# Statement of Verification

BREG EN EPD No: 000838 Issue: 01

This is to verify that the Environmental Product Declaration provided by:

## LSI Stones

are in accordance with the requirements of:

**EN 15804:2012+A2:2019**

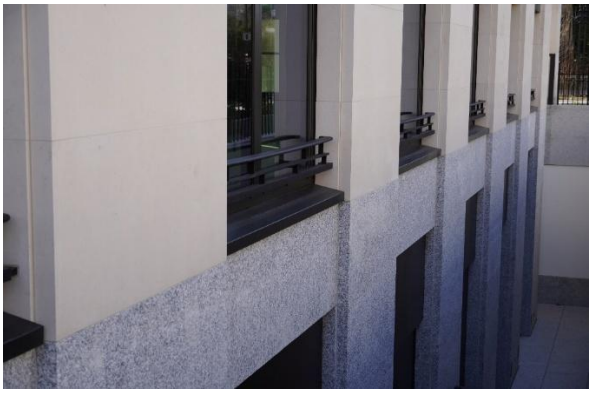
and

BRE Global Scheme Document SD207

This declaration is for:
1 $m^3$ of Granite slabs with the average density of 2850 $kg/m^3$

## Company Address

LSI Stones,
IC2 km 104,
2480-093 Pedreiras,
Leiria,
Portugal



Signed for BRE Global Limited — Hayley Thomson, Operator

| Date of this Issue | Date of First Issue | Expiry Date |
|---|---|---|
| 21 August 2026 | 21 August 2026 | 20 August 2031 |



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# Environmental Product Declaration

# EPD Number: 000838

## General Information

| EPD Programme Operator | Applicable Product Category Rules |
|---|---|
| BRE Global<br>Watford, Herts<br>WD25 9XX<br>United Kingdom | BRE 2025 Product Category Rules (PN 514 Rev 3.2) for Type III environmental product declaration of construction products to EN 15804:2012+A2:2019. |
| **Commissioner of LCA study** | **LCA consultant/Tool** |
| LSI Stones,<br>IC2 km 104,<br>2480-093 Pedreiras,<br>Leiria,<br>Portugal | Bala Subramanian/ BRE LINA A2 |
| **Declared/Functional Unit** | **Applicability/Coverage** |
| 1 $m^3$ of Granite slabs with the average density of 2850 $kg/m^3$ | Product Average. |
| **EPD Type** | **Background database** |
| Cradle to Gate with options | Ecoinvent 3.8 |

| Demonstration of Verification |
|---|
| CEN standard EN 15804 serves as the core PCR [a] |
| Independent verification of the declaration and data according to EN ISO 14025:2010<br>☒Internal ☐ External |
| (Where appropriate [b]) Third party verifier:<br>Kim Allbury |
| a: Product category rules<br>b: Optional for business-to-business communication; mandatory for business-to-consumer communication (see EN ISO 14025:2010, 9.4) |

| Comparability |
|---|
| Environmental product declarations from different programmes may not be comparable if not compliant with EN 15804:2012+A2:2019. Comparability is further dependent on the specific product category rules, system boundaries and allocations, and background data sources. See Clause 5.3 of EN 15804:2012+A2:2019 for further guidance |

## Information modules covered

| Product | | | Construction | | Use stage | | | | | | | End-of-life | | | | | Benefits and loads beyond the system boundary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Related to the building fabric | | | | | Related to the building | | | | | | | |
| A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | | D |
| Raw materials supply | Transport | Manufacturing | Transport to site | Construction – Installation | Use | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | Deconstruction demolition | Transport | Waste processing | Disposal | | Reuse, Recovery and/or Recycling potential |
| ☑ | ☑ | ☑ | ☑ | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☑ | ☑ | ☑ | ☑ | | ☑ |

Note: Ticks indicate the Information Modules declared.

### Manufacturing site(s)

LSI Stones,
IC2 km 104,
2480-093 Pedreiras,
Leiria,
Portugal

Quarry operation - Angola

## Construction Product:

### Product Description

Granite is an igneous rock, mainly composed of quartz and feldspar with minor amounts of mica, amphiboles, and other minerals. These minerals, and their variation in richness and alteration, give the numerous colours and textures. Granite usage will be dependent on their properties because they are hard enough to resist abrasion, strong enough to bear significant weight, inert enough to resist weathering, and they accept a brilliant polish as well as different finishes like flamed, cropped etc. These characteristics make it a very desirable and useful dimension stone. In line with their physical properties, they will be used for both indoor and outdoor applications. Keeping a natural focus on Portuguese granite, LSI stone transforms any type of granite, proceeding with slab processing inside the LSI factory. Granite blocks are used in a variety of applications, including slabs, tiles, floors and stairs, external paving, and rough slabs.

Depending on the application, different types of granite may be used, such as Amarelo Macieira, Amarelo Real, Black Tear, Cinza Evora, Favaco, Pedras Salgadas, Silver Grey, Soft Yellow, SPI, and Zimbabwe. The LCA analysis has been conducted using an average granite density of 2,850 kg/m³. As the density can vary between different granite types, users of this EPD may calculate bespoke environmental impacts by adjusting the results based on the measured density of the specific granite product being assessed.

### Technical Information

| Property | Value, Unit |
|---|---|
| [EN 13501-1] Reaction to fire | Class: A1 |
| [EN 12372] Flexural tensile strength | 15-22 Mpa |
| [EN 12371] Flexural strength against freeze thaw (56 cycles) | 14-21 Mpa |

| Property | Value, Unit |
|---|---|
| [EN 1936] Apparent density & Open porosity | 2550- 2900 kg/m3, 5 - 8 % |
| [EN 13755] Water absorption at atmospheric pressure | 0.1 – 0.5 % |
| [EN 13364] Determination of breaking load at dowel hole (30 mm) | 2900-3500 N |
| [EN 14157] Abrasion | 14-18 mm |
| [EN 14231] Slip resistance (sandblasted) | 75-95 PTV Wet<br>85-105 PTV Dry |
| [EN 1926] Compressive strength | 180-240 Mpa |
| EN 1469:2015 – Natural stone products – slabs for cladding | |
| EN 12057:2015 – Natural stone products – Modular tiles | |
| EN 12058:2015 – Natural stone products – Slabs for floors and stairs | |
| EN 1341:2014 – Natural stone products – Slabs of natural stone for external paving | |
| EN 1342:2014 – Natural stone products – Setts of natural stone for external paving | |
| EN 1343:2014 – Natural stone products – Kerbs of natural stone for external paving | |
| EN 1468:2012 – Natural stone products – Rough Slabs | |

Note: The above technical properties have been taken from the UK Declaration of Conformity for granite products. The referenced standards / properties are applicable to all the natural stone products, including slabs for cladding, slabs for floors and stairs, modular tiles, slabs and setts for external paving, and rough slabs.

For further information or clarification regarding these technical properties, please contact the LSI Stones technical team.

## Main Product Contents

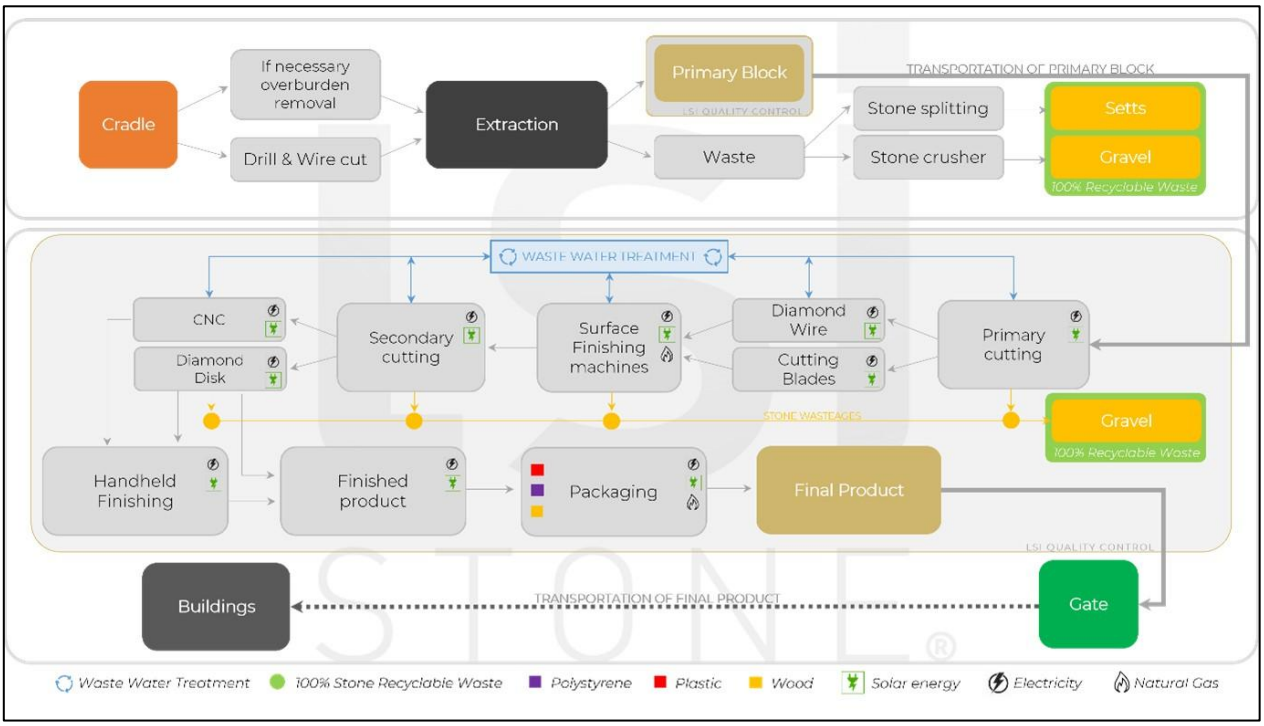
| Material Input | % |
|---|---|
| Unprocessed Granite | 100 |

## Manufacturing Process

In general, the extraction process involves drilling and cutting the rock mass to detach a bench from the desired geological layer, followed by division of the layer into blocks.
LSI's factory receives granite from multiple quarries, with the Angola site used as a representative source. After extraction, LSI carries out quality control to select suitable blocks from the quarry and to assess the bench material.

All extracted rock material that is not suitable for block production is 100% recyclable. This material undergoes splitting and/or crushing processes, resulting in two by-products: setts and gravel. At the LSI Factory, the first process consists of transforming the blocks into slabs, by either using the diamond wire or cutting blades, and the next process is to finish the slabs. In the second cutting phase, the slabs are transformed and detailed into pieces to customise according to the projects by going through the diamond disc and CNC phases. During all these processes, water is used for cutting and other purposes. The used water is recycled by passing through a water treatment plant. After the cutting and detailing phases on CNC Machine, the stone pieces are finished by hand or even machine. After obtaining the final pieces and going through numerous quality control processes, the finished stone piece will be packed and properly set into wooden crates. Additionally, all stone waste is crushed and turned into by-products such as gravel. Hence, during all the phases the LSI factory uses electricity for the manufacturing processes, and natural gas has been used in the finishing and packaging phase.

## Process flow diagram



## Construction Installation

The installation of the granite product is assumed to involve standard mechanical placement at the construction site. In accordance with EN 15804, no additional energy use or ancillary materials (e.g. adhesives, sealants, or fixings) are included in Module A5, as their contribution is considered negligible.

Module A5 is included in this assessment to ensure proper accounting of biogenic carbon associated with the wooden packaging materials (pallets). The biogenic carbon stored in the wood is assumed to be released at the installation stage, in line with EN 15804 requirements for carbon flows.

End of life scenario for treatment of wood waste has been taken from BRE PCR EN15804+A2 V3.2

## End of Life

At the end of life, granite stone pieces are removed during building deconstruction using heavy machinery. The recovered granite can often be recycled into new products or used as aggregate in construction projects. Some companies specialise in repurposing granite countertops or slabs into smaller items like tiles, pavers, or decorative accents. If the granite slabs are in good condition, they may be salvaged and reused in other construction projects. Additionally, some companies or individuals may be interested in purchasing used granite for various purposes, such as creating custom furniture or outdoor installations. The energy attributed to the removal of granite slabs during deconstruction is negligible compared to the overall demolition process, so therefore no impacts from C1.
It is assumed 100% of the product will be recovered at the end of life

# Life Cycle Assessment Calculation Rules

## Declared unit description

1 $m^3$ of Granite slabs with the average density of 2850 $kg/m^3$

## System boundary

Two LCA analyses have been conducted for this EPD.

The first LCA analysis is based on data from the quarry operations in Angola and covers modules Cradle to Gate (A1–A3). This includes:

- A1: Extraction of raw materials during quarry operations.
- A2: Transportation of ancillary materials to the quarry.
- A3: Quarry processing activities, including energy and water consumption, waste disposal, and wastewater generated from operations.

The second LCA analysis incorporates the impacts from the primary LCA as A1 and expands the system boundary to include downstream processing activities which was carried out as a Cradle to Gate with options LCA. This analysis covers:

- A1: Quarry operations in Angola (as assessed in the primary LCA).
- A2: Transportation of raw materials from Angola to the LSI facility for further processing, as well as transportation of ancillary materials.
- A3: Processing of the granite at the LSI facility, including fuel and electricity consumption, water use, waste generation, non-production waste disposal, and wastewater treatment.
- A4: Transportation of the finished granite product from the factory gate to the construction site.
- A5: Installation activities at the construction site.
- C1–C4: End-of-life stages, including deconstruction, transportation of granite waste, waste processing, and final disposal.
- D – Benefits and loads beyond the system boundary

Both the LCAs has been carried out in accordance with EN 15804:2012+A2:2019 and BRE 2025 Product Category Rules (PN 514 Rev 3.2)

## Data sources, quality and allocation

This study is a cradle-to-gate with Modules C and D LCA, developed in accordance with EN 15804:2012+A2:2019. The assessment includes Modules A1–A3 (production stage), C1–C4 (end-of-life), and Module D (benefits and loads beyond the system boundary). The LCA modelling was carried out using BRE LINA, with background datasets sourced from Ecoinvent v3.8. All relevant inputs and outputs, including raw materials, energy, water use, and ancillary materials, have been included. Direct emissions to air, water, and soil were not measured and are therefore excluded.

LSI Stones factory: As the LSI Stones facility produces multiple products, allocation of fuel, water, wastewater, and waste emissions was necessary. An allocation factor of 36.4% was applied, based on granite block production relative to total site output (calculated by $m^3$) during the data collection period (01/01/2023 – 31/12/2023).

Angola Quarry - Raw material consumption is based on quarry extraction, where 71% of extracted material is converted into granite blocks (calculated by kg). No allocation was required for input materials, as mass balance verification confirmed that input quantities sufficiently cover both production output and waste within acceptable tolerances. Primary data for granite quarrying was provided by LSI Stones, based on operations in Angola. This process has been modelled as a separate dataset and integrated into the overall factory system. Production waste (e.g. mud and gravel) generated during quarrying and processing is reused externally (e.g. in cement production, construction applications, and road works), while overburden material is returned to the quarry.

Secondary data has been obtained for all other upstream and downstream processes that are beyond the control of the manufacturer (i.e. raw material production) from the ecoinvent 3.8 database. All ecoinvent datasets (Cut-off, EN 15804+A2) are complete within the context used and conform to the system boundary and the criteria for the exclusion of inputs and outputs, according to the requirements specified in EN15804+A2:2019. BRE LINA+A2 uses the characterisation factors that are specified in annex C of the 15804 A2 standard.

| ISO14044 guidance. **Quality Level** | **Geographical representativeness** | **Technical representativeness** | **Time representativeness** |
|---|---|---|---|
| Very Good | Data from area under study. | Data from processes and products under study. Same state of technology applied as defined in goal and scope (i.e., identical technology). | There is approximately less than 3 years between the Ecoinvent LCI reference year, and the time period for which the LCA was undertaken |

The data quality assessment presented above has been carried out in accordance with Table E.1 in the Annex section of the BRE PCR EN 15804+A2 V3.2. Specific European datasets have been selected from the ecoinvent LCI for this LCA.
Energy use and modelling approach:
Granite extraction at the Angola quarry relies on diesel generators and diesel-powered heavy vehicles. At the LSI factory, production uses a combination of national grid electricity, natural gas and on-site renewable electricity generated by solar panels.

Electricity and fuel assumptions:
For national grid electricity consumption, a location-based modelling approach has been applied. The Portugal national grid electricity dataset from Ecoinvent 3.8 was therefore used in the LCA model. The following GWP emission factors were applied:

- Portugal grid electricity - Electricity, medium voltage {PT}| market for electricity, medium voltage | EN15804, U – emission factor per kWh = 0.400 kg $CO_2$e
- EU natural gas - heat production, natural gas, at industrial furnace >100kW {Europe without Switzerland} - emission factor per kWh = 0.256 kg $CO_2$e/kWh
- On-site solar electricity - Electricity, low voltage {PT}| electricity production, photovoltaic, 3kWp slanted-roof installation, multi-Si, panel, mounted | EN15804, U – emission factor per kWh 0.061 kg $CO_2$e

The time representativeness of the background data is assessed as Very Good. The background LCI datasets are based on Ecoinvent v3.8, compiled in 2021, meaning there is less than three years between the Ecoinvent LCI reference year and the period for which the LCA was undertaken. Therefore, there is less than 3 years between the ecoinvent LCI reference year and the time period for which the LCA was undertaken.

## Cut-off criteria

At Angola quarry operation site, the raw material extraction, ancillary materials, process energy, water use/discharge and production waste have been included and the direct emissions to air, water, soil, and packaging are not measured.
At LSI factory processing site, the raw material extraction, ancillary materials, packaging, process energy, water use/discharge and production waste have been included and the direct emissions to air, water, and soil are not measured

## LCA Results

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

| Parameters describing environmental impacts | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | GWP-total | GWP-fossil | GWP-biogenic | GWP-luluc | ODP | AP | EP-freshwater |
| | | | kg $CO_2$ eq | kg $CO_2$ eq | kg $CO_2$ eq | kg $CO_2$ eq | kg CFC11 eq | mol $H^+$ eq | kg $(PO_4)^{3-}$ eq |
| Product stage | Raw material supply | A1 | 4.26E+02 | 4.25E+02 | 7.95E-01 | 1.05E-01 | 9.44E-05 | 4.21E+00 | 3.22E-02 |
| | Transport | A2 | 4.41E+02 | 4.41E+02 | 3.52E-02 | 2.91E-01 | 9.05E-05 | 1.18E+01 | 1.73E-02 |
| | Manufacturing | A3 | 1.20E+02 | 3.42E+02 | -2.25E+02 | 3.16E+00 | 2.64E-05 | 2.50E+00 | 1.28E-01 |
| | Total (Consumption grid) | A1-3 | 9.87E+02 | 1.21E+03 | -2.24E+02 | 3.56E+00 | 2.11E-04 | 1.85E+01 | 1.78E-01 |
| Construction process stage | Transport | A4 | 2.37E+01 | 2.37E+01 | 2.02E-02 | 9.30E-03 | 5.48E-06 | 9.61E-02 | 1.53E-03 |
| | Construction | A5 | 2.96E+02 | 1.43E+01 | 2.82E+02 | 1.71E-03 | 2.40E-07 | 6.38E-02 | 1.61E-03 |
| End of life | Deconstruction, demolition | C1 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | Transport | C2 | 2.37E+01 | 2.37E+01 | 2.02E-02 | 9.30E-03 | 5.48E-06 | 9.61E-02 | 1.53E-03 |
| | Waste processing | C3 | 9.74E+00 | 9.73E+00 | 3.44E-03 | 9.71E-04 | 2.08E-06 | 1.01E-01 | 3.02E-04 |
| | Disposal | C4 | 1.51E+00 | 1.50E+00 | 1.15E-02 | 1.52E-03 | 4.56E-07 | 1.27E-02 | 4.35E-04 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | -2.04E+01 | -2.01E+01 | -2.60E-01 | -2.84E-02 | -1.62E-06 | -1.29E-01 | -1.09E-02 |

GWP-total = Global warming potential, total;
GWP-fossil = Global warming potential, fossil;
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; and
EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment

## LCA Results (continued)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

### Parameters describing environmental impacts

| | | | EP-marine | EP-terrestrial | POCP | ADP-mineral &metal | ADP-fossil | WDP | PM |
|---|---|---|---|---|---|---|---|---|---|
| | | | kg N eq | mol N eq | kg NMVOC eq | kg Sb eq | MJ, net calorific value | $m^3$ world eq deprived | disease incidence |
| Product stage | Raw material supply | A1 | 1.82E+00 | 1.96E+01 | 5.51E+00 | 7.08E-04 | 6.41E+03 | 7.44E+01 | 1.08E-04 |
| | Transport | A2 | 2.91E+00 | 3.23E+01 | 8.43E+00 | 7.96E-04 | 5.85E+03 | 1.67E+01 | 1.87E-05 |
| | Manufacturing | A3 | 4.85E-01 | 4.26E+00 | 1.32E+00 | 3.13E-03 | 5.04E+03 | 1.74E+02 | 1.38E-05 |
| | Total (Consumption grid) | A1-3 | 5.22E+00 | 5.62E+01 | 1.53E+01 | 4.63E-03 | 1.73E+04 | 2.65E+02 | 1.41E-04 |
| Construction process stage | Transport | A4 | 2.90E-02 | 3.16E-01 | 9.69E-02 | 8.24E-05 | 3.58E+02 | 1.61E+00 | 2.04E-06 |
| | Construction | A5 | 3.10E-02 | 3.33E-01 | 8.71E-02 | 8.03E-06 | 2.89E+01 | 4.40E+00 | 4.98E-07 |
| End of life | Deconstruction, demolition | C1 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | Transport | C2 | 2.90E-02 | 3.16E-01 | 9.69E-02 | 8.24E-05 | 3.58E+02 | 1.61E+00 | 2.04E-06 |
| | Waste processing | C3 | 4.48E-02 | 4.91E-01 | 1.35E-01 | 5.01E-06 | 1.34E+02 | 3.09E-01 | 2.07E-05 |
| | Disposal | C4 | 4.36E-03 | 4.75E-02 | 1.37E-02 | 4.90E-06 | 3.52E+01 | 1.59E+00 | 2.54E-07 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | -2.98E-02 | -3.59E-01 | -9.25E-02 | -1.90E-04 | -2.96E+02 | -3.86E+01 | -1.63E-06 |

EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment;
EP-terrestrial = Eutrophication potential, accumulated exceedance;
POCP = Formation potential of tropospheric ozone;
ADP-mineral&metals = Abiotic depletion potential for non-fossil resources;
ADP-fossil = Depletion potential of the stratospheric ozone layer;
WDP = Water (user) deprivation potential, deprivation-weighted water consumption; and
PM = Particulate matter.

## LCA Results (continued)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

| Parameters describing environmental impacts | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | IRP | ETP-fw | HTP-c | HTP-nc | SQP |
| | | | kBq $U^{235}$ eq | CTUe | CTUh | CTUh | dimensionless |
| Product stage | Raw material supply | A1 | 2.98E+01 | 4.88E+03 | 2.95E-07 | 3.73E-06 | 3.08E+03 |
| | Transport | A2 | 2.73E+01 | 3.82E+03 | 2.46E-07 | 2.90E-06 | 1.54E+03 |
| | Manufacturing | A3 | 2.92E+01 | 7.71E+03 | 4.81E-07 | 5.09E-06 | 2.10E+04 |
| | Total (Consumption grid) | A1-3 | 8.63E+01 | 1.64E+04 | 1.02E-06 | 1.17E-05 | 2.57E+04 |
| Construction process stage | Transport | A4 | 1.84E+00 | 2.79E+02 | 9.05E-09 | 2.93E-07 | 2.46E+02 |
| | Construction | A5 | 3.28E-01 | 4.96E+01 | 5.81E-08 | 1.88E-07 | 7.33E+00 |
| End of life | Deconstruction, demolition | C1 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | Transport | C2 | 1.84E+00 | 2.79E+02 | 9.05E-09 | 2.93E-07 | 2.46E+02 |
| | Waste processing | C3 | 6.02E-01 | 7.81E+01 | 3.02E-09 | 5.67E-08 | 1.70E+01 |
| | Disposal | C4 | 1.66E-01 | 2.51E+01 | 1.08E-09 | 1.68E-08 | 8.44E+01 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | -4.58E+00 | -3.43E+02 | -1.99E-08 | -3.59E-07 | -2.72E+02 |

IRP = Potential human exposure efficiency relative to U235;
ETP-fw = Potential comparative toxic unit for ecosystems;
HTP-c = Potential comparative toxic unit for humans;
HTP-nc = Potential comparative toxic unit for humans; and
SQP = Potential soil quality index.

## LCA Results (continued)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

### Parameters describing resource use, primary energy

| | | | PERE | PERM | PERT | PENRE | PENRM | PENRT |
|---|---|---|---|---|---|---|---|---|
| | | | MJ | MJ | MJ | MJ | MJ | MJ |
| Product stage | Raw material supply | A1 | 7.87E+01 | 8.42E-01 | 1.59E+02 | 6.06E+03 | 2.21E+02 | 1.26E+04 |
| | Transport | A2 | 4.95E+01 | 0.00E+00 | 4.95E+01 | 5.74E+03 | 0.00E+00 | 5.74E+03 |
| | Manufacturing | A3 | 4.31E+03 | 2.19E+03 | 6.50E+03 | 4.60E+03 | 3.81E+02 | 4.99E+03 |
| | Total (Consumption grid) | A1-3 | 4.44E+03 | 2.19E+03 | 6.71E+03 | 1.64E+04 | 6.02E+02 | 2.33E+04 |
| Construction process stage | Transport | A4 | 5.04E+00 | 0.00E+00 | 5.04E+00 | 3.52E+02 | 0.00E+00 | 3.52E+02 |
| | Construction | A5 | -2.46E+03 | 2.46E+03 | 5.79E-01 | -1.45E+02 | 1.69E+02 | 2.43E+01 |
| End of life | Deconstruction, demolition | C1 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | Transport | C2 | 5.04E+00 | 0.00E+00 | 5.04E+00 | 3.52E+02 | 0.00E+00 | 3.52E+02 |
| | Waste processing | C3 | 7.48E-01 | 0.00E+00 | 7.48E-01 | 1.31E+02 | 0.00E+00 | 1.31E+02 |
| | Disposal | C4 | 6.02E-01 | 0.00E+00 | 6.02E-01 | 3.47E+01 | 0.00E+00 | 3.47E+01 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | -2.78E+01 | 0.00E+00 | -2.78E+01 | -2.96E+02 | 0.00E+00 | -2.96E+02 |

PERE = Use of renewable primary energy excluding renewable primary energy used as raw materials;
PERM = Use of renewable primary energy resources used as raw materials;
PERT = Total use of renewable primary energy resources;

PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials;
PENRM = Use of non-renewable primary energy resources used as raw materials;
PENRT = Total use of non-renewable primary energy resource

## LCA Results (continued)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

| Parameters describing resource use, secondary materials and fuels, use of water | | | | | | |
|---|---|---|---|---|---|---|
| | | | SM | RSF | NRSF | FW |
| | | | kg | MJ net calorific value | MJ net calorific value | $m^3$ |
| Product stage | Raw material supply | A1 | 2.65E+00 | 0.00E+00 | 0.00E+00 | 1.78E+00 |
| | Transport | A2 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.14E-01 |
| | Manufacturing | A3 | 8.36E+00 | 0.00E+00 | 0.00E+00 | 4.78E+00 |
| | Total (Consumption grid) | A1-3 | 1.10E+01 | 0.00E+00 | 0.00E+00 | 6.97E+00 |
| Construction process stage | Transport | A4 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.99E-02 |
| | Construction | A5 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.04E-01 |
| End of life | Deconstruction, demolition | C1 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | Transport | C2 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.99E-02 |
| | Waste processing | C3 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 7.62E-03 |
| | Disposal | C4 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.73E-02 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | 0.00E+00 | 0.00E+00 | 0.00E+00 | -9.13E-01 |

SM = Use of secondary material;
RSF = Use of renewable secondary fuels;
NRSF = Use of non-renewable secondary fuels;
FW = Net use of fresh water

## LCA Results (continued)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

| Other environmental information describing waste categories | | | | | |
|---|---|---|---|---|---|
| | | | HWD | NHWD | RWD |
| | | | kg | kg | kg |
| Product stage | Raw material supply | A1 | 1.44E+01 | 0.00E+00 | 0.00E+00 |
| | Transport | A2 | 7.50E+00 | 7.56E+01 | 4.04E-02 |
| | Manufacturing | A3 | 3.39E+01 | 5.75E+02 | 1.18E-02 |
| | Total (Consumption grid) | A1-3 | 5.58E+01 | 6.51E+02 | 5.22E-02 |
| Construction process stage | Transport | A4 | 3.95E-01 | 7.01E+00 | 2.42E-03 |
| | Construction | A5 | 1.10E+00 | 1.83E+02 | 4.49E-05 |
| End of life | Deconstruction, demolition | C1 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | Transport | C2 | 3.95E-01 | 7.01E+00 | 2.42E-03 |
| | Waste processing | C3 | 1.75E-01 | 1.23E+00 | 9.23E-04 |
| | Disposal | C4 | 6.84E-02 | 1.44E+02 | 2.11E-04 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | -1.70E+00 | -5.18E+01 | -1.51E-03 |

HWD = Hazardous waste disposed;
NHWD = Non-hazardous waste disposed;
RWD = Radioactive waste disposed

## LCA Results (continued)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

| Other environmental information describing output flows – at end of life | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | CRU | MFR | MER | EE | Biogenic carbon (product) | Biogenic carbon (packaging) |
| | | | kg | kg | kg | MJ per energy carrier | kg C | kg C |
| Product stage | Raw material supply | A1 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | Transport | A2 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | Manufacturing | A3 | 0.00E+00 | 1.68E-01 | 2.49E-09 | 0.00E+00 | 0.00E+00 | 6.89E+01 |
| | Total (Consumption grid) | A1-3 | 0.00E+00 | 1.68E-01 | 2.49E-09 | 0.00E+00 | 0.00E+00 | 6.89E+01 |
| Construction process stage | Transport | A4 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | Construction | A5 | 0.00E+00 | 2.91E-01 | 4.96E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| End of life | Deconstruction, demolition | C1 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | Transport | C2 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | Waste processing | C3 | 0.00E+00 | 1.74E-04 | 2.79E-06 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | Disposal | C4 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |

CRU = Components for reuse;
MFR = Materials for recycling

MER = Materials for energy recovery;
EE = Exported Energy

# Scenarios and additional technical information

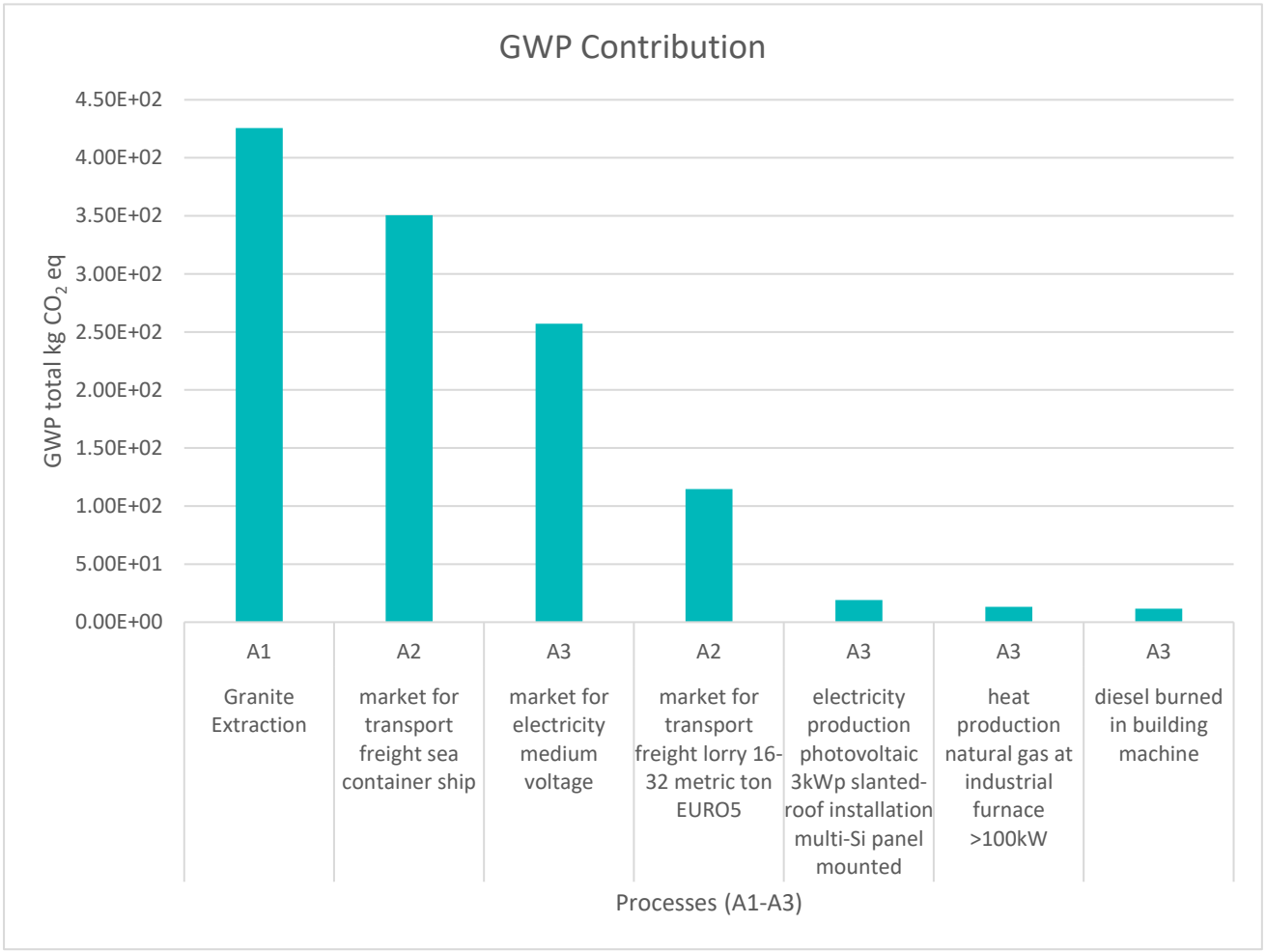
| Scenarios and additional technical information | | | |
|---|---|---|---|
| Scenario | Parameter | Units | Results |
| A4 – Transport to the building site | 50km by road has been modelled for module A4 as a typical distance from the factory gate to the construction installation site. However, end-users of the EPD can use this information to calculate the impacts of a bespoke transport distance for module A4 if required. | | |
| | Road transport (km) | Lorry, 16-32 tonne | 50 |
| | Bulk density | kg/m$^3$ | 2850 |
| | Litres per km | Litres | 0.227 |
| A5 – Installation in the building | The installation of the granite product is assumed to involve standard mechanical placement at the construction site. In accordance with EN 15804, no additional energy use or ancillary materials (e.g. adhesives, sealants, or fixings) are included in Module A5, as their contribution is considered negligible.<br>Module A5 is included in this assessment to ensure proper accounting of biogenic carbon associated with the wooden packaging materials (pallets). The biogenic carbon stored in the wood is assumed to be released at the installation stage, in line with EN 15804 requirements for carbon flows.<br>End of life scenario for treatment of wood waste has been taken from BRE PCR EN15804+A2 v3.2 | | |
| Installation waste | 0% | | |
| Packaging waste | Wood waste to recycling | kg | 56.151 |
| | Wood waste to incineration | kg | 119.32 |
| | PE waste to incineration | kg | 3.985 |
| | Steel waste to recycling | kg | 0.048 |
| | Paper/Cardboard waste to recycling | kg | 0.149 |
| C1 - Deconstruction | At the end of life, granite slabs are removed during building deconstruction using heavy machinery. The recovered granite can often be recycled into new products or used as aggregate in construction projects. Some companies specialise in repurposing granite countertops or slabs into smaller items like tiles, pavers, or decorative accents. If the granite slabs are in good condition, they may be salvaged and reused in other construction projects. Additionally, some companies or individuals may be interested in purchasing used granite for various purposes, such as creating custom furniture or outdoor installations. The energy attributed to the removal of granite slabs during deconstruction is negligible compared to the overall demolition process, so therefore no impacts from C1.<br><br>It's assumed as 100% recovery of the waste granite at the demolition facility. | | |
| C2 – Transportation | 50km by road has been modelled for module C2 as a typical distance from the demolition site to the disposal unit. However, end-users of the EPD can use this information to calculate the impacts of a bespoke transport distance for module C2 if required. | | |
| | Litres per km | Litres | 0.227 |
| | Fuel type / Vehicle type | Road transport | 16–32-ton lorry |
| | Deconstruction site to the disposal unit | km | 50 |

| Scenarios and additional technical information | | | |
|---|---|---|---|
| Scenario | Parameter | Units | Results |
| C3 – Preprocessing | At the pre-processing sector, waste management facilities can employ workers to manually sort through mixed construction waste to separate out recyclable materials, including granite. This process may involve conveyor belts and sorting stations where workers can pick out granite waste for recycling or another reuse. According to BRE EN15804 PCR 3.2 – industrial average Landscape hard surfacing (paving), Granite (setts, Chinese) EOL scenario has used which has 85% of the granite waste will be recycled and 10% of the waste will be reused and 5% is considered as a natural loss during the recycling process. | | |
| | 10% of the Granite waste to reuse | kg | 285 |
| | 85% of the Granite waste to recycling | kg | 2422.5 |
| C4 – Disposal | 5% of the waste will be considered as a natural loss during the recycling process and it will be sent to landfill. | | |
| | 5% of the Granite waste to landfill | kg | 142.5 |
| Module D | Recycling granite products at the end of their service life reduces the demand for virgin stone extraction and helps to divert waste from landfill. In the benefits calculation, 100% virgin material is assumed, as no secondary material is included in the final product. Recycled granite may also be processed for use in construction applications such as aggregates, paving materials, and landscaping products. In this analysis its assumed as 100% yield for the recycling processing | | |
| | Products Recycled Content (post-consumer) | Kg | 0 |
| | Recovered for recycling | Kg | 2422.5 |
| | Recovered for re-use | Kg | 0 |
| | Recovered for energy | Kg | 0 |

## Interpretation of results

The bulk of the environmental impacts and primary energy demand are attributed to the extraction and processing of the granite slabs, covered by information modules A1-A3 of EN15804:2012+A2:2019.
The bar chart titled "GWP Contribution" (Global Warming Potential) shows the relative greenhouse gas emissions from various processes involved in the granite production and supply chain. Here's a summary of the interpretation:

- Granite Extraction (A1) is the highest contributor to GWP, indicating that the quarrying process itself is the most carbon-intensive stage.
- Transport by Sea Container Ship (A2) and Electricity Use (A3) also contribute significantly, with the sea freight having the second-highest impact, likely due to long-distance shipping of heavy granite materials.
- Transport by Lorry (A2) has a moderate contribution, reflecting overland transportation emissions.
- The remaining sources—photovoltaic electricity production, natural gas heating at industrial furnaces, and diesel used in machinery (all A3)—have much lower GWP contributions in comparison.



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EN 12372 - Determines the flexural (bending) strength of stone, indicating its ability to resist breaking under load.

EN 12371 - Assesses the durability of stone under repeated freeze–thaw cycles, simulating weathering conditions.

EN 1936 - Measures apparent density and open porosity, which influence strength, durability, and water uptake.
EN 13755 - Determines the amount of water absorbed, an indicator of durability and resistance to weathering.

EN 13364 - Evaluates the breaking load at anchor/dowel points, important for mechanically fixed cladding systems.

EN 14157 - Measures resistance to surface wear, relevant for flooring and high-traffic applications.

EN 14231 - Assesses slip resistance, ensuring safety for pedestrian use, especially in wet conditions.

EN 1926 - Determines the compressive strength, indicating the stone's ability to withstand loads without crushing.

EN 1469:2015 - Specifies requirements for stone slabs used in façade cladding, including performance and conformity.

EN 12057:2015 - Covers dimensioned stone tiles used for floors, walls, and other modular applications.

EN 12058:2015 - Defines requirements for larger stone slabs used in flooring and stair applications.

EN 1341:2014 - Applies to flat paving stones used in outdoor areas such as walkways and plazas.

EN 1342:2014 - Covers small block stones (setts) typically used for roads, driveways, and pavements.

EN 1343:2014 - Specifies requirements for kerbstones, used for edging roads and pavements.

EN 1468:2012 - Defines requirements for unfinished stone slabs, typically used as intermediate products for further processing.