MACCAFERRI

Environmental product declaration (EPD) for

MACMAT

THE INTERNATIONAL EPD® SYSTEM

EPD in accordance with ISO 14025 and EN 15804+A1

PCR: 2012:01 Construction products and construction services version 2.2
Geographical scope: Global
EPD registration number: **S-P-01469**
Date of publication (issue): 2019-01-18
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Date of validity: 2023-12-17 (5 years)

SUMMARY

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/

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.

MacMat products covered by the present EPD are:
MacMat ®, **MacMat R Steel** ® and **MacMat R Polymer** ®.

MacMat ®

are made of synthetic material filaments, tangled together to form a highly deformable layer 10-20 mm thick, featured by a very high porosity (greater than 90% on average).

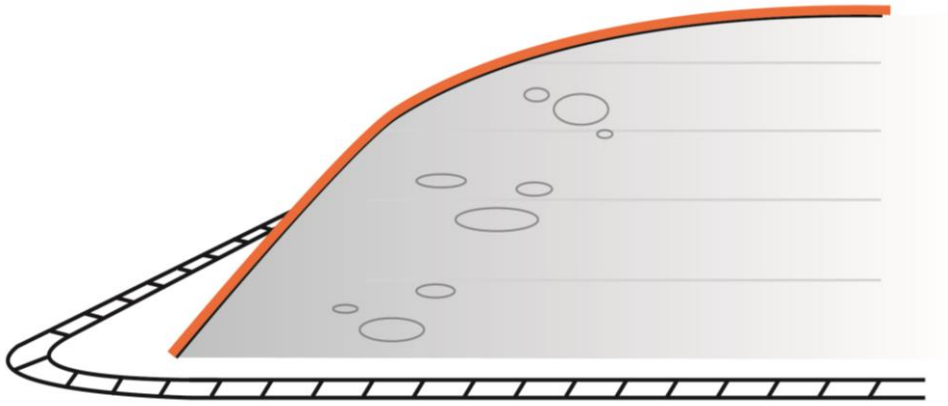
MacMat ® R - Steel

is a reinforced geomat obtained by a polymer made three-dimensional matrix extruded onto a double twisted steel woven mesh. Double twisted woven mesh used in production of MACMAT R – STEEL can be with or without Polymeric coating.

MacMat ® R - Polymer

is a reinforced geomat obtained by a polymer made three-dimensional matrix extruded onto a polymeric woven geogrid.

MacMat products can be used on slopes, along the banks of canals and river courses, or to convey liquids (drainage) in association with geotextiles and/or geomembranes.



Erosion control with MacMat

The main applications are:

- Superficial erosion protection caused by the impact of rain drops and rills
- Lining of river banks with low water velocities

Reinforced **MacMat ® (R Steel and R polymer)** is used for the most demanding slope face stabilisation applications which require a combination of erosion protection and surface stabilisation.

The products covered by the present EPD are produced in Officine Maccaferri plant in Slovakia. The process of analysis has been performed on a sample of products selected against a production mass criteria and representing 70% of the total production.

The reference CPC code is 369 "Other plastic products".

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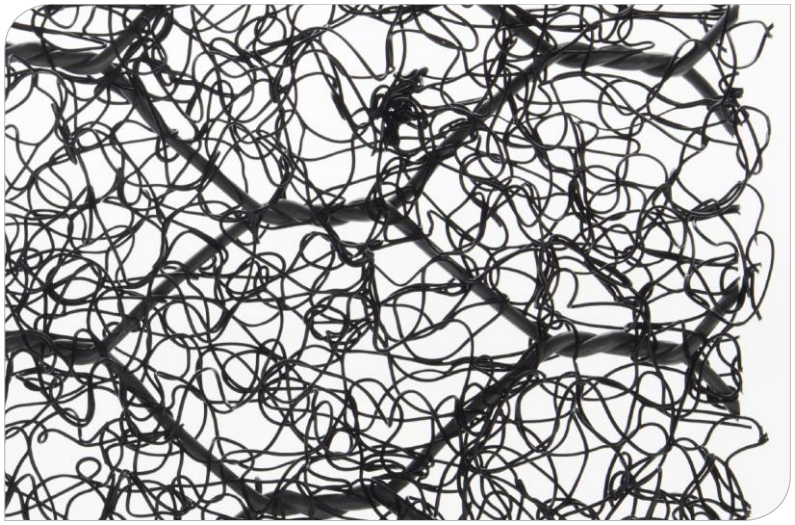
VIEW OF THE MACMAT

MacMat



MacMat R Steel

MacMat R Polymer

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THE MACMAT APPLICATION

2.1 THE PRODUCTION PROCESS

The production process (Figure 4) common to all MacMat is the implementation of the core (geomat), through an extrusion process of the polymer. The whole set of products under analysis are made of a geomat. Additional elements are added to improve the mechanical performance of the product, i.e. the steel reinforcement for MacMat R Steel® or the polymer reinforcement for MacMat R Polymer®.

Technical Characteristics of the MACMAT range products 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 230008-00-0106 (MacMat R steel), or EN 13249, EN 13250, EN 13251, EN 13253, EN 13254, EN 13255, EN 13257 and EN 13265, (MacMat and MacMat R Polymer), are reported in the Declaration of Performances (DOP).

This EPD describes the impacts of the MacMat ®, MacMat R Steel® and MacMat R Polymer® produced in Slovakia, using for each product a reference product which is the most produced product variant in the plant for the reference year. The results reported in this EPD, through the three selected reference products, are representative of the production of the three products family.

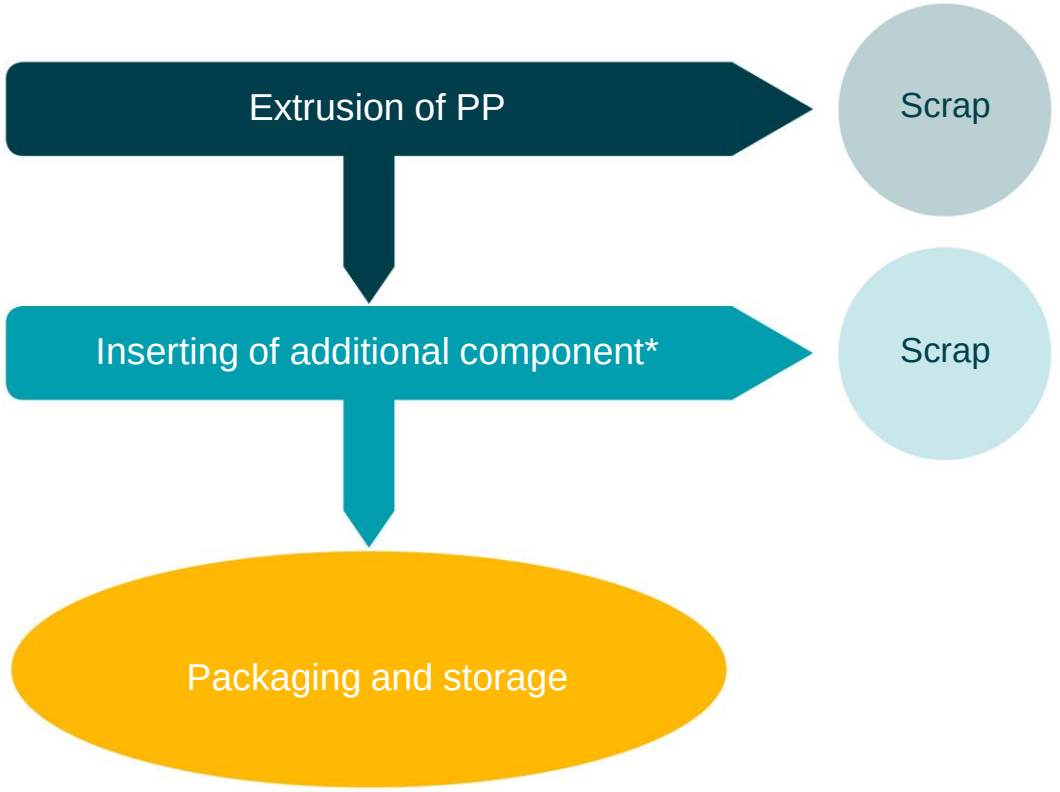

Figure 4: Production process of MacMat Products

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2.2 PRODUCT COMPOSITION

The composition of the reference products is reported in Table 1 to Table 3. The content of SVHC does not exceed 0.1 % of the total weight.

MACMAT	
MACMAT 19.1	
BoM - contribution (% in weight) of materials to the declared unit - 1 kg of product	
Polypropylene	97.86
Master Batch Polypropylene	2.14
Packaging (kg)	
Stretch foil	0.004

Table 1: BoM of the reference product for the MacMat ®

MACTMAT R STEEL - TYPE	
MACMAT R1 6822GN	
BoM - contribution (% in weight) of materials to the declared unit - 1 kg of product	
Polypropylene	26.67
Master Batch Polypropylene	0.55
Steel	68.98
Packaging (kg)	
Stretch foil	0.004

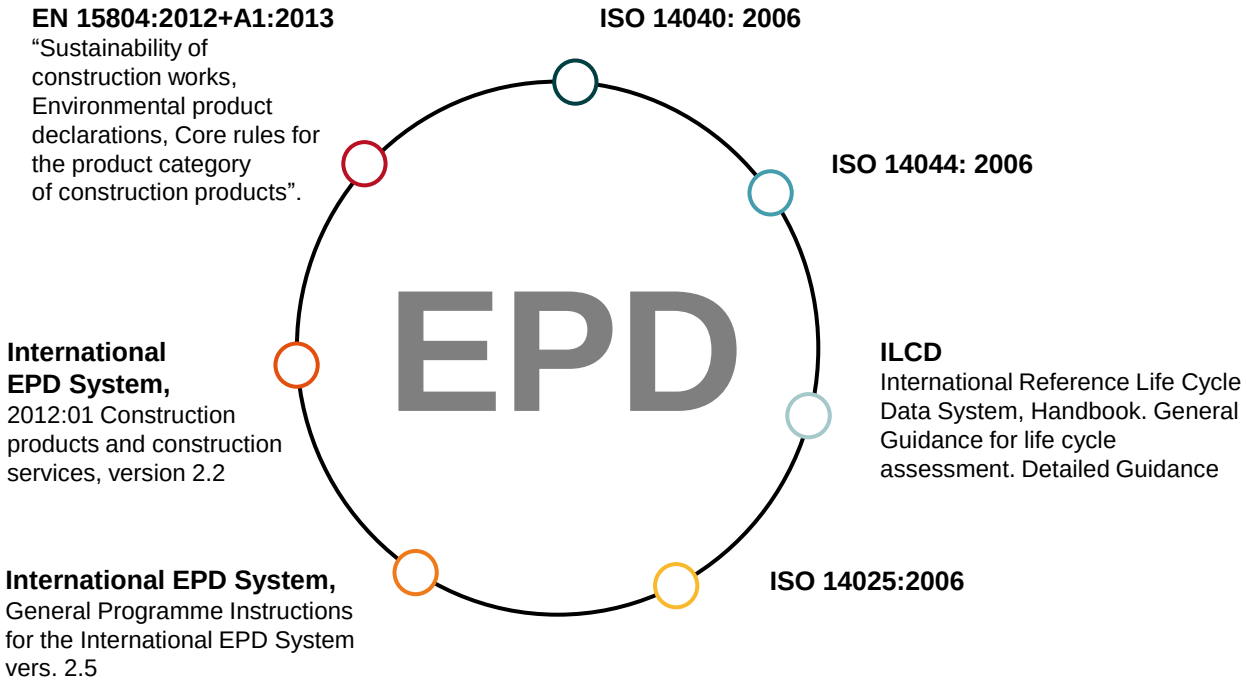
Table 2: BoM of the reference product for the MacMat R steel ®

MACTMAT R POLYMER - TYPE	
MACMAT R1 200	
BoM - contribution (% in weight) of materials to the declared unit - 1 kg of product	
Polypropylene	37.09
Master Batch Polypropylene	0.77
High tenacity polyester	49.71
Styrene-Butadiene rubber	12.43
Packaging (kg)	
Stretch foil	0.004

Table 3: BoM of the reference product for the MacMat R Polymer ®

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 MacMat ®, MacMat R Steel ® and MacMat R Polymer ®.

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).

3.2 DECLARED UNIT

The declared unit is 1 kg of MacMat (MacMat®, MacMat R Steel® and MacMat R Polymer®), plus its packaging.

3.3 SYSTEM BOUNDARY

The EPD only covers the Cradle to Gate stage (as represented in Table 4 and in showed in Figure 4) 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 4: Life cycle stages included in the study for Officine Maccaferri MacMat

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 MactMat (A3).
It includes the following production phases:

- Extrusion of the polymer
- Inserting of additional elements, if any
- 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.

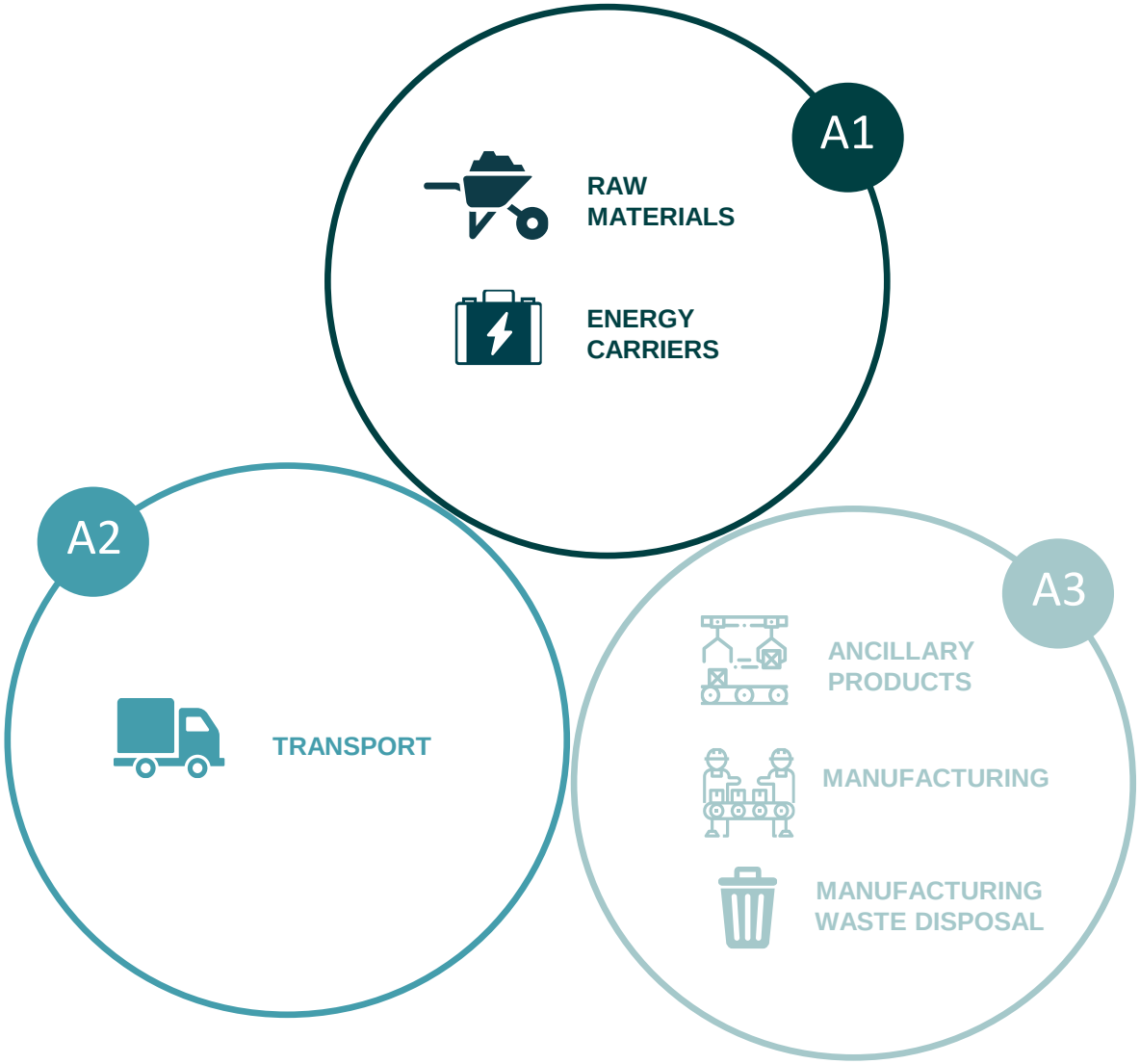


Figure 5: System boundaries for the Officine Maccaferri MacMat

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 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.

The construction of the manufacturing site (capital goods) in not included in the LCA study.

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

3.5 PARAMETERS DESCRIBING THE ENVIRONMENTAL IMPACTS

The variability of impacts among products in the family of MacMat ®and MacMat R Polymer ® is lower than 10%. More in detail, for MacMat it is lower than -1% in all impact categories, whereas for MacMat R Polymer run from -9.9% in GWP to -0.5% in ODP.

The variability of impacts among products in the family of MacMat R Steel ® is higher than ±10%. More in detail it run from -35% for ADP elements to 35% for POCP.

IMPACT CATEGORY	MACMAT PRODUCTS - MODULES A1-A3		
	MACMAT 19.1	MACMAT R1 6822GN	MACMAT R1 200
Abiotic Depletion (ADP fossil) [MJ]	7,39E+01	2,87E+01	8,50E+01
Abiotic Depletion (ADP elements) [kg Sb-Equiv.]	4,81E-07	7,13E-05	6,42E-07
Acidification Potential (AP) [kg SO2-Equiv.]	4,29E-03	4,31E-03	5,40E-03
Eutrophication Potential (EP) [kg Phosphate-Equiv.]	4,65E-04	5,92E-04	6,49E-04
Global Warming Potential (GWP 100 years) [kg CO2-Equiv.]	2,17E+00	1,35E+00	3,28E+00
Ozone Layer Depletion Potential (ODP, steady state) [kg R11-Equiv.]	1,81E-11	5,24E-09	1,89E-11
Photochem. Ozone Creation Potential (POCP) [kg Ethene-Equiv.]	4,98E-04	3,23E-04	7,53E-04

Table 5: Environmental profile for Officine Maccaferri MacMat ®, MacMat R Steel ®, MacMat R Polymer ®

3.6 INDICATORS OF RESOURCES USE

INDICATOR OF RESOURCES	MACMAT PRODUCTS - MODULES A1-A3		
	MACMAT 19.1	MACMAT R1 6822GN	MACMAT R1 200
Use of renewable primary energy excluding renewable primary energy resources used as raw materials [MJ, net calorific value]	3,48E+00	3,66E+00	5,17E+00
Use of renewable primary energy resources used as raw materials [MJ, net calorific value]	0.00E+00	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]	3,48E+00	3,66E+00	5,17E+00
Use of non- renewable primary energy excluding non-renewable primary energy resources used as raw materials [MJ, net calorific value]	3,18E+01	2,02E+01	5,07E+01
Use of non- renewable primary energy resources used as raw materials [MJ, net calorific value]	4,74E+01	1,42E+01	4,11E+01
Total use of non- renewable primary energy resources (primary energy and primary energy resources used as raw materials) [MJ, net calorific value]	7,92E+01	3,44E+01	9,17E+01
Use of secondary material [kg]	0.00E+00	7,00E-01	0.00E+00
Use of non renewable secondary fuels [MJ, net calorific value]	4,01E-22	8,99E-22	3,76E-19
Use of renewable secondary fuels [MJ, net calorific value]	3,41E-23	7,65E-23	3,20E-20
Use of net fresh water [m3]	2,38E-02	3,20E-01	3,28E-02

Table 6: Indicators of resources use for Officine Maccaferri MacMat®, MacMat R Steel®, MacMat R Polymer ®

3.7 INDICATORS OF WASTE AND OUTPUT FLOWS

INDICATOR OF WASTE	MACMAT PRODUCTS – MODULES A1-A3		
	MACMAT 19.1	MACMAT R1 6822GN	MACMAT R1 200
Hazardous waste disposed [kg]	5,79E-08	7,36E-08	8,01E-08
Non-hazardous waste disposed [kg]	2,53E-02	2,51E-02	2,50E-02
Radioactive waste disposed [kg]	2,10E-03	2,25E-03	2,63E-03

Table 7: Indicators of waste for Officine Maccaferri MacMat®, MacMat R Steel®, MacMat R Polymer®

INDICATOR OF OUTPUT FLOWS	MACMAT PRODUCTS - MODULES A1-A3		
	MACMAT 19.1	MACMAT R1 6822GN	MACMAT R1 200
Material for Energy Recovery (MER)	1,03E-02	1,02E-02	1,02E-02
Materials for Recycling (MFR)	1,24E-02	3,73E-02	1,22E-02

Table 8: Indicators of output flows for Officine Maccaferri MacMat®, MacMat R Steel®, MacMat R Polymer®

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

Ecoinnovazione, 2018. Technical report: LCA study of Geosynthetic product for civil engineering 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 Cyle 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

5. GLOSSARY

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 (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 o companies, which use those substances as such, in formulation or in their products.

6. ADDITIONAL INFORMATION

6.1 ADDITIONAL INFORMATION CONCERNING THE PROGRAMME AND THE EPD

EPDs within the same product category but from different program 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

MacMat, MacMat R Polymer and MacMat R Steel units covered by the present EPD are produced in Slovakia (Senica) plant. The management and production system of the plant is certified in compliance to ISO 9001.

For further information on product characteristics, typical applications, technical datasheet and case histories, please visit our website (maccaferri.com) or contact us info@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

MACCAFERRI

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
EPD Registration no:	S-P-01469
EPD validity:	2023-12-17 (5 years)
EPD valid within the following geographical area:	Global
Technical support:	Ecoinnovazione S.r.l. – spin-off ENEA - Via d'Azeglio 51, 40123 Bologna ecoinnovazione spin off ENEA www.ecoinnovazione.it
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.www.it.sgs.com
Accredited or approved by:	Accredia, certificate n.006H