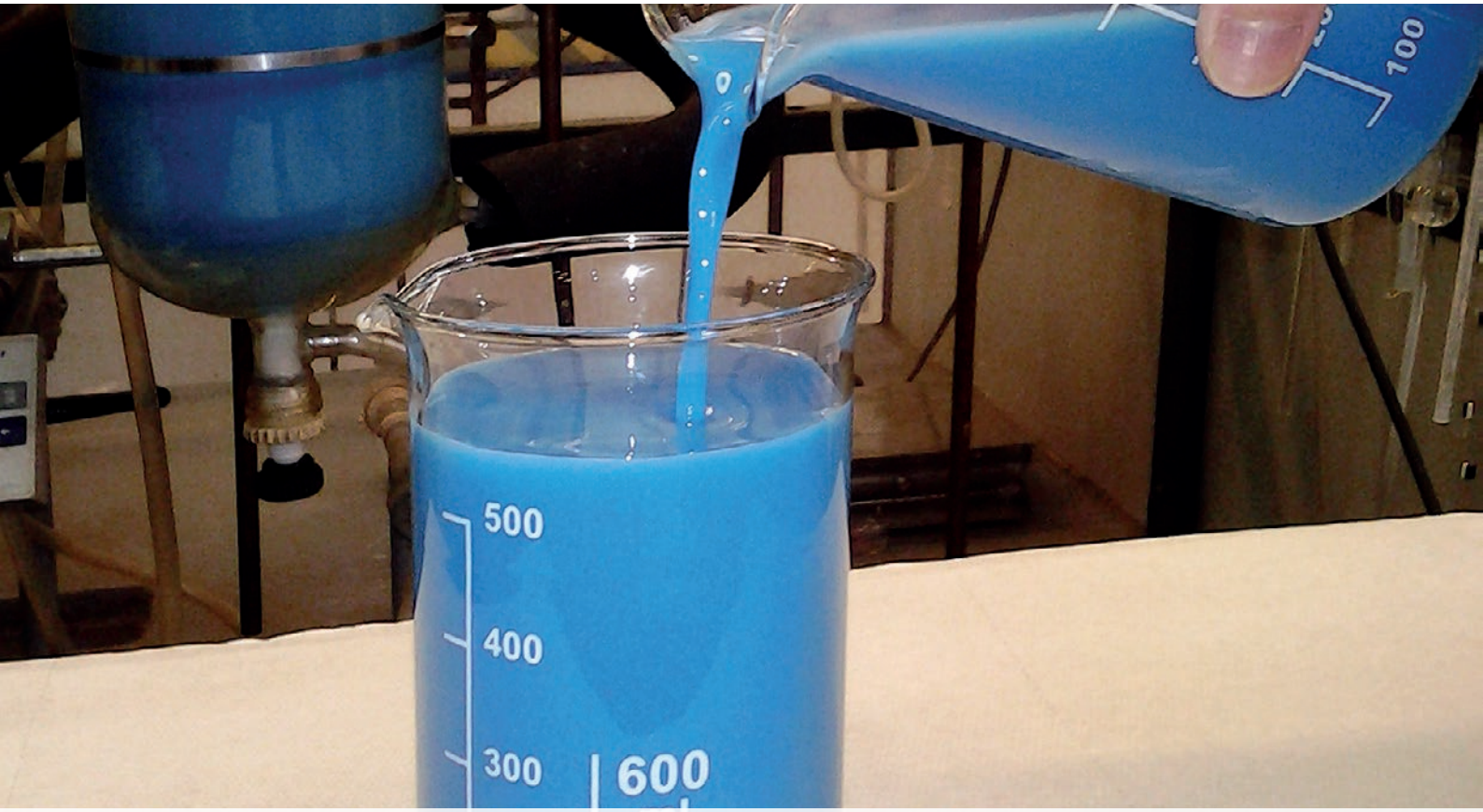
EPD®
THE INTERNATIONAL EPD® SYSTEM

ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO 14025 for

Mapefast Ultra
Mapefast Ultra N



Programme:	Programme operator:	EPD registration number:	Approval date:	Valid until:	Geographical scope:
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ADHESIVES · SEALANTS · CHEMICAL PRODUCTS FOR BUILDING

1. COMPANY DESCRIPTION / GOAL & SCOPE

Founded in 1937 in Milan, Italy, Mapei produces adhesives and complementary products for laying all types of floor, wall and coating materials, and also specializes in other chemical products used in the building industry, such as waterproofing products, specialty mortars, admixtures for concrete, products for underground constructions and for the restoration of concrete and historical buildings.

There are currently 85 subsidiaries in the Mapei Group, with a total of 80 production facilities located around the world in 34 different countries and in 5 different continents. Mapei also has 18 central laboratories. Most locations are ISO 9001 and ISO 14001 or EMAS-certified.

Mapei's strategy of internationalization is based on two main objectives: being closer to local needs and lowering transportation costs. With the declared objective of being close to buyers and clients, Mapei's presence in the five continents enables the company to comply with the requirements of each location, and to use only locally-based managers and qualified personnel, without changing the approach of Mapei.

Mapei invests 12% in its company's total work-force and 5% of its turnover in Research & Development; in particular, 70% of its R&D efforts are directed to develop eco-sustainable and environmentally friendly products, which give important contribution to all major green rating systems for eco-sustainable buildings such as LEED and BREEAM.

Furthermore, Mapei has developed a sales and technical service network with offices all over the world and offers an efficient Technical Assistance Service that is valued by architects, engineers, contractors and owners.

The goal of the study is to provide necessary data and documentation to produce an EPD according to the requirements of PCR Environdec (version 2.2, 2017-05-30) under EN 15804:2014, and to have more comprehension about the environmental impacts related to **Mapefast Ultra** and **Mapefast Ultra N** manufactured in Mapei S.p.A. located in Robbiano di Mediglia (Italy), including packaging of the finished products; **Mapefast Ultra N** is sold by Mapei AS. Target audiences of the study are customers and other parties with an interest in the environmental impacts of **Mapefast Ultra** and **Mapefast Ultra N**.

This analysis shall not support comparative assertions intended to be disclosed to the public.

2. PRODUCT DESCRIPTION

Mapefast Ultra and **Mapefast Ultra N** are chloride-free liquid hardening accelerators of the latest generation for mortar and concrete.
Mapefast Ultra and **Mapefast Ultra N** are admixtures that may be used in all concrete mixes prepared in pre-cast plants and concrete mixing units. They act as catalysers for the nucleation and growth process of hydration products of the cement and rapidly accelerate the development of strength during short curing cycles, including at low temperatures.

3. CONTENT DECLARATION

The main components of **Mapefast Ultra** and **Mapefast Ultra N** are the following:

Table 1: Composition

Materials	Percentage (%)
Inorganic Substances	20 – 40
Organic Substances	0 – 15
Water	< 50
Packaging	< 2

Mapefast Ultra and **Mapefast Ultra N** contain no substances of very high concern (SVHC) on the REACH Candidate List published by the European Chemicals Agency in a concentration more than 0,1% (by unit weight).

4. DECLARED UNIT AND REFERENCE SERVICE LIFE

The declared unit is 1 kg of packaged finish product.
The primary packaging material is 200 litres drum made of HDPE (high density polyethylene).
Due to the selected system boundary and the use of **Mapefast Ultra** and **Mapefast Ultra N**, the reference service life of the products is not specified.

5. SYSTEM BOUNDARIES & ADDITIONAL TECHNICAL INFORMATION

The approach is “cradle to gate”. The following modules have been considered:

- A1, A2, A3 (Product stage): extraction and transport of raw materials and packaging, production process;

Table 2: System boundaries

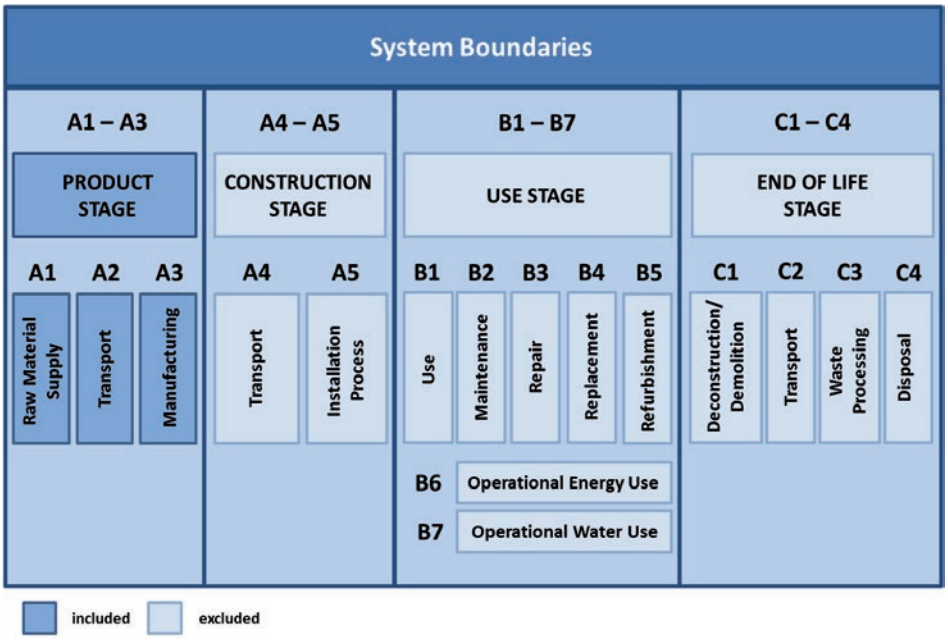
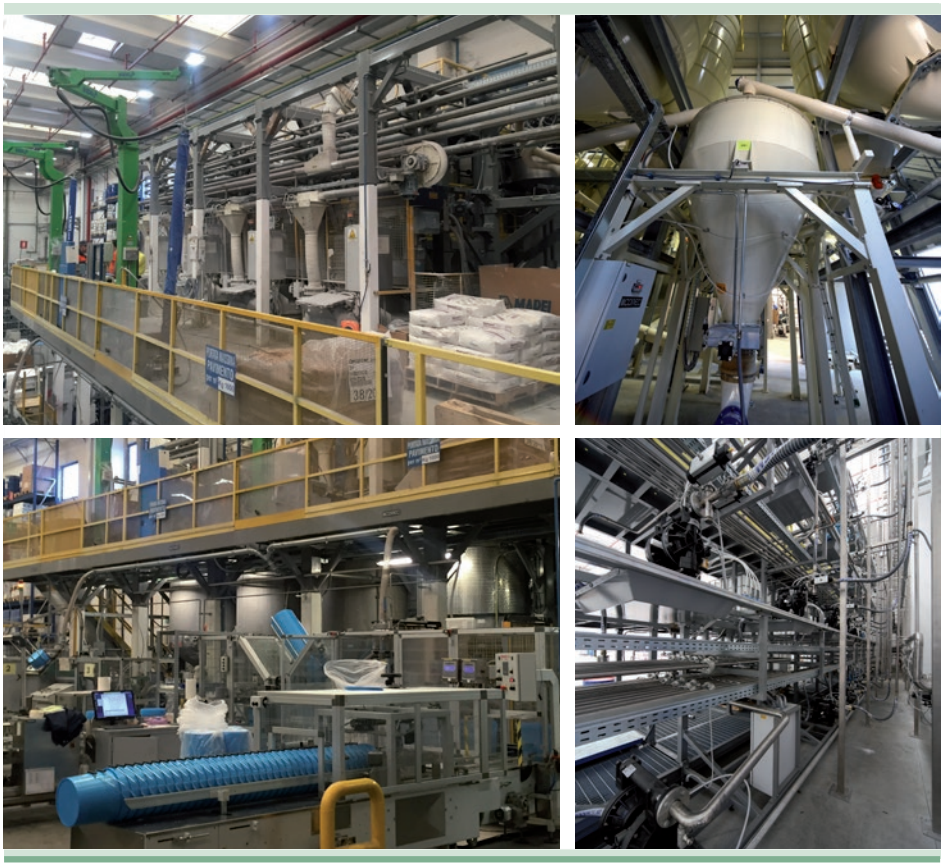


Figure 1: Mediglia Plant

A brief description of production process, is the following:
Raw materials, that are purchased from external and intercompany suppliers, are transported and stored in the plant. Bulk raw materials are stored in specific silos and added automatically in the production mixer, according to the formula of the product. Packaged raw materials, supplied in bags, big bags or tanks, are stored in the warehouse and added automatically or manually in the mixer. The production is a discontinuous process, in which all the components are mechanically mixed in batches. The semi-finished product is then packaged in 200l drum and stored in the Finished Products' warehouse. The finished product can be delivered also in bulk. The quality of the final products is controlled before the sale.

Figure 2: Production process detail



6. CUT-OFF RULES & ALLOCATION

Criteria for the exclusion of inputs and outputs (cut-off rules) in the LCA, information modules and any additional information are intended to support an efficient calculation procedure. They are not applied in order to hide data.
The following procedure is followed for the exclusion of inputs and outputs:

- All inputs and outputs to a unit process, for which data are available, are included in the calculation.
- Cut-off criteria, where applied, are described in Table 3.

Table 3: Cut-off criteria

Process excluded from study	Cut-off criteria	Quantified contribution from process
A3: production (auxiliary materials)	less than 10^{-5} kg/kg of finished product	Sensitivity studies demonstrate a relative contribution lower than 0,5%
A3: waste	less than 10^{-5} kg/kg of finished product	Sensitivity studies demonstrate a relative contribution lower than 0,5%

For the allocation procedure and principles, consider the following table (Table 4):

Table 4: Allocation procedure and principles

Module	Allocation Principle
A1	All data are referred to 1 kg of product: • A1: electricity is allocated to the whole plant
A3	All data are referred to 1 kg of packaged product: • A3-wastes: all data are allocated to the whole plant

7. ENVIRONMENTAL PERFORMANCE & INTERPRETATION

GWP_{100}

Global Warming Potential refers to the emission/presence of GHGs (greenhouse gases) in the atmosphere (mainly CO_2, N_2O, CH_4) which contribute to the increase in the temperature of the planet.

AP

Acidification Potential refers to the emission of specific acidifying substances (i.e. NOx, SOx) in the air. These substances decrease the pH of the rainfall with predictable damages to the ecosystem.

EP

Eutrophication Potential refers to the nutrient enrichment of flowing water, which determines unbalance in aquatic ecosystems and causes the death of the aquatic fauna.

ODP

Ozone Depletion Potential refers to the degradation of the stratospheric layer of the ozone involved in blocking the UV component of sunrays. Depletion is due to particularly reactive components that originate from chlorofluorocarbon (CFC) or chlorofluoromethanes (CFM).

POCP

The Photochemical Ozone Creation Potential is the ozone formation in low atmosphere. This is quite common in the cities where a great amount of pollutants (like VOC and NOx) are emitted every day (industrial emissions and vehicles). It is mainly diffused during the summertime.

ADP_e (elements)

Abiotic Depletion Potential elements refers to the depletion of the mineral resources.

ADP_f (fossil fuel)

Abiotic Depletion Potential fossil fuel refers to the depletion of the fossil fuel resources.

Following tables show environmental impacts for the products considered according to CML methodology (2001 – Jan2016). All the results are referred to the functional unit (see chapter 4).

*Table 5: **Mapefast Ultra N**: Environmental categories referred to the declared unit*

Environmental Category	Unit	A1-A3
GWP_{100}	kg CO_2 eq.	1,12E+00
ADP_e (element)	kg Sb eq.	1,53E-05
ADP_f (fossil)	MJ	1,21E+01
AP	kg SO_2 eq.	5,36E-03
EP	kg $(PO_4)^{3-}$ eq.	2,43E-03
ODP	kg R-11 eq.	7,67E-08
POCP	kg ethylene eq.	-3,32E-06

GWP_{100}: Global Warming Potential; **ADPe**: Abiotic Depletion Potential (elements); **EP**: Eutrophication Potential; **AP**: Acidification Potential; **POCP**: Photochemical Ozone Creation Potential; **ODP**: Ozone Depletion Potential; **ADPf**: Abiotic Depletion Potential (fossil)

*Table 6: **Mapefast Ultra N**: Other environmental indicators referred to the declared unit*

Environmental Indicator	Unit	A1-A3
RPEE	MJ	1,34E+00
RPEM	MJ	-
TPE	MJ	1,34E+00
NRPE	MJ	1,30E+01
NRPM	MJ	-
TRPE	MJ	1,30E+01
SM	kg	-
RSF	MJ	-
NRSF	MJ	-
W	m^3	1,78E-02

RPEE Renewable primary energy as energy carrier; **RPEM** Renewable primary energy as material utilisation; **TPE** Total use of renewable primary energy sources; **NRPE** Non-renewable primary energy as energy carrier; **NRPM** Non-renewable primary energy as material utilization; **TRPE** Total use of non-renewable primary energy sources; **SM** Use of secondary materials; **RSF** Renewable secondary fuels; **NRSF** Non-renewable secondary fuels; **W** Net use of fresh water [total freshwater consumption]

*Table 7: **Mapefast Ultra N**: Waste production & other output flows referred to the declared unit*

Output Flow	Unit	A1-A3
NHW	kg	5,25E-03
HW	kg	4,21E-06
RW	kg	-
Components for re-use	kg	-
Materials for recycling	kg	-
Materials for energy recovery	kg	-
Exported energy	MJ	-

HW Hazardous waste disposed; **NHW** Non Hazardous waste disposed; **RW** Radioactive waste disposed

*Table 8: **Mapefast Ultra**: Environmental categories referred to the declared unit*

Environmental Category		Unit	A1-A3
	**GWP_{100}**	kg CO_2 eq.	1,01E+00
	**ADP_e (element)**	kg Sb eq.	1,52E-05
	**ADP_f (fossil)**	MJ	1,06E+01
	**AP**	kg SO_2 eq.	4,71E-03
	**EP**	kg $(PO_4)^{3-}$ eq.	2,27E-03
	**ODP**	kg R-11 eq.	7,67E-08
	**POCP**	kg ethylene eq.	2,83E-04

GWP_{100}: Global Warming Potential; **ADPe**: Abiotic Depletion Potential (elements); **EP**: Eutrophication Potential; **AP**: Acidification Potential; **POCP**: Photochemical Ozone Creation Potential; **ODP**: Ozone Depletion Potential; **ADPf**: Abiotic Depletion Potential (fossil)

*Table 9: **Mapefast Ultra**: Other environmental indicators referred to the declared unit*

Environmental Indicator	Unit	A1-A3
RPEE	MJ	1,26E+00
RPEM	MJ	-
TPE	MJ	1,26E+00
NRPE	MJ	1,16E+01
NRPM	MJ	-
TRPE	MJ	1,16E+01
SM	kg	-
RSF	MJ	-
NRSF	MJ	-
W	m^3	1,60E-02

RPEE Renewable primary energy as energy carrier; **RPEM** Renewable primary energy as material utilisation; **TPE** Total use of renewable primary energy sources; **NRPE** Non-renewable primary energy as energy carrier; **NRPM** Non-renewable primary energy as material utilization; **TRPE** Total use of non-renewable primary energy sources; **SM** Use of secondary materials; **RSF** Renewable secondary fuels; **NRSF** Non-renewable secondary fuels; **W** Net use of fresh water [total freshwater consumption]

*Table 10: **Mapefast Ultra**: Waste production & other output flows referred to the declared unit*

Output Flow	Unit	A1-A3
NHW	kg	4,43E-03
HW	kg	4,21E-06
RW	kg	-
Components for re-use	kg	-
Materials for recycling	kg	-
Materials for energy recovery	kg	-
Exported energy	MJ	-

HW Hazardous waste disposed; **NHW** Non Hazardous waste disposed; **RW** Radioactive waste disposed

Tables above (from 5 to 10) and the following histograms (Table 11 and Table 12) show absolute results and relative contributions for the environmental categories considered in this EPD. Calculations point out that module **A1** has the highest contribution for both products on all environmental indicators. Considering ODP and ADPe, module **A1** highlights a relative contribution close to 100%. The module **A2** (raw materials transportation) gives a negative contribution to POCP due to the NO and NO_2 emission factors (for more details, see the methodology used: *HBEFA -Handbook Emission Factors for Road Transport*).

Table 11: Environmental impact as percentage – ***Mapefast Ultra N***

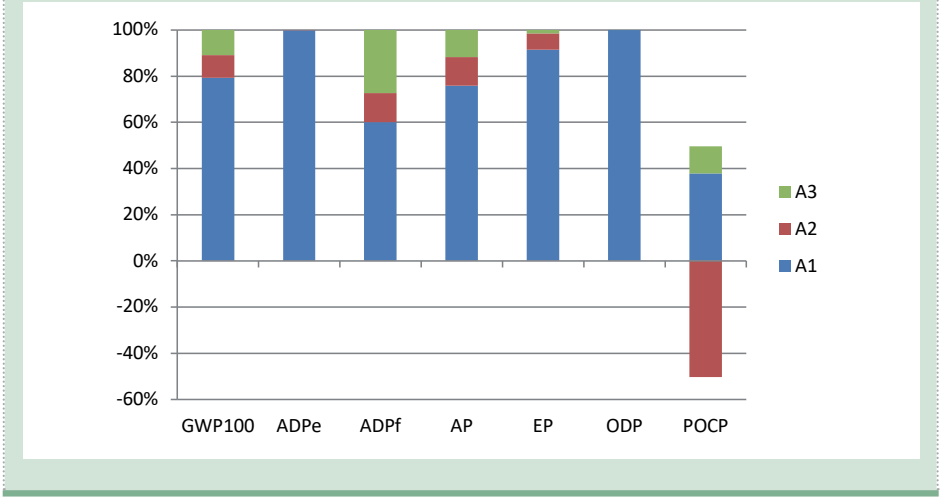
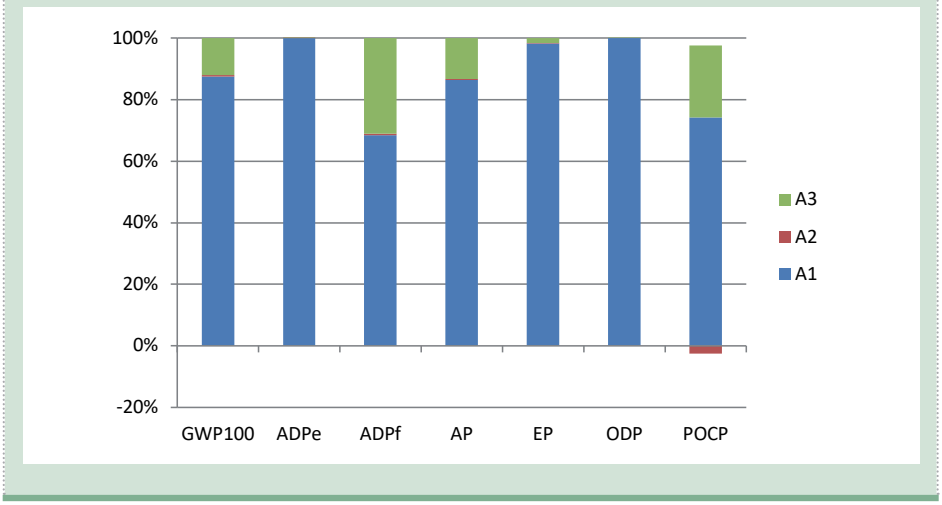


Table 12: Environmental impact as percentage – ***Mapefast Ultra***



More details about electrical mixes used in this EPD are shown below:

	Data source	Amount	Unit
Electricity grid mix (IT) – 2013	GaBi database	0,4290	kg CO_2-eqv/kWh
Electricity from photovoltaic (IT) – 2013	GaBi database	0,0512	kg CO_2-eqv/kWh

8. DATA QUALITY

Table 13: Data quality

Dataset & Geographical reference	Database (source)	Temporary reference
A1; A3		
Inorganic Additives (GLO)	ecoinvent v. 3.3	2014
Organic Additives (GLO)	ecoinvent v. 3.3	2014
Electricity grid mix (IT)	GaBi Database	2013
Electricity from photovoltaic (IT)	GaBi Database	2013
Packaging components	GaBi Database, ecoinvent v 3.3	2006 - 2016
A2		
Truck transport (euro 3,27 ton payload – GLO)	GaBi Database	2016
Diesel for transport (EU)	GaBi Database	2013

All data included in table above refer to a period between 2006 and 2016; the most relevant ones are specific from supplier, while the others (i.e. transport and minor contribution dataset), come from European and global databases.
All datasets are not more than 10 years old according to EN 15804 § 6.3.7 “Data quality requirements”. The only exception is represented by one raw material used for one packaging component production.
Primary data concern the year 2017 and represent the whole annual production.

9. VERIFICATION AND REGISTRATION

EPD 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.

CEN standard EN15804 served as the core PCR	
PCR:	PCR 2012:01 Construction products and Construction services, Version 2.2, 2017-05-30
PCR review was conducted by:	The Technical Committee of the International EPD® System. Chair: Massimo Marino Contact via **info@environdec.com**
Independent verification of the declaration and data, according to ISO 14025	☒ EPD Process Certification (Internal) ☐ EPD Verification (external)
Third party verifier:	Certiquality S.r.l. Number of accreditation: 003H rev14
Accredited or approved by:	Accredia
Procedure for follow-up of data during EPD validity involves third-party verifier	☒ Yes ☐ No

10. REFERENCES

- GENERAL PROGRAMME INSTRUCTIONS OF THE INTERNATIONAL EPD® SYSTEM. VERSION 3.0
- PCR 2012:01; "PRODUCT GROUP CLASSIFICATION: MULTIPLE UN CPC CODES CONSTRUCTION PRODUCTS AND CONSTRUCTION SERVICES"; VERSION 2.2
- HBEFA: HANDBOOK EMISSION FACTORS FOR ROAD TRANSPORT

11. CONTACT INFORMATION

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LCA Author:	Mapei SpA www.mapei.it; Environmental Sustainability Office
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ANNEX 1

ANNEX 1*:* Self declaration from EPD owner

Specific Norwegian requirements

1 Applied electricity data set used in the manufacturing phase

The electricity mix for the electricity used in manufacturing (A3) is the electricity grid mix

<0,4290 kg CO_2 eqv/kWh> (Italian grid mix)

<0,0512 kg CO_2 eqv/kWh> (Italian mix from photovoltaic)

2 Content of dangerous substances

☒ The product contains no substances given by the REACH Candidate list or the Norwegian priority list.

☐ The product contains substances that are less than 0.1% by weight given by the REACH Candidate or the Norwegian priority list.

☐ The product contains dangerous substances more than 0.1% by weight given in the REACH candidate list or the Norwegian Priority List, concentrations is given in the EPD:

Dangerous substances from the REACH candidate list or the Norwegian Priority List	**CAS No.**	**Quantity (concentration, wt%/FU(DU)).**
Substance 1		
Substance n		

3 Transport from the place of manufacture to a central warehouse

Transport distance, and CO_2-eqv./DU from transport of the product from factory gate to central warehouse in Oslo shall be given. The following table shall be included in the EPD:

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance km	Fuel/Energy use	Unit	Value (l/t)	Kg CO2-eqv./DU
Boat							
Truck	85	27 tonn, EURO 3	1950	0,0182	l/tkm	35,49	1,37E-02
Railway							
Rail							
Air							
Total							

4 Impact on the indoor environment

☐ Indoor air emission testing has been performed; specify test method and reference:

☐ No test has being performed

☒ Not relevant; specify : the product is an admixture used for fresh concrete inside concrete-mixer truck. They do not affect the indoor air quality.