

ENVIRONMENTAL PRODUCT DECLARATION

This EPD is in accordance with ISO 14025 and EN 15804.

Owner of the declaration:	Beer Sten AS
Program operator:	The Norwegian EPD Foundation
Publisher:	The Norwegian EPD Foundation
Declaration number:	NEPD-4060-3090-EN
Issue date:	19.12.2022
Valid to:	19.12.2027

BeerEcoSten® Europe - The Norwegian Selection

BEER & LUNDHS Breeze™
BEER & LUNDHS Earth™
BEER & LUNDHS Night™
BEER & LUNDHS Sea™
BEER & LUNDHS Sky™

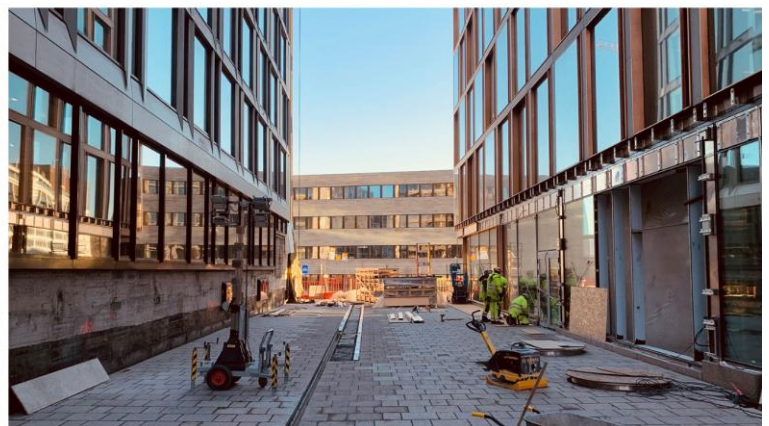
BEER STEN AS

Etabl ★ 1879

Et trygt valg

Beer Sten AS

www.epd-norge.no



General information

Product

BEER & LUNDHS Breeze™
 BEER & LUNDHS Earth™
 BEER & LUNDHS Night™
 BEER & LUNDHS Sea™
 BEER & LUNDHS Sky™

Program holder

Næringslivets Stiftelse for Miljødeklarasjoner
 Postboks 5250 Majorstuen, 0303 Oslo
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 e-mail: post@epd-norge.no

Declaration number

NEPD-4060-3090-EN

This declaration is based on Product Category Rules:

EN 15804:2012+A1:2013 v.1.0 (24.11.2013).
 NPCR Part A v.1.0 for Construction products and services (07.04.2017).
 NPCR 018 v.1.0 Part B for natural stone products, aggregates and fillers
 (20.05.2020).

Statements:

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

Declared unit:

Declared unit with option:

Functional unit:

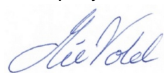
1 tonne of BeerEcoSten® installed in roads/pavements/parking lots/city squares/driveways/gardens/parks etc.

Verification:

Independent verification of the declaration and data, according to ISO14025:2010

internal external

Third party verifier:



Mie Vold - LCA.no AS
 (Independent verifier approved by EPD Norway)

Owner of the declaration

EPD owner: Beer Sten AS
 Contact person: Monica Midtun Sander
 Phone: +47 415 52 474
 e-mail: monica@beersten.no
 Address: Habornveien 56
 1630 Gamle Fredrikstad

Manufacturer

Raw material manufacturer: Lundhs AS
 Address: Kanalgata 59, 3263 Larvik
 Telephone: +47 90776451
 Email: rolf.nilsen@lundhs.no

Three manufactures was declared, here named as;
 Portugal 1
 Portugal 2
 Portugal 3
 Can be provided upon request.

Place of production:

Norway (extraction): Krukåsen, Larvik, Norge
 Portugal (manufacturing)

Management system:

Organisation no:

952 440 330

Issue date

19.12.2022

Valid to

19.12.2027

Year of study:

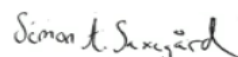
2021

Comparability:


EPD of construction products may not be comparable if they do not comply with EN15804 and are seen in a building context. EPDs from other programmes than EPD-Norway may not be comparable.

The EPD has been worked out by:

Simon A. Saxegård




Approved



Håkon Hauan
 Managing Director of EPD-Norway

Product

Product description:

BeerEcoSten® Europe is a product group of stone products with different colors of natural stone. The stones are already declared from block cutting to harbour (A1-A4) which in this EPD is used as A1 and part of A2 inputs to the A1-A3 aggregation. The product group includes paving, wallstones, elements and curbs in an infinite variety of sizes. During installation it is only curb stones that requires adhesive concrete. A specific installation scenario (A5) is described for curb stones because these require additional B30 concrete.

Technical data:

Density of product: 2.6 t/m³

Product specifications are tested in accordance to standards:
 NS-EN 1926 (Compressive strength).
 NS-EN 12372 (Bending tensile strength).
 NS-EN 13755 (Water absorption).

Product specification

Declared stone types	Water absorption	Bending tensile strength		Compressive strenght		Mineral composition
BEER & LUNDHS Breeze™	0,03 %	14,6	Mpa	264	Mpa	Feldspar, nepheline, pyroxene, olivine, amphibole, opagues, apatite, biotite
BEER & LUNDHS Earth™	0,09 %	10,7	Mpa	155	Mpa	Plagioclase feldspar, pyroxene, opagues, chlorite
BEER & LUNDHS Night™	0,16 %	12,5	Mpa	174,8	Mpa	Feldspar, pyroxene, olivine, amphibole, opagues, apatite, biotite
BEER & LUNDHS Sea™	0,14 %	11,4	Mpa	175,8	Mpa	Feldspar, nepheline, pyroxene, olivine, amphiboles, opagues, apatite, biotite
BEER & LUNDHS Sky™	0,03 %	14,9	Mpa	251,8	Mpa	Feldspar, pyroxene, nepheline, amphibole, opagues, biotite, olivine, apatite

Use and application:

- Elements and wallstones
- Curb stone
- Pavers
- Setts and cubes
- Steps

Market: Norway

Reference service life:

>60 years.

All products are licensed for road use according to strength and property parameters.
 All products are intended for outdoor use.

Average data:

This EPD declares natural stone products, from five types of materials, in various shapes, sizes and surfaces. The manufacturing data collected represent an average of all variations. A test was performed to investigate variations in the amount of saw dust from variations in saw blade thicknesses for cutting. It was found less than 10% variations in amounts of saw dust for the smallest stones cut (10x10x10) across the range of saw blade thicknesses. Similarly, flaming contributed with less than 10% variation for all stone sizes. Data were normalised per tonne stone product sold from manufacturer. Cut wastages, flaming, administrative consumables, and waste management are averaged accordingly.

LCA: Calculation rules

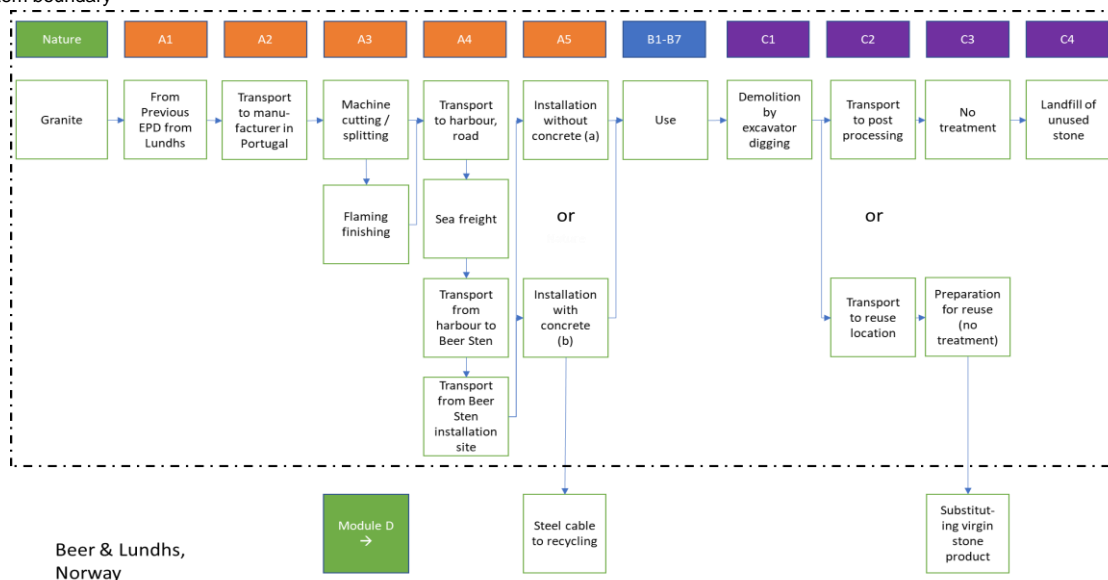
Functional unit

1 tonne of BeerEcoSten® Europe installed in roads/pavements/parking lots/city squares/driveways/gardens/parks etc.

System boundary:

The system boundary includes the whole life cycle of BeerEcoSten® Europe natural stone products from Portugal, installed, used, and handled after end-of-useful-life in Norway.

Figure 1: System boundary



Data quality:

Data quality: Good quality. Data based on manufacturer and Beer Sten AS.
 Transport based on information from distribution actors.
 Database data based on Ecoinvent 3.8, where no data are more than 10 years old.
 LCA software: SimaPro 9.4.0.2
 Year of average data from manufacturer: 2019, 2020 from raw material provider.

Cut-off criteria:

All major raw materials and all the essential energy flows are included. The production processes for raw materials and energy flows that are included with very small amounts (<1%) are not included. This cut-off rule does not apply for hazardous materials and substances.

Allocation:

The allocation is made in accordance with the provisions of ISO 14025 and the definitions in EN 15804+A1 and NPCR 018 Part B. The manufactured natural stones make up 100% of the revenue for two of the three factories in Portugal. For Portugal 2 the revenue of the co-product stone flour was 1.2%. Mass allocation was used between the three factories according to the weighted production: 16.2% Portugal 1, 80.5% Portugal 2, and 3.3% Portugal 3. The net allocation between the co-product stone flour (from Portugal 2) and the total amount of natural stones provided from Portugal will thus be far less than 1% and is accordingly negligible. However, we here chose to include an economic allocation for the Portugal 2 inventories with 98.8% of the activity to the declared functional unit as the data were readily available.

LCA: Scenarios and additional technical information

The following information describes the scenarios in the different modules of the EPD.

Transport from production place to assembly/user (A4)

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance km	Fuel/Energy consumption	Value (l/t)
Truck	55 %	>32 EURO 4	45	0,0221 l/tkm	1,0
Boat	60 %	10802 DWT container ship	1342	0,0040 l/tkm	5,4
Boat	60 %	13000 DWT container ship	1342	0,0054 l/tkm	7,3
Truck	55 %	>32 EURO 6 B7 fuel	90	0,0221 l/tkm	2,0

Stones are transported from the factories in Portugal to Lexioes harbour (45 km) before being shipped to Fredrikstad with a transshipment in Rotterdam. Sea vessel sizes have been adjusted according to information from EPD owner. Fuel consumption is based on Smith et al. (2014).

Assembly (A4) Intermediate storage

	Unit	Value
Beer Sten AS' sales and storage operation	t	1

Activities at Beer Sten AS are included as storage activity during the transport phase A4. Impacts associated with the storage are yearly activities and direct emissions divided on the annual sales of all natural stones.

Assembly (A5)

	Unit	Value
Excavator in operation	min/t	2

Assembly (A5b) Curbe stone installment with concrete

	Unit	Value
Excavator in operation	min/t	2
Concrete B30 (NEPD-2327-1071-NO)	m ³ /t	0,0007

Use phase (B1-B7)

No activity necessary to achieve the function of the declared unit. Natural stones are products which need no maintenance, washing or other activities to fulfill their intended use through the entire use time.

End of Life (C1, C3, C4)

Natural stone products can be reused. No national statistics on the life cycle scenario of natural stones are available, so a conservative approach was selected in accordance with NPCR 018. The end-of-life treatments typical for natural stone products are either direct reuse (80%), i.e., reuse as raw material to new stone produce, or reuse as raw material to gravel/sand production (10%) or as inert landfill (10%).

C1 Demolition

	Unit	Value
Excavator in operation	min/t	10

The demolition phase is mainly performed by hand, but it is likely some other machinery, like an excavator aiding the process.

Transport to waste processing (C2)

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance km	Fuel/Energy consumption	Value (l/t)
Truck	36 %	16-32t EURO 5	50	0,043287 l/tkm	2,2

C3 Waste treatment

	Unit	Value
Rock crushing, for landfill	t	0,1
Rock crushing, as recycling	t	0,1
Preparing reuse of rocks (no activity)	t	0,8

C4 Disposal

	Unit	Value
Inert waste, landfill	t	0,1

Benefits and loads beyond the system boundaries (D)

	Unit	Value
Natural stone, reused at site or nearby	t	0,8
Crushed stone, recycled to road constructions etc.	t	0,1

Natural stone products can in most cases be reused directly for refurbishment or new installments. Beer Sten describes that about 10% will be landfilled/long time stored (>3 years) as inert gravel, leaving 90% to be reused either as natural stones (80%) or downcycled to gravel (10%). Crushing to gravel is included as the waste management process.

Additional technical information

The stones will maintain the same technical properties as described for the declared functional unit when reused or recycled.

LCA: Results

The results present the environmental and resource impacts, as well as delivered outputs, connected to the declared unit as described in EN 15804+A1. This EPD is made for each of the stone blocks manufactured in Portugal, and therefore multiple results for A1-A3 are presented.

System boundaries (X=included, MND=module not declared, MNR=module not relevant)

Product stage			Assembly stage		Use stage							End of life stage				Beyond the system boundaries
Raw materials	Transport	Manufacturing	Transport	Assembly	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
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Environmental impact - Lundhs stones transported and manufactured in Portugal

Parameter	Unit	A1-A3 Earth™	A1-A3 Sky™	A1-A3 Night™	A1-A3 Sea™	A1-A3 Breeze™
GWP	kg CO2 -eqv	6,0E+01	6,5E+01	7,3E+01	8,6E+01	1,0E+02
ODP	kg CFC11 -eqv	8,2E-06	8,8E-06	1,0E-05	1,3E-05	1,6E-05
POCP	kg C2H4 -eqv	2,5E-02	2,5E-02	0,0E+00	3,0E-02	3,4E-02
AP	kg SO2 -eqv	7,2E-01	7,2E-01	8,0E-01	9,1E-01	1,1E+00
EP	kg PO43 -eqv	1,2E-01	1,2E-01	1,4E-01	1,6E-01	2,1E-01
ADPM	kg Sb -eqv	2,8E-04	2,9E-04	2,9E-04	2,9E-04	3,1E-04
ADPE	MJ	7,8E+02	8,6E+02	9,8E+02	1,2E+03	1,4E+03

Environmental impact Lundhs stones transported to Norway including all use scenarios and module D

Parameter	Unit	A4	A5a	A5b	B1-B7	C1	C2	C3	C4	D
GWP	kg CO2 -eqv	3,7E+01	2,2E+00	2,2E+00	0,0E+00	1,1E+01	8,2E+00	5,9E-03	6,7E-01	-9,6E+01
ODP	kg CFC11 -eqv	6,1E-06	3,9E-07	3,9E-07	0,0E+00	2,0E-06	1,5E-06	2,9E-10	2,1E-07	-1,6E-05
POCP	kg C2H4 -eqv	1,6E-02	3,3E-04	5,3E-04	0,0E+00	1,7E-03	1,1E-03	1,9E-06	1,5E-04	-1,7E-02
AP	kg SO2 -eqv	4,5E-01	7,6E-03	7,7E-03	0,0E+00	3,8E-02	2,6E-02	2,1E-05	4,9E-03	-6,6E-01
EP	kg PO43 -eqv	6,7E-02	1,7E-03	1,7E-03	0,0E+00	8,4E-03	5,8E-03	9,8E-06	1,1E-03	-1,8E-01
ADPM	kg Sb -eqv	1,1E-04	2,5E-06	2,5E-06	0,0E+00	1,2E-05	2,9E-05	1,2E-07	9,8E-07	-3,6E-04
ADPE	MJ	5,3E+02	3,3E+01	3,3E+01	0,0E+00	1,6E+02	1,3E+02	5,6E-02	1,8E+01	-1,3E+03

GWP Global warming potential; ODP Depletion potential of the stratospheric ozone layer; POCP Formation potential of tropospheric photochemical oxidants; AP Acidification potential of land and water; EP Eutrophication potential; ADPM Abiotic depletion potential for non fossil resources; ADPE Abiotic depletion potential for fossil resources

Resource use - Lundhs stones transported and manufactured in Portugal

Parameter	Unit	A1-A3 Earth™	A1-A3 Sky™	A1-A3 Night™	A1-A3 Sea™	A1-A3 Breeze™
RPEE	MJ	1,29E+02	1,42E+02	1,69E+02	1,42E+02	2,36E+02
RPEM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
TPE	MJ	1,29E+02	1,42E+02	1,69E+02	1,42E+02	2,36E+02
NRPE	MJ	7,96E+02	8,72E+02	9,93E+02	1,18E+03	1,42E+03
NRPM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
TRPE	MJ	7,96E+02	8,72E+02	9,93E+02	1,18E+03	1,42E+03
SM	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	kg	1,15E-03	3,26E-03	7,90E-03	4,65E-03	1,90E-02
NRSF	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
W	kg	7,96E+02	8,72E+02	9,93E+02	1,18E+03	1,42E+03

Resource use - Lundhs stones transported to Norway including all use scenarios and module D

Parameter	Unit	A4	A5a	A5b	B1-B7	C1	C2	C3	C4	D
RPEE	MJ	1,42E+01	2,63E-01	2,63E-01	0,00E+00	1,31E+00	1,78E+00	5,56E-01	3,85E-01	-1,35E+03
RPEM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
TPE	MJ	1,42E+01	2,63E-01	2,63E-01	0,00E+00	1,31E+00	1,78E+00	5,56E-01	3,85E-01	-1,35E+03
NRPE	MJ	5,15E+02	3,15E+01	3,15E+01	0,00E+00	1,58E+02	1,26E+02	9,01E-02	1,72E+01	-2,59E+03
NRPM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
TRPE	MJ	5,15E+02	3,15E+01	3,15E+01	0,00E+00	1,58E+02	1,26E+02	9,01E-02	1,72E+01	-2,59E+03
SM	kg	0,00E+00	0,00E+00	1,18E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-1,16E-04
NRSF	kg	0,00E+00	0,00E+00	4,26E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
W	kg	5,15E+02	3,15E+01	3,15E+01	0,00E+00	1,58E+02	1,26E+02	9,01E-02	1,72E+01	-2,59E+03

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 - Lundhs stones transported and manufactured in Portugal

Parameter	Unit	A1-A3 Earth™	A1-A3 Sky™	A1-A3 Night™	A1-A3 Sea™	A1-A3 Breeze™
HW	kg	1,15E-03	3,26E-03	7,90E-03	4,65E-03	1,90E-02
NHW	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RW	kg	7,96E+02	8,72E+02	9,93E+02	1,18E+03	1,42E+03

End of life - Waste - Lundhs stones transported to Norway including all use scenarios and module D

Parameter	Unit	A4	A5a	A5b	B1-B7	C1	C2	C3	C4	D
HW	kg	8,73E-04	8,60E-05	8,60E-05	0,00E+00	4,30E-04	3,28E-04	2,52E-07	2,47E-05	-3,33E-03
NHW	kg	2,86E+01	4,60E-01	4,60E-01	0,00E+00	2,30E+00	7,27E+00	8,16E-03	2,00E+02	-1,79E+01
RW	kg	3,39E-03	2,14E-04	2,14E-04	0,00E+00	1,07E-03	8,50E-04	6,59E-07	1,17E-04	-2,76E-02

HW Hazardous waste disposed; NHW Non hazardous waste disposed; RW Radioactive waste disposed

End of life - Output flow - Lundhs stones transported and manufactured in Portugal

Parameter	Unit	A1-A3 Earth™	A1-A3 Sky™	A1-A3 Night™	A1-A3 Sea™	A1-A3 Breeze™
RPEE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RPEM	MJ	6,97E-03	6,97E-03	6,97E-03	6,97E-03	7,00E-03
TPE	MJ	2,21E-02	2,21E-02	2,21E-02	2,21E-02	2,21E-02
NRPE	MJ	1,73E-02	1,73E-02	1,73E-02	1,73E-02	1,74E-02
NRPM	MJ	3,59E-02	3,59E-02	3,59E-02	3,59E-02	3,59E-02

End of life - Output flow - Lundhs stones transported to Norway including all use scenarios and module D

Parameter	Unit	A4	A5a	A5b	B1-B7	C1	C2	C3	C4	D
CR	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,00E-01	0,00E+00	0,00E+00
MR	kg	0,00E+00	1,40E-06	1,40E-06	0,00E+00	0,00E+00	0,00E+00	1,00E-01	0,00E+00	0,00E+00
MER	kg	8,68E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EEE	MJ	1,21E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
ETE	MJ	2,47E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

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

Reading example: 9,0 E-03 = 9,0*10⁻³ = 0,009

Figure 2: Contribution assessment Breeze™

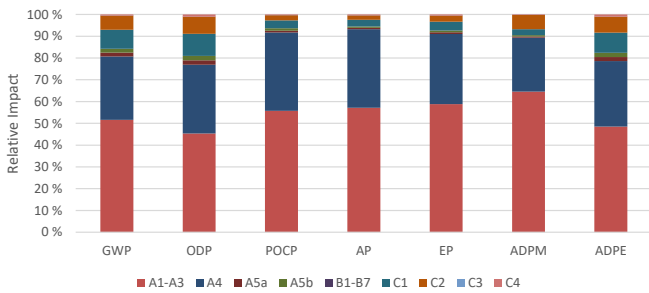
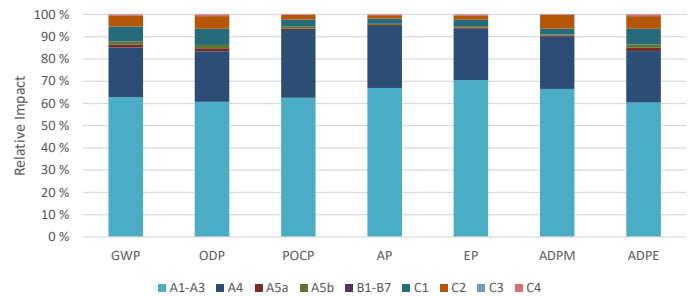


Figure 3: Contribution assessment Earth™



The figure above shows the contribution to environmental impacts from life cycle stages A1-C4 for Beer & Lundhs Breeze™, which has the highest A1-A3 GWP results. The impact distribution shows that the production stage A1-A3 is the main cause of potential environmental impact for BeerEcoSten® Europe. The second largest impact contribution stems from A4.

The figure above shows the impact contribution of A1-C4 for Earth™, which has the least A1-A3 impacts of the assessed Lundhs originated natural stone products manufactured in Portugal. The two diagrams can be assumed to indicate typical impact distributions.

Additional Norwegian requirements

Greenhouse gas emission from the use of electricity in the manufacturing phase

National production mix from import, medium voltage (production of transmission lines, in addition to direct emissions and losses in grid) of applied electricity for the manufacturing process(A3).

Data source	Amount	Unit
Ecoinvent v3.8 Electricity, medium voltage (PT) market for Cut-off, U	394	g CO2-eqv/kWh

Dangerous substances

- The product contains no substances given by the REACH Candidate list or the Norwegian priority list
- The product contains substances given by the REACH Candidate list or the Norwegian priority list that are less than 0,1 % by weight.
- The product contain dangerous substances, more then 0,1% by weight, given by the REACH Candidate List or the Norwegian Priority list, see table.
- The product contains no substances given by the REACH Candidate list or the Norwegian priority list. The product is classified as hazardous waste (Avfallsforskiten, Annex III), see table.

Name	CAS no.	Amount

Indoor environment

The product meets the requirements for low emissions.



No tests have been carried out on the product concerning indoor climate because the usage is intended for outdoor applications and installation.

Carbon footprint

Calculations connected to climate change and global warming potential (GWP) include greenhouse gas emissions from fossil sources and land use change connected to the extraction of natural stones, but does not include calculations of biogenic emissions of CO₂.

Bibliography

ISO 14025:2010	Environmental labels and declarations - Type III environmental declarations - Principles and procedures
ISO 14044:2006	Environmental management - Life cycle assessment - Requirements and guidelines
Ecoinvent v.3.8	Swiss Centre of Life Cycle Inventories. www.ecoinvent.ch
EN 15804:2012+A1:2013 v.1.0	Sustainability of construction works - Environmental product declaration - Core rules for the product category of construction products (24.11.2013).
ISO 21930:2007	Sustainability in building construction - Environmental declaration of building products
NEPD-2327-1071-NO	NEPD-2327-1071-NO, 1002 B30 M60 22mm
NEPD-2556-1293-NO	Naturstein av larvikitt, uttak av LUNDHS Blue
NEPD-2557-1297-NO	Naturstein av larvikitt, uttak av LUNDHS Ocean
NEPD-2558-1291-NO	Naturstein av larvikitt/anortositt, uttak av LUNDHS Antique
NEPD-2559-1290-NO	Naturstein av larvikitt, uttak av LUNDHS Marina
NEPD-2560-1289-NO	Naturstein av larvikitt, uttak av LUNDHS Emerald
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