Rakennustietosäätiö RTS Building Information Foundation RTS

RTS EPD, No.RTS_57_20

Slate: yard and façade stone

Scope of the Declaration

This environmental product declaration covers the environmental impacts of Finnish slate yard and façade stone. The declaration has been prepared in accordance with EN 15804:2012+A1:2013 and ISO 14025 standards and the additional requirements stated in the RTS PCR (English version, 14.6.2018). This declaration covers the life cycle stages from cradle-to-gate with options including transportation to installation site, deconstruction, transportation, treatment, and recovery of the product at its end-of-life.

29.4.2020 (date of RTS meeting)
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Laura Sariola
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ECO EPD Ref. no. 00001212

General information, declaration scope and verification (7.1)

1. Owner of the declaration, manufacturer

Kivi ry,
Kasarmikatu 5, 15700 LAHTI
Sini Laine, Executive Director
+358 50 330 1630
sini.laine@kivi.info

2. Product name and number

Slate yard and façade stone produced in Finland.

3. Place of production

Place of production: Suomi
Manufacturers: Liuskemestarit Oy, Ikikivi Oy, KiviHerttua Oy.

4. Additional information

More information can be found at webpage of the company: https://kivi.info/

5. Product Category Rules and the scope of the declaration

This EPD has been prepared in accordance with EN 15804:2012+A1:2013 and ISO 14025 standards together with the RTS PCR (English version, 14.6.2018). Product specific category rules have not been applied in this EPD. EPD of construction materials may not be comparable if they have not been done according to EN 15804.

6. Author of the life cycle assessment and declaration

Anastasia Sipari and Valtteri Kainila
Bionova Oy
www.bionova.fi
Date of study 20.4.2020

7. Verification

This EPD has been verified according to the requirements of ISO 14025:2010, EN 15804: 2012+A1:2013 and RTS PCR by a third party. The verification has been carried out by Teija Käpynen, Vahanen Environment Oy, Date of the declaration 20.4.2020

8. Declaration issue date and validity

29.4.2020 (Date of RTS meeting) Valid trough: 29.4.2020- 20.4.2025

European standard EN 15804: 2014 A1 serves as the core PCR
Independent verification of the declaration and data, according to ISO14025:2010
☐ Internal ☑ External
Third party verifier: Teija Käpynen Vahanen Environment Oy

Product information

9. Product description

This EPD represents average street slab stones made in Finland. The market of the product is Finland.

10. Technical specifications

Slate yard and façade stones are manufactured from Finnish slate. They are used in yard covering, cladding of indoor wall surfaces and in facades.

11. Product standards

SFS-EN 1341:2013, Slabs of natural stone for external paving

EN 771-6:2012, Specification for masonry units. Part 6: Natural stone masonry units

12. Physical properties

1. Yard stone

Yard stone is typically a 3 - 6 cm thick piece of stone with varying shapes and other dimensions, which has been cut to size by hand. The diagonal of the stone is typically between 200 - 1000 mm long. The base unit yard stone is sold with is a pallet square. The number of stones in a pallet square varies between 1-12 kpl/m2. A single pallet square weigh is approximately 80 - 110 kg/m2.

2. Façade stone

Stone tiles made from slate to be used in masonry are commonly called façade stones or masonry slate. The depth of a tile is typically 80 - 120 mm. The length and thickness vary greatly depending on the type of slate. The weight of masonry slate is typically between 150 - 250 kg/m2.

13. Raw materials of the product

Product structure / composition / raw-material	Amount %
Natural stone	100 %

14. Substances under European Chemicals Agency's REACH, SVHC restrictions

Name	EC Number	CAS Number
The product does not contain REACH SVHC substances.		

15. Functional / declared unit

1 ton of yard or façade stone made from Finnish slate. Conversion factors are presented in the table below. The conversion factors are presented for 1 m2 of example product with thickness of 40 mm for yard stone and depth (thickness of stone layer on the wall the stone is installed in) of 80 mm for façade stone.

Description	Amount	Unit
Functional / declared unit	1	t
Typical thickness (Yard stone)	40	mm
Typical thickness (Façade stone)	80	mm
Volume for 1 m2 (Yard stone)	0,04	m3
Volume for 1 m2 (Façade stone)	0,08	m3
Density	2700	kg/m3
Weight for 1 m2 (Yard stone)	0,108	t/m2
Weight for 1 m2 (Façade stone)	0,216	t/m2

16. System boundary

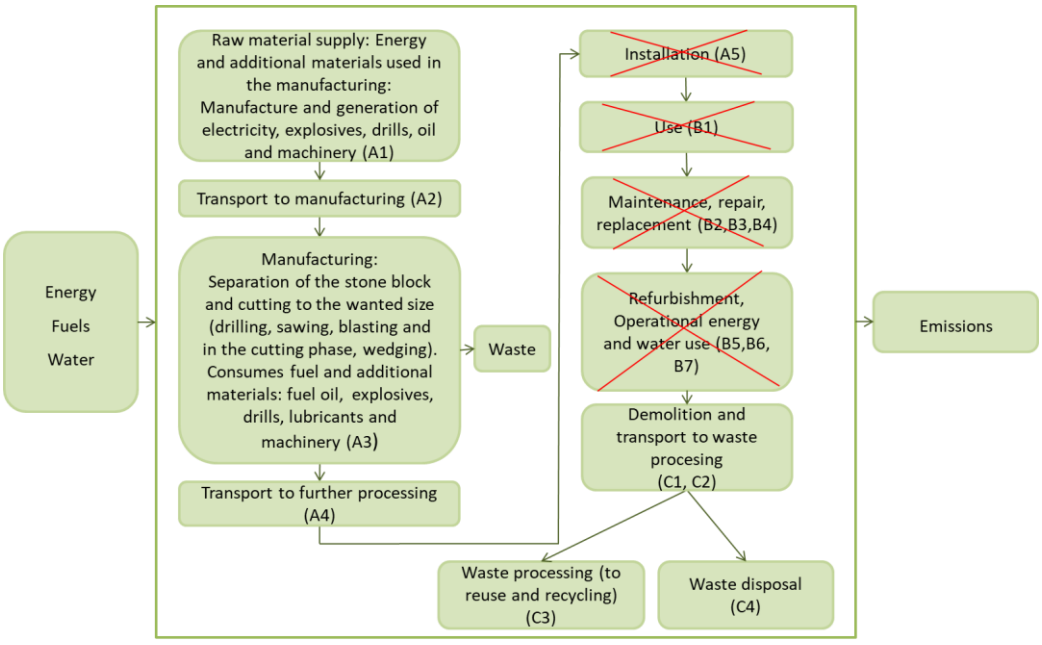
This EPD covers the following modules; A1 (Raw material supply), A2 (Transport), A3 (Manufacturing) and A4 (Transportation of the product to the building site) as well as C1 (Deconstruction), C2 (Transport at end-of-life), C3 (Waste processing) and C4 (Disposal). In addition, module D - benefits and loads beyond the system boundary - have been included. No modules or processes required by EN 15804 and RTS PCR were excluded from this assessment. No harmful substances were excluded from the study.

17. Cut-off criteria

Modules A1-A3 environmental impacts include all the used materials, energy, and transportation until the end-of-waste state. In addition, the vehicles and construction equipment used at the quarry have been considered. A4 transportation has been estimated to be 213 km, the return trip has not been considered. Of module C all impacts have been calculated (C1-C4). C1 includes the deconstruction. The distance for C2 has been estimated to be 50 km. C3 includes the energy use of rock crushing for recycling of the product (50 %). Module D considers the benefits of recycling and reuse of natural stone that replace primary material. An assumption is made that 50 % of the product is reused at end of life.

18. Production process

The products manufacturing stages: separation of the stone block, cutting it into smaller blocks and then into the wanted shape and size. A flow chart of the process is presented below



Scope of the Life-Cycle Assessment (7.2.1-2)

Below are all the covered modules of the EPD, which are marked with X. Mandatory modules are marked with blue in the table below. This declaration covers “cradle-to-gate with options”. For other fields mark MND (module not declared) or NR (module not relevant)

Product stage			Assembly stage		Use stage							End of life stage				Beyond the system boundaries		
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	D	D
x	x	x	x	NR	NR	NR	NR	NR	NR	NR	NR	x	x	x	x	x	x	x
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

Mandatory modules
Mandatory as per the RTS PCR section 6.2.1 rules and terms
Optional modules based on scenarios

Environmental impacts and raw-material use (7.2.3-7.2.4)

19. Environmental impacts

The results of a life cycle assessment are relative. They do not predict impact on category endpoints, exceeding of limit values, safety margins, or risks. The impacts are presented per declared unit, 1 ton of slate yard or façade stone. The impacts are mainly caused by the manufacturing process (A3). The results are presented in scientific form, interpretation example: 3,54E-2 = 3,54*10-2 = 0,0354

Environmental impact, Yard stone								
Parameter	**Unit**	**A1-A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Global warming potential	kg CO2 -eqv	2,89E+1	1,85E+1	0E0	2,17E+0	1,66E-1	0E0	-1,99E+1
Depletion of stratospheric ozone layer	kg CFC11-eqv	4,43E-6	3,63E-6	0E0	4,26E-7	1,67E-8	0E0	-2,55E-6
Formation of photochemical ozone	kg C2H4 -eqv	7,24E-3	2,94E-3	0E0	3,45E-4	3,48E-5	0E0	-5,31E-3
Acidification	kg SO2 -eqv	1,97E-1	5,95E-2	0E0	6,98E-3	8,70E-4	0E0	-1,27E-1
Eutrophication	kg PO4 3--eqv	4,06E-2	1,00E-2	0E0	1,18E-3	1,14E-4	0E0	-2,42E-2
Abiotic depletion of non-fossil resources	kg Sb-eqv	7,56E-4	1,15E-4	0E0	1,34E-5	1,84E-7	0E0	-5,41E-4
Abiotic depletion of fossil resources	MJ	4,13E+2	2,90E+2	0E0	3,40E+1	2,52E+0	0E0	-2,82E+2

Environmental impact, Façade stone								
Parameter	**Unit**	**A1-A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Global warming potential	kg CO2 -eqv	7,67E+1	1,85E+1	0E0	2,17E+0	1,66E-1	0E0	-4,38E+1
Depletion of stratospheric ozone layer	kg CFC11-eqv	1,34E-5	3,63E-6	0E0	4,26E-7	1,67E-8	0E0	-7,03E-6
Formation of photochemical ozone	kg C2H4 -eqv	1,65E-2	2,94E-3	0E0	3,45E-4	3,48E-5	0E0	-9,94E-3
Acidification	kg SO2 -eqv	4,49E-1	5,94E-2	0E0	6,98E-3	8,70E-4	0E0	-2,53E-1
Eutrophication	kg PO4 3--eqv	8,79E-2	1,00E-2	0E0	1,18E-3	1,14E-4	0E0	-4,79E-2
Abiotic depletion of non-fossil resources	kg Sb-eqv	1,26E-3	1,15E-4	0E0	1,34E-5	1,84E-7	0E0	-7,93E-4
Abiotic depletion of fossil resources	MJ	1,03E+3	2,89E+2	0E0	3,40E+1	2,52E+0	0E0	-5,90E+2

20. Use of natural resources

Resource use, Yard stone								
Parameter	**Unit**	**A1-A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Renewable primary energy resources used as energy carrier	MJ	2,42E-2	5,23E+0	0E0	6,14E-1	0E0	0E0	-1,21E-2
Renewable primary energy resources used as raw materials	MJ	6,03E+1	0E0	0E0	0E0	5,19E-1	0E0	-3,56E+1
Total use of renewable primary energy resources	MJ	6,04E+1	5,23E+0	0E0	6,14E-1	5,19E-1	0E0	-3,56E+1
Nonrenewable primary energy resources used as energy carrier	MJ	1,38E+0	2,98E+2	0E0	3,50E+1	0E0	0E0	-6,90E-1
Nonrenewable primary energy resources used as materials	MJ	4,38E+2	0E0	0E0	0E0	4,05E+0	0E0	-3,03E+2
Total use of non-renewable primary energy resources	MJ	4,39E+2	2,98E+2	0E0	3,50E+1	4,05E+0	0E0	-3,03E+2
Use of secondary materials	kg	7,17E-1	1,25E-1	0E0	1,46E-2	0E0	0E0	-3,59E-1
Use of renewable secondary fuels	MJ	0E0	0E0	0E0	0E0	0E0	0E0	0E0
Use of non-renewable secondary fuels	MJ	2,48E+0	4,70E-1	0E0	5,52E-2	6,36E-3	0E0	-1,49E+0
Use of net fresh water	m3	1,34E-1	6,49E-2	0E0	7,62E-3	2,63E-3	0E0	-2,53E-1

Resource use, Façade stone								
Parameter	**Unit**	**A1-A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Renewable primary energy resources used as energy carrier	MJ	4,08E-2	5,22E+0	0E0	6,14E-1	0E0	0E0	-2,04E-2
Renewable primary energy resources used as raw materials	MJ	2,89E+2	0E0	0E0	0E0	5,19E-1	0E0	-1,50E+2
Total use of renewable primary energy resources	MJ	2,89E+2	5,22E+0	0E0	6,14E-1	5,19E-1	0E0	-1,50E+2
Nonrenewable primary energy resources used as energy carrier	MJ	2,33E+0	2,98E+2	0E0	3,50E+1	0E0	0E0	-1,17E+0
Nonrenewable primary energy resources used as materials	MJ	1,59E+3	0E0	0E0	0E0	4,05E+0	0E0	-8,79E+2
Total use of non-renewable primary energy resources	MJ	1,60E+3	2,98E+2	0E0	3,50E+1	4,05E+0	0E0	-8,84E+2
Use of secondary materials	kg	1,97E+0	1,25E-1	0E0	1,46E-2	0E0	0E0	-9,85E-1
Use of renewable secondary fuels	MJ	0E0	0E0	0E0	0E0	0E0	0E0	0E0
Use of non-renewable secondary fuels	MJ	4,33E+0	4,70E-1	0E0	5,52E-2	6,36E-3	0E0	-2,42E+0
Use of net fresh water	m3	8,64E-1	6,49E-2	0E0	7,62E-3	2,63E-3	0E0	-6,18E-1

21. End of life – Waste

Waste, Yard stone								
Parameter	**Unit**	**A1-A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste	kg	6,32E-2	7,84E-3	0E0	9,20E-4	2,14E-5	0E0	-3,56E-2
Non-hazardous waste	kg	2,18E+0	2,59E+1	0E0	3,04E+0	8,19E-3	0E0	-1,90E+0
Radioactive waste	kg	2,66E-3	2,12E-3	0E0	2,48E-4	2,31E-5	0E0	-1,57E-3

Waste, Façade stone								
Parameter	**Unit**	**A1-A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste	kg	1,24E-1	7,83E-3	0E0	9,20E-4	2,14E-5	0E0	-6,60E-2
Non-hazardous waste	kg	5,69E+0	2,59E+1	0E0	3,04E+0	8,19E-3	0E0	-3,66E+0
Radioactive waste	kg	1,32E-2	2,12E-3	0E0	2,48E-4	2,31E-5	0E0	-6,84E-3

22. End of life – Output flows

Output flow, Yard stone								
Parameter	**Unit**	**A1-A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Components for reuse	kg	0E0	0E0	0E0	0E0	0E0	0E0	0E0
Materials for recycling	kg	2,81E-2	1,19E-4	0E0	1,40E-5	4,24E-6	0E0	-1,48E-2
Materials for energy recovery	kg	2,68E-11	5,80E-12	0E0	6,80E-13	6,92E-14	0E0	-1,73E-11
Exported energy	MJ	0E0	0E0	0E0	0E0	0E0	0E0	0E0

Output flow, Façade stone								
Parameter	**Unit**	**A1-A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Components for reuse	kg	0E0	0E0	0E0	0E0	0E0	0E0	0E0
Materials for recycling	kg	5,90E-2	1,19E-4	0E0	1,40E-5	4,24E-6	0E0	-3,03E-2
Materials for energy recovery	kg	8,10E-11	5,79E-12	0E0	6,80E-13	6,92E-14	0E0	-4,44E-11
Exported energy	MJ	0E0	0E0	0E0	0E0	0E0	0E0	0E0

Scenarios and additional technical information (7.3)

23. Electricity in the manufacturing phase (7.3. A3)

A3 data quality of electricity and CO2 emission kg CO2 eq. / kWh	FI 0,24	The environmental impacts of Finnish average electricity are based on ecoinvent 3.4 database resource "Market for electricity, medium voltage" Finland, 2018

24. Transport from production place to user (7.3.2 A4)

Variable	Amount	Data quality
Fuel type and consumption in **liters / 100 km**	50	Source: www.lipasto.vtt.fi
Transportation distance **km**	213	Information given by manufacturer
Transport capacity utilization **%**	100	Assumption
Bulk density of transported products **kg/m^3**	Varies	Information given by manufacturer
Volume capacity utilisation factor (factor: =1 or <1 or ≥ 1 for compressed or nested packaged products)	1	Assumption

25. End-of-life process description (7.3.4)

Processes	**Unit** (expressed per functional unit or per declared unit of components products or materials and by type of material)	**Amount kg/kg Data quality**
Collection process specified by type	kg collected separately	1000
	kg collected with mixed construction waste	0
Recovery system specified by type	kg for re-use	500
	kg for recycling	500
	kg for energy recovery	0
Disposal specified by type	kg product or material for final deposition	0
Waste transport	units as appropriate	Transportation distance estimation based on average recycling facility locations. 50 km

26. Additional technical information

Additional information can be found on the webpages of KIVI Ry and the manufacturers.

27. Additional information (7.4)

Air, soil, and water impacts during the use phase have not been studied.

28. Bibliography

ISO 14025:2010 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+A1 Sustainability in construction works – Environmental product declarations – Core rules for the product category of construction products. RTS PCR 14.6.2018 RTS PCR protocol: EPDs published by the Building Information Foundation RTS sr. PT 18 RT EPD Committee. (English version)