

Environmental Product Declaration (EPD)

TERRAMESH

implemented with plastic coated
double twist mesh



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and construction services version 2.2
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1.	The company	3	4.	Reference	14
2.	The Products	4	5.	Glossary	15
	2.1 The production process	6			
	2.2. Product composition	7			
3.	Environmental product declaration	8	6.	Additional information	16
	3.1 Methodology	8			
	3.2 Declared unit	9			
	3.3 System boundary	9			
	3.4 Main assumptions	11			
	3.5 Parameters describing the environmental impacts	11	7.	Verification and registration	17
	3.6 Indicators of resources use	12			
	3.7 Indicators of waste output flows	13			

PROGRAMME RELATED INFORMATION

This EPD is developed under The International EPD ® System Programme Operator, in compliance with the General Program Instruction version 2.5. for the EPD development and the Product Category Rules PCR CPC 54 “Construction products and Construction services” 2012:01 version 2.2. More information about the International EPD ® System is available on the website <https://www.environdec.com/>

1. THE COMPANY

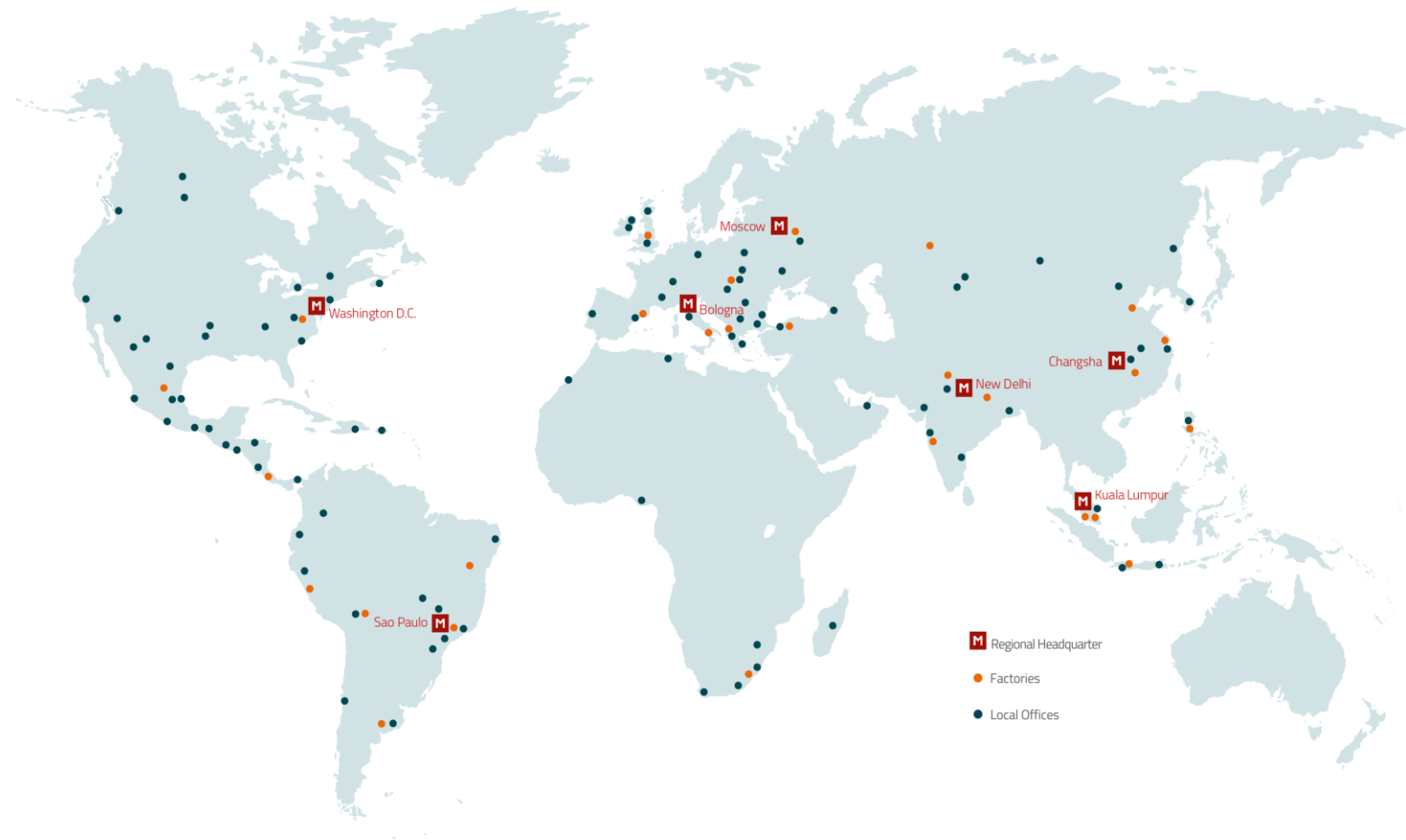
MACCAFERRI

Founded in 1879, Officine Maccaferri is specialised in the development of engineering solutions for the civil and environmental construction industry.

Its continued growth is based upon long-held values of innovation, integrity, excellent service and respect for the environment.

Our vision is to become a leading international provider of advanced solutions to the civil, geotechnical and environmental construction markets. We deliver solutions from retaining walls to hydraulic works and from rockfall mitigation systems to soil reinforcement.

By implementing a strategy of vertical integration, we research, manufacture materials, design, supply and build solutions within these fields. Our differentiating factor is our people and their knowledge capital, which we share with our clients to overcome their engineering challenges.



Terramesh® System and **Green Terramesh®** are modular systems used to form rock and vegetated (green) faced soil reinforced slopes (also known as Mechanically Stabilised Earth).

TERRAMESH® SYSTEM

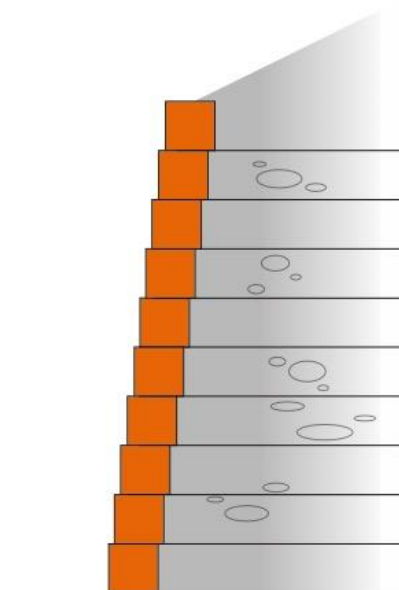
Consists of pre-assembled units of double twisted, heavily galvanised and polymer coated wire mesh (8×10 type, wire diameter 2.2 mm or 2.7 mm). The facing section of the unit is formed by connecting a back panel and diaphragms to the main fascia unit, thus creating the rectangular shaped cells used for stone confinement. The geogrid reinforcement, fascia and lid are all one continuous panel of mesh. **Terramesh® System** units are supplied in standard lengths, requiring no cuts on site.

GREEN TERRAMESH®

Consists of pre-fabricated units of double twisted wire mesh (8×10 type, wire diameter 2.2 mm or 2.7 mm) lined with an erosion control blanket and stiffened with a welded mesh panel. Two pre-formed steel braces are supplied to be connected at the job site to maintain the unit to the required slope angle.

The angled front face and the erosion control blanket are designed to facilitate the establishment of natural vegetation of the units; an important requirement of **Green Terramesh®**. As all components are factory fitted, **Green Terramesh®** is more rapid to install than competitor reinforced soil systems. The unit is simply erected on site, the bracing angles support the face at the designated angle without the need for any external formwork or shuttering.

Terramesh® System and **Green Terramesh®** have been used on the most significant infrastructure schemes and have been used globally on some of the most significant infrastructure schemes, including what is believed to be the tallest reinforced soil structure in the world at 74m high.



Terramesh System wall
with a battered face

On taller slopes and structures, **Terramesh® System** and **Green Terramesh** can be used in conjunction with our high performance primary geogrids, **ParaLink®**, **ParaGrid®** and **MacGrid® WG**.

The products covered by the present EPD are all **Terramesh®** (Green Terramesh and Terramesh System) implemented with polymeric coated steel wire (diameter 2.2mm and 2.7mm) and produced in two plants: Italy and Slovakia.

The process of analysis has been performed on a sample of **Terramesh®** variants selected against the production mass criteria and representing at least 70% of total **Terramesh®** production in each plants in the reference year.

The reference CPC code is 412 "Products of iron or steel".

2. THE PRODUCTS

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VIEW OF THE TERRAMESH



Terramesh System



Green Terramesh



Green Terramesh

2. THE PRODUCTS

2.1 THE PRODUCTION PROCESS

The production process (Figure 4) includes the weaving of the double twist wire mesh, starting from steel wire, whose the polymeric coating can eventually be performed on site through an extrusion process of the polymer. The steel used in the wire is 100% from electric arc route.

Technical Characteristics of the double twist wire mesh products TERRAMESH are listed and detailed in the technical data sheet available on Maccaferri website (<https://www.maccaferri.com/>). According to Construction Product Regulation CEE 305/2011 the essential technical characteristics, as per Harmonized Document EAD 200026-00-0102, are reported in the Declaration of Performances (DOP).

This EPD describes the impacts of the Terramesh produced in Italy and Slovakia, using as reference products the Terramesh variant most produced in each plant for the reference year. The results reported in this EPD, through the selected reference products for Italy and Slovakia, are representative of the product family impacts in Italy and Slovakia respectively.



Figure 4: Production process of the Terramesh

2. THE PRODUCTS

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2.2 PRODUCT COMPOSITION

The composition of the reference products is reported in Table 1.

They are implemented with plastic coated galvanized steel wire (diameter 2.2 mm for the mesh, diameter 2.7 and/or 3.4 mm for the edges, polymeric coating thickness 0.5 mm) and galvanized steel wire not plastic coated (diameter 3 mm), plus the additional components for reinforcing and/or installation (geogrid, steel panel, steel ties and steel brackets). PoliMac is an extruded polymer specifically developed by Maccaferri.

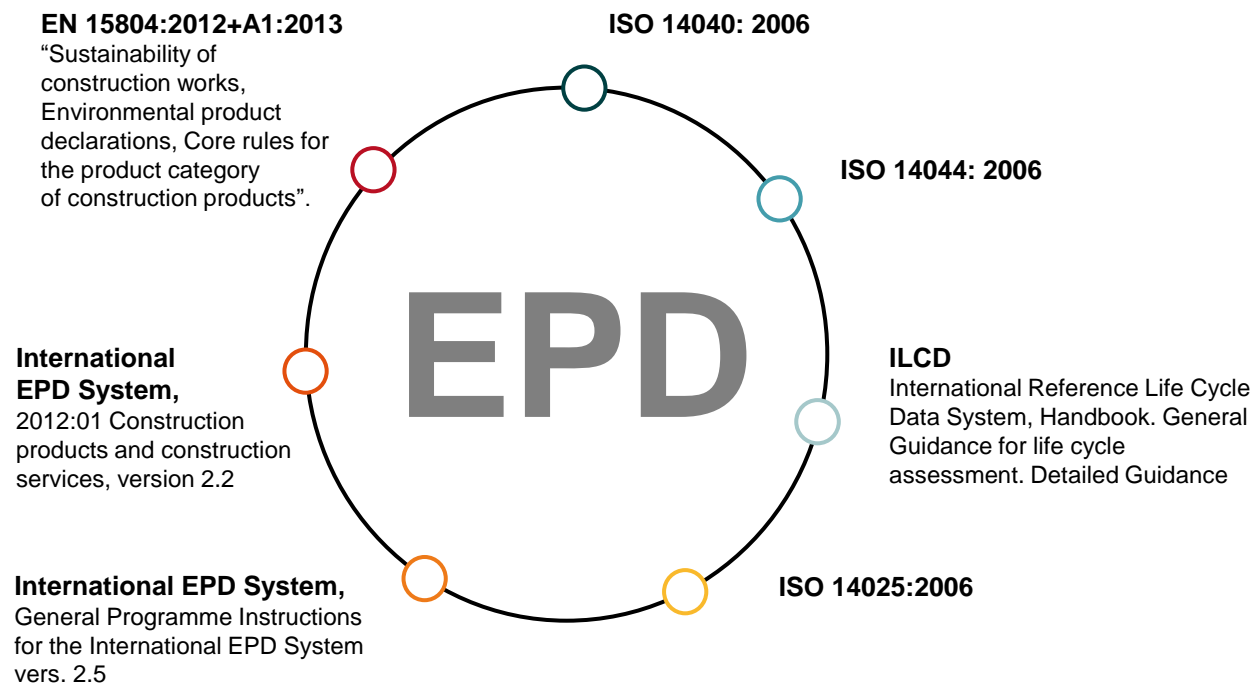
The content of SVHC does not exceed 0.1 % of the weight of the product.

PRODUCT COMPOSITION OF THE TERRAMESH (REFERENCE PRODUCTS)		
	Green Terramesh 3X3x0.70 73 76, mesh 8X10, wire PVC - Polimac D22 (Italy)	Green Terramesh 2X3x0.70 73 76, mesh 8X10, wire PVC - Polimac D22 (Slovakia)
BoM – contribution (% in weight) of components to 1 kg of product		
PVC - POLIMAC	8	7.5
Steel	91.5	91.5
PET	0.5	0.5
EVA	0.5	0.5
Packaging (kg)		
Polyester strap	0.00106	0.00106

Table 1: BoM of the reference product for the two plants (Italy and Slovakia)

3.1 METHODOLOGY

The study behind the present EPD has been performed according to the state of art of the LCA methodology, with specific reference to the construction sector, in accordance to the following standard and guide lines:



The goal of the study is the evaluation of the potential environmental impacts of Terramesh implemented with polymeric coated steel wire.

The EPD is mainly addressed to the business-to-business communication. The data elaboration has been performed with the Gabi software, version 8.0.6.0.20. . The database used are the most updated ones implemented in Gabi software. More in detail, main database used is thinkstep. The LCIA method used is CML 2001 version 4.2 (April 2013).

The EPD only covers the Cradle to Gate stage (as represented in Table 2 and showed in Figure 5) because other stages are very dependent on particular scenarios and are better d

3. ENVIRONMENTAL PRODUCT DECLARATION






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3.2 DECLARED UNIT

The declared unit is 1 kg of Terramesh, plus its packaging

3.3 SYSTEM BOUNDARY

The EPD only covers the Cradle to Gate stage (as represented in Table 2 and showed in Figure 5) because other stages are very dependent on particular scenarios and are better developed for specific construction works.

 PRODUCT STAGE	A1	Raw Material Supply	X
	A2	Transport	X
	A3	Manufacturing	X
 CONSTRUCTION PROCESS STAGE	A4 to A5	Transport from the gate to the installation site, Construction/ Installation	Mnd*
 USE STAGE	B1 to B7	Use, Maintenance, Repair, Replacement, Refurbishment, Operational energy use, Operational water use	Mnd*
 END-OF-LIFE STAGE	C1 to C4	Deconstruction/Demolition, Transport, Waste processing, Disposal	Mnd*
 BENEFITS and LOADS BEYOND SYSTEM BOUNDARY	D	Reuse, Recycling potential	Mnd*

* Module Not Declared

Table 2: Life cycle stages included in the study for Officine Maccaferri Terramesh

3. ENVIRONMENTAL PRODUCT DECLARATION

The following stages are included in the study:

Raw Materials supply (A1). Production of raw materials used in the products, of as well as the production of energy carriers used in the production process.

Transport of raw materials to the factory (A2)

Manufacturing of the Officine Maccaferri Terramesh (A3).

It includes the following production phases:

- Extrusion for the implementation of the polymeric coating (only for Italian plant)
- Weaving of the double twist mesh, inserting of additional components and product implementation
- Final check on finished product and packaging.

Moreover, in module A3, the production of primary packaging and of the ancillary materials and the treatment of waste generated from the manufacturing processes are accounted for.

The electricity used in the manufacturing processes is from the national grid, for both the plants.

The reference year of the study is from November 2016 to October 2017.

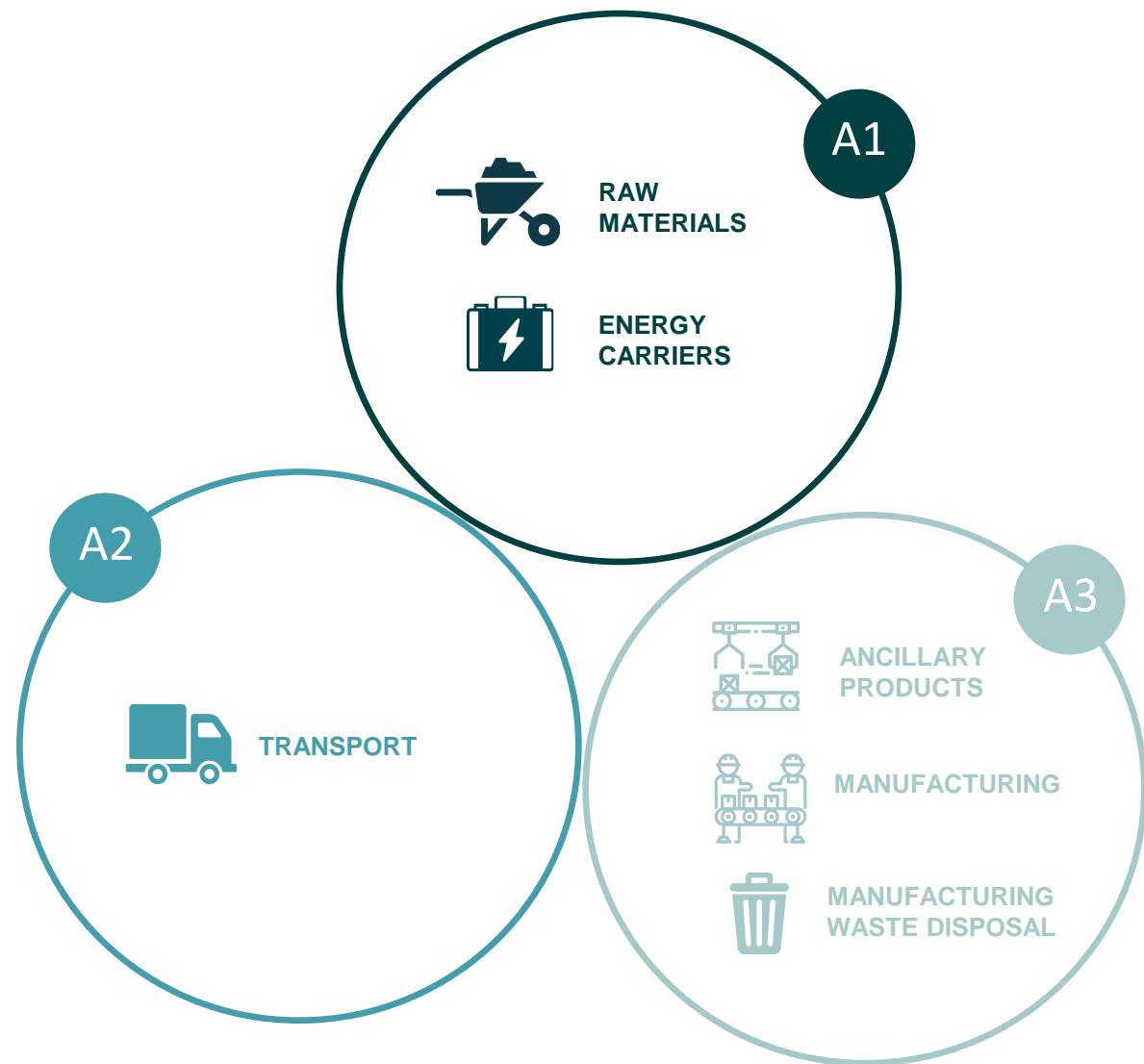


Figure 5: System boundaries for the Officine Maccaferri Terramesh

3. ENVIRONMENTAL PRODUCT DECLARATION

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3.4 MAIN ASSUMPTIONS, CUT OFFS AND BACKGROUND DATA INFORMATION

Regarding the exclusion of product life cycle stages and processes, the capital goods have not been accounted for, as well as the use and the end of life phases.

The main assumptions applied in the study are reported below.

- For the majority of the raw materials as well as for the packaging for the finished products a European production is assumed.
- A default mean a transportation (truck Euro 4 > 32 t) with an utilization ratio of 0.61 has been assumed when primary data on transport size were not available.
- For the energy consumption and the ancillary consumption in the manufacturing process, an allocation based on the mass of finished products from the plants has been applied.

Background data used in the study are from LCI database and are not older than 5 years.

For the production in Italy and in Slovakia, the

3.5 PARAMETERS DESCRIBING THE ENVIRONMENTAL IMPACTS

For the production in Italy and in Slovakia, the variability of impacts for products in the same product family is higher than 10%. For Italy, the range span from +29% for ADP elements to -31%, still for ADP elements. For Slovakia the range span from +45% in ADP elements to -18% in AP

IMPACT CATEGORY	Terramesh – Modules A1-A3	
	Green Terramesh 3X3X0.70 73 76, mesh 8x10, wire PVC - Polimac D22 (Italy)	Green Terramesh 2X3X0.70 73 76, mesh 8x10, wire PVC - Polimac D22 (Slovakia)
Abiotic Depletion (ADP fossil) [MJ]	1,46E+01	1,50E+01
Abiotic Depletion (ADP elements) [kg Sb-Equiv.]	3,87E-05	3,50E-05
Acidification Potential (AP) [kg SO ₂ -Equiv.]	2,89E-03	3,07E-03
Eutrophication Potential (EP_ [kg Phosphate-Equiv.]	4,08E-04	4,34E-04
Global Warming Potential (GWP 100 years) [kg CO ₂ -Equiv.]	1,04E+00	1,08E+00
Ozone Layer Depletion Potential (ODP, steady state) [kg R11-Equiv.]	3,26E-09	3,05E-09
Photochem. Ozone Creation Poten- tial (POCP) [kg Ethene-Equiv.]	3,78E-04	3,10E-04

Table 3: Environmental profile for Officine Maccaferri Terramesh

3. ENVIRONMENTAL PRODUCT DECLARATION

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3.6 INDICATORS OF RESOURCES USE

INDICATOR OF RESOURCES	Terramsh – Modules A1-A3	
	Green Terramesh 3X3X0.70 73 76, mesh 8x10, wire PVC - Polimac D22 (Italy)	Green Terramesh 3X3X0.70 73 76, mesh 8x10, wire PVC - Polimac D22 (Slovakia)
Use of renewable primary energy excluding renewable primary resources used as raw materials [MJ, net calorific value]	4,56E+00	4,24E+00
Use of renewable primary energy resources used as raw materials [MJ, net calorific value]	0,00E+00	0,00E+00
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) [MJ, net calorific value]	4,56E+00	4,24E+00
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials [MJ, net calorific value]	1,68E+01	1,76E+01
Use of non-renewable primary energy resources used as raw materials [MJ, net calorific value]	2,14E+00	1,96E+00
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) [MJ, net calorific value]	1,90E+01	1,96E+01
Use of secondary material [kg]	9,10E-01	9,15E-01
Use of non renewable secondary fuels [MJ, net calorific value]	5,19E-07	4,67E-07
Use of renewable secondary fuels [MJ, net calorific value]	4,09E-08	3,68E-08
Use of net fresh water [m^3]	1,94E-01	1,78E-01

Table 4: Indicators of resources use for Officine Maccaferri Terramesh

3. ENVIRONMENTAL PRODUCT DECLARATION

3.7 INDICATORS OF WASTE AND OUTPUT FLOWS

INDICATOR OF WASTE	Terramesh – Modules A1-A3	
	Green Terramesh 3X3X0.70 73 76, mesh 8x10, wire PVC - Polimac D22 (Italy)	Green Terramesh 2X3X0.70 73 76, mesh 8x10, wire PVC - Polimac D22 (Slovakia)
Hazardous waste disposed [kg]	1,21E-07	1,45E-07
Non-hazardous waste disposed [kg]	9,51E-04	8,76E-05
Radioactive waste disposed [kg]	1,69E-03	1,79E-03

Table 5: Indicators of waste for Officine Maccaferri Terramesh

INDICATOR OF OUTPUT FLOWS	Terramesh – Modules A1-A3	
	Green Terramesh 3X3X0.70 73 76, mesh 8x10, wire PVC - Polimac D22 (Italy)	Green Terramesh 2X3X0.70 73 76, mesh 8x10, wire PVC - Polimac D22 (Slovakia)
Materials for energy recovery [kg]	8,50E-04	4,87E-05
Materials for recycling recovery [kg]	1,59E-02	3,73E-02

Table 6: Indicators of output flows for Officine Maccaferri Terramesh

4. REFERENCE

EC-JRC, 2010. International reference Life Cycle data System Handbook. General Guidance for life cycle assessment. Detailed Guidance

Ecoinnovazione, 2018. Technical report: LCA study of plastic coated double twist products for Geoengineering works

EN 15804:2012+A1:2013 “Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products”

International EPD® System, 2017. General Programme Instructions for the International EPD System, vers. 2.5

International EPD® System, 2012. PCR 2012:01 Construction products and construction services, version 2.2

International Organisation for Standardization (ISO), 2006a Environmental management – Life Cycle assessment – Principles and framework. ISO 14040:2006, Geneva

International Organisation for Standardization (ISO), 2006b Environmental management – Life Cycle assessment – Requirements and guidelines. ISO 14044:2006, Geneva

International Organisation for Standardization (ISO), 2006c Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures. ISO 14025:2006, Geneva

ENVIRONMENTAL IMPACT: Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects [ISO 14001:2004].

ENVIRONMENTAL DECLARATION: Claim which indicates the environmental aspects of a product or service. An environmental label or declaration may take the form of a statement, symbol or graphic on a product or package label, in product literature, in technical bulletins, in advertising or in publicity, amongst other things. [ISO 14020:2000].

HAZARDOUS WASTE: Hazardous waste is waste that poses substantial or potential threats to public health or the environment [EPD, General Programme Instructions 2.0].

IMPACT CATEGORY: Class representing environmental issues of concern to which life cycle inventory analysis results may be assigned [ISO 14040:2006]

LIFE CYCLE ASSESSMENT (LCA): Compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle [ISO 14040:2006]

PRODUCT CATEGORY RULES (PCR): Set of specific rules, requirements and guidelines for developing Type III environmental declarations for one or more product categories [ISO 14025:2006].

RAW MATERIAL: Primary or secondary material that is used to produce a product. Secondary material includes recycled material. [ISO 14040:2006]

RECOVERED MATERIAL (SECONDARY MATERIAL): Material that would have otherwise been disposed of as waste or used for energy recovery, but has instead been collected and recovered as a material input, in lieu of new primary material, for a recycling or a manufacturing process. [ISO 14021:1999].

SYSTEM BOUNDARY: Set of criteria specifying which unit processes are part of a product system [ISO 14040:2006].

SVHC: Substances that may have serious and often irreversible effects on human health and the environment can be identified as substances of very high concern (SVHCs). If a substance is identified as an SVHC, it will be added to the Candidate List for eventual inclusion in the Authorization List of the REACH Regulation). The inclusion in this list implicates legal duties for manufacturers, importers or companies, which use those substances as such, in formulation or in their products.

6.1 ADDITIONAL INFORMATION CONCERNING THE PROGRAMME AND THE EPD

EPDs within the same product category but from different programme may not be comparable.

EPDs of construction products may not be comparable if they do not comply with EN 15804. Environmental product declarations within the same product category from different programs may not be comparable. This EPD and the PCR CPC 54 “Construction products and Construction services” are available on the website of The International EPD® System (www.environdec.com).

The verifier and the Programme Operator do not make any claim nor have any responsibility of the legality of the products included in the present EPD.

The LCA study and the present EPD have been issued with the technical scientific support of Ecoinnovazione S.r.l., spin-off ENEA (<http://ecoinnovazione.it/?lang=en>).

6.2 ADDITIONAL INFORMATION ON THE PRODUCTS AND ON THE COMPANY

Terramesh® units covered by the present EPD are produced in Italy (Bellizzi) and Slovakia (Senica) plants. The management and production system in both the plants is certified in compliance to ISO 9001. In addition, the Italian plant has an environmental management system certified in compliance to ISO 14001.

In selected factories, the **Terramesh® System** units are produced in compliance with CPR – Construction Product Regulation 305/2011, having EC marking in compliance with ETA 16/0767.

Additional information on the company and on the products covered by the present EPD are available at maccaferri.com and info@hq.maccaferri.com


6.3 DIFFERENCES VS PREVIOUS VERSION

Editorial changes occurred respect the previous version in order to delete the reference to Maccaferri Industrial Group in paragraph 1.

7. VERIFICATION AND REGISTRATION

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CEN STANDARD EN 15804 SERVED AS CORE PCR TERRAMESH – MODULES A1-A3

EPD Programme:	The International EPD® System. For more information - www.environdec.com
PCR:	PCR 2012:01 Construction products and construction services version 2.2
PCR review was conducted by:	The Technical Committee of the International EPD® System. Contact via info@environdec.com
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EPD valid within the following geographical area:	International
Technical support:	Ecoinnovazione S.r.l. – spin-off ENEA - Via d'Azeglio 51, 40123 Bologna  ecoinnovazione <small>spin off ENEA</small> www.ecoinnovazione.it
Independent verification of the declaration and data according to ISO 14025:	EPD verification (external)
Third party verifier:	SGS SGS Italia S.p.A. Via Caldera 21, 20153 Milano. www.it.sgs.com
Accredited or approved by:	Accredia, certificate n.006H