**Environmental Product Declaration Type III ITB No. 433/2023**

Issuance date: 30.03.2023
Validity date: 30.03.2028

# Concrete ECOPact

based on CEM IV/B (V) 42,5 N - LH/NA
from Kujawy Cement Plant

## Poznań sector



### EPD Program Operator:

Instytut Techniki Budowlanej (ITB)
Address: Filtrowa 1, 00-611 Warsaw, Poland
Website: www.itb.pl
Contact: energia@itb.pl

### Owner of the EPD:

Lafarge Cement S.A.
Address: Warszawska 110; 28-366 Małogoszcz
Contact: +48 41 248 70 00
Website: https://www.lafarge.pl/


**ITB is the verified member of The European Platform for EPD program operators and LCA practitioner www.eco-platform.org**

## Basic information

This declaration is the Type III Environmental Product Declaration (EPD) based on EN 15804 and verified according to ISO 14025 by an external auditor. It contains the information on the impacts of the declared construction materials on the environment. Their aspects were verified by the independent body according to ISO 14025. Basically, a comparison or evaluation of EPD data is possible only if all the compared data were created according to EN 15804.

**Life cycle analysis (LCA):** A1-A3, in accordance with EN 15804+A2
**The year of preparing the EPD:** 2023
**Product standard:** PN-EN 206+A2:2021-08
**Service Life:** no reference service life of concretes is declared as they are intermediate products used in construction
**PCR:** ITB-PCR A (PCR based on EN 15804) and EN 16908
**Declared unit:** 1 $m^3$ of concrete mix
**Reasons for performing LCA:** B2B
**Representativeness:** Polish, European

## BASIC INFORMATION

The Lafarge company has been operating in Poland since 1995 (since 2015 as Lafarge Cement S.A.). It has over 60 production plants, including: cement plants, mines, aggregate transshipments and concrete plants. The largest Lafarge plants in Poland are Małogoszcz and Kujawy Cement Plants.

Declaration covers 6 groups of concretes produced by Lafarge plants located in Poland at Poznań sector (plants: Gołężycka, Wysogotowo, Rabowice, Piła, Gorzów Wlkp., Zielona Góra).

Cement used for these concretes is produced by Lafarge Cement S.A. in the Kujawy Cement Plant.

The life-cycle assessment was carried out according to the following standards: PN-EN 15804+A2, PN-EN ISO 14025, PN-EN ISO 14040 and the product categorization rules provided in document ITB PCR-A. Declared reference unit is 1 $m^3$ of concrete.

LCI data for cement was collected by Lafarge from own cement plant between January and December 2021 and gathered data is representative for production technology also used in 2022. LCI data for concrete was collected by Lafarge from own concrete plants between January and August 2022. LCA assessment was carried out using GCCA tool v3.2 dedicated to calculate the LCA and data collected by the cement industry. CEM production (used in concretes) is characterized by high use of alternative fuels and consumed electricity based on renewable energy.

## PRODUCTS DESCRIPTION

Concrete is specified and supplied in accordance with EN 206. Delivered to site on a just-in-time basis, mixed concrete may be cast into any conceivable shape with almost no limit on volume. When hardened, concrete can carry substantial compressive loads by itself, but is more frequently reinforced to substantially increase its tensile and flexural strength. Concrete is used for site-mixed structures, precast structures and structural precast products in buildings prefabricated structures and structural prefabricated products in buildings and buildings.

The product assessed is a generic 1 $m^3$ of mixed concrete, where the constituent proportions, in mass percent, for six groups are provided in table 1.

**Table 1.** Concrete mix recipes for each group

| | Group I | Group II | Group III | Group IV | Group V | Group VI |
|---|---|---|---|---|---|---|
| Cement | 5-7% | 7-8,5% | 8,5-10% | 10-11,5% | 11,5-13% | 13-14,5% |
| Ash | 0-6% | 0-6% | 0-6% | 0-5% | 0-5% | 0-5% |
| Sand | 50-59% | 40-59% | 30-59% | 32-52% | 30-50% | 28-48% |
| Coarse Aggregate | 23-35% | 23-42% | 23-49% | 27-48% | 29-50% | 31-52% |
| Admixtures | 0-0,2% | 0-0,2% | 0-0,2% | 0-0,3% | 0-0,3% | 0-0,4% |
| Water | 5-12% | 5-12% | 5-12% | 6-10% | 6-10% | 6-10% |

Table 1 values represent an averaged factory produced mixed concrete produced in Poland by Lafarge. The composition of products complying with the EPD will vary depending on client's specification and application. More detailed information is available in the respective manufacturer's documentation (e.g. product data sheets).

## LIFE CYCLE ASSESSMENT (LCA) – general rules applied

### Unit

The declared unit is 1 $m^3$ of representative concretes ECOPact for a group I to VI (according to Table 1).

### System boundary

The EPD covers the product stage analysis ("cradle to gate") based on ECOPact concrete production plants data analyzed. The selected system boundaries comprise the production of input raw materials' extraction up to the finished product at the factory gate (ready concrete). The product stage contains: Module A1: extraction and processing of raw materials (ash, sand, gravel, additives, water, and cement (2 plants) and fuels, Module A2: transportation up to factory gate of raw materials and fuels, Module A3: concrete production (mixing). Inputs and processes of product system are presented in Figure 1.

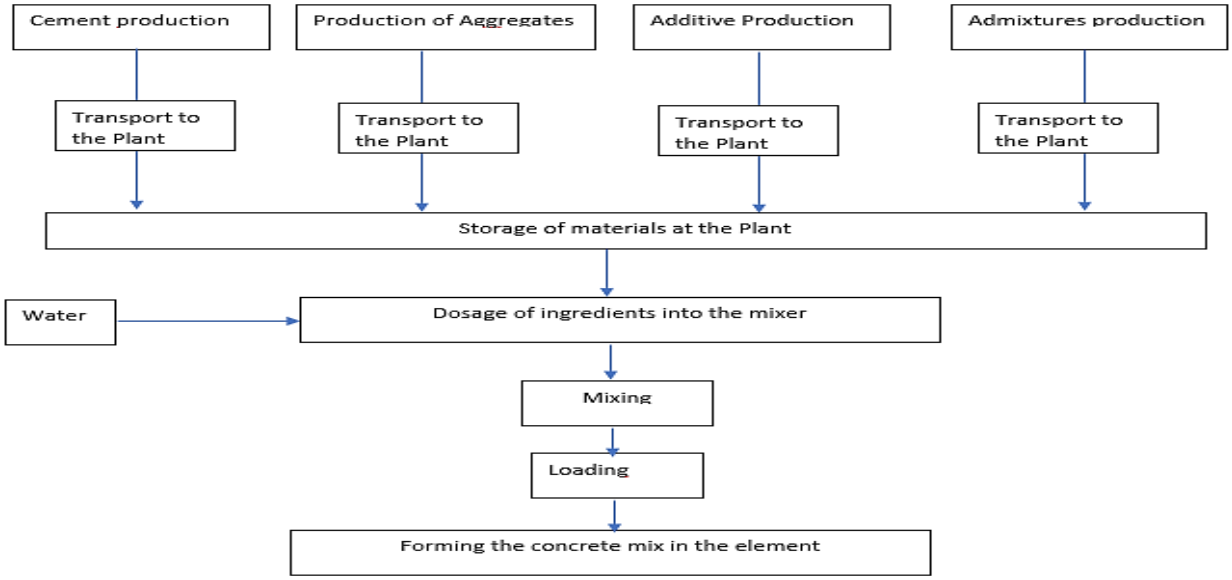


**Figure 1.** Concrete mix production - inputs and processes of the product system.

### Allocation rules

The allocation rules used for this EPD are based on general requirements provided in ITB PCR A and EN 15804+A2. As no co-products are produced, the flow of materials and energy and the associated release of substances and energy into the environment are related exclusively to the concrete mix produced. ECOPlanet cement from the offer of Lafarge Cement S.A. is used. In the case of fly ash, eco-product from electricity production used as a cement constituent, economic allocation was applied. Minimum 99.5% of impacts from the production lines were allocated to product covered by this declaration. Emissions allocated in clinker/cement production (module A1) are assessed including international methods for ETS system declaration. Calculations for GWP indicator are made taking into account gross and net emissions. The indicated gross value includes the $CO_2$ emissions from waste incineration (excluding biomass fraction of fuels), net-value excluding impacts from alternative waste-based fuels.

### System limits

In this assessment, all information gathered from data collection for the production of concrete has been modelled, i.e. all raw materials used, the electrical energy and other fuels used, use of ancillary materials and all direct production waste. Transport data on input was considered. No cut-offs have been made in accordance with EN 15804. The machines and facilities (capital goods) required for and during production are excluded, as is transportation of employees. Calculations for GWP indicator are made taking into account gross and net emissions.

### A1 – A2 Modules: Raw materials supply and transport

Concrete according to EN 206 is made by mixing coarse and fine aggregates, cement and water in controlled proportions. Chemical admixtures are used to reduce water content and improve fresh and hardened concrete properties. The averaged compositions of each class mix is provided in Table 1. Cement production used (A1) in concrete are characterized by high use of alternative fuels and consumed renewable electric energy (based on green certifictaes) Transport of input materials to production plants was inventoried. Most of the other additives, such as ash and aggregates, come from local suppliers.

### A3 Module Production

Substrates for concrete production are transported to the plant and then stored in silos. Electricity is used for production (mixing). Substrates are weighed and mixed according to of the process shown in Figure 1. The production uses cements produced by the Lafarge Cement S.A..

### Data collection period

The data for manufacture of the declared products refer to period between 01.01.2022 – 31.08.2022. The life cycle assessments were done for Poland as reference area.

### Data quality - production

The values determined to calculate A1 (cement) and A3 originate from verified Lafarge inventory data. A1 values (raw materials) were prepared considering specific EPDs (for cements), GCCA v3.2 data.

### Assumptions and estimates

The impacts of the representative products were aggregated using weighted average. Data regarding production per 1 $m^3$ of product were averaged for the analyzed production of each product class. Due to the difficulty of separating the cement production processes from concrete in six cases, the data were aggregated as A1-A3.

### Calculation rules

LCA was done in accordance with ITB PCR A document. Characterization factors are CML ver. 4.2 based.
ITB-LCA algorithms were used for impact calculations. Module A1 was calculated based on data from the database and specific EPDs, A3 and A2 are calculated based on the LCI questionnaire provided by the manufacturer.

### Databases

The background data for the processes come from the following databases: GCCA tool v3.2 (sand, water, aggregate, admixtures, RES electricity production for Poland, transport), specific EPD and specific emission reporting data for cement production by Lafarge in each of own plants. Electricity provider guarantees a certificate of origin of renewable electricity used by Lafarge Cement Plants. Energy in accordance with the standard energy mix is used for the production of concrete. Specific (LCI) data quality analysis was a part of audit. The time related quality of the data used is valid (5 years).

### Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to EN 15804 and the building context, respectively the product-specific characteristics of performance, are taken into account. In practice, this means that concrete may be compared in a specific application with the selected usage scenario.

## LIFE CYCLE ASSESSMENT (LCA) – Results

### Declared unit

The declaration refers to the unit DU – 1 $m^3$ of concretes for group I to VI produced by Lafarge in Poland.
The LCA results are presented for 1 $m^3$ (Tables 3-8).

**Table 2.** System boundaries (life stage modules included) in a product environmental assessment

| **Environmental assessment information (MA – Module assessed, MNA – Module not assessed, INA – Indicator Not Assessed)** | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Product stage | | | Construction process | | Use stage | | | | | | | End of life | | | | Benefits and loads beyond the system boundary |
| Raw material supply | Transport | Manufacturing | Transport to construction site | Construction-installation process | Use | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | Deconstruction demolition | Transport | Waste processing | Disposal | Reuse-recovery-recycling potential |
| A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
| MA | MA | MA | MNA | MNA | MNA | MNA | MNA | MNA | MNA | MNA | MNA | MNA | MNA | MNA | MNA | MNA |

**Table 3.** Environmental product characteristic (product stage) – 1 $m^3$ of concrete group I EcoPact based on: cement ECOPlanet 4B, CEM IV/B (V) 42,5 N - LH/NA

| Environmental impacts: (DU) 1 $m^3$ | | |
|---|---|---|
| Indicator | Unit | A1-A3 |
| Global Warming Potential | | |
| Global Warming Potential (net value)[1] | eq. kg $CO_2$ | 7,68E+01 |
| Greenhouse potential – fossil (gross value) [2] | eq. kg $CO_2$ | 8,77E+01 |
| Greenhouse potential - biogenic | eq. kg $CO_2$ | 4,57E-02 |
| Global warming potential - land use and land use change | eq. kg $CO_2$ | 2,95E-02 |
| Stratospheric ozone depletion potential | eq. kg CFC 11 | 4,87E-06 |
| Soil and water acidification potential | eq. mol $H^+$ | 3,12E-01 |
| Eutrophication potential - freshwater | eq. kg P | 9,80E-03 |
| Eutrophication potential - seawater | eq. kg N | 6,78E-04 |
| Eutrophication potential - terrestrial | eq. mol N | 9,15E-01 |
| Potential for photochemical ozone synthesis | eq. kg NMVOC | 2,57E-01 |
| Potential for depletion of abiotic resources - non-fossil resources | eq. kg Sb | 1,04E-04 |
| Abiotic depletion potential - fossil fuels | MJ | 5,32E+02 |
| Water deprivation potential | eq. $m^3$ | 1,20E+02 |
| Environmental aspects: (DU) 1 $m^3$ | | |
| Use of renewable primary energy excluding renewable primary energy resources used as raw materials | MJ | 6,35E+01 |
| Use of renewable primary energy resources used as raw materials | MJ | 0,00E+00 |
| Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) | MJ | 6,35E+01 |
| Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials | MJ | 5,32E+02 |
| Use of non-renewable primary energy resources used as raw materials | MJ | 0,00E+00 |
| Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) | MJ | 5,32E+02 |
| Use of secondary material | kg | 1,28E+02 |
| Use of renewable secondary fuels | MJ | 1,22E+02 |
| Use of non-renewable secondary fuels | MJ | 1,90E+02 |
| Net use of fresh water | $m^3$ | 2,86E+00 |
| Other environmental information describing waste categories: (DU) 1 $m^3$ | | |
| Hazardous waste disposed | kg | 0,00E+00 |
| Non-hazardous waste disposed | kg | 8,40E-02 |
| Radioactive waste disposed | kg | 0,00E+00 |
| Components for re-use | kg | 5,29E-01 |
| Materials for recycling | kg | 6,27E-01 |
| Materials for energy recover | kg | 0,00E+00 |
| Exported energy | MJ | 0,00E+00 |

1) net-value excludes alternative waste-based fuels

2) The gross value includes the $CO_2$ emissions from waste incineration (excluding biomass fraction of fuels)

**Table 4.** Environmental product characteristic (product stage) – 1 $m^3$ of concrete group II EcoPact based on: cement ECOPlanet 4B, CEM IV/B (V) 42,5 N - LH/NA

| Environmental impacts: (DU) 1 $m^3$ | | |
|---|---|---|
| Indicator | Unit | A1-A3 |
| Global Warming Potential | | |
| Global Warming Potential (net value)[1] | eq. kg $CO_2$ | 9,16E+01 |
| Greenhouse potential – fossil (gross value) [2] | eq. kg $CO_2$ | 1,06E+02 |
| Greenhouse potential - biogenic | eq. kg $CO_2$ | 5,12E-02 |
| Global warming potential - land use and land use change | eq. kg $CO_2$ | 3,13E-02 |
| Stratospheric ozone depletion potential | eq. kg CFC 11 | 4,99E-06 |
| Soil and water acidification potential | eq. mol $H^+$ | 3,41E-01 |
| Eutrophication potential - freshwater | eq. kg P | 1,05E-02 |
| Eutrophication potential - seawater | eq. kg N | 7,30E-04 |
| Eutrophication potential - terrestrial | eq. mol N | 1,02E+00 |
| Potential for photochemical ozone synthesis | eq. kg NMVOC | 2,84E-01 |
| Potential for depletion of abiotic resources - non-fossil resources | eq. kg Sb | 1,06E-04 |
| Abiotic depletion potential - fossil fuels | MJ | 5,58E+02 |
| Water deprivation potential | eq. $m^3$ | 1,17E+02 |
| Environmental aspects: (DU) 1 $m^3$ | | |
| Use of renewable primary energy excluding renewable primary energy resources used as raw materials | MJ | 7,73E+01 |
| Use of renewable primary energy resources used as raw materials | MJ | 0,00E+00 |
| Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) | MJ | 7,73E+01 |
| Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials | MJ | 5,58E+02 |
| Use of non-renewable primary energy resources used as raw materials | MJ | 0,00E+00 |
| Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) | MJ | 5,58E+02 |
| Use of secondary material | kg | 1,61E+02 |
| Use of renewable secondary fuels | MJ | 1,63E+02 |
| Use of non-renewable secondary fuels | MJ | 2,54E+02 |
| Net use of fresh water | $m^3$ | 2,81E+00 |
| Other environmental information describing waste categories: (DU) 1 $m^3$ | | |
| Hazardous waste disposed | kg | 0,00E+00 |
| Non-hazardous waste disposed | kg | 8,40E-02 |
| Radioactive waste disposed | kg | 0,00E+00 |
| Components for re-use | kg | 6,60E-01 |
| Materials for recycling | kg | 0,00E+00 |
| Materials for energy recover | kg | 0,00E+00 |
| Exported energy | MJ | 0,00E+00 |

1) net-value excludes alternative waste-based fuels

2) The gross value includes the $CO_2$ emissions from waste incineration (excluding biomass fraction of fuels)

**Table 5.** Environmental product characteristic (product stage) – 1 $m^3$ of concrete group III EcoPact based on: cement ECOPlanet 4B, CEM IV/B (V) 42,5 N - LH/NA

| Environmental impacts: (DU) 1 $m^3$ | | |
|---|---|---|
| Indicator | Unit | A1-A3 |
| Global Warming Potential | | |
| Global Warming Potential (net value)[1] | eq. kg $CO_2$ | 1,02E+02 |
| Greenhouse potential – fossil (gross value) [2] | eq. kg $CO_2$ | 1,19E+02 |
| Greenhouse potential - biogenic | eq. kg $CO_2$ | 5,55E-02 |
| Global warming potential - land use and land use change | eq. kg $CO_2$ | 3,29E-02 |
| Stratospheric ozone depletion potential | eq. kg CFC 11 | 5,12E-06 |
| Soil and water acidification potential | eq. mol $H^+$ | 3,62E-01 |
| Eutrophication potential - freshwater | eq. kg P | 1,11E-02 |
| Eutrophication potential - seawater | eq. kg N | 7,72E-04 |
| Eutrophication potential - terrestrial | eq. mol N | 1,09E+00 |
| Potential for photochemical ozone synthesis | eq. kg NMVOC | 3,01E-01 |
| Potential for depletion of abiotic resources - non-fossil resources | eq. kg Sb | 1,09E-04 |
| Abiotic depletion potential - fossil fuels | MJ | 5,81E+02 |
| Water deprivation potential | eq. $m^3$ | 1,19E+02 |
| Environmental aspects: (DU) 1 $m^3$ | | |
| Use of renewable primary energy excluding renewable primary energy resources used as raw materials | MJ | 8,69E+01 |
| Use of renewable primary energy resources used as raw materials | MJ | 0,00E+00 |
| Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) | MJ | 8,69E+01 |
| Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials | MJ | 5,81E+02 |
| Use of non-renewable primary energy resources used as raw materials | MJ | 0,00E+00 |
| Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) | MJ | 5,81E+02 |
| Use of secondary material | kg | 1,79E+02 |
| Use of renewable secondary fuels | MJ | 1,90E+02 |
| Use of non-renewable secondary fuels | MJ | 2,98E+02 |
| Net use of fresh water | $m^3$ | 2,85E+00 |
| Other environmental information describing waste categories: (DU) 1 $m^3$ | | |
| Hazardous waste disposed | kg | 0,00E+00 |
| Non-hazardous waste disposed | kg | 8,40E-02 |
| Radioactive waste disposed | kg | 0,00E+00 |
| Components for re-use | kg | 7,49E-01 |
| Materials for recycling | kg | 0,00E+00 |
| Materials for energy recover | kg | 0,00E+00 |
| Exported energy | MJ | 0,00E+00 |

1) net-value excludes alternative waste-based fuels

2) The gross value includes the $CO_2$ emissions from waste incineration (excluding biomass fraction of fuels)

**Table 6.** Environmental product characteristic (product stage) – 1 $m^3$ of concrete group IV EcoPact based on: cement ECOPlanet 4B, CEM IV/B (V) 42,5 N - LH/NA

| Environmental impacts: (DU) 1 $m^3$ | | |
|---|---|---|
| Indicator | Unit | A1-A3 |
| Global Warming Potential | | |
| Global Warming Potential (net value)[1] | eq. kg $CO_2$ | 1,18E+02 |
| Greenhouse potential – fossil (gross value) [2] | eq. kg $CO_2$ | 1,39E+02 |
| Greenhouse potential - biogenic | eq. kg $CO_2$ | 6,20E-02 |
| Global warming potential - land use and land use change | eq. kg $CO_2$ | 3,54E-02 |
| Stratospheric ozone depletion potential | eq. kg CFC 11 | 5,37E-06 |
| Soil and water acidification potential | eq. mol $H^+$ | 3,94E-01 |
| Eutrophication potential - freshwater | eq. kg P | 1,20E-02 |
| Eutrophication potential - seawater | eq. kg N | 8,38E-04 |
| Eutrophication potential - terrestrial | eq. mol N | 1,19E+00 |
| Potential for photochemical ozone synthesis | eq. kg NMVOC | 3,29E-01 |
| Potential for depletion of abiotic resources - non-fossil resources | eq. kg Sb | 1,14E-04 |
| Abiotic depletion potential - fossil fuels | MJ | 6,16E+02 |
| Water deprivation potential | eq. $m^3$ | 1,23E+02 |
| Environmental aspects: (DU) 1 $m^3$ | | |
| Use of renewable primary energy excluding renewable primary energy resources used as raw materials | MJ | 1,02E+02 |
| Use of renewable primary energy resources used as raw materials | MJ | 0,00E+00 |
| Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) | MJ | 1,02E+02 |
| Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials | MJ | 6,16E+02 |
| Use of non-renewable primary energy resources used as raw materials | MJ | 0,00E+00 |
| Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) | MJ | 6,16E+02 |
| Use of secondary material | kg | 1,84E+02 |
| Use of renewable secondary fuels | MJ | 2,33E+02 |
| Use of non-renewable secondary fuels | MJ | 3,65E+02 |
| Net use of fresh water | $m^3$ | 2,93E+00 |
| Other environmental information describing waste categories: (DU) 1 $m^3$ | | |
| Hazardous waste disposed | kg | 0,00E+00 |
| Non-hazardous waste disposed | kg | 8,40E-02 |
| Radioactive waste disposed | kg | 0,00E+00 |
| Components for re-use | kg | 8,86E-01 |
| Materials for recycling | kg | 0,00E+00 |
| Materials for energy recover | kg | 0,00E+00 |
| Exported energy | MJ | 0,00E+00 |

1) net-value excludes alternative waste-based fuels

2) The gross value includes the $CO_2$ emissions from waste incineration (excluding biomass fraction of fuels)

**Table 7.** Environmental product characteristic (product stage) – 1 $m^3$ of concrete group V EcoPact based on: cement ECOPlanet 4B, CEM IV/B (V) 42,5 N - LH/NA

| Environmental impacts: (DU) 1 $m^3$ | | |
|---|---|---|
| Indicator | Unit | A1-A3 |
| Global Warming Potential | | |
| Global Warming Potential (net value)[1] | eq. kg $CO_2$ | 1,30E+02 |
| Greenhouse potential – fossil (gross value) [2] | eq. kg $CO_2$ | 1,53E+02 |
| Greenhouse potential - biogenic | eq. kg $CO_2$ | 6,65E-02 |
| Global warming potential - land use and land use change | eq. kg $CO_2$ | 3,73E-02 |
| Stratospheric ozone depletion potential | eq. kg CFC 11 | 5,80E-06 |
| Soil and water acidification potential | eq. mol $H^+$ | 4,42E-01 |
| Eutrophication potential - freshwater | eq. kg P | 1,31E-02 |
| Eutrophication potential - seawater | eq. kg N | 9,09E-04 |
| Eutrophication potential - terrestrial | eq. mol N | 1,33E+00 |
| Potential for photochemical ozone synthesis | eq. kg NMVOC | 3,55E-01 |
| Potential for depletion of abiotic resources - non-fossil resources | eq. kg Sb | 1,17E-04 |
| Abiotic depletion potential - fossil fuels | MJ | 6,67E+02 |
| Water deprivation potential | eq. $m^3$ | 1,24E+02 |
| Environmental aspects: (DU) 1 $m^3$ | | |
| Use of renewable primary energy excluding renewable primary energy resources used as raw materials | MJ | 1,11E+02 |
| Use of renewable primary energy resources used as raw materials | MJ | 0,00E+00 |
| Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) | MJ | 1,11E+02 |
| Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials | MJ | 6,67E+02 |
| Use of non-renewable primary energy resources used as raw materials | MJ | 0,00E+00 |
| Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) | MJ | 6,67E+02 |
| Use of secondary material | kg | 1,81E+02 |
| Use of renewable secondary fuels | MJ | 2,61E+02 |
| Use of non-renewable secondary fuels | MJ | 4,08E+02 |
| Net use of fresh water | $m^3$ | 2,94E+00 |
| Other environmental information describing waste categories: (DU) 1 $m^3$ | | |
| Hazardous waste disposed | kg | 0,00E+00 |
| Non-hazardous waste disposed | kg | 8,40E-02 |
| Radioactive waste disposed | kg | 0,00E+00 |
| Components for re-use | kg | 9,75E-01 |
| Materials for recycling | kg | 0,00E+00 |
| Materials for energy recover | kg | 0,00E+00 |
| Exported energy | MJ | 0,00E+00 |

1) net-value excludes alternative waste-based fuels

2) The gross value includes the $CO_2$ emissions from waste incineration (excluding biomass fraction of fuels)

**Table 8.** Environmental product characteristic (product stage) – 1 $m^3$ of concrete group VI EcoPact based on: cement ECOPlanet 4B, CEM IV/B (V) 42,5 N - LH/NA

| Environmental impacts: (DU) 1 $m^3$ | | |
|---|---|---|
| Indicator | Unit | A1-A3 |
| Global Warming Potential | | |
| Global Warming Potential (net value)[1] | eq. kg $CO_2$ | 1,42E+02 |
| Greenhouse potential – fossil (gross value) [2] | eq. kg $CO_2$ | 1,68E+02 |
| Greenhouse potential - biogenic | eq. kg $CO_2$ | 7,08E-02 |
| Global warming potential - land use and land use change | eq. kg $CO_2$ | 3,89E-02 |
| Stratospheric ozone depletion potential | eq. kg CFC 11 | 6,09E-06 |
| Soil and water acidification potential | eq. mol $H^+$ | 4,76E-01 |
| Eutrophication potential - freshwater | eq. kg P | 1,38E-02 |
| Eutrophication potential - seawater | eq. kg N | 9,64E-04 |
| Eutrophication potential - terrestrial | eq. mol N | 1,44E+00 |
| Potential for photochemical ozone synthesis | eq. kg NMVOC | 3,76E-01 |
| Potential for depletion of abiotic resources - non-fossil resources | eq. kg Sb | 1,20E-04 |
| Abiotic depletion potential - fossil fuels | MJ | 7,04E+02 |
| Water deprivation potential | eq. $m^3$ | 1,24E+02 |
| Environmental aspects: (DU) 1 $m^3$ | | |
| Use of renewable primary energy excluding renewable primary energy resources used as raw materials | MJ | 1,21E+02 |
| Use of renewable primary energy resources used as raw materials | MJ | 0,00E+00 |
| Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) | MJ | 1,21E+02 |
| Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials | MJ | 7,04E+02 |
| Use of non-renewable primary energy resources used as raw materials | MJ | 0,00E+00 |
| Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) | MJ | 7,04E+02 |
| Use of secondary material | kg | 1,99E+02 |
| Use of renewable secondary fuels | MJ | 2,90E+02 |
| Use of non-renewable secondary fuels | MJ | 4,54E+02 |
| Net use of fresh water | $m^3$ | 2,93E+00 |
| Other environmental information describing waste categories: (DU) 1 $m^3$ | | |
| Hazardous waste disposed | kg | 0,00E+00 |
| Non-hazardous waste disposed | kg | 8,40E-02 |
| Radioactive waste disposed | kg | 0,00E+00 |
| Components for re-use | kg | 1,07E+00 |
| Materials for recycling | kg | 0,00E+00 |
| Materials for energy recover | kg | 0,00E+00 |
| Exported energy | MJ | 0,00E+00 |

1) net-value excludes alternative waste-based fuels

2) The gross value includes the $CO_2$ emissions from waste incineration (excluding biomass fraction of fuels)

## VERIFICATION

The process of verification of this EPD was in accordance with ISO 14025 and ISO 21930.
After verification this EPD is valid for a 5-year-period. EPD does not have to be recalculated after 5 years if the underlying data have not changed significantly.

| |
|---|
| The basis for LCA analysis was EN 15804 and ITB PCR A |
| Independent verification corresponding to ISO 14025 (subclause 8.1.3.)<br>[X] external [ ] internal |
| External verification of EPD: Ph.D. Eng. Halina Prejzner<br>LCA \ LCI audit and input data verification: Ph.D. D.Sc. Eng. Michał Piasecki. m.piasecki@itb.pl |

The purpose of this EPD is to provide the basis for assessing buildings and other construction works. A comparison of EPD data is only meaningful if all the data sets compared were developed according to EN 15804 and the product-specific performance characteristics and its impacts on the construction works are taken into account.

## Normative references


- ITB PCR A General Product Category Rules for Construction Products.
- https://gccassociation.org/
- EN 206: Concrete. Specification – performance -production and conformity (with amendments).
- EN 197-1:2011: Cement - part 1: Composition, specifications and conformity criteria for common cements.
- PN-EN ISO 14025:2010 Environmental labels and declarations. Type III environmental declarations. Principles and procedures.
- PN-EN 15804 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.
- PN-EN 16908:2017-02 Cement and building lime. Environmental product declarations. Product cate-gory rules complementary to EN 15804.
- PN-EN ISO 14040:2009 Environmental management - Life cycle assessment - Principles and frame-work.
- ECRA (European Cement Research Academy) – Background report “TR-ECRA 0181/2014 Environmental Product Declarations for representative European cements“.
- KOBiZE Wskaźniki emisyjności $CO_2$, $SO_2$, $NO_X$, CO i pyłu całkowitego dla energii elektrycznej.
- PN-B-19707 Cement specjalny - Skład, wymagania i kryteria zgodności.


Signature Not Verified

Dokument podpisany przez Michał Piasecki; ITB
Data: 2023.03.30 10:39:18 CEST

Elektronicznie podpisany przez Agnieszka Winkler-Skalna; ITB
Data: 2023.03.30 11:07:12 +02'00'