



Environmental Product Declaration (EPD)

# MATTRESSES

implemented with plastic coated  
double twist mesh



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## 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/>

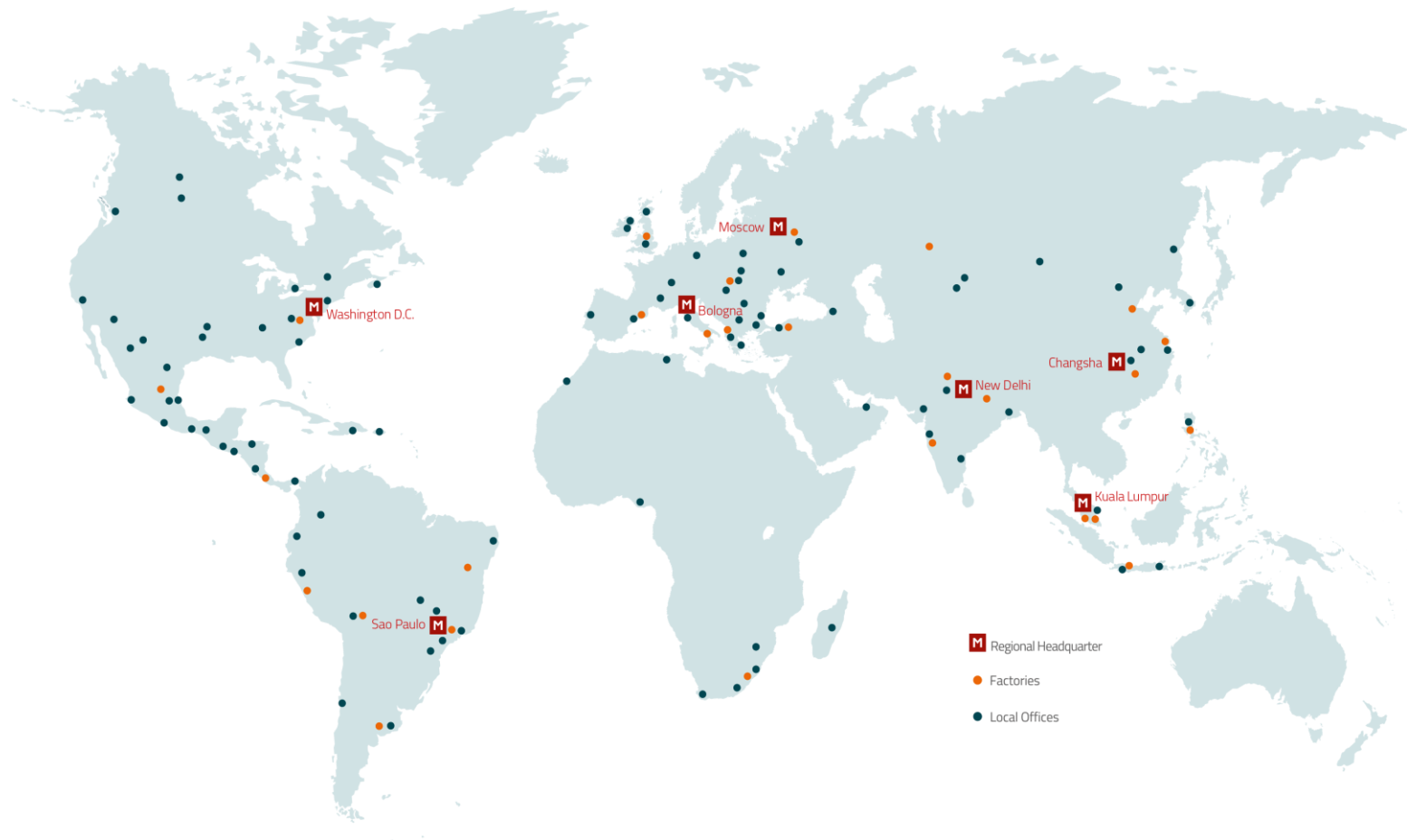
# 1. THE COMPANY

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.





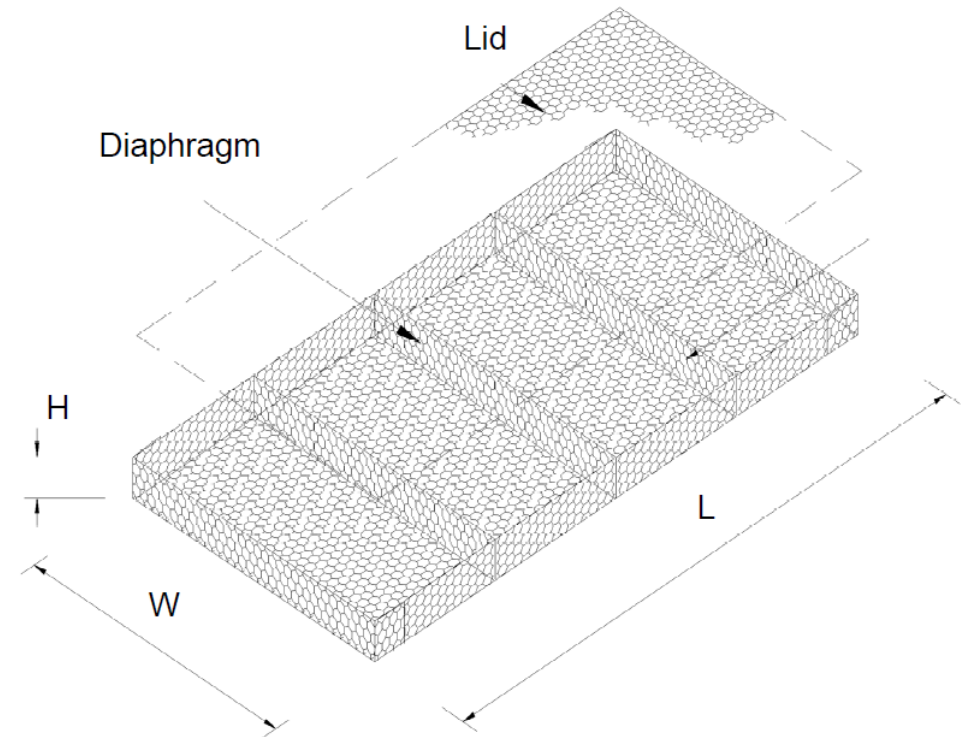
### Maccaferri Reno Mattresses

Mattress units manufactured from double twisted hexagonal woven steel wire mesh divided into uniformly portioned cells by internal diaphragms. These are positioned by inserting an upright double-mesh fold in the base panel, which improves diaphragm stability during filling operations.

Reno mattresses are filled with stones at the project site to form flexible, permeable, monolithic structures such as river bank protection and channel linings for erosion control projects. In order to reinforce the structure, all mesh panel edges are selvaged with a wire having a greater diameter.

The products covered by the present EPD are all mattresses implemented with plastic coated steel wire and produced in two plants: Italy and Slovakia. The process of analysis has been performed on a sample of product variants selected against the production mass criteria and representative of at least 70% of the production in each plants in the reference year.

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



## 2. THE PRODUCTS

### VIEW OF THE RENO MATTRESS



### 2.1 THE PRODUCTION PROCESS

The production (figure 4) process 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 RENO MATTRESSES 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 Documents EAD 200039-00-0102 and EAD 200019-00-0102, are reported in the Declaration of Performances (DOP).

This EPD describes the impacts of the Mattresses produced in Italy and Slovakia, using as reference products the Gabion 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 in Italy and Slovakia respectively.

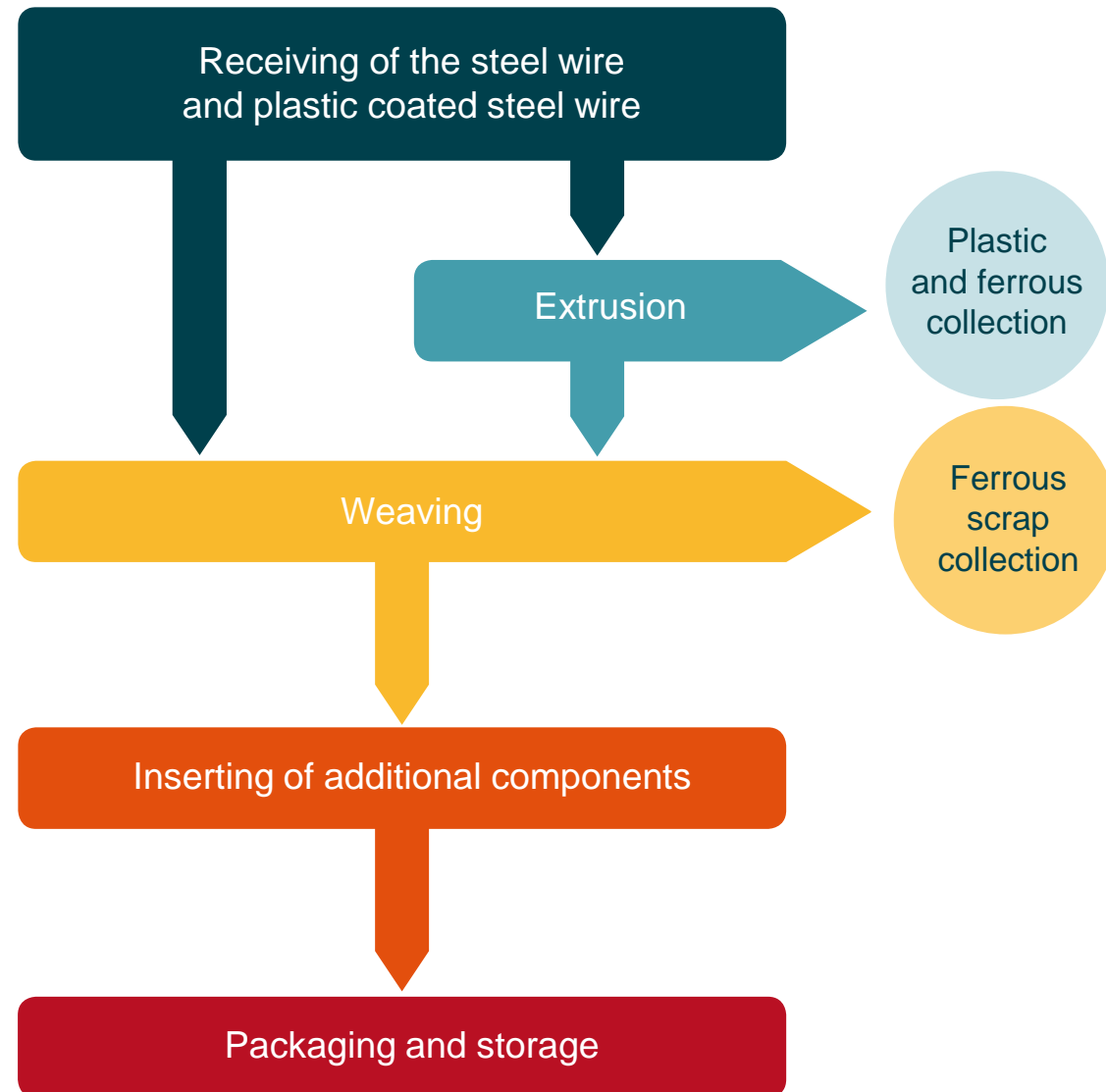


Figure 4: Production process of the Reno Mattress

### 2.2 PRODUCT COMPOSITION

Mattresses do not contain SVHC. The composition of the reference products is reported in Table 1.

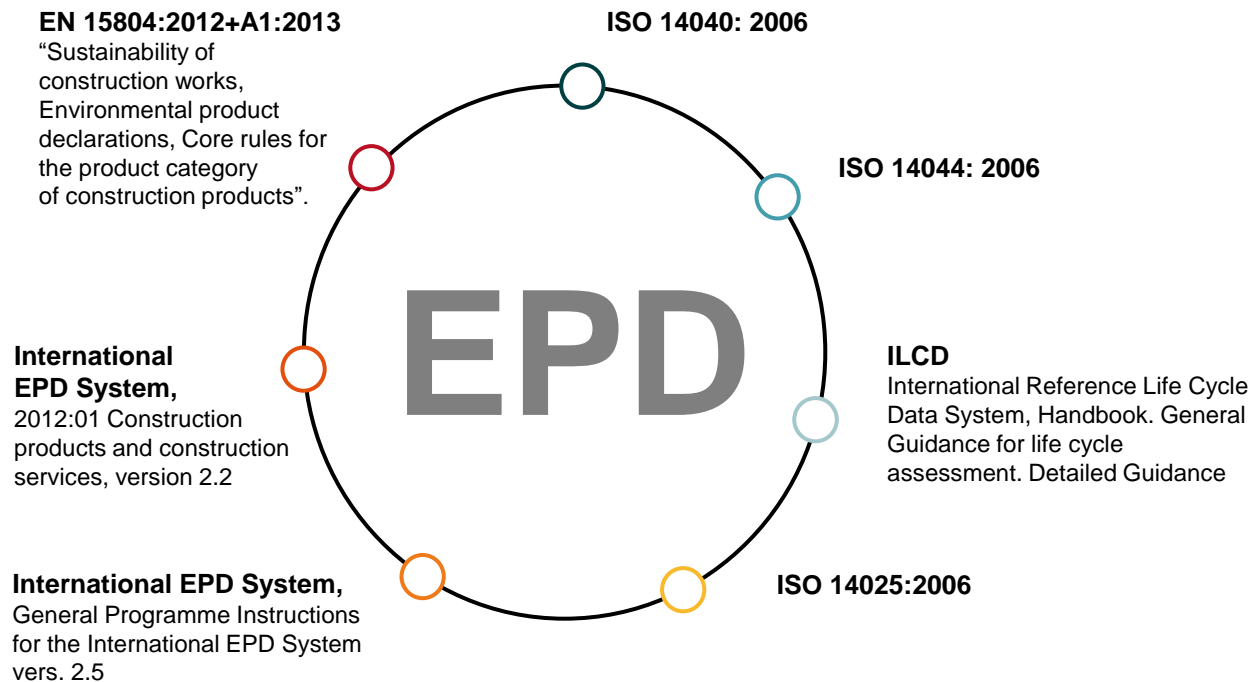
They are implemented with galvanized steel wire (diameter 2.2 mm for the mesh and diameter 2.7 mm for the edges), plastic coated (polymeric coating thickness 0.5 mm). PoliMac is an extruded polymer specifically developed by Maccaferri.

PRODUCT COMPOSITION OF THE MATTRESS (REFERENCE PRODUCTS)		
	Mattress 6x2x0.3, mesh 6x8, wire PVC - Polimac D22 (Italy)	Mattress 6x2x0.3, mesh 6x8, wire PVC - Polimac D22 (Slovakia)
<b>BoM - contribution (% in weight) of components to 1 kg of product</b>		
<b>PVC - POLIMAC</b>	17	17
<b>STEEL (Galvanized steel)</b>	83	83
<b>Packaging (kg)</b>		
<b>Polyester strap</b>	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 mattresses 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).



# 3. ENVIRONMENTAL PRODUCT DECLARATION






## 3.2 DECLARED UNIT

The declared unit is 1 kg of Mattress, 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

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

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

\* Module Not Declared

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

### 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 Gabions (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.

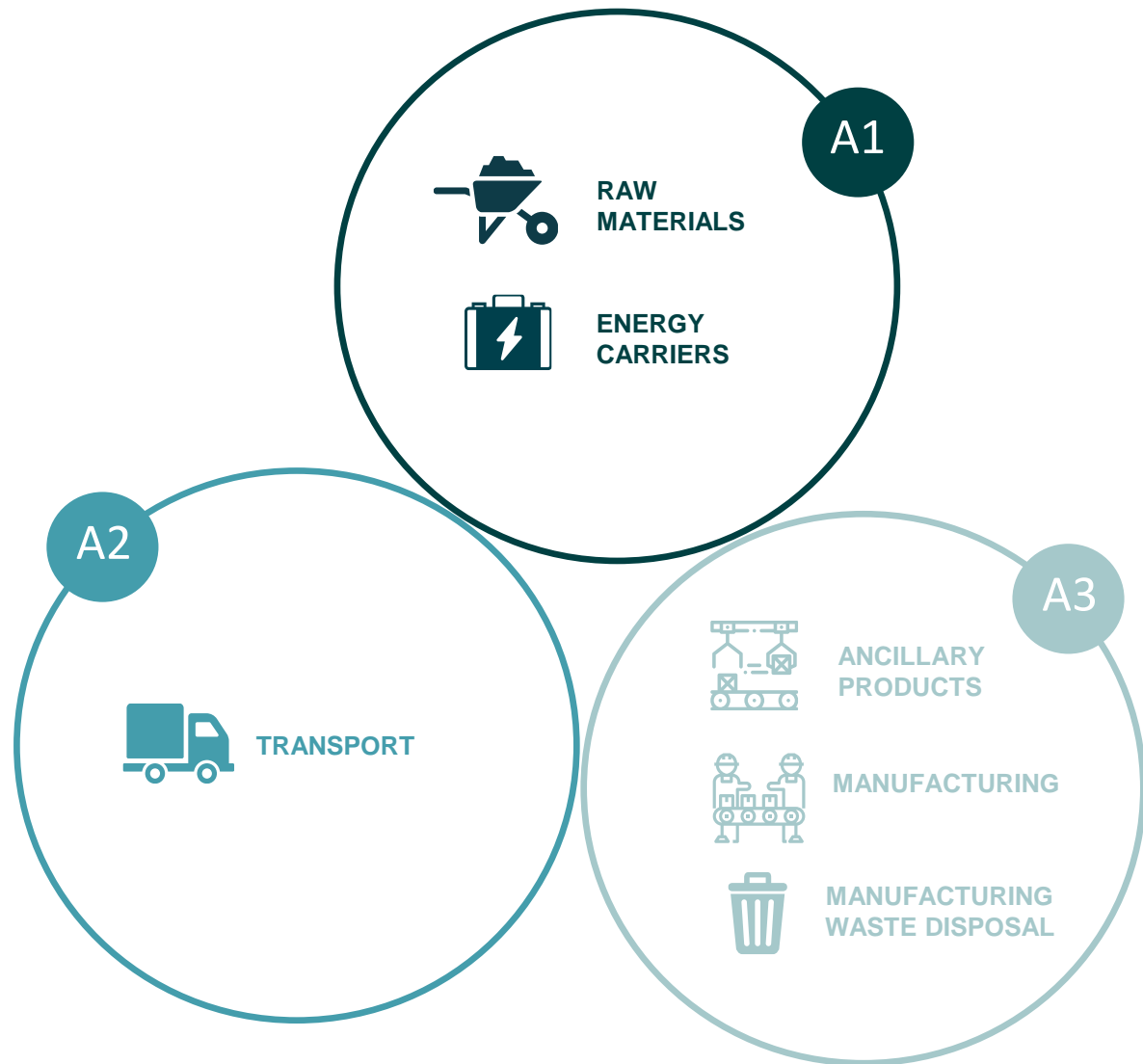


Figure 5: System boundaries for the Officine Maccaferri Mattresses

### 3. ENVIRONMENTAL PRODUCT DECLARATION

#### 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 an European production is assumed.
- A default mean a transportation (truck Euro 4 > 32 t) with an utilisation 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.

#### 3.5 PARAMETERS DESCRIBING THE ENVIRONMENTAL IMPACTS

For the production in Italy and in Slovakia, the variability of impacts registered among products in the family is not higher than ±1%.

IMPACT CATEGORY	Mattress – Modules A1-A3	
	Mattress 6x2x0.3, mesh 6x8, wire PVC - Polimac D22 (Italy)	Mattress 6x2x0.3, mesh 6x8, wire PVC – Polimac D22 (Slovakia)
Abiotic Depletion (ADP fossil) [MJ]	1,57E+01	1,64E+01
Abiotic Depletion (ADP elements) [kg Sb-Equiv.]	8,00E-05	8,15E-05
Acidification Potential (AP) [kg SO2-Equiv.]	2,74E-03	2,90E-03
Eutrophication Potential (EP_ [kg Phosphate-Equiv.]	4,97E-04	5,22E-04
Global Warming Potential (GWP 100 years) [kg CO2-Equiv.]	9,56E-01	9,99E-01
Ozone Layer Depletion Potential (ODP, steady state) [kg R11-Equiv.]	5,90E-09	6,02E-09
Photochem. Ozone Creation Potential (POCP) [kg Ethene-Equiv.]	3,52E-04	3,23E-04

Table 3: Environmental profile for Officine Maccaferri Mattresses

### 3. ENVIRONMENTAL PRODUCT DECLARATION

#### 3.6 INDICATORS OF RESOURCES USE

INDICATOR OF RESOURCES	Mattresses – Modules A1-A3	
	Mattress 6x2x0.3, mesh 6x8, wire PVC - Polimac D22 (Italy)	Mattress 6x2x0.3, mesh 6x8, wire PVC – Polimac D22 (Slovakia)
Use of renewable primary energy excluding renewable primary resources used as raw materials [MJ, net calorific value]	3,28E+00	2,99E+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]	3,28E+00	2,99E+00
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials [MJ, net calorific value]	1,49E+01	1,59E+01
Use of non-renewable primary energy resources used as raw materials [MJ, net calorific value]	3,52E+00	3,52E+00
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) [MJ, net calorific value]	1,85E+01	1,94E+01
Use of secondary material [kg]	8,30E-01	8,30E-01
Use of non renewable secondary fuels [MJ, net calorific value]	1,06E-06	1,09E-06
Use of renewable secondary fuels [MJ, net calorific value]	8,37E-08	8,57E-08
Use of net fresh water [ $m^3$ ]	3,52E-01	3,56E-01

Table 4: Indicators of resources use for Officine Maccaferri Mattresses



### 3. ENVIRONMENTAL PRODUCT DECLARATION

#### 3.7 INDICATORS OF WASTE AND OUTPUT FLOWS

INDICATOR OF WASTE	Mattresses – Modules A1-A3	
	Mattress 6x2x0.3, mesh 6x8, wire PVC - Polimac D22 (Italy)	Mattress 6x2x0.3, mesh 6x8, wire PVC – Polimac D22 (Slovakia)
Hazardous waste disposed [kg]	2,27E-07	2,50E-07
Non-hazardous waste disposed [kg]	1,03E-03	1,95E-03
Radioactive waste disposed [kg]	1,08E-03	1,19E-03

Table 5: Indicators of waste for Officine Maccaferri Mattresses

INDICATOR OF OUTPUT FLOWS	Mattresses – Modules A1-A3	
	Mattress 6x2x0.3, mesh 6x8, wire PVC – Polimac D22 (Italy)	Mattress 6x2x0.3, mesh 6x8, wire PVC - Polimac D22 (Slovakia)
Materials for energy recovery [kg]	9,21E-04	1,08E-04
Materials for recycling recovery [kg]	1,60E-02	3,74E-02

Table 6: Indicators of output flows for Officine Maccaferri Mattresses

## 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 Program Instructions 2.5].

**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 (RECLAIMED) 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](http://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

Mattress 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 mattress mesh is produced in compliance with CPR – Construction Product Regulation 305/2011, having CE marking in compliance with ETA 15/0219 and ETA 17/0002.


Additional information on the company and on the products covered by the present EPD are available at [maccaferri.com](http://maccaferri.com) and [info@hq.maccaferri.com](mailto: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.



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

EPD Programme:	The International EPD® System. For more information - <a href="http://www.environdec.com">www.environdec.com</a>
PCR:	PCR 2012:01 Construction products and construction services version 2.2
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Independent verification of the declaration and data according to ISO 14025:	EPD verification (external)
Third party verifier:	SGS Italia S.p.A. Via Caldera 21, 20153 Milano. <a href="http://www.it.sgs.com">www.it.sgs.com</a>
Accredited or approved by:	Accredia, certificate n.006H