



Rakennustietosäätiö RTS Building Information Foundation RTS

RTS EPD,
No.RTS_55_20
Rectangular paving stones

Scope of the Declaration

This environmental product declaration covers the environmental impacts of Finnish rectangular paving stones. 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)
Building Information Foundation RTS
Malminkatu 16 A
00100 Helsinki <http://cer.rts.fi>

Laura Sariola
Committee Secretary

Markku Hedman
RTS General Director



This verified Environmental Product Declaration was created with One Click LCA - the world leading life-cycle assessment, life-cycle costing and sustainability metrics tool designed by Bionova Ltd, Finland, www.oneclicklca.com.



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

Rectangular paving stones produced in Finland.

3. Place of production

Place of production: Suomi
Manufacturers: Tampereen Kovakivi Oy, Kymen Granite Oy, Kurun Kivi Oy, Interrock Oy, Ikikivi Oy, RG Stone 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 rectangular paving stones made in Finland. The market of the product is Finland.

10. Technical specifications

Rectangular paving stones are manufactured from Finnish natural stone and they are used in many different paving and covering applications, e.g. in yard covering, street, and market plaza pavements, and traffic in circles. There are two methods for making rectangular paving stones: guillotine cutting and sawing. In cutting, the stone is simply cut to appropriate size, but in sawing the upwards facing side is often also treated by burning.

11. Product standards

SFS-EN 1342:2013, Setts of natural stone for external paving

12. Physical properties

The size of the stones varies. Typical dimensions for rectangular paving stones are 140x200x140 +/-15 mm and 100x100x100 mm.

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 Nuber
The product does not contain REACH SVHC substances.		



15. Functional / declared unit

1 ton of rectangular paving stones. Conversion factors are presented in the table below. The conversion factors are presented for 1 m² of example product with a thickness of 100 mm and ja 140 mm.

Description	Amount	Unit
Functional / declared unit	1	t
Thickness (stone size 100x100x100)	100	mm
Thickness (stone size 140x200x140)	140	mm
Volume for 1 m ² of stone (stone size 100x100x100)	0,10	m ³
Volume for 1 m ² of stone (stone size 140x200x140)	0,14	m ³
Density	2700	kg/m ³
Weight for 1 m ² of stone (stone size 100x100x100)	0,270	t/m ²
Weight for 1 m ² of stone (stone size 140x200x140)	0,378	t/m ²

16. System boundary

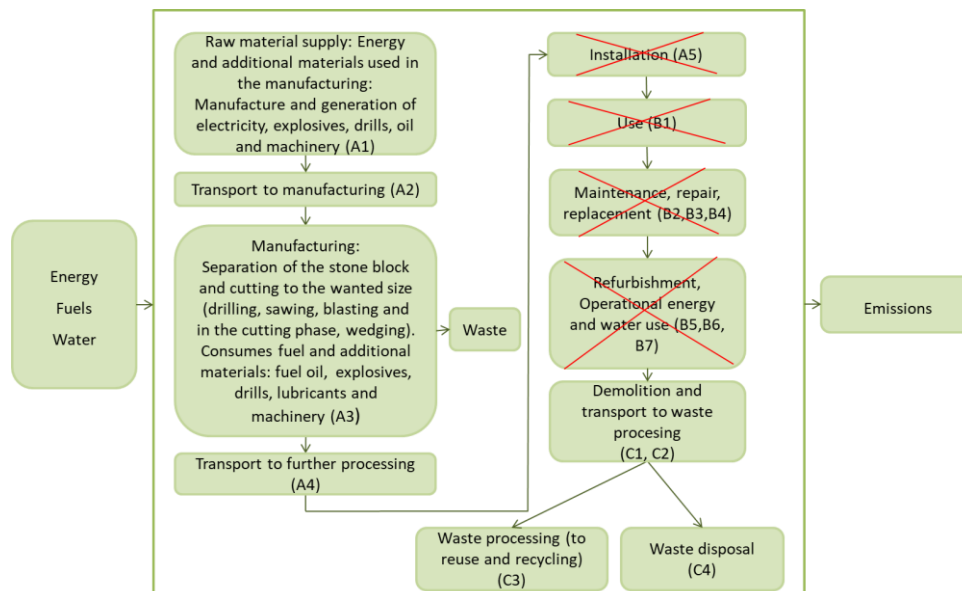
This EPD covers the following modules; A1 (Raw material supply), A2 (Transport), A3 (Manufacturing) and A4 (Transportation of the product to the building site) as well as C1 (Deconstruction), C2 (Transport at end-of-life), C3 (Waste processing) and C4 (Disposal). In addition, module D - benefits and 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 100 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 rectangular paving stones. The impacts are mainly caused by the manufacturing process (A3). The results are presented in scientific form, interpretation example: $3,54E-2 = 3,54 \cdot 10^{-2} = 0,0354$

Environmental impact, Rectangular paving stones								
Parameter	Unit	A1-A3	A4	C1	C2	C3	C4	D
Global warming potential	kg CO ₂ -eqv	5,00E+1	8,67E+0	0E0	2,17E+0	1,66E-1	0E0	-3,04E+1
Depletion of stratospheric ozone layer	kg CFC11-eqv	8,64E-6	1,70E-6	0E0	4,26E-7	1,67E-8	0E0	-4,65E-6
Formation of photochemical ozone	kg C ₂ H ₄ -eqv	1,17E-2	1,38E-3	0E0	3,45E-4	3,48E-5	0E0	-7,54E-3
Acidification	kg SO ₂ -eqv	3,27E-1	2,79E-2	0E0	6,98E-3	8,70E-4	0E0	-1,92E-1
Eutrophication	kg PO ₄ 3--eqv	6,73E-2	4,71E-3	0E0	1,18E-3	1,14E-4	0E0	-3,76E-2
Abiotic depletion of non-fossil resources	kg Sb-eqv	7,82E-4	5,38E-5	0E0	1,34E-5	1,84E-7	0E0	-5,54E-4
Abiotic depletion of fossil resources	MJ	7,15E+2	1,36E+2	0E0	3,40E+1	2,52E+0	0E0	-4,33E+2



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

Variable	Amount	Data quality
Fuel type and consumption in liters / 100 km	50	Source: www.lipasto.vtt.fi
Transportation distance km	100	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)