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## Environmental Product Declaration

Average EPD

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021

# Crushed Stone

## Danucem Slovensko a.s.

**Programme**
EPD Square | www.epdsquare.com

**Programme operator**
EPD Square, s.r.o.

**EPD Registration number**
SQ 00-057

**Publication date**
01.02.2026

**Valid until**
31.01.2031

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# General information

**Product**
Crushed Stone

**Program operator**
EPD Square, s.r.o.
Lermontovova 3, 811 05,
Bratislava, Slovak Republic
Email: info@epdsquare.com

**Registration number**
SQ 00-057

**Publication date**
01.02.2026

**Valid until date**
31.01.2031

**Owner of the declaration**
Danucem Slovensko a.s.
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**Manufacturer**
Danucem Slovensko a.s.
906 38 Rohožník, Slovak Republic
www.danucem.com

**Place of production**
Quarry Jablonica (mining area Jablonica), Slovakia
Quarry Hubina (mining area Hubina I), Slovakia
Quarry Čachtice (mining area Čachtice), Slovakia
Quarry Mníchová Lehota (mining area Rožňove Mitice I), Slovakia

**Product Category Rules (PCR)**
EPD Square PCR v1.0.1, 2025

**Declared unit**
1 t

**Mass per DU**
1000 kg

**UN CPC code**
153

**Geographical scope**
Europe

**Year of study**
2024

**Comparability**
EPDs of construction products may not be comparable if they do not comply with EN 15804 and if they are not compared in the context of the building.

**EPD author**
Ľudmila Vaculová Mečiarová, Silvia Vilčeková, EPD Clarity, s.r.o.

**Verification type**
Independent verification of the declaration and data, according to ISO14025:2006
External: ☑

**Verified by**
Shai Ben Aharon, KVS

*The owner of the declaration shall be liable for the underlying information and evidence.*
*EPD Square shall not be liable with respect to manufacturer, life cycle assessment data and evidence.*

## System boundaries

This EPD is based on system boundary cradle to gate (A1-A3) with modules C1-C4 and module D. The Reference Service Life (RSL) of the product is 50 years.

### Modules declared and geographical scope

| | 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 | De-construction 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 | MND | MND | MND | MND | MND | MND | MND | MND | MND | x | x | x | x | x |
| Geographic scope | SK | SK | SK | - | - | - | - | - | - | - | - | - | SK | SK | SK | SK | SK |

MND = Modules not declared.

## Description of Organization

Danucem Slovensko a.s. is the largest producer and supplier of building materials - cement, aggregates and ready-mixed concrete and related services in Slovakia. Premium quality aggregates are produced in DANUCEM quarries in Jablonica, Hubina, Čachtice and Mníchova Lehota and also sand & gravel pits in Veľké Úľany and Geča. Danucem Slovnesko a.s. has implemented the quality management system EN ISO 9001, the environmental management system EN ISO 14001 and the occupational health and safety management system EN ISO 45001. For Danucem Slovensko a.s. and CRH Company sustainability is the key value, and we commit us to the highest standards of environmental management in all our activities. Our management systems are implemented optimally and checked regularly, with respect to the best available practices in this industry. Sharing of knowledge in the DANUCEM Group plays a significant role in this process. Our policy, applied in all our groups, obliges us to:

• to follow all relevant environmental regulations,
• to improve environmental management in order to achieve the best practices,
• to monitor and report on the performance of environmental management in accordance with our policy,
• to maintain open communication and ensure that our employees and contractors carry out their environmental obligations,
• to handle challenges of climate change proactively,
• to prevent environmental pollution, reduce emissions and optimize the consumption of energy, water and other natural resources,
• to promote sustainable products, processes and new business innovations,
• to develop positive relationships with other parties and to aim to be good neighbours in every community in which we operate.

# Product information

## Product name

**Aggregate**

## Product description

This LCA focuses on aggregates made entirely from natural materials — crushed stone. Aggregates are categorized by particle size and consistency, and divided into:

Natural aggregates: sand and gravel
Crushed aggregates: stone chippings and crushed stone

They are typically supplied as homogeneous bulk products with standardized characteristics to ensure reliability and ease of processing.

Types and Sizes:
Crushed stone: various fractions (e.g., 0/2 mm to 63/125 mm) and monofractions (e.g., 0/16 mm, 0/32 mm, 0/63 mm, 0/100 mm), depending on quarry equipment

## Technical specifications

The deposit in our quarries is mainly formed by limestone and dolomite minerals. These are carbonate rocks commonly used in construction, road base, cement production, and as aggregate in concrete.

Technical Parameters

- Chemical Composition:
  - Limestone: Predominantly calcium carbonate ($CaCO_3$), typically >90%.
  - Dolomite: Calcium magnesium carbonate ($CaMg(CO_3)_2$), with $MgCO_3$ content ranging from 40–50%.
- Hardness:
  - Limestone: Mohs hardness of 3–4.
  - Dolomite: Mohs hardness of 3.5–4.
- Durability: Generally good, but susceptible to chemical weathering (especially acid rain).
- Reactivity: Limestone is highly reactive with acids; dolomite is less so due to magnesium content.
- Los Angeles Abrasion Value: Typically ranges from 20–40%, indicating moderate resistance to wear.

Physical Parameters

- Density:
  - Limestone: ~2.6–2.8 g/cm³
  - Dolomite: ~2.8–2.9 g/cm³
- Porosity: Varies widely; typically 1–20% depending on formation.
- Water Absorption: Generally <2% by weight.
- Compressive Strength:
  - Limestone: ~30–250 MPa
  - Dolomite: ~50–300 MPa

## Product application

Aggregates are widely used across industries, primarily in:

- Concrete and asphalt production
- Road and railway construction
- As filter and fill materials

## Product standards

Both crushed stone and sand & gravel production must adhere to rigorous quality control protocols as defined by STN EN standards (Slovak Technical Norms harmonized with European Norms).

Our aggregate products are certified according to Slovak Technical Standards (STN):

STN EN 13383 – Armourstone (Specifies the properties of aggregates used as armourstone in hydraulic engineering works)
STN EN 13043 – Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas (Defines the requirements for aggregates used in asphalt and surface treatments)
STN EN 13242 – Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction (Covers aggregates used in both unbound and hydraulically bound applications in infrastructure projects)
STN EN 12620 – Aggregates for concrete (Specifies the properties of aggregates for use in concrete, including precast and pavement concrete)

These standards govern:

- Particle size distribution (EN 933 series)
- Shape and flakiness index (EN 933-3)
- Mechanical strength and durability (e.g., Los Angeles abrasion test – EN 1097-2)
- Cleanliness and fines content (EN 933-1)
- Water absorption and density (EN 1097-6)

Routine sampling and laboratory testing are mandatory to ensure compliance. These tests are conducted at various stages of production and stockpiling to verify that the aggregates meet the specifications required for structural applications, such as concrete, asphalt, and road base layers.

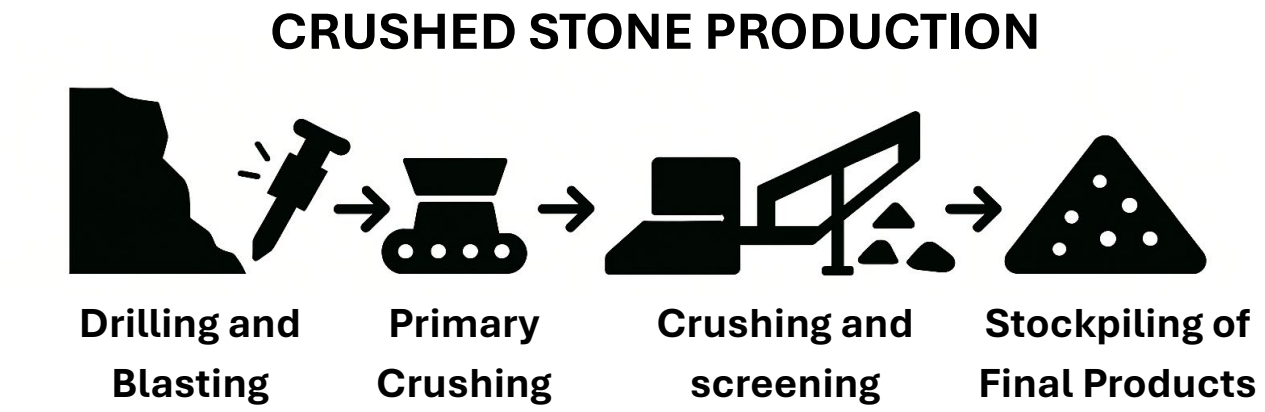
## Geographical scope

Slovak Republic, Europe

## Product contents information

| Product components | Weight, kg | Post-consumer material, weight-% | Renewable material, weight-% |
|---|---|---|---|
| Crushed stone | 1000 | 0 | 0 |
| TOTAL | 1000 | 0 | 0 |

## Manufacturing process




Crushed stone production is a fundamental process in the construction and infrastructure sectors, involving the mechanical transformation of solid rock into graded aggregates suitable for various engineering applications. The process is typically carried out in several distinct stages:

1. Drilling and Blasting

This initial phase involves the preparation of the rock mass for fragmentation. Boreholes are drilled into the rock face using hydraulic or pneumatic drilling rigs. These boreholes are then charged with controlled quantities of industrial explosives. The blasting operation is carefully designed to optimize fragmentation, minimize environmental impact, and ensure safety. The result is a pile of fragmented rock, known as shot rock, which is ready for further processing.

2. Crushing

The fragmented rock is transported to a stationary crushing facility, where it undergoes mechanical size reduction. Primary crushers (e.g., jaw crushers) and secondary crushers (e.g., cone or impact crushers) are employed to reduce the rock to specific sizes. The crushing process is designed to produce aggregates with desirable shape characteristics and minimal fines, which are critical for structural integrity in concrete and asphalt applications.

3. Sorting (Screening)

Following crushing, the material is conveyed to vibrating screens that separate the aggregates into predefined size fractions. This step ensures that each fraction meets the dimensional requirements for its intended use. Oversized material may be recirculated through the crusher, while undersized particles are either discarded or used in other applications.

4. Stockpiling of Final Fractions

The sorted aggregates are systematically stockpiled according to size categories (e.g., 0–4 mm, 4–8 mm, 8–16 mm,…). Proper stockpile management is essential to prevent contamination and segregation, ensuring consistent quality for end users.

# Life cycle assessment

## Cut-off criteria

The study does not exclude any modules or processes which are stated mandatory in the reference standard and the applied PCR. The study does not exclude any hazardous materials or substances. The study includes all major raw material and energy consumption. All inputs and outputs of the unit processes, for which data is available for, are included in the calculation. There is no neglected unit process more than 1% of total mass or energy flows. The module specific total neglected input and output flows also do not exceed 5% of energy usage or mass.

## Allocation, estimations, and assumptions

Allocation is based on annual production rate and made with high accuracy and precision. The values for 1 ton of the product which is used within this study are calculated by considering the total product weight per annual production. Results are calculated based on weighted average. The product output is fixed to 1 ton and the corresponding amount of product is used in the calculations.
Only aggregates are produced at the quarry. The annual production percentages are taken into consideration for allocation. According to the annual production of the declared product, the annual total energy consumption and the generated waste per declared product are allocated.

## Database(s) and LCA software

This EPD has been created using One Click LCA Pre-Verified EPD Generator. Ecoinvent v3.10.1/v3.11 and One Click LCA databases were used as sources of environmental data.

# LCA Scenarios and additional technical information

## Module A1

This stage considers the extraction and processing of all raw materials. Within the product stage accurate data has been used. In the case of absence in the database, it was modelled as close to reality as possible using proxy, representative datapoint.

## Module A2

This stage accounts for transport activities.

| | |
|---|---|
| Vehicle type used for transport | Transport, freight, lorry 16-32 metric ton, EURO6 |
| Distance | 0,7 |
| Capacity utilization | 100 |
| Capacity utilization factor | 1 |

## Module A3

In the plant, electricity and diesel are allocated on yearly consumption.

## Manufacturing energy scenario (A3)

| | |
|---|---|
| Electricity data source and quality | Electricity, Slovakia, residual mix |
| Electricity $CO_2$ eq. / kWh | 0,43 |
| Energy data source and quality | Diesel, burned in building machine |
| Diesel $CO_2$ eq. / MJ | 0,1 |

## End of Life (C1, C3, C4)

100% of the aggregates are collected and relocated for re-use as filling material.

| | Value | Unit |
|---|---|---|
| Collected separately | 1000 | kg |
| Collected as mixed construction waste | 0 | kg |
| Reuse | 720 | kg |
| Recycling | 0 | kg |
| Energy recovery | 0 | kg |
| To landfill | 280 | kg |

## Benefits and Loads (D)

The benefits of avoided virgin gravel production are accounted for as well as the loads related to the transport of gravel.

## Data quality

The data quality information has been provided according to the requirements of EN 15941. The data assessment was done using the Product Environmental Footprint Category Rules. The data has been collected internally, considering the latest available average production amounts and measurements during the time period of 2024. The quality level in this study is qualified as Good. Data quality rating procedure has been performed using a rating system where “1” means Very good quality, and “5” means Very poor quality. No fair, poor or very poor data was found during the assessment of relevant data.

| Geographical rating | Technology rating | Time-related rating | Average rating |
|---|---|---|---|
| 1,9 | 1,4 | 1,0 | 1,4 |

# LCA results

## Core environmental impact indicators – EN 15804+A2

| Indicator | Unit | A1-A3 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|
| GWP-total | kg $CO_2$ eq. | 2,84E+00 | 0,00E+00 | 9,67E+00 | 9,74E+00 | 1,75E+00 | 4,72E+01 |
| GWP-fossil | kg $CO_2$ eq. | 2,78E+00 | 0,00E+00 | 9,67E+00 | 9,73E+00 | 1,75E+00 | 4,72E+01 |
| GWP-biogenic | kg $CO_2$ eq. | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| GWP-LULUC | kg $CO_2$ eq. | 5,98E-02 | 0,00E+00 | 3,42E-03 | 1,72E-02 | 9,99E-04 | -1,56E-03 |
| ODP | kg CFC11 eq. | 7,48E-08 | 0,00E+00 | 1,92E-07 | 1,47E-07 | 5,06E-08 | 7,49E-07 |
| AP | mol $H^+$ eq. | 2,26E-02 | 0,00E+00 | 3,02E-02 | 6,70E-02 | 1,24E-02 | 4,41E-01 |
| EP-freshwater | kg P eq. | 5,38E-04 | 0,00E+00 | 6,41E-04 | 2,86E-03 | 1,44E-04 | -7,99E-04 |
| EP-marine | kg N eq. | 7,96E-03 | 0,00E+00 | 1,02E-02 | 2,47E-02 | 4,72E-03 | 2,16E-01 |
| EP-terrestrial | mol N eq. | 8,94E-02 | 0,00E+00 | 1,11E-01 | 2,67E-01 | 5,16E-02 | 2,35E+00 |
| POCP | kg NMVOC eq. | 2,62E-02 | 0,00E+00 | 4,74E-02 | 8,41E-02 | 1,85E-02 | 7,05E-01 |
| ADP-M&M | kg Sb eq. | 7,01E-04 | 0,00E+00 | 3,16E-05 | 2,59E-05 | 2,78E-06 | -2,27E-05 |
| ADP-fossil | MJ | 4,05E+01 | 0,00E+00 | 1,36E+02 | 1,40E+02 | 4,29E+01 | 6,17E+02 |
| WDP | $m^3$ | 4,80E+00 | 0,00E+00 | 6,67E-01 | 9,64E-01 | 1,24E-01 | -9,15E+00 |

***GWP-total**: Global Warming Potential; **GWP-fossil**: Global Warming Potential fossil fuels; **GWP-biogenic**: Global Warming Potential biogenic; **GWP-LULUC**: Global Warming Potential land use and land use change; **ODP**: Depletion potential of the stratospheric ozone layer; **AP**: Acidification potential, Accumulated Exceedance; **EP-freshwater**: Eutrophication potential, fraction of nutrients reaching freshwater end compartment; See "additional requirements" for indicator given as PO4 eq. **EP-marine**: Eutrophication potential, fraction of nutrients reaching freshwater end compartment; **EP-terrestrial**: Eutrophication potential, Accumulated Exceedance; **POCP**: Formation potential of tropospheric ozone; **ADP-M&M**: Abiotic depletion potential for non-fossil resources (minerals and metals); **ADP-fossil**: Abiotic depletion potential for fossil resources; **WDP**: Water deprivation potential, deprivation weighted water consumption*

## Additional (optional) environmental impact indicators – EN 15804+A2

| Indicator | Unit | A1-A3 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|
| PM | Disease incidence | 4,72E-07 | 0,00E+00 | 7,60E-07 | 6,81E-06 | 2,82E-07 | 1,32E-05 |
| IRP | kBq U235 eq. | 4,44E-01 | 0,00E+00 | 1,73E-01 | 3,46E-01 | 2,70E-02 | -4,08E-01 |
| ETP-fw | CTUe | 6,96E+00 | 0,00E+00 | 1,78E+01 | 4,84E+01 | 3,60E+00 | 1,95E+02 |
| HTP-c | CTUh | 7,52E-10 | 0,00E+00 | 1,65E-09 | 2,10E-09 | 3,22E-10 | 3,57E-09 |
| HTP-nc | CTUh | 3,15E-08 | 0,00E+00 | 8,53E-08 | 8,82E-08 | 7,40E-09 | 2,81E-08 |
| SQP | Dimensionless | 8,34E+01 | 0,00E+00 | 8,08E+01 | 1,09E+02 | 8,45E+01 | -3,41E+01 |

***PM**: Particulate matter emissions; **IRP**: Ionising radiation, human health; **ETP-fw**: Ecotoxicity (freshwater); **ETP-c**: Human toxicity, cancer effects; **HTP-nc**: Human toxicity, non-cancer effects; **SQP**: Land use related impacts / soil quality*

## Use of Natural Resources

| Parameter | Unit | A1-A3 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|
| RPEE | MJ | 2,94E+00 | 0,00E+00 | 2,35E+00 | 5,14E+00 | 4,14E-01 | -4,40E+00 |
| RPEM | MJ | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| TPE | MJ | 2,94E+00 | 0,00E+00 | 2,35E+00 | 5,14E+00 | 4,14E-01 | -4,40E+00 |
| NRPE | MJ | 4,24E+01 | 0,00E+00 | 1,36E+02 | 1,40E+02 | 4,29E+01 | 6,17E+02 |
| NRPM | MJ | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| TRPE | MJ | 4,24E+01 | 0,00E+00 | 1,36E+02 | 1,40E+02 | 4,29E+01 | 6,17E+02 |
| SM | kg | 3,85E-02 | 0,00E+00 | 6,22E-02 | 5,44E-02 | 1,08E-02 | 1,94E-01 |
| RSF | MJ | 2,18E-04 | 0,00E+00 | 7,85E-04 | 4,99E-04 | 2,23E-04 | 5,91E-05 |
| NRSF | MJ | 1,83E-05 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| W | $m^3$ | 1,91E-02 | 0,00E+00 | 1,83E-02 | -3,13E-01 | 4,46E-02 | -2,08E-01 |

***RPEE**: Renewable primary energy resources used as energy carrier; **RPEM**: Renewable primary energy resources used as raw materials; **TPE**: Total use of renewable primary energy resources; **NRPE**: Non-renewable primary energy resources used as energy carrier; **NRPM**: Non-renewable primary energy resources used as materials; **TRPE**: Total use of non-renewable primary energy resources; **SM**: Use of secondary materials; **RSF**: Use of renewable secondary fuels; **NRSF**: Use of non-renewable secondary fuels; **W**: Use of net fresh water*

## End of life – Waste

| Parameter | Unit | A1-A3 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|
| HW | kg | 9,85E-02 | 0,00E+00 | 1,95E-01 | 3,57E-01 | 4,74E-02 | 8,63E-02 |
| NHW | kg | 1,89E+00 | 0,00E+00 | 4,11E+00 | 4,60E+02 | 1,08E+00 | -2,36E+00 |
| RW | kg | 3,70E-04 | 0,00E+00 | 4,30E-05 | 8,46E-05 | 6,58E-06 | -9,85E-05 |

***HW**: Hazardous waste disposed; **NHW**: Non-hazardous waste disposed; **RW**: Radioactive waste disposed*

## End of life – Output flows

| Parameter | Unit | A1-A3 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|
| CR | kg | 0,00E+00 | 0,00E+00 | 0,00E+00 | 7,20E+02 | 0,00E+00 | 0,00E+00 |
| MR | kg | 5,77E-03 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| MER | kg | 1,20E-03 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| EEE | MJ | 6,85E-07 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| ETE | MJ | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |

***CR**: Components for reuse; **MR**: Materials for recycling; **MER**: Materials for energy recovery; **EEE**: Exported electric energy; **ETE**: Exported thermal energy*

## Information describing biogenic carbon content at factory gate

| Biogenic carbon content | Value | Unit |
|---|---|---|
| Biogenic carbon content in product | 0 | kg C |
| Biogenic carbon content in the accompanying packaging | n/a | kg C |

## Specific data (GWP-GHG) and data variation for A1-A3

| Specific data and data variation | Value-% |
|---|---|
| Specific data | 80,8 |
| Variation - product | - |
| Variation - site | -32,6%; 23,6% |

## Hazardous substances

☑ The product does not contain any REACH SVHC substances in amounts greater than 0.1 %.

# Contact information

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# Bibliography

**ISO 14020:2000**
Environmental labels and declarations – General principles

**ISO 14025:2006**
Environmental labels and declarations - Type III environmental declarations - Principles and procedures

**ISO 14040:2006**
Environmental management — Life cycle assessment — Principles and frameworks

**ISO 14044:2006**
Environmental management - Life cycle assessment - Requirements and guidelines

**EN 15804:2012+A2:2019/AC:2021**
Sustainability of construction works - Environmental product declaration - Core rules for the product category of construction products

**EN 15941:2024**
Sustainability of construction works – Data quality for environmental assessment of products and construction work – Selection and use of data

EPD Square PCR v.1.0.1, 2025

EPD Square, General Programme Instructions v.1, 2024

Ecoinvent database v3.10.1/v3.11 (2024) and One Click LCA database

# Annex

## Environmental impacts – GWP-GHG

| Indicator | Unit | A1-A3 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|
| GWP - GHG | kg $CO_2e$ | 2,84E+00 | 0,00E+00 | 9,67E+00 | 9,74E+00 | 1,75E+00 | 4,72E+01 |

***GWP- GHG**: Global Warming Potential, greenhouse gases*