

# Environmental Product Declaration



In accordance with ISO 14025, 15804:2012+A2:2019 and ISO 21930 for:

## Roofinggreen® NATURE M20

by

**Roofinggreen Srl**



Programme:	The International EPD® System, <a href="http://www.environdec.com">www.environdec.com</a>
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## Programme information

<b>Programme:</b>	The International EPD® System  EPD International AB Box 210 60 SE-100 31 Stockholm Sweden  <a href="http://www.environdec.com">www.environdec.com</a> <a href="mailto:info@environdec.com">info@environdec.com</a>
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CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product category rules (PCR): <i>Construction products, PCR 2019:14 version 1.11</i>
PCR review was conducted by: <i>IVL Swedish Environmental Research Institute Secretariat of the International EPD® System</i>
Independent third-party verification of the declaration and data, according to ISO 14025:2006:  <input type="checkbox"/> EPD process certification <input checked="" type="checkbox"/> EPD verification
Third party verifier: <i>Ugo Pretato-Studio Fieschi &amp; soci srl, Approved Individual Verifier</i>  Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier:  <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

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EPDs within the same product category but from different programmes may not be comparable.  
EPDs of construction products may not be comparable if they do not comply with EN 15804.

## 1. General information

Owner of the EPD: Roofinggreen Srl., +39.011.0714037, info@roofinggreen.it, Via Pinelli, 31 10144 Torino, Italy

Description of the organisation: Roofinggreen Srl is a company that designs and manufactures modular outdoor flooring systems. The modules are made with recycled plastic SUPPORTS, insulation systems and synthetic grass. The manufacturers of the plastic supports, synthetic grass finish and insulating layer of Roofinggreen systems are certified according to UNI EN ISO 9001 and UNI EN ISO 14001.

Roofinggreen products are not subject to CE marking as they do not fall under harmonized standards. (ASHRAE 90.1-2010 mandatory provisions)

Name and location of production site: The production of *Nature M20 modules* is located at Via Torino 137, 13040, Palazzolo Vercellese (VC), Italy.

Contact: Dario Campra, Arch.

## 2. The company

Roofinggreen is a company founded in Turin, Italy, which in 2012 devised an innovative outdoor flooring system combining, in a single module, aesthetic qualities and high levels of technical performance.

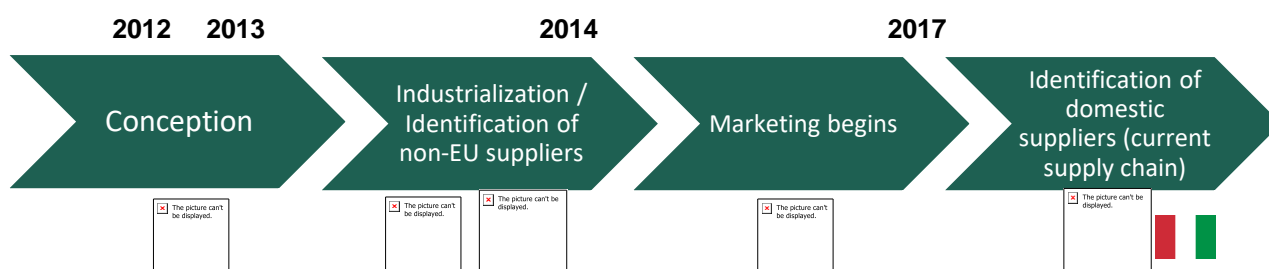
The extensive experience of its founders in the field of architecture and design has resulted in the company's specific and distinctive approach towards the identification of green surface coverings as an element to be developed in contemporary construction.

After a few years of in-depth experimentation and after setting up production on an industrial scale, Roofinggreen began, in 2014, to market its first modules, nationally and internationally. In a short time, the company positioned itself as a young industrial reality in the sector, collaborating with important real estate groups and international architects with installations in Europe, the Far East and the USA, redefining the concept of the traditional green roof.

The company has always placed the issues of sustainability, circularity and durability of building materials as foundational elements of its business.

The application areas are extremely transversal and embrace all primary sectors, from real estate to the public sector, from contracts to retail.

An important milestone was achieved in 2017, when Italgreen Spa acquired share capital of the company, providing industrial impetus and technical know-how to the world of synthetic grass. Since this moment, the entire production chain has become 100% made in Italy, recruiting logistically efficient suppliers and subcontractors, in addition to guaranteeing quality and punctuality in supply management.



Currently, the Company works with several Italian companies that supply semi-finished products and services, using equipment owned exclusively by Roofinggreen.

The consolidation of the domestic market and the ambition to pursue high quality standards prompted the Company to obtain **ISO 9001** certification in 2021.

### 3. Product information

Product name: Roofinggreen® NATURE M20

UN CPC code:36910 -Floor coverings of plastics, in rolls or in the form of tiles; wall or ceiling coverings of plastics

Geographical scope:Global

#### 3.1. Product description - Roofinggreen® NATURE M20

Roofinggreen® Nature M20 is part of the Nature series and is designed as a modular raised flooring system characterized by a high degree of comfort and high thermal insulation capacity that can result in significant energy savings in both winter and summer periods.

The model is designed for use in combination with the adjustable supports of the B product line to create a height-adjustable raised flooring system.

The cavity underneath (when contained within 4/ 5 cm) together with the perimeter edge closure, contributes to the thermal insulation of the underlying surface, since the recompressed air is stationary, as demonstrated by the research activity carried out in collaboration with the Polytechnic University of Turin (Politecnico di Torino).

This aspect must be considered in the design stratigraphy, and thus the overall heat input is conferred by the combination of the insulating layer and stationary air space.

Nature M20 modules are suitable for outdoor applications on waterproofed surfaces.

Typical applications include balconies, solar slabs, flat-roofed low buildings and flat surfaces.

#### 3.2. Production chain - Roofinggreen® NATURE M20:

Roofinggreen® coordinates, manages and monitors all stages in the production of Roofinggreen® NATURE M20 modules in order to ensure the quality of materials, production processes and installation methods.

The stages of the production chain include the production and assembly of different materials in order to package the flooring modules, ready to be delivered to the customer for installation.

Thanks to multidisciplinary studies conducted, Roofinggreen® is able to provide accessories and support for installation on any surface, guaranteeing the best performance of the flooring mantle with Roofinggreen® NATURE M20 modules.

The production chain for the manufacturing of Roofinggreen® NATURE M20 modules consist of the following stages:

- **Joining synthetic grass rolls to insulation rolls:** synthetic grass rolls are thermally joined to polyethylene foam (XPE) insulation rolls and cut into sheets;
- **Cutting the sheets into contoured modules:** the composite layers of grass and insulation are cut into modules of 0.50x0.50m, shaped with dovetails for interlocking;
- **Production of backing tiles:**the plastic backing tile is produced by injection molding using recycled polycarbonate granules;
- **Assembling and bonding:** the polycarbonate tile is joined to the plastic turf sheet and foam material using adhesive;

- **Module packing:** the modules are packed in boxes, placed on pallets and protected with stretch film.

### 3.3. Technical information - Roofinggreen® NATURE M20

Roofinggreen® Nature is a modular system ideal for the cladding, insulation and flooring of horizontal outdoor surfaces.

Thanks to a special support structure, with support bases at adjustable heights supplied separately, it allows for elevated and ventilated surfaces.

The integration of a pleasant synthetic turf with an insulating layer improves the aesthetic qualities and thermal insulation of the building.

The NATURE M20 line makes it possible to upgrade terraces, balconies, paved areas of any size and shape by:

- improving water run off
- protecting the waterproof covering of slabs from day/night temperature changes
- facilitating the passage of electrical cables or 'drip' irrigation systems
- overcoming height differences and mitigating the natural slopes of exterior flat surfaces



The table below shows the technical and technological specifications of the Roofinggreen® NATURE M20 system modules.

MATERIAL SPECIFICATIONS	
Synthetic Grass	
Material	polyethylene/polypropylene (PE/PP) monofilament, multi-shade
Backing	polypropylene (PP)
Foam Layer	
Material	XPE (cross-linked expanded polyethylene)
Thickness	20 mm (± 10%)
Base Structure	
Material	polycarbonate (PC)
Module	
Length / Width	530 mm (± 2 mm) x 530 mm (± 2 mm)
Height	50mm (± 5%)
Weight	2.5kg (± 10%)
Drainage Holes	12 with 6mm diameter
INSTALLED SYSTEM	
Surface Area	4 modules per 1 square meter
Height	50mm module only, 95-195mm in combination with the B series support feet
Weight	10 kg/m2 (± 10%)
TECHNICAL PERFORMANCE	
Parameter	Value
Compressive Strength	2.5 kN/m2 distributed load
Drainage Capacity	40 l / min / m2
Colour Fastness UV Exposure	Grey scale ≥ 4 – ISO EN 20105-A02, 5000h exposure (Xenon)
Sunlight Exposure	Low intensity zones (≤ 120 kLy): minimum 10 years
	Medium intensity zones (140-160 kLy): minimum 7 years
	High intensity zones (≥ 180 kLy): minimum 5 years
	The number of years refer to the period in which there should be no visible change. Beyond this period a gradual colour change of the synthetic grass may occur; data are indicative and may be affected by particular local conditions.
Chemical Resistance	Excellent resistance to acids, alkalis, oils, mould, rot and soil. Suitable for installation near pools (chlorine) and seaside (salt). Resistant to salt used for melting snow.
Service Temperature Range	-20°C to 75°C









### 3.4. Product description - Roofinggreen® B range supports

Roofinggreen's B range of support feet are designed to be used in conjunction with Roofinggreen® NATURE M20 and M20Drain modules to create a raised surface.

The two types of bases (feet) B50 and B100 have different heights. Each foot has an integrated screwable part that allows the height of the system to be adjusted; thus, a range of about 90 to 200 mm in height can be obtained for the raised surface.

The support feet contribute to the creation of a stable flooring system with a high degree of microventilation, exceptional water drainage properties, and, in addition, important thermal insulation properties.

They also facilitate the passage of cables, piping for systems, etc. under the surface of the Roofinggreen modules.

Brange adjustable feet are installed on Roofinggreen® GroundCare, an accessory for waterproof surface protection.

### 3.5. Production chain - Roofinggreen® B range supports:



Roofinggreen® coordinates, manages and monitors all stages in the production of Roofinggreen® B range supports in order to ensure the quality of materials, production processes and installation methods.

Stages in the production chain include: quality testing and control of materials; injection moulding of recycled polypropylene granules; packaging in boxes placed on pallets and protected with stretch film.

### 3.6. Technical information - Roofinggreen® B range supports:

The B50 and B100 supports belonging to Roofinggreen's B range are of the following heights:

- 55 mm (not including the screw) for the B50
- 105 mm (not including the screw) for the B100

The surface of the M20 module mounted on a B50 base has a range of 9.5 to 11.5 cm, while that mounted on B100 has a range of about 14.5 to 19.5 cm.

Each module requires the use of at least 4 support feet (16 supports per m<sup>2</sup> of NATURE M20 or M20 Drain) an extra support foot placed in the centre of the module in case more stability is needed.

B 50 supports are packaged in boxes containing 32 pieces, while B 100 supports are in packs of 64 pieces.

The technical and technological specifications of the B range supports are as follows:

- - Material: black recycled estrude polypropylene
- - Dimensions: the B50 support's dimensions are 85x85x h67/87 mm, the B100's dimensions are 85X85X117/167 mm
- - Weight: the B50 stand weighs 180g, and the B100 stand weighs 300g.



## 4. Life Cycle Assessment

### 4.1. Study objectives and LCA information.

The objective of this study is to assess the potential environmental impacts of 1 m<sup>2</sup> of outdoor modular flooring system.

This EPD is aimed at B2B communication.

The following table shows the main information from the LCA study:

<u>Functional unit / declared unit:</u> 1m <sup>2</sup> of modular flooring, consisting of 4 modules.
<u>Time representativeness:</u> 2019
<u>Database(s) and LCA software used:</u> Ecoinvent v. 3.7.1 (cut-off allocation dataset); SimaPro9.2.0.1; methods LCIA: EF 3.0 v. 1.01, EDIP2003 v.1.07, IPCC2013, AWARE v1.04, CED v.1.11
<u>Description of system boundaries:</u> Cradle-to-gate with modules C1-C4 and module D.
<u>System boundaries:</u> A1-A3, C1-C4, D
<u>Excluded lifecycle stages:</u> A4-A5, B1-B7
<u>Additional information:</u>
<u>LCA analysis:</u> This study was conducted by Francesca Thiebat and Corrado Carbonaro of the Department of Architecture and Design, with support from the LaSTIn laboratory, Polytechnic University of Turin (Politecnico di Torino), Viale Mattioli 39, 10125, Turin, Italy.
<u>Reference legislation:</u> EN 15804:2012+A2:2019; ISO 21930; PCR 2019:14 'Construction products' Version 1.11: General Programme Instructions for the international EPD© SYSTEM, v.3.01 (2019-09-18)

## 4.2. System boundaries

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
Modules	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
	Rawmaterial supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Modules declared	X	X	X	ND	ND	ND							X	X	X	X	X
Geography	IT; CH; DE			IT									IT				IT
Specific data used	77%			-	-	-											
Variations - products	-			-	-	-											
Variations - sites				-	-	-											

### Legend

X: declared modules

ND: undeclared modules

This study is from 'cradle-to-gate' with modules C1-C4 and module D.  
Specifically, the study includes the following stages:

### A1-A3 production stages:

Modules A1-A3 encompass the processes related to the extraction and transformation of raw materials and energy, including the packaging of the finished products, their transport to the manufacturer and the production of the final products, including waste and emissions.

In-company production steps include:

- Production of 100% recycled polypropylene plastic tiles by moulding,
- Production of B-Line supports, B50 and B100, from 100% recycled polypropylene by moulding,
- Assembly and adhesive bonding of the plastic tiles to the composite layers of synthetic grass and XPE to produce the modules of the modular flooring system.

- Packaging of the modules
- Packaging of the B range supports.

**C1-C4 end-of-life phase:**

C1-C4 modules include resources used for the removal of Roofinggreen® NATURE M20 modules, handling at the site and transport to the disposal location.

If the supports are used, they are easily separated from the module and transported to the disposal site.

For the end-of-life product, a scenario based on ISPRA Report estimates was used and can be quantified as 4.2 % finishing in incinerators (without recovery) and 95.8 % at disposal sites.

**D - environmental benefits and loads beyond the system boundaries of the product:**

At present, there are no processes for the reuse or recovery of the module NATURE M20. In the proposed end-of-life scenario for module D, only the packaging systems led to potential benefits, as follows:

- cardboard box and plastic film (LLDPE) packaging is subject to the recycling process;
- wooden (pallet) packaging is subject to the reuse process.

B-range support feet and packaging follow the same end-of-life procedure as the NATURE M20 module.

The following are excluded from the system boundaries:

- the energy used for heating and cooling.
- infrastructure (buildings, machinery, means of transport, etc.).

### 4.3. Cut-off rules

For this study, 100 per cent of the inflows and outflows within the company were considered, based on the input and output data given in the flowchart.

### 4.4. Data quality

The data used for the LCA assessment of the Roofinggreen® M20 NATURE modular flooring modules and B range supports are primary data where possible, or average data (secondary data) that is traceable to the primary data. The direct data were collected in-company and subsequently reprocessed and entered in the SimaProv.9.2.0 (Pré) software.

In relation to energy-related data, the following specifications are given:

- Energy used in the production of the recycled PP tile, for the production of the recycled PP B-range modules and for the pressing and cooling phase, is directly measured and provided by Roofinggreen.
- Energy for adhesive bonding, compressed air and warehousing with electric forklift trucks is calculated through the material allocation of Roofinggreen® NATURE M20



with respect to the Roofinggreen products as a total. The same procedure has been adopted for the PP supports.

- Energy for heating, lighting and water consumption is derived from material allocation and takes into account the ratio between the quantity of NATURE M20 and the-B range supports produced in 2019 and the total quantity of products manufactured in the Palazzolo Vercellese factory (2.7%).

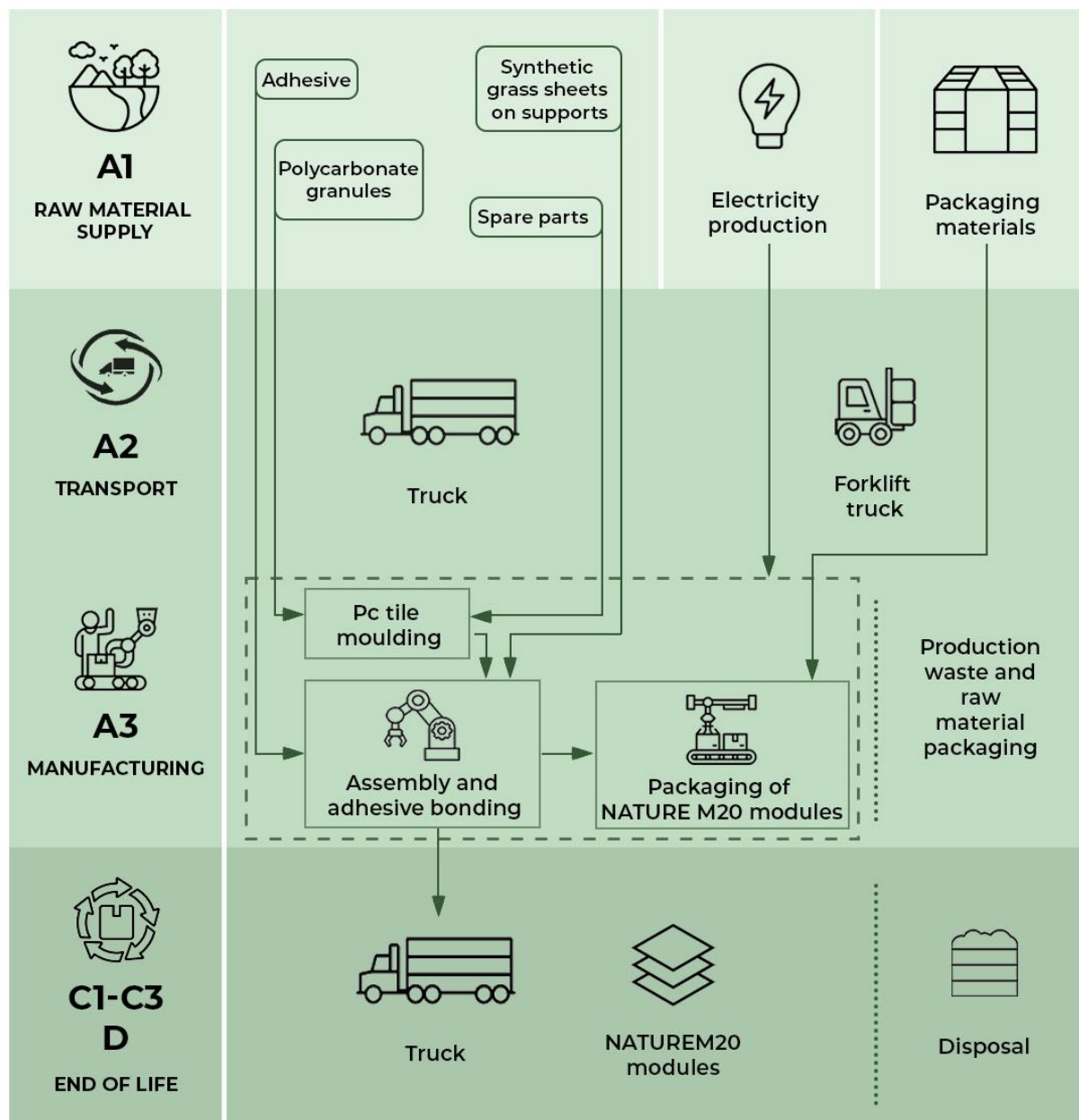
In relation to data on materials used in the production processes and waste produced, the following specifications are given:

- data related to hydraulic press oil, production waste and packaging materials are primary data and are collected in direct connection with the product Roofinggreen® NATURE M20 and B range supports
- Adhesive glue waste deriving from the production of NATURE M20 was calculated using the quantity by weight per year (2019), then apportioned equally for each Roofinggreen tile produced in the factory.
- The amount of adhesive used in the bonding phase, the quantities of the materials used to make the tiles, the sheets of synthetic turf and XPE, plus the materials used in the packaging, are primary data provided by Roofinggreen®.
- Waste related to the packaging material used in transportation to the Palazzolo Vercellese plant was calculated according to primary data provided by Roofinggreen®.

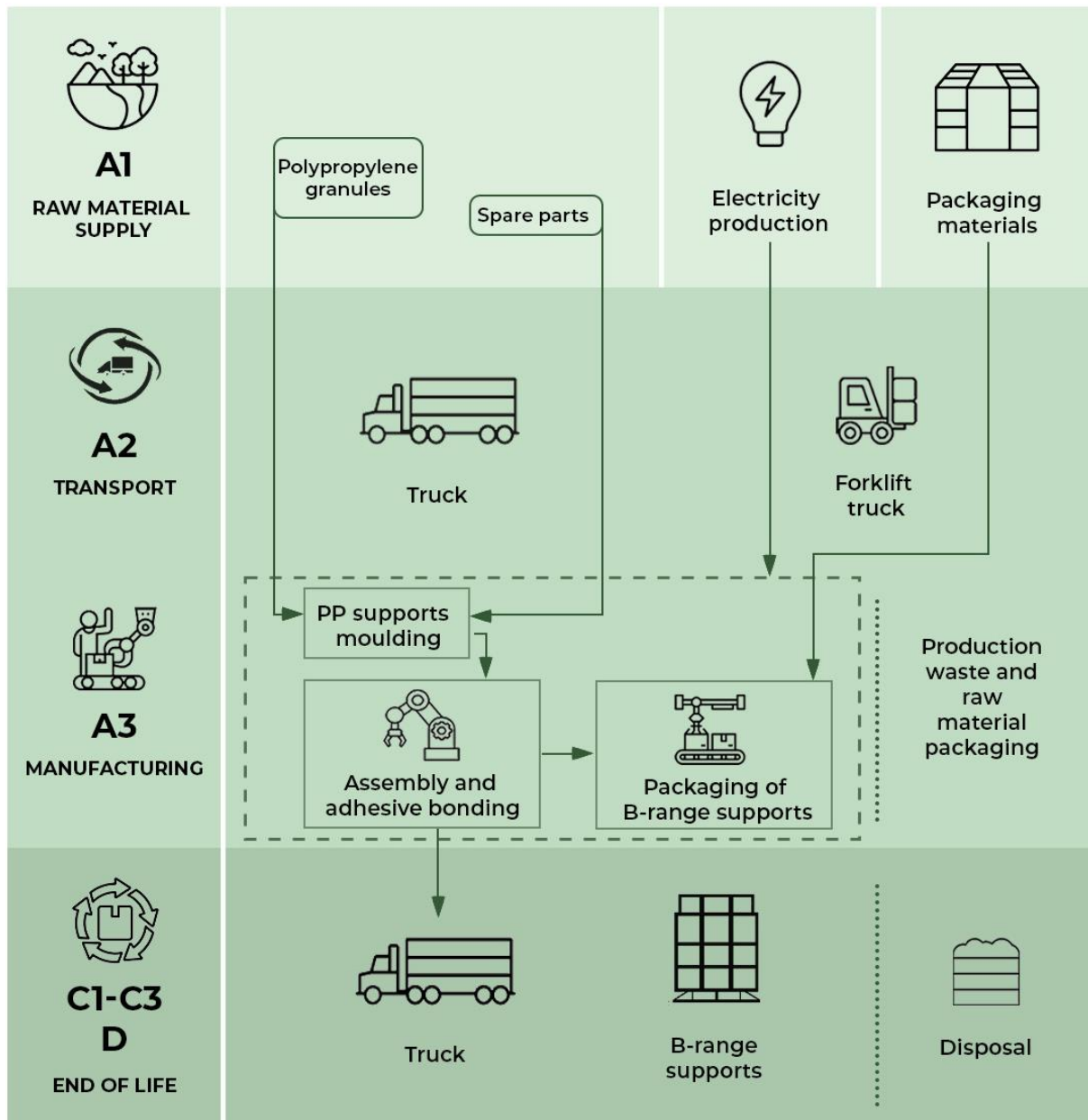
The indirect data used in the LCA analysis concerning the production of some of the raw materials and packaging belong to the Ecoinvent v.3.7.1 database (cut-off allocation dataset) or are taken from scientific publications. The geographical scope of these data is European and in some cases the data refer specifically to Italy.

The machinery for the production of Roofinggreen® NATURE M20 is powered by electricity drawn from the grid. The Roofinggreen company does not have a specific energy supply contract (guarantee of origin) and does not produce renewable electricity on site. Therefore, the data related to electricity have been estimated on the basis of the Italian Residual Mix 2020, whose GWP-GHG value is 0.4854 kgCO<sub>2</sub>/kWh.

## 4.5. Flowchart – Nature M20 module



#### 4.6. Flowchart – B-range supports



## 5. Content information

### Product -Roofinggreen® NATURE M20

Composition of 1 m<sup>2</sup> of modular outdoor flooring system according to the data sheet

PRODUCTS	Weight (%)	Weight (kg)
Synthetic grass	13,7	1,8
XPE insulating mat	15,1	1.99
Recycled polycarbonate tile	48,1	6,32
Adhesive: Polyolefin	1,2	0,16
Total	100,0	10,27

PACKAGING	Massa (%)	Massa (kg)
Spruce wood pallets	56,5	0,4456
Stretch film: LLDPE	1,1	0,0085
Cardboard boxes	42,4	0,3342
Total	100,00	0,7884

Packaging takes place in cardboard boxes containing 18 modules each. The boxes are placed on a wooden pallet and secured with linear low-density polyethylene (LLDPE) stretch film.

### Product Roofinggreen® B-range supports

For 1 m<sup>2</sup> of Roofinggreen® NATURE M20, 16 x B 50 and B100 supports are required, the values of which are given in the following tables:

PRODUCT	Weight (%)	Weight (kg)
B50 Polypropilene support	100	2,88

PACKAGING	Weight (%)	Weight (kg)
Sprucewood pallets	35,1%	0,0833
Stretch film: LLDPE	0,7%	0,0016
Cardboard boxes	64,2%	0,1525
Total	100,0%	0,2374

PRODUCT	Weight (%)	Weight (kg)
B100 Polypropilene support	100	4,80

	Weight (%)	Weight (kg)
Sprucewood pallets	35,1%	0,1667
Stretch film: LLDPE	0,7%	0,0032
Cardboard boxes	64,2%	0,3051
Total	100,0%	0,4750

Packaging of B50 supports takes place in cardboard boxes containing 32 adjustable pieces in each box, while for B100 supports each box contains 64 pieces. The boxes are placed on a wooden pallet and secured with linear low-density polyethylene (LLDPE) stretch film.

## 5.1. Recycled materials

The backing tile to the composite sheet of artificial turf and XPE is made of Polycarbonate which is produced entirely from 100% recycled Polycarbonate granules.

B range supports are made entirely from 100% recycled polypropylene granules.

### Recycled Material Content and Compliance with Minimum Environmental Requirements (CAM)

The materials and components that make up the Roofinggreen® NATURE M20 modular flooring system and the B range supports are fully compliant with the Minimum Environmental Requirements (CAM), as defined in the Italian Ministerial Decree of 23 June 2022 n.256 "Awarding contracts related to the design and building services for the new construction, renovation and maintenance of public buildings".

The table below shows the percentages of recycled material deriving from other industrial production cycles (pre-consumer) which are contained in the plastic tile of the Roofinggreen® NATURE M20 module and in the B range B50 e B100 supports.

Product description	Finished product weight (kg/m <sup>2</sup> )	Recycled material weight Pre-consumer (kg/m <sup>2</sup> )	Recycled material weight Post consumer (kg/m <sup>2</sup> )	% recycled material Pre-consumer	% recycled material Post consumer
Roofinggreen® NATURE M20	10,27	6,32	0	61,55%	0%
Roofinggreen® B50 Support	2,88	2,88	0	100,00%	0%
Roofinggreen® S B100 supporto	4,8	4,8	0	100,00%	0%



The table below shows the percentages of recycled material in configurations that combining the Roofinggreen® NATURE M20 module with B range supports.

Product description	Finished product weight (kg/m2)	Recycled material weight Pre-consumer (kg/m2)	Recycled material weight Post consumer (kg/m2)	% recycled material Pre-consumer	% recycled material Post consumer
Roofinggreen® NATURE M20 with B50 supports	13,15	9,2	0	69,96%	0%
Roofinggreen® NATURE M20 with B100 supports	15,07	11,12	0	73,79%	0%

More specifically, depending on the type of material of the components used in each module, the following declarations of conformity are identified:

- The insulation contained in Roofinggreen® NATURE M20 is XPE (expanded polyethylene). The paragraph related to CAM insulation 2.5.7- Thermal and acoustic insulation - does not require a minimum amount of recycled content for this type of insulation material.
- At the end of its life, the RoofinggreenM20 NATURE system is designed to be completely disassembled from the underlying supporting flooring. In addition, the base of the PC tile is separable from the synthetic turf plus XPE. This makes Roofinggreen NATURE M20 compliant with requirement 2.4.14for new buildings - Disassembly and end-of-life.
- Although Roofinggreen® NATURE M20 is a roofing mantle system, if it were used as a floor or wall covering it would comply with CAM requirement 2.5.10.2 - Resilient Plastic Flooring - as it far exceeds the 20% minimum recycled content.

## 6. Environmental information

### Potential environmental impact - Roofinggreen® NATURE M20 (Tab. 3 EN 15804)

Impact indicator		Unit	Roofinggreen® NATURE M20 modular flooring (UF = 1m2)					
			Total production	De-construction	Transport	Waste processing	Disposal	Benefit and Load
			A1-A3	C1	C2	C3	C4	D
Global warming potential (GWP)	Fossil	kg CO <sub>2</sub> eq.	2,78E+01	0,00E+00	1,31E-02	0,00E+00	2,13E+00	-3,10E-03
	Biogenic	kg CO <sub>2</sub> eq.	-3,42E-01	0,00E+00	1,03E-05	0,00E+00	1,02E-03	-4,66E-06
	Land use and land transformation	kg CO <sub>2</sub> eq.	1,77E-02	0,00E+00	9,99E-08	0,00E+00	3,58E-05	-9,96E-08
	TOTAL	kg CO <sub>2</sub> eq.	2,75E+01	0,00E+00	1,31E-02	0,00E+00	2,13E+00	-3,11E-03
Global warming potential (GWP-GHG) <sup>1</sup>		kg CO <sub>2</sub> eq.	2,73E+01	0,00E+00	1,30E-02	0,00E+00	1,97E+00	-3,09E-03
Depletion potential of the stratospheric ozone layer (ODP)		kg CFC 11 eq.	2,50E-06	0,00E+00	3,06E-09	0,00E+00	1,14E-08	-7,14E-10
Acidification potential, Accumulated Exceedance (AP)		mol H+ eq.	1,15E-01	0,00E+00	6,10E-05	0,00E+00	7,79E-04	-1,70E-05
Eutrophication potential, fraction of nutrients reaching freshwater end compartment (EP-freshwater)		kg PO <sub>4</sub> - eq.	6,68E-03	0,00E+00	5,79E-08	0,00E+00	1,10E-05	-5,01E-08
Eutrophication potential, fraction of nutrients reaching marine water end compartment (EP-marine)		kg N eq.	2,42E-02	0,00E+00	2,27E-05	0,00E+00	2,11E-02	-6,68E-06
Eutrophication potential, Accumulated Exceedance (EP-terrestrial)		mol N eq.	2,23E-01	0,00E+00	2,50E-04	0,00E+00	3,44E-03	-7,32E-05
Formation potential of tropospheric ozone (POCP)		kg NMVOC eq.	8,62E-02	0,00E+00	6,47E-05	0,00E+00	1,15E-03	-1,90E-05
Abiotic depletion potential for non-fossil resources (ADP-minerals&metals) (2)		kg Sb eq.	1,38E-05	0,00E+00	5,59E-10	0,00E+00	1,14E-08	-1,31E-10
Abiotic depletion for fossil resources potential (ADP-fossil) (2)		MJ	6,39E+02	0,00E+00	1,87E-01	0,00E+00	9,33E-01	-4,43E-02
Water (user deprivation potential, deprivation-weighted water consumption (WDP) (3)		m <sup>3</sup> eq.	2,22E+01	0,00E+00	0,00E+00	0,00E+00	4,98E-02	-1,15E-06

1) This indicator includes all greenhouse gases of GWP-total, but excludes biogenic carbon dioxide emissions and uptake and biogenic carbon stored in the product. Characterization factors are based on IPCC AR5 (IPCC 2013).

2) This impact category mainly concerns the possible impact of low-dose ionising radiation on human health from the nuclear fuel cycle. It does not include effects due to possible nuclear accidents, occupational exposure or disposal of radioactive waste in underground facilities. Potential ionising radiation from soil, radon and some building materials is not measured by this indicator.

3) The results of this environmental impact indicator should be used with caution because uncertainties about these results are high or because experience with the indicator is limited.

## Use of resources - Roofinggreen® NATURE M20 (Tab. 6 EN 15804)

Parameter		Unit	Roofinggreen® NATURE M20 modular flooring (UF = 1m <sup>2</sup> )					
			Total production	De-construction	Transport	Waste processing	Disposal	Benefit and Load
			A1-A3	C1	C2	C3	C4	D
Use of renewable primary energy	Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	5,20E+01	0,00E+00	2,75E-04	0,00E+00	3,10E-02	-2,15E-04
	Use of renewable primary energy resources used as raw materials	MJ	8,54E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	Total use of renewable primary energy resources	MJ	5,29E+01	0,00E+00	2,75E-04	0,00E+00	3,10E-02	-2,15E-04
Use of non-renewable primary energy	Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	1,65E+02	0,00E+00	1,98E-01	0,00E+00	9,95E-01	-4,70E-02
	Use of non-renewable primary energy resources used as raw materials	MJ	5,21E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	Total use of non-renewable primary energy resources	MJ	6,86E+02	0,00E+00	1,98E-01	0,00E+00	9,95E-01	-4,70E-02
Secondary material		kg	6,32E+00	6,32E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Renewable secondary fuels		MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Non-renewable secondary fuels		MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Net use of fresh water		m <sup>3</sup>	4,06E-01	0,00E+00	0,00E+00	0,00E+00	1,62E-03	-8,05E-07

## Waste production and output flows - Roofinggreen® NATURE M20

### Waste production (Tab. 7 EN 15804)

Parameter	Unit	Roofinggreen® NATURE M20 modular flooring (UF = 1m <sup>2</sup> )					
		A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	2,16E-02	0,00E+00	4,95E-07	0,00E+00	2,00E-06	-1,15E-07
Non-hazardous waste disposed	kg	1,10E+00	0,00E+00	0,00E+00	0,00E+00	1,03E+01	0,00E+00
Radioactive waste disposed	kg	1,20E-03	0,00E+00	1,36E-06	0,00E+00	4,90E-06	-3,21E-07

### Output flows (Tab. 8 EN 15804)

Parameter	Unit	Roofinggreen® NATURE M20 modular flooring (UF = 1m <sup>2</sup> )					
		A1-A3	C1	C2	C3	C4	D
Components for reuse	kg	4,86E-02	0,00E+00	0,00E+00	4,46E-01	0,00E+00	4,46E-01
Material for recycling	kg	5,32E-02	0,00E+00	0,00E+00	3,43E-01	0,00E+00	3,43E-01
Materials for energy recovery	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

### Information on biogenic carbon content (Tab. 9 EN 15804)

Parameter	Unit	Roofinggreen® NATURE M20 modular flooring (UF = 1m <sup>2</sup> ) (A1-A3)
Biogenic carbon content in product	Kg C	0,00
Biogenic carbon content in accompanying packaging	Kg C	3,90E-01

Calculation performed according to EN 16449:2014

### Transport to disposal site C2 (Tab. 10 EN 15804)

Scenario information	Unit	Roofinggreen®LEAF modular flooring (UF = 1m <sup>2</sup> )
		Transport
		C2
Fuel type and consumption of vehicle or vehicle type used for transport e.g. long distance truck, boat, ecc	Litre of fuel type per distance or vehicle type, Commission Directive 2007/37/EC	EURO 4 articulated vehicle
Distance	km	10
Capacity utilisation (including empty returns)	%	50%
Bulk density of transported products	kg/m <sup>3</sup>	183
Volume capacity utilisation factor (factor: =1 or <1 or >1 for compressed or nested packaged products)	Not applicable	1



The evaluation related to the impact of the B50 supports is reported in the following tables.

Since the materials, processing, and packaging are the same, to calculate the values of the indicators in the following tables it will be sufficient to increase them in proportion to weight according to a coefficient of 1.6667 obtained from the ratio of the two weights per m<sup>2</sup>: (4.8kg/2.88kg).

### Potential environmental impacts - Roofinggreen® B range supports (Tab. 3 EN 15804)

Impact indicator		Unit	Roofinggreen® B50 Supports for 1m2 of NATURE M20 (UF = 1m <sup>2</sup> )					
			Total production	De-construction	Transport	Waste processing	Disposal	Benefit and Load
			A1-A3	C1	C2	C3	C4	D
Global warming potential (GWP)	Fossil	kg CO <sub>2</sub> eq.	3,64E+00	0,00E+00	1,62E-03	0,00E+00	5,96E-01	-5,80E-04
	Biogenic	kg CO <sub>2</sub> eq.	-2,88E-03	0,00E+00	1,28E-06	0,00E+00	2,85E-04	-8,72E-07
	Land use and land transformation	kg CO <sub>2</sub> eq.	6,29E-03	0,00E+00	1,24E-08	0,00E+00	1,01E-05	-1,86E-08
	TOTAL	kg CO <sub>2</sub> eq.	3,65E+00	0,00E+00	1,63E-03	0,00E+00	5,97E-01	-5,81E-04
Global warming potential (GWP-GHG) <sup>1</sup>		kg CO <sub>2</sub> eq.	3,63E+00	0,00E+00	1,62E-03	0,00E+00	5,53E-01	-5,77E-04
Depletion potential of the stratospheric ozone layer (ODP)		kg CFC 11 eq.	4,49E-07	0,00E+00	3,81E-10	0,00E+00	3,21E-09	-1,34E-10
Acidification potential, Accumulated Exceedance (AP)		mol H <sup>+</sup> eq.	1,58E-02	0,00E+00	7,58E-06	0,00E+00	2,19E-04	-3,17E-06
Eutrophication potential, fraction of nutrients reaching freshwater end compartment (EP-freshwater)		kg PO <sub>4</sub> - eq.	1,13E-03	0,00E+00	7,20E-09	0,00E+00	3,09E-06	-9,38E-09
Eutrophication potential, fraction of nutrients reaching marine water end compartment (EP-marine)		kg N eq.	3,16E-03	0,00E+00	2,83E-06	0,00E+00	5,91E-03	-1,25E-06
Eutrophication potential, Accumulated Exceedance (EP-terrestrial)		mol N eq.	3,18E-02	0,00E+00	3,10E-05	0,00E+00	9,64E-04	-1,37E-05
Formation potential of tropospheric ozone (POCP)		kg NMVOC eq.	1,09E-02	0,00E+00	8,05E-06	0,00E+00	3,21E-04	-3,56E-06
Abiotic depletion potential for non-fossil resources (ADP-minerals&metals) (2)		kg Sb eq.	3,31E-06	0,00E+00	6,96E-11	0,00E+00	3,21E-09	-2,46E-11
Abiotic depletion for fossil resources potential (ADP-fossil) (2)		MJ	5,91E+01	0,00E+00	2,32E-02	0,00E+00	2,62E-01	-8,28E-03
Water (user deprivation potential, deprivation-weighted water consumption (WDP) (3)		m <sup>3</sup> eq.	2,39E+00	0,00E+00	0,00E+00	0,00E+00	1,40E-02	-2,15E-07

1) This indicator includes all greenhouse gases of GWP-total, but excludes biogenic carbon dioxide emissions and uptake and biogenic carbon stored in the product.Characterization factors are based on IPCC AR5 (IPCC 2013).

2)This impact category mainly concerns the possible impact of low-dose ionising radiation on human health from the nuclear fuel cycle. It does not include effects due to possible nuclear accidents, occupational exposure or disposal of radioactive waste in underground facilities. Potential ionising radiation from soil, radon and some building materials is not measured by this indicator.

3) The results of this environmental impact indicator should be used with caution because uncertainties about these results are high or because experience with the indicator is limited.

## Use of resources - Roofinggreen® - B range supports (Tab. 6 EN 15804)

Parameter		Unit	Roofinggreen® B50 Supports for 1m2 of NATURE M20 (UF = 1m²)					
			Total production	De-construction	Transport	Waste processing	Disposal	Benefit and Load
			A1-A3	C1	C2	C3	C4	D
Use of renewable primary energy	Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	5,47E+01	0,00E+00	3,42E-05	0,00E+00	8,68E-03	-4,02E-05
	Use of renewable primary energy resources used as raw materials	MJ	3,58E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	Total use of renewable primary energy resources	MJ	5,51E+01	0,00E+00	3,42E-05	0,00E+00	8,68E-03	-4,02E-05
Use of non-renewable primary energy	Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	6,34E+01	0,00E+00	2,47E-02	0,00E+00	2,79E-01	-8,79E-03
	Use of non-renewable primary energy resources used as raw materials	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	Total use of non-renewable primary energy resources	MJ	6,34E+01	0,00E+00	2,47E-02	0,00E+00	2,79E-01	-8,79E-03
Secondary material		kg	2,88E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Renewable secondary fuels		MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Non-renewable secondary fuels		MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Net use of fresh water		m³	2,95E-02	0,00E+00	3,91E-08	0,00E+00	4,54E-04	-1,51E-07

## Waste production and output flows - Roofinggreen® B range supports

### Waste production (Tab. 7 EN 15804)

Parameter	Unit	Roofinggreen® B50 Supports for 1m2 of NATURE M20 (UF = 1m²)					
		A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	1,21E-02	0,00E+00	6,16E-08	0,00E+00	5,62E-07	-2,16E-08
Non-hazardous waste disposed	kg	6,51E-02	0,00E+00	0,00E+00	0,00E+00	2,88E+00	0,00E+00
Radioactive waste disposed	kg	2,32E-04	0,00E+00	1,69E-07	0,00E+00	1,37E-06	-6,01E-08

### Output flows (Tab. 8 EN 15804)

Parameter	Unit	Roofinggreen® B50 Supports for 1m2 of NATURE M20 (UF = 1m²)					
		A1-A3	C1	C2	C3	C4	D
Components for reuse	kg	5,78E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,33E-02
Material for recycling	kg	6,78E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,54E-01
Materials for energy recovery	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

### Information on biogenic carbon content (Tab. 9 EN 15804)

Parameter	Unit	Roofinggreen® B50 Supports for 1m2 of NATURE M20 (UF = 1m²) (A1-A3)
Biogenic carbon content in product	Kg C	0,00
Biogenic carbon content in accompanying packaging	Kg C	1,18E-01

Calculation performed according to EN 16449:2014

## Transport to disposal site C2 (Tab. 10 EN 15804)

Scenario information	Unit	Roofinggreen® B50 Supports for 1m2 of LEAF (UF = 1m²)
		Transport
		C2
Fuel type and consumption of vehicle or vehicle type used for transport e.g. long distance truck, boat, ecc	Litre of fuel type per distance or vehicle type, Commission Directive 2007/37/EC	EURO 4 articulated vehicle
Distance	km	10
Capacity utilisation (including empty returns)	%	50%
Bulk density of transported products	kg/m3	286
Volume capacity utilisation factor (factor: =1 or <1 or >1 for compressed or nested packaged products)	Not applicable	1

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