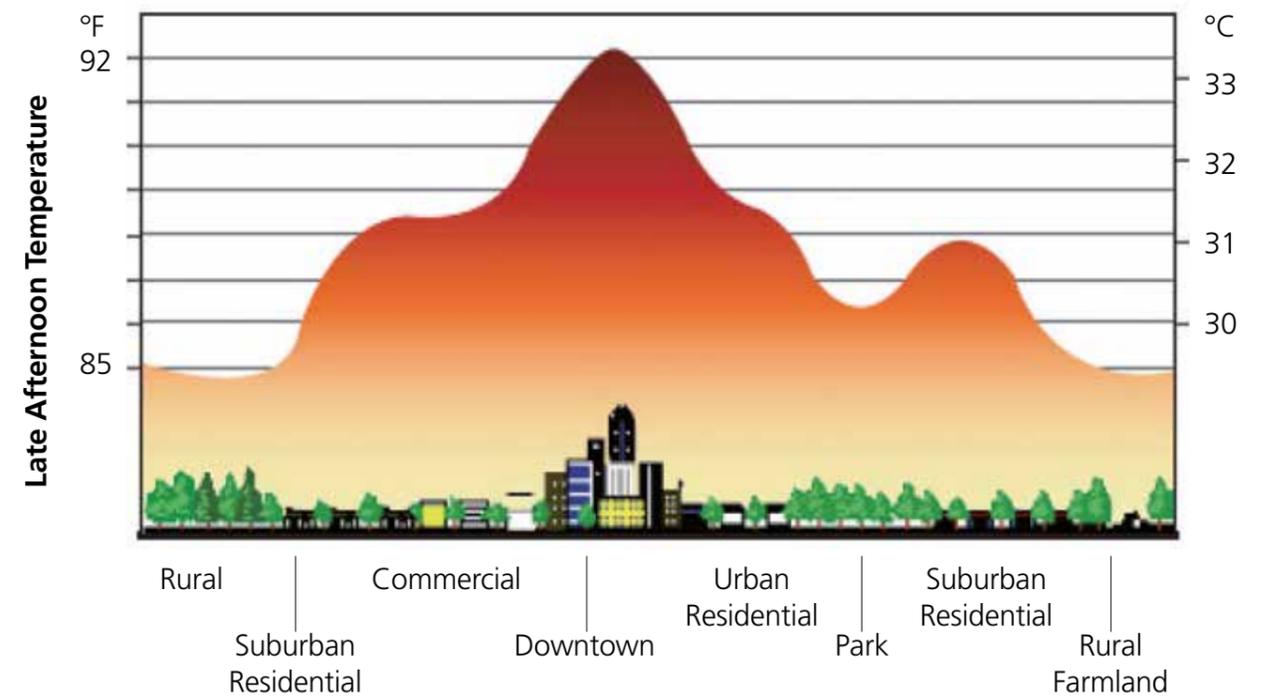
Radioactive waste, Components for re-use, Materials for recycling, Materials for energy recover and Exported energy are zero.

### Additional information

The results above refer not only to the volume of concrete produced but also to its draining capacity. **i.idro DRAIN** delivers, alongside a resistant surface, a draining capacity which ranges from 300 mm/min to 1000 mm/min. Draining capacities of concrete not used for draining purposes will normally fall under the 10 mm/min mark. The primary advantage of permeable pavements is the storm water management aspects together with the control of runoff and the reduction of imperviousness. By encouraging water from storms to recharge the groundwater table, **i.idro DRAIN** pavements have a profound effect on localized ecosystems. Use of permeable pavements by designers is encouraged by the Leadership in Energy and Environmental Design (LEED®) Green Building Rating System™ which awards credits for Stormwater Management. This credit is meant to minimize impervious surfaces and to encourage the natural processes of infiltration. The use of **i.idro DRAIN**, therefore, aides in obtaining LEED credits on both stormwater quantity and quality control.

Pavements made up of **i.idro DRAIN** are capable of reducing the heat Island effect in urban areas. The heat island effect is due to the replacement of open land and vegetation with buildings, roads, and other infrastructure which have low Solar reflectance indices(SRI). This causes urban regions to become warmer than their rural surroundings, forming an "island" of higher temperatures in the landscape.

### The Heat Island effect



The effect of **i.idro DRAIN** on the heat island effect can be seen by the results of tests carried out by Istituto Giordano according to ASTM E903, ASTM E 1980, ASTM C 1371 and AST G173 which show SRI values of more than 29.

Reflectance index of i.idro DRAIN pavements		
Pavement type	SRI (initial)	SRI 3 years aged
Grey <b>i.idro DRAIN</b>	33.4	30.4
White <b>i.idro DRAIN</b>	46.7	NA

Source: Istituto Giordano Spa - Optics Laboratory



Moreover, the LEED awards credits to paving materials with a three-year aged SRI value of at least 28, in order to minimize effects on microclimates and human and wildlife habitats by reducing heat islands.

The use onsite of i.dro DRAIN involves the addition of water and application on a surface through vibrating road pavers or manually resorting to special building site equipment. During this operation no toxic emissions occur and no safety risks for the operators are involved. The safety data sheet of **i.idro DRAIN**, in Italian, is published on the website of Italcementi. <http://it.i-nova.net/it/content?articleId=67794>

The production of **i.idro DRAIN** is in line with our Sustainability Policies which advocate designing products suitable for sustainable construction. Moreover, blended cements are being promoted to reduce the use of clinker and thus to further curb environmental impacts in concretes. In particular, research focuses on the use of renewable and reusable raw materials and the development of specialty admixtures and special additions for concrete, also through investigations and experiments based on nano and biotechnologies applied to the construction materials sector. In addition, unconventional products in portfolio of Italcementi, such as TX Active®, i.light®, are able to provide added technological and functional value to traditional products. More information on Sustainable development at Italcementi, Sustainability Policies and related activities can be accessed at the official website <http://www.italcementi.it/it/sostenibilita>

Rezzato and Calusco plants, providing cement used in **i.idro DRAIN**, are both certified according to ISO 14001 and ISO 9001:2000, in line with sustainability policies and strategy.

## References

ISO 14025:2010	Environmental labels and declarations - Type III environmental declarations
ISO 14040:2006	Environmental management - Life cycle assessment -- Principles and Framework
ISO 14044:2006	Environmental management - Life cycle assessment – Requirements and Guidelines
GPI	General Programme Instructions of IES <a href="http://www.environdec.com">www.environdec.com</a> (Version 2.5)
EN 15804 :2013	Sustainability of construction works - Environmental product declarations Core rules for the product category of construction products
PCR for concrete	<a href="http://www.environdec.com">www.environdec.com</a> - PRODUCT CATEGORY RULES (PCR) for Product Group "Concrete", CPC 375. (PCR Concrete 2013:02 VERSION 1.02)
Verification Report	Environmental Product Declaration Verification Report for <b>i.idro DRAIN</b> , Italcementi Group (date: September 2016)

## Demonstration of verification

CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
The PCR Concrete 2013:02 VERSION 1.02 was reviewed by the Technical Committee of the International EPD® System (IES). Chair: Massimo Marino. Contact via <a href="mailto:info@environdec.com">info@environdec.com</a> . <b>PCR Moderator:</b> Cristiana Ciaraldi Jolivet WBCSD Cement Sustainability Initiative (CSI), <a href="mailto:Ciaraldi@wbcsd.org">Ciaraldi@wbcsd.org</a>
<b>Independent verification of the declaration, according to ISO 14025:2010</b> <input type="checkbox"/> Internal <input checked="" type="checkbox"/> External
<b>Certification No.:</b> P2065
<b>Date of Certification:</b> 19/10/2016
<b>Validity:</b> 18/10/2021
<b>Independent Verifier:</b> Certiquality Srl
<b>Accredited by:</b> Accredia

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## Glossary

<b>Ozone layer depletion 20a</b>	Destructive effects on the stratospheric ozone layer over a time horizon of 20 years.
<b>Acidification</b>	Increase of soil and water acidity.
<b>Eutrophication</b>	Excessive levels of macronutrients in the environment caused by emissions of nutrients to air, water and soil.
<b>Photochemical oxidation</b>	Oxidizing of volatile compounds in the presence of nitrogen oxides (NOx) which frees ozone in the low atmosphere.
<b>Abiotic depletion</b>	Extraction of minerals and fossil fuels due to inputs in the system.





## HeidelbergCement

### Competence and quality

In around 60 countries across the world, HeidelbergCement stands for competence and quality.

With the takeover of Italian cement producer Italcementi, HeidelbergCement has become the number 1 in aggregates production, number 2 in cement, and number 3 in ready-mixed concrete worldwide.

In the significantly expanded HeidelbergCement Group, 63,000 employees work at more than 3,000 production sites in around 60 countries on five continents. The core activities of HeidelbergCement include the production and distribution of cement and aggregates, the two essential raw materials for concrete. Our downstream activities include mainly the production of ready-mixed concrete, but also of asphalt and other building products in some countries.

### Building on sustainability

HeidelbergCement is committed to sustainability and builds on the three pillars of economy, ecology, and social responsibility.

We build our long-term success on sustainable business practices, primarily focused on customers, employees, shareholders, and local partners at all locations. With the Sustainability Ambitions 2020 programme, we demonstrate our long-term commitment. This includes securing access to raw materials reserves, efficient and innovative production processes, the development of new products and the use of alternative raw materials and fuels. HeidelbergCement is also active in the promotion of biodiversity at its extraction sites.

### i.lab: innovation by tradition

A laboratory of innovative solutions for sustainable construction built with the most advanced materials and technologies.

Located at the Kilometro Rosso Science & Technology Park in Bergamo (Italy), i.lab hosts the Product Innovation Centre of HeidelbergCement Group. Designed by arch. Richard Meier and rated Leed Platinum - the highest LEED rating for energyefficient and environmentally sustainable buildings - i.lab combines innovative materials with the ethics of sustainability and the value of beauty and aesthetics. Through the activities of i.lab, the Group intends to anticipate market trends and requirements promoting innovative solutions for sustainable construction, through a constant dialogue with the building community.

i.lab's strong vocation for innovation is rooted in a longstanding tradition of partnership with world-class engineers and architects and in a successful contribution to Universal Expositions. i.lab played an active role in Expo 2010 Shanghai, by developing i.light, the transparent cement used for the Italian Pavilion, a masterpiece among 2010's best inventions. More recently, i.lab researchers developed a new and truly innovative material - i.active BIODYNAMIC - allowing for the creation of the extremely complex shapes of Palazzo Italia, the iconic place of Expo 2015 Milano.