

Environmental product declaration

in accordance with ISO 14025 and EN 15804+A2

Natural stone larvikite - extraction of LUNDHS Ocean



The Norwegian EPD Foundation

Owner of the declaration:

Lundhs AS

Product:

Natural stone larvikite - extraction of LUNDHS Ocean

Declared unit:

1 tonne

This declaration is based on Product Category Rules:

CEN Standard EN 15804:2012+A2:2019 serves as core PCR

NPCR 018:2022 Part B for natural stone products, aggregates and fillers

Program operator:

The Norwegian EPD Foundation

Declaration number:

NEPD-4898-4246-EN

Registration number:

NEPD-4898-4246-EN

Issue date: 31.08.2023

Valid to: 31.08.2028

EPD Software:

LCA.no EPD generator ID: 71393

General information

Product

Natural stone larvikite - extraction of LUNDHS Ocean

Program operator:

Post Box 5250 Majorstuen, 0303 Oslo, Norway
The Norwegian EPD Foundation
Phone: +47 23 08 80 00
web: post@epd-norge.no

Declaration number: NEPD-4898-4246-EN

This declaration is based on Product Category Rules:

CEN Standard EN 15804:2012+A2:2019 serves as core PCR
NPCR 018:2022 Part B for natural stone products, aggregates and fillers

Statement of liability:

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

Declared unit:

1 tonne Natural stone larvikite - extraction of LUNDHS Ocean

Declared unit with option:

A1-A3,A4,C1,C2,C3,C4,D

Functional unit:

General information on verification of EPD from EPD tools:

Independent verification of data, other environmental information and the declaration according to ISO 14025:2010, § 8.1.3 and § 8.1.4. Verification of each EPD is made according to EPD-Norway's guidelines for verification and approval requiring that tools are i integrated into the company's environmental management system, ii the procedures for use of the EPD tool are approved by EPD-Norway, and iii the process is reviewed annually by an independent third party verifier. See Appendix G of EPD-Norway's General Programme Instructions for further information on EPD tools

Verification of EPD tool:

Independent third party verification of the EPD tool, background data and test-EPD in accordance with EPDNorway's procedures and guidelines for verification and approval of EPD tools.

Third party verifier:

Martin Erlandsson, IVL Swedish Environmental Research Institute
(no signature required)

Owner of the declaration:

Lundhs AS
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Phone: +47 33 12 11 64
e-mail: marketing@lundhs.no

Manufacturer:

Lundhs AS

Place of production: Not

Lundhs AS
Kanalgata 59
3263 Larvik, Norway

Management system:

ISO 14001, sert. 17-010

Organisation no:

993 071 641

Issue date: 31.08.2023

Valid to: 31.08.2028

Year of study:

2022

Comparability:

EPD of construction products may not be comparable if they not comply with EN 15804 and seen in a building context.

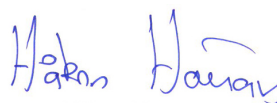
Development and verification of EPD:

The declaration is created using EPD tool lca.tools ver EPD2022.03, developed by LCA.no. The EPD tool is integrated in the company's management system, and has been approved by EPD Norway.

Developer of EPD: Helene Nesheim

Reviewer of company-specific input data and EPD: Clas Herland

Approved:



Håkon Hauan
Managing Director of EPD-Norway

Product

Product description:

LUNDHS Ocean is a coarse-grained rock of the monzonite (larvikite) type. The stone is around 300 million years old and consists mainly of feldspar minerals, which gives larvikite its characteristic blue color, the stone has a green-grey background.

LUNDHS Ocean has a homogenous appearance and is an excellent material for larger projects.

Product specification

Larvikite is a durable material and is particularly suitable for facades, tiles, worktops, crushed stone and as environmental stone.

Materials	Value	Unit
Stone	100%	

Technical data:

Mineralogy	%
Feldspar	77.5
Pyroxene	5.5
Biotite	3.5
Opaque (magnetite, ilmenite)	3.5
Olivine	3
Apatite	2
Amphibole	2

Market:

Main markets for raw blocks of larvikite are Italy, Spain, China, India and Vietnam.

Reference service life, product

Natural stone / larvikite has an almost unlimited lifespan.

Reference service life, building or construction works

Normally, the lifespan of buildings is assumed to be around 60 years.

LCA: Calculation rules

Declared unit:

1 tonne Natural stone larvikite - extraction of LUNDHS Ocean

Cut-off criteria:

All major raw materials and all the essential energy is included. The production processes for raw materials and energy flows with very small amounts (less than 1%) are not included. These cut-off criteria do not apply for hazardous materials and substances.

Allocation:

The allocation is made in accordance with the provisions of EN 15804. Incoming energy and water and waste production in-house is allocated equally among all products through mass allocation. Effects of primary production of recycled materials is allocated to the main product in which the material was used. The recycling process and transportation of the material is allocated to this analysis.

Lundhs' main product is raw blocks of stone. In Krukeåsen, the stone is also used for landscaping purposes. All consumption in the production is allocated to both the raw blocks and the landscaping stone. Land fill have zero consumption.

Data quality:

Specific data for the product composition are provided by the manufacturer. The data represent the production of the declared product and were collected for EPD development in the year of study. Background data is based on EPDs according to EN 15804 and different LCA databases.

Data for extraction and transport of LUNDHS Ocean is based on specific consumption figures from Lundhs' quarry in Krukeåsen from 2022.

Generic data from Norsk Bergindustri's EPD calculator is also used.

Materials	Source	Data quality	Year
Explosives	ecoinvent 3.6	Database	2019
Stein	LCA.no	Database	2021

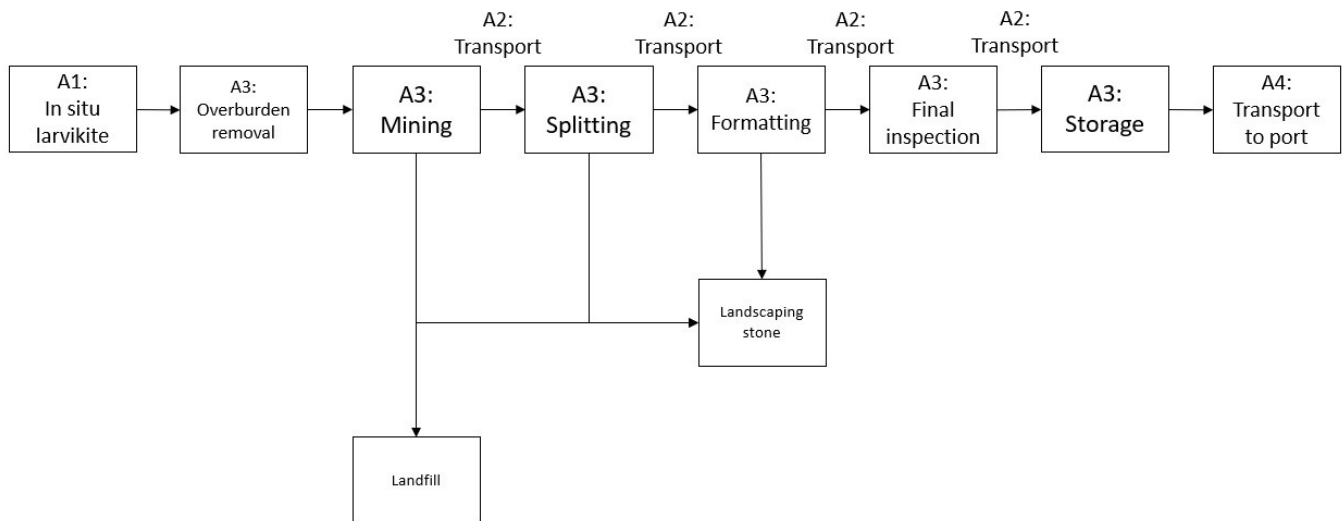
System boundaries (X=included, MND=module not declared, MNR=module not relevant)

Product stage			Construction installation 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	De-construction 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	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X

System boundary:

Modules A1-A4 for own production are included in the analysis. A1-A3 includes the extraction of stone from the quarry, internal transport and mass handling, formatting, sorting and depositing of masses. A4 is the transport of raw blocks from the quarry to the port of Larvik. The raw blocks are exported from Larvik by ship to larger factories abroad which are responsible for the further processing into other natural stone products.

As Larvikite is an everlasting material and the end result of a raw block is endless, modules C1-C4 and D are generic examples with 70% of the masses going to recycling and 30% to landfill.



Additional technical information:

- Apparent density, EN 1936, 2732 kg/m³
- Open porosity, EN 1936, 0,40%
- Water absorption, EN 13755, 0,14 % weight
- Compressive strength, EN 1926, 175,8 MPa
- Flexural strength, EN 12372, 11,4 MPa
- Rupture energy, EN 14158, 4,9 J





LCA: Scenarios and additional technical information

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

Transport from production place to user (A4)	Capacity utilisation (incl. return) %	Distance (km)	Fuel/Energy Consumption	Unit	Value (Liter/tonne)
Lastebil med henger over 32 tonn, EURO 6 (km)	53,3 %	9	0,023	l/tkm	0,21
De-construction demolition (C1)		Unit	Value		
Riving av steinmaterialer, C1 (kg)	kg/DU	1000,00			
Transport to waste processing (C2)	Capacity utilisation (incl. return) %	Distance (km)	Fuel/Energy Consumption	Unit	Value (Liter/tonne)
Lastebil, 16-32 tonn, EURO 6 (km)	36,7 %	85	0,043	l/tkm	3,66
Waste processing (C3)		Unit	Value		
Avfallsbehandling av steinprodukt etter riving (kg)	kg	700,00			
Disposal (C4)		Unit	Value		
Avfall, stein, til deponi (kg)	kg	300,00			
Benefits and loads beyond the system boundaries (D)		Unit	Value		
Substitusjon av stein (kg)	kg	700,00			

LCA: Results

The LCA results are presented below for the declared unit defined on page 2 of the EPD document.

Environmental impact									
Indicator	Unit	A1-A3	A4	C1	C2	C3	C4	D	
 GWP-total	kg CO ₂ -eq	1,88E+01	7,84E-01	4,00E+00	1,39E+01	5,04E-01	1,29E+00	-5,62E+08	
 GWP-fossil	kg CO ₂ -eq	1,87E+01	7,84E-01	4,00E+00	1,39E+01	4,97E-01	1,28E+00	-5,50E+08	
 GWP-biogenic	kg CO ₂ -eq	1,09E-02	3,36E-04	7,50E-04	5,75E-03	4,29E-03	1,09E-03	-1,10E+07	
 GWP-luluc	kg CO ₂ -eq	2,56E-03	2,39E-04	3,15E-04	4,94E-03	6,88E-04	2,52E-04	-3,72E+05	
 ODP	kg CFC11 -eq	4,94E-06	1,89E-07	8,64E-07	3,15E-06	9,80E-08	6,26E-07	-1,00E+02	
 AP	mol H ⁺ -eq	2,00E-01	2,52E-03	4,19E-02	3,99E-02	4,02E-03	1,25E-02	-4,95E+06	
 EP-FreshWater	kg P -eq	9,32E-05	6,24E-06	1,46E-05	1,11E-04	3,14E-05	9,59E-06	-1,46E+04	
 EP-Marine	kg N -eq	8,46E-02	5,53E-04	1,85E-02	7,90E-03	1,18E-03	4,70E-03	-1,72E+06	
 EP-Terrestrial	mol N -eq	9,42E-01	6,16E-03	2,00E-01	8,83E-02	1,36E-02	5,18E-02	-2,02E+07	
 POCP	kg NMVOC -eq	2,57E-01	2,42E-03	5,57E-02	3,38E-02	3,64E-03	1,48E-02	-5,33E+06	
 ADP-minerals&metals ¹	kg Sb -eq	6,62E-05	1,40E-05	6,14E-06	3,84E-04	6,31E-06	1,14E-05	-4,89E+04	
 ADP-fossil ¹	MJ	3,21E+02	1,27E+01	5,51E+01	2,10E+02	1,54E+01	4,15E+01	-9,31E+09	
 WDP ¹	m ³	6,52E+02	9,76E+00	1,17E+01	2,03E+02	1,70E+03	8,73E+01	-4,37E+11	

GWP-total = Global Warming Potential total; 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; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption







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

*INA Indicator Not Assessed

1. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator

Remarks to environmental impacts

Additional environmental impact indicators







Indicator	Unit	A1-A3	A4	C1	C2	C3	C4	D
 PM	Disease incidence	4,94E-06	7,20E-08	5,07E-06	8,50E-07	6,44E-08	2,67E-07	-1,06E+02
 IRP ²	kgBq U235 -eq	1,41E+00	5,56E-02	2,40E-01	9,18E-01	2,59E-01	1,80E-01	-8,55E+07
 ETP-fw ¹	CTUe	6,90E+02	9,31E+00	3,01E+01	1,56E+02	1,09E+01	2,05E+01	-9,59E+09
 HTP-c ¹	CTUh	6,51E-09	0,00E+00	1,00E-09	0,00E+00	7,00E-10	6,00E-10	-4,81E-01
 HTP-nc ¹	CTUh	1,49E-07	9,00E-09	2,80E-08	1,70E-07	9,80E-09	1,20E-08	-1,18E+01
 SQP ¹	dimensionless	4,33E+02	1,46E+01	6,69E+00	1,47E+02	8,73E+00	1,51E+02	2,11E+10

PM = Particulate Matter emissions; IRP = Ionizing radiation – human health; ETP-fw = Eco toxicity – freshwater; HTP-c = Human toxicity – cancer effects; HTP-nc = Human toxicity – non cancer effects; SQP = Potential Soil Quality Index (dimensionless)

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

*INA Indicator Not Assessed

1. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator
2. This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.




Resource use									
Indicator	Unit	A1-A3	A4	C1	C2	C3	C4	D	
 PERE	MJ	3,06E+01	1,60E-01	3,00E-01	3,01E+00	7,95E+00	6,38E-01	-2,18E+09	
 PERM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	
 PERT	MJ	3,06E+01	1,60E-01	3,00E-01	3,01E+00	7,95E+00	6,38E-01	-2,18E+09	
 PENRE	MJ	3,21E+02	1,27E+01	5,51E+01	2,10E+02	1,54E+01	4,15E+01	-9,83E+09	
 PENRM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	
 PENRT	MJ	3,21E+02	1,27E+01	5,51E+01	2,10E+02	1,54E+01	4,15E+01	-9,83E+09	
 SM	kg	3,61E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	
 RSF	MJ	8,53E-02	5,60E-03	0,00E+00	1,08E-01	0,00E+00	1,32E-02	-4,46E+07	
 NRSF	MJ	5,64E-01	1,88E-02	0,00E+00	3,84E-01	0,00E+00	3,79E-02	-4,58E+07	
 FW	m ³	5,18E-01	1,45E-03	2,83E-03	2,25E-02	2,64E-02	4,94E-02	-3,42E+08	

PERE = Use of renewable primary energy excluding renewable primary energy resources 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 resources; SM = Use of secondary materials; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Net use of fresh water

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

*INA Indicator Not Assessed

End of life - Waste






Indicator	Unit	A1-A3	A4	C1	C2	C3	C4	D
 HWD	kg	2,50E-02	6,97E-04	1,62E-03	1,08E-02	1,54E-03	0,00E+00	-2,24E+06
 NHWD	kg	8,05E+02	1,11E+00	6,52E-02	1,02E+01	4,87E-02	3,00E+02	-6,81E+07
 RWD	kg	1,46E-03	8,69E-05	3,82E-04	1,43E-03	1,63E-04	0,00E+00	-7,39E+04

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

*Reading example: 9,0 E-03 = $9,0 \cdot 10^{-3} = 0,009$

*INA Indicator Not Assessed

End of life - Output flow

Indicator	Unit	A1-A3	A4	C1	C2	C3	C4	D
 CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
 MFR	kg	1,47E-01	0,00E+00	0,00E+00	0,00E+00	7,00E+02	0,00E+00	0,00E+00
 MER	kg	7,97E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
 EEE	MJ	3,44E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
 EET	MJ	5,20E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported energy electrical; EET = Exported energy thermal

*Reading example: 9,0 E-03 = $9,0 \cdot 10^{-3} = 0,009$

*INA Indicator Not Assessed

Biogenic Carbon Content

Indicator	Unit	At the factory gate
Biogenic carbon content in product	kg C	0,00E+00
Biogenic carbon content in accompanying packaging	kg C	0,00E+00

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO₂

Additional requirements

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

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

Electricity mix	Data source	Amount	Unit
Elektrisitet, Norge (kWh)	ecoinvent 3.6	24,33	g CO ₂ -eq/kWh

Dangerous substances

The product contains no substances given by the REACH Candidate list or the Norwegian priority list.

Indoor environment

Additional Environmental Information






Additional environmental impact indicators required in NPCR Part A for construction products								
Indicator	Unit	A1-A3	A4	C1	C2	C3	C4	D
GWPIOBC	kg CO ₂ -eq	1,53E+01	7,84E-01	4,00E+00	1,39E+01	9,23E-01	0,00E+00	-5,89E+08

GWPI-IOBC: Global warming potential calculated according to the principle of instantaneous oxidation. In order to increase the transparency of biogenic carbon contribution to climate impact, the indicator GWP-IOBC is required as it declares climate impacts calculated according to the principle of instantaneous oxidation. GWP-IOBC is also referred to as GWP-GHG in context to Swedish public procurement legislation.

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.
 EN 15804:2012+A2:2019 Environmental product declaration - Core rules for the product category of construction products.
 ISO 21930:2007 Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products.
 ecoinvent v3, Allocation, cut-off by classification, Swiss Centre of Life Cycle Inventories.
 Iversen et al., (2021) eEPD v2021.09 Background information for EPD generator tool system verification, LCA.no Report number: 07.21
 Vold, M., and Iversen, O. M. K. (2022) EPD generator for for NPCR 018 Part B for natural stone products, aggregates and fillers
 Background information for EPD generator application and LCA data, LCA.no report number: 09.22.
 NPCR Part A: Construction products and services. Ver. 2.0, 24.03.2021 EPD Norway.
 NPCR 018 Part B for natural stone products, aggregates and fillers, Ver. 1.1, 20.01.2022, EPD Norway.

The Excel file for data collection is saved as a reference in the document folder in the EPD generator for the owner of this declaration.

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