# ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH ISO 14025:2006 AND EN 15804+A2:2019/AC:2021

## Water-based primers by NORDIA S.A.

EPD of multiple products, based on the average results of the product group.
An EPD should provide current information and may be updated if conditions change.
The stated validity is therefore subject to the continued registration and publication at www.environdec.com


**EPD registration number**
IES-0014663

**Publication date**
2024-09-05

**Date of validity**
2029-09-04

**Program**
The International EPD® system
www.Environdec.com

**Program operator**
EPD international AB

**UN CPC**
351 Paints and varnishes and related products

# PROGRAM INFORMATION

MARMOLINE

## DETAILS OF PROGRAM OPERATOR

EPD®

THE INTERNATIONAL EPD® SYSTEM

| | |
|---|---|
| PROGRAM OPERATOR: | EPD International AB |
| ADDRESS: | Box 210 60, SE-100 31 Stockholm, Sweden |
| WEBSITE: | www.environdec.com |
| E-MAIL ADDRESS: | info@environdec.com |

## ACCOUNTABILITIES FOR PCR, LCA & INDEPENDENT, THIRD-PARTY VERIFICATION

| | |
|---|---|
| **PRODUCT CATEGORY RULES (PCR)** | ▪ CEN Standard EN 15804 serves as the Core Product Category Rules (PCR)<br>▪ PCR 2019:14 Construction products version 1.3.3 (EN 15804:A2) |
| **PCR REVIEW WAS CONDUCTED BY** | The technical Committee of the International EPD System. See www.environdec.com for a list of members. |
| **REVIEW CHAIR** | No chair appointed. The review panel may be contacted via the Secretariat www.environdec.com/contact. |
| **LIFE CYCLE ASSESSMENT (LCA)** | LCA Accountability<br>**SustChem Technical Consulting S.A.**<br>www.sustchem.gr |
| **THIRD-PARTY VERIFICATION** | ▪ Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:<br>**EPD verification by accredited certification body**<br>▪ Third-party verification:<br>**Business Quality Verification P.C.** is an approved certification body accountable for third-party verification<br>www.bqv.gr – info@bqv.gr<br>▪ Approved by:<br>**Hellenic Accreditation System ESYD with accreditation number 1218** |
| **PROCEDURE FOR FOLLOW-UP OF DATA DURING EPD VALIDITY INVOLVED THIRD PARTY VERIFIER** | YES<br>✓ NO |

Nordia S.A. has the sole ownership, liability and responsibility for the EPD.
EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

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# COMPANY INFORMATION

MARMOLINE

**EPD OWNER**

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NORDIA

| | |
|---|---|
| EPD OWNER: | Nordia S.A. |
| TELEPHONE: | +30 (0) 22950 22225 |
| WEBSITE: | www.marmoline.gr |
| EMAIL ADDRESS: | info@nordia.gr |

# DESCRIPTION OF THE ORGANIZATION

## VISION

NORDIA S.A. is a prominent company with extensive expertise in the building materials industry, actively engaged in the following sectors:

- Production and construction of construction chemicals and mortars under the MARMOLINE brand.
- Production of concrete admixtures as an authorized licensee of the French multinational CHRYSO.
- Quarrying, processing, and sales of marble under the NORDIA MARBLE brand.

The company's objective is to cater to the construction sector's diverse needs, ranging from home renovations to large-scale new developments. Its foundation lays back in 1998 by establishing a manufacturing plant for construction mortars in Dionyssos, Attica. Dionyssos marble dust, a unique raw material featured in most of their products even today, played a significant role in the development of a product line focused on ready-to-use mortars, with particular emphasis on ready-to-use renders and tile adhesives.

## ENVIRONMENTAL COMMITMENT

Each product is designed and produced according to the following principles:

- Raw material saving and recycling.
- Energy saving.
- Zero environmental pollution.
- Clean and tidy building site.


## VALUES

The company's dedication is to create top-notch, user-friendly materials while maintaining a strong commitment to environmental responsibility. It adheres to the ISO 14001 standard for Environmental Management Systems, implement innovative and secure production processes, and employ state-of-the-art production facilities with ISO 9001-certified Quality Management. These measures ensure the production of high-quality products that conform to European Commission standards and meet the specific requirements of the countries where the products are distributed.

Its primary focus is on delivering safe, user-friendly, and environmentally responsible products for both residential and commercial developments. The company's team stands out for their exceptional scientific knowledge and professional expertise. Its main objective is to continually seek new knowledge to stay at the forefront of technological advancements. Concurrently, it prioritizes the development of its workforce's skills and foster a culture of teamwork and respect.

## FACILITY-PRODUCTION SITE & HEADQUARTERS

The Manufacturing site for the products examined in this EPD is located in 1km of provincial road Markopoulos - Oropos, Polydendri, 19011, Greece.


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# PRODUCT INFORMATION


**MST 11** is a transparent acrylic water-based primer for the preparation of surfaces before plastering or painting. It can be used on interior and exterior absorbent surfaces. It provides better adhesion of the next coat of plaster or paint. It prevents flaking. High-tech composition, it deeply penetrates the surface of the substrate and provides better adhesion.

It can be applied to old or new surfaces, such as plaster or stucco walls. It reinforces and stabilizes porous surfaces to be painted with emulsion or acrylic paint. Due to the decrease in surface absorbance, the time required for painting is reduced, and the paint coverage is increased. It is also used as a primer to the surfaces to be coated with a colored plaster, so as to reduce the absorbency of the substrate and let the colored plaster dry evenly.


**MST 10C** is a white, acrylic, water-based, coarse primer for renders enriched with fine aggregates. Used either white or colored. It is suitable for interior and exterior surfaces.

It improves the adhesion of organic renders to the substrate that will be rendered. It contains fine aggregates that ensures adequate roughness on the substrate and helps the bonding of the final coating. It increases the coverage of colored finished organic plaster or wall paint and helps to deliver the selected shade more faithfully. It is applied on substrates of cementitious renders, concrete or plasterboards. Also on substrates already been rendered in the past. When applied colored, it is recommended to have the same color with the final plaster or paint. It should not be applied on smooth trowel walls that will be repainted, due to the rough (coarse) surface that will create.

*Information regarding the technical characteristics of the products can be acquired from the respective Technical Data Sheets (TDSs), which are available on demand from Nordia's personnel. Some of these characteristics are presented in the following table.*

| TECHNICAL CHARACTERISTICS | | |
|---|---|---|
| **TYPE** | **MST 11** | **MST 10C** |
| **Form** | Water-based primer | Water-based primer |
| **Color** | Transparent | White or in various shades through the Marmoline coloring system |
| **Density** | 1kg/lt | 1.5±0.03 kg/lt |
| **Application Temperature** | 5°C and +35°C | 5°C and +35°C |
| **Consumption** | Approx. 1 kg per 10 to 15 $m^2$ | 120-200 $gr/m^2$ depending on the absorbency of the surface |
| **Storage** | Store in a covered and shady place, in temperatures between + 5 °C to + 30 °C | Stored in original, unopened packaging at temperatures between +5°C and +35°C. Protect from direct sunlight and frost |
| **pH** | - | 8.5±0.5 |
| **Fire Behaviour** | Not flammable | Not flammable |

*According to the UN CPC classification system, these products can be classified under the UN CPC code: 351 Paints and varnishes and related products*

# CONTENT DECLARATION

MARMOLINE

This is an EPD of multiple products, based on an average product weighted over production volumes. The composition of the product is expressed in mass per declared unit (kg/kg). The table below displays the content declaration for this average product along with the range in content for all products within the product group.

No substances included in the Candidate List of Substances of Very High Concern for authorization under the REACH Regulations that exceed 0.1% of the total weight are present in the examined systems.

## CONTENT DECLARATION OF AN AVERAGE WATER-BASED PRIMER EXPRESSED IN KG PER D.U. (KG/KG)

| PRODUCT COMPONENTS | WEIGHT KG/KG | POST-CONSUMER RECYCLED MATERIAL (%) | BIOGENIC MATERIAL, WEIGHT % & KG C/KG |
|---|---|---|---|
| Water | 0.32 | 0% | 0 |
| Binders | 0.11 | 0% | 0 |
| Aggregates | 0.27 | 0% | 0 |
| Preservatives | 0.00 | 0% | 0 |
| Pigments | 0.03 | 0% | 0 |
| Dispersing Agents | 0.24 | 0% | 0 |
| Glycols, esters & ethers | 0.01 | 0% | 0 |
| Additives | 0.01 | 0% | 0 |
| **TOTAL** | 1.00 | 0% | 0 |

| PACKAGING MATERIALS | WEIGHT KG/KG | WEIGHT (%) VERSUS THE PRODUCT | WEIGHT, BIOGENIC CARBON, KG C/KG |
|---|---|---|---|
| High-density Polyethylene - HDPE (Buckets) | 0.001 | 0.14% | 0 |
| Wood (Pallets) | 0.003 | 0.35% | 0.0001 |
| Polythylene Film - LDPE (film, labels) | 0.0001 | 0.01% | 0 |
| Polypropylene - PP (Buckets) | 0.001 | 0.11% | 0 |
| **TOTAL** | 0.01 | 0.61% | 0.0001 |

# LCA INFORMATION

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## SYSTEM BOUNDARIES

This LCA study follows a "cradle-to-gate" approach with modules C1-C4 & module D.

## DECLARED UNIT

The declared unit used in this EPD is **one (1) kilogram (kg) of an average water-based primer.**

## TIME REPRESENTATIVENESS

The data used for the analysis are based on one-year average production data, from 1st of January 2023 to 31st of December 2023.

## GEOGRAPHICAL SCOPE

For Modules A1-A2, the geographic scope is global. Module A3 focuses on Greece, while Module C encompasses the European Union's region (EU-27)

## DATABASES USED

Ecoinvent 3.9.1 & Managed LCA Content

## SOFTWARE USED

LCA for experts provided by Sphera

| | PRODUCT STAGE | | | CONSTRUCTION PROCESS STAGE | | USE STAGE | | | | | | | END OF LIFE STAGE | | | | RESOURCE RECOVERY STAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | RAW MATERIAL 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 |
| **MODULE** | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
| **MODULES DECLARED** | X | X | X | ND | ND | ND | ND | ND | ND | ND | ND | ND | X | X | X | X | X |
| **GEOGRAPHY** | GLO | GLO | GR | - | - | - | - | - | - | - | - | - | EU-27 | EU-27 | EU-27 | EU-27 | EU-27 |
| **SHARE OF SPECIFIC DATA** | <1% | | | | | | | | | | | | | | | | |
| **VARIATION – PRODUCTS** | Variation – products up to -94.27% | | | | | | | | | | | | | | | | |
| **VARIATION - SITES** | 0% | | | | | | | | | | | | | | | | |

*The variation above corresponds to the differences in GWP-GHG indicator results in A1-A3 between an average water-based primer and MST 11.*

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# SYSTEM DIAGRAM

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## MODULES A1-A3

## MODULE D

### PRODUCT STAGE

- Water
- Preservatives
- Binders
- Dispersing Agents
- Aggregates
- Additives
- Glycols, esters & ethers
- Polyethylene Film
- Polypropylene Buckets
- HDPE Buckets
- Polyethylene Labels
- Wooden pallets

Transportation of Raw Materials to manufacturing plant

Diesel

Water

Transportation of Packaging Materials to manufacturing plant

Diesel

Production of an Average Water-based Primer

### RECOVERY STAGE

Potential benefits from recycling and /or energy recovery of waste flows from Module C3

## MODULE C1

## MODULE C2

## MODULE C3

## MODULE C4

### END-OF-LIFE STAGE

Demolition / deconstruction of the building

Diesel

Transportation of Raw Materials to manufacturing plant

Diesel

Treatment of deconstructed waste

Disposal of Inert waste

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# DESCRIPTION OF EXAMINED MODULES

As shown in the preceding diagram, the study includes specific life cycle stages: **Product, End-of-life**, and **Resource Recovery**. Information modules A4-A5 (Construction stage) and B1-B7 (Use phase stage) are excluded. These excluded modules are scenario-based, while the purpose of this EPD is to communicate the environmental aspects across life cycle stages where the company has influence.

## PRODUCT STAGE

### MODULE A1

This module includes all activities related to the production of input commodities, covering the generation of raw materials used in the manufacturing of the evaluated products and the supply of utilities, which in this context, is confined to electricity and propane used for drying aggregates. The electricity utilized in production is obtained from the Greek medium voltage electricity grid, with the company having a contractual agreement with the electricity provider 'Protergia'. For electricity modeling, the provider's residual electricity mix is considered, based on the latest report from the Greek Administrator of Renewable Energy and Guarantees of Origin (DAPEEP), reflecting the year 2022. The emission intensity of electricity production, calculated using the LCA Software 'LCA for Experts' for the provider's residual electricity mix for 2022, results in a GWP-GHG value of 0.546 kg $CO_2$ eq./kWh.

### MODULE A2

In Module A2, the transport of input commodities to the manufacturing plant is covered, including both raw and packaging materials. The transportation routes and distances in kilometers are based on assumptions considering the actual locations of the producers. Transportation modes were modeled using selected LCI datasets from the Managed LCA Database (MLC database), taking into account technological and temporal specifics. Due to the varying densities of the goods transported, two different datasets were used for heavy and light goods for road transportation.

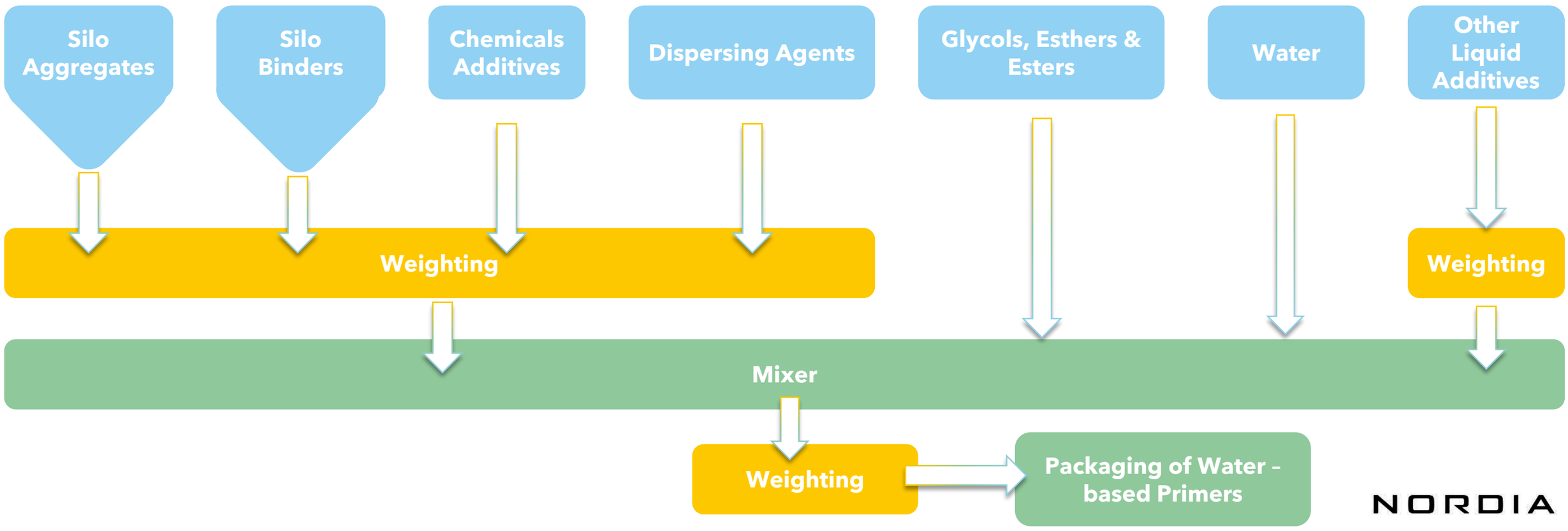
### MODULE A3

This module includes the manufacturing of packaging materials, the operation of dryer, as well as the production of the examined products. The production process of water-based primers involves several crucial steps to ensure the final product's quality and performance. Initially, high-quality raw materials, including glycols, esters, ethers, binders, aggregates, pigments, preservatives, dispersing agents, and various additives, are selected. A 2000-litre mixer is used to combine these materials, starting with the automatic addition of resin and water, followed by manual incorporation of other components. The mixer operates until achieving optimal dispersion. In the let-down stage, additional elements such as thickeners, defoamers, and solvents are added to fine-tune the primer's properties. Rigorous quality control is conducted, and necessary adjustments are made before the primer is packaged, labeled, and stored in controlled environments for distribution.

**SCENARIOS FOR PROVISION OF INPUT COMMODITIES**

| TRANSPORTATION ROUTE | TYPE OF TRANSFERRED GOOD | TRANSPORTATION MODE |
|---|---|---|
| Road | Heavyweight cargo transferred in bulk | Lorry, Euro 6, 28 - 32t gross weight / 22t payload capacity/ Fuel type: Diesel |
| Road | Lightweight cargo | Truck, Euro 6, 12 - 14t gross weight / 9.3t payload capacity/ Fuel type: Diesel |

**PRODUCTION PROCESS OVERVIEW**



# DESCRIPTION OF EXAMINED MODULES

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## END-OF-LIFE STAGE

The end-of-life stage for the construction product begins when it is replaced, dismantled, or removed from the building or construction project, ceasing to serve any function. This stage can also commence at the building's end-of-life, based on the chosen end-of-life scenario for the product. In this study, the end-of-life stage for water-based primers is considered to start when they are deconstructed along with the building, as they become an integrated part of the structure once installed.

| WATER-BASED PRIMERS | |
|---|---|
| **Processes** | **Unit (expressed per declared unit)** |
| Collection process specified by type | 0kg collected separately<br>1kg collected with mixed construction waste |
| Recovery system specified by type | 0kg for re-use<br>0kg for recycling<br>0kg for energy recovery |
| Disposal specified by type | 1kg product or material for final deposition |
| Assumptions for scenario development (transportation) | Distance of waste disposal facilities: 100km |

### MODULE C1

The deconstruction of water-based primers is expected to take place concurrently with the demolition of the building structure. In particular, the removal of the water-based primers, along with the rest of the building, is assumed to be carried out by a 100kW diesel-powered excavator.

### MODULE C2

This module considers the transportation of dismantled water-based primers to final waste handling facilities. It assumes an average distance of 100 km between construction sites and landfill facilities. Road route is chosen as the primary mode of transportation.

### MODULE C3

This module does not include any emissions since the end-of-life scenario assumes that all dismantled water-based primers are sent to landfill.

### MODULE C4

This module reports the emissions associated with the landfilling of water-based primers designated for disposal. Selection of disposal was conducted based on the most plausible scenario for inert waste management in Greece.

## RESOURCE/ RECOVERY STAGE

### MODULE D

Generally, this module accounts for the net benefits from recovery processes. However, in this study, the product is assumed to be fully landfilled after use, yielding no recovery benefits. Additionally, Module A5 is outside the system boundary, so potential benefits from recycling or reusing packaging materials cannot be considered.

## ADDITIONAL LCA INFORMATION

### ALLOCATIONS:

- Identifying 39% of the total consumed electricity specifically allocated to aggregates, where drying and breaking of aggregates takes place, while 2.5% of total electricity consumption is attributed to paste products, including paste renders & coatings, was achieved by measuring the kWh consumption across each machinery within each production line throughout the reference period.
- Propane, employed exclusively in the drying process, is dedicated solely to the aggregates production line. As a result, the entire propane consumption, amounting to 100%, is allocated to aggregates, i.e. limestone from the quarry.

### CUT-OFFS:

The study incorporates data for processes, accounting for at least 99% of the stated environmental impacts. Excluded processes are:

- Production of infrastructure and capital goods
- End-of-life of waste packaging from raw materials and problematic batches of plastic buckets may occur, resulting in their disposal as out-of-spec packaging materials.
- Wooden pallets and IBCs management introduced as packaging of the raw materials is not included since these packaging materials are designed for reuse

### ASSUMPTIONS:

- A distance of 100 kilometers (km) between construction sites and waste treatment facilities was considered in within the study's calculations. This assumption takes into account the hypothetical distance that materials would need to be transported to access the treatment facilities necessary for their processing or disposal. It serves as a baseline assumption for logistical planning and environmental impact assessments
- It is assumed that all of the waste generated from the deconstruction process will be disposed of in landfills as part of its waste handling procedure.

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# ENVIRONMENTAL PERFORMANCE

MARMOLINE

## ENVIRONMENTAL RESULTS NORMALIZED TO 1KG OF WATER-BASED PRIMER

In this EPD, the selected impact categories and respective indicators describing them, as defined by International EPD System, default indicator list version 2.0. and PCR 2019:14 "Construction products" v.1.3.3 are declared. In addition, the results of a supplementary indicator for climate impact is declared. The characterization factors (CFs) used, are aligned with the EF-JRC package for EN 15804 based on EF reference package 3.1.

Please note that the estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks. The LCIA results are normalized to the selected declared unit, **1kg of average water-based primer**.

Please be advised that the inclusion of module C in the Environmental Product Declaration (EPD) mandates a comprehensive consideration of its results alongside modules A1-A3. It is strongly discouraged to utilize the outcomes of modules A1-A3 without duly integrating the results of module C.

### POTENTIAL ENVIRONMENTAL IMPACTS/ 1 KG OF AVERAGE WATER-BASED PRIMER

| CORE ENVIRONMENTAL IMPACT INDICATORS | | UNIT | A1-A3 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|
| Global Warming Potential – total | GWP-total | kg CO2 eq. | 1.05E+00 | 6.46E-04 | 1.23E-02 | 0.00E+00 | 1.05E-02 | 0.00E+00 |
| Global Warming Potential – fossil | GWP-fossil | kg CO2 eq. | 1.04E+00 | 6.41E-04 | 1.22E-02 | 0.00E+00 | 1.05E-02 | 0.00E+00 |
| Global Warming Potential – biogenic[1] | GWP-biogenic | kg CO2 eq. | -6.55E-05 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 6.55E-05 | 0.00E+00 |
| Global Warming Potential – land use and land use change | GWP-luluc | kg CO2 eq. | 1.47E-03 | 5.06E-06 | 9.96E-05 | 0.00E+00 | 1.10E-05 | 0.00E+00 |
| Ozone Depletion Potential | ODP | kg CFC 11 eq. | 3.52E-07 | 7.89E-20 | 2.41E-18 | 0.00E+00 | 3.20E-09 | 0.00E+00 |
| Acidification Potential | AP | Mole of H+ eq. | 3.48E-03 | 3.04E-06 | 1.33E-05 | 0.00E+00 | 8.88E-05 | 0.00E+00 |
| Eutrophication Potential – freshwater | EP-freshwater | kg P eq. | 1.64E-04 | 1.83E-09 | 3.62E-08 | 0.00E+00 | 3.06E-06 | 0.00E+00 |
| Eutrophication Potential – marine | EP-marine | kg N eq. | 6.84E-04 | 1.43E-06 | 4.29E-06 | 0.00E+00 | 3.06E-05 | 0.00E+00 |
| Eutrophication Potential – terrestrial | EP-terrestrial | mol N eq. | 6.29E-03 | 1.58E-05 | 5.11E-05 | 0.00E+00 | 3.33E-04 | 0.00E+00 |
| Photochemical Oxidant Formation Potential | POCP | kg NMVOC eq. | 2.73E-03 | 4.03E-06 | 1.15E-05 | 0.00E+00 | 9.65E-05 | 0.00E+00 |
| Abiotic Depletion Potential – elements[2] | ADPe | kg Sb eq. | 4.15E-06 | 4.70E-11 | 1.08E-09 | 0.00E+00 | 3.44E-08 | 0.00E+00 |
| Abiotic Depletion Potential. fossil resources[2] | ADPf | MJ net calorific value | 2.00E+01 | 8.22E-03 | 1.62E-01 | 0.00E+00 | 2.53E-01 | 0.00E+00 |
| Water Deprivation Potential[2] | WDP | $m^3$ world eq. deprived | 6.53E-01 | 5.36E-06 | 1.13E-04 | 0.00E+00 | 1.12E-02 | 0.00E+00 |

*[1] Negative results of GWP-biogenic corresponding biogenic carbon dioxide which is stored in the wood packaging are already balanced out in modules A1-A3 since Module A5 is out of the system boundaries.*

*[2] The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.*

# ENVIRONMENTAL PERFORMANCE

MARMOLINE

## ENVIRONMENTAL RESULTS NORMALIZED TO 1KG OF WATER-BASED PRIMER

### POTENTIAL ENVIRONMENTAL IMPACTS/ 1 KG OF AVERAGE WATER-BASED PRIMER

| CLIMATE CHANGE | | UNIT | A1-A3 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|
| Global Warming Potential – GHG[3] | GWP-GHG | kg CO2 eq. | 1.05E+00 | 6.46E-04 | 1.23E-02 | 0.00E+00 | 1.05E-02 | 0.00E+00 |

*[3] This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such. the indicator is identical to GWP-total except that the CF for biogenic CO2 is set to zero.*

### POTENTIAL ENVIRONMENTAL IMPACTS/ 1 KG OF AVERAGE WATER-BASED PRIMER

| RESOURCE USE INDICATORS | | UNIT | A1-A3 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|
| Use of renewable primary energy excluding renewable primary energy resources used as raw materials | PERE | MJ. net calorific value | 5.78E-01 | 4.59E-04 | 9.34E-03 | 0.00E+00 | 4.27E-03 | 0.00E+00 |
| Use of renewable primary energy resources used as raw materials | PERM | MJ. net calorific value | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Total use of renewable primary energy resources | PERT | MJ. net calorific value | 5.78E-01 | 4.59E-04 | 9.34E-03 | 0.00E+00 | 4.27E-03 | 0.00E+00 |
| Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials | PENRE | MJ. net calorific value | 2.00E+01 | 8.23E-03 | 1.63E-01 | 0.00E+00 | 2.53E-01 | 0.00E+00 |
| Use of non-renewable primary energy resources used as raw materials | PENRM | MJ. net calorific value | 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 | PENRT | MJ. net calorific value | 2.00E+01 | 8.23E-03 | 1.63E-01 | 0.00E+00 | 2.53E-01 | 0.00E+00 |
| Use of secondary material | SM | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Use of renewable secondary fuels | RSF | MJ. net calorific value | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Use of non-renewable secondary fuels | NRSF | MJ. net calorific value | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Use of net fresh water | FW | m3 | 1.52E-02 | 5.25E-07 | 1.07E-05 | 0.00E+00 | 2.62E-04 | 0.00E+00 |

# ENVIRONMENTAL PERFORMANCE

MARMOLINE

## ENVIRONMENTAL RESULTS NORMALIZED TO 1KG OF WATER-BASED PRIMER

### POTENTIAL ENVIRONMENTAL IMPACTS/ 1 KG OF AVERAGE WATER-BASED PRIMER

| WASTE INDICATORS | | UNIT | A1-A3 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|
| Hazardous waste disposed | HWD | kg | 3.35E-11 | 4.15E-13 | 8.59E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Non-hazardous waste disposed | NHWD | kg | 1.88E-04 | 1.22E-06 | 2.56E-05 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Radioactive waste disposed | RWD | kg | 3.58E-06 | 9.96E-09 | 2.96E-07 | 0.00E+00 | 0.00E+00 | 0.00E+00 |

### POTENTIAL ENVIRONMENTAL IMPACTS/ 1 KG OF AVERAGE WATER-BASED PRIMER

| OUTPUT FLOWS | | UNIT | A1-A3 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|
| Components for re-use | CRU | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Material for recycling | MFR | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Materials for energy recovery | MER | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Exported energy. Electricity | EEe | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Exported energy. Thermal | EEt | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |

### POTENTIAL ENVIRONMENTAL IMPACTS/ 1 KG OF AVERAGE WATER-BASED PRIMER

| ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS | | UNIT | A1-A3 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|
| Particulate matter emissions | PM | Disease incidence | 3.32E-08 | 3.45E-11 | 9.00E-11 | 0.00E+00 | 1.72E-09 | 0.00E+00 |
| Ionizing radiation human[4] | IRP | kBq U235 eq. | 4.29E-02 | 1.43E-06 | 4.32E-05 | 0.00E+00 | 1.17E-03 | 0.00E+00 |
| Eco-toxicity. Freshwater[2] | ETP-fw | CTUe | 2.38E+01 | 5.94E-03 | 1.21E-01 | 0.00E+00 | 1.80E-01 | 0.00E+00 |
| Human toxicity. cancer effects[2] | HTP-c | CTUh | 7.23E-10 | 1.20E-13 | 2.44E-12 | 0.00E+00 | 7.60E-12 | 0.00E+00 |
| Human toxicity. non-cancer effects[2] | HTP-nc | CTUh | 1.94E-08 | 7.21E-12 | 1.27E-10 | 0.00E+00 | 1.19E-10 | 0.00E+00 |
| Land use related impacts/Soil quality[2] | SQP | dimensionless | 3.61E+00 | 2.82E-03 | 5.58E-02 | 0.00E+00 | 5.92E-01 | 0.00E+00 |

*[2] The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.*

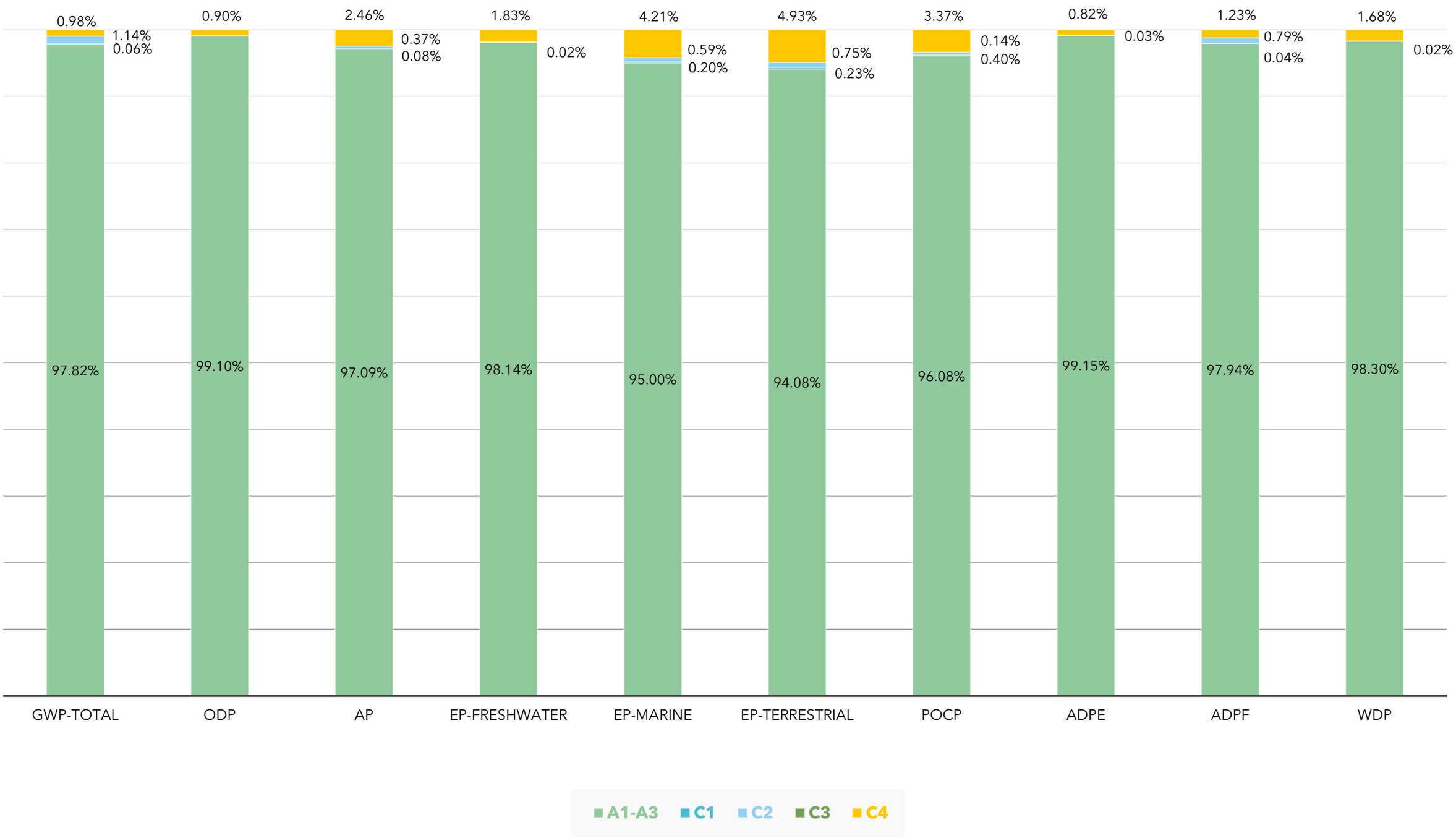
*[4] This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents. occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil. from radon and from some construction materials is also not measured*

# INTERPRETATION

As illustrated in the diagram, it is evident that the production stage (Modules A1-A3) makes the most substantial contribution to the results of each of the examined impact indicators. More specifically the following observations are pointed out:

- The total Global Warming Potential is allocated across Modules A1-A3, accounting for more than 97% of the overall potential environmental impacts.
- The contribution of disposal in Module C4 is significant of Eutrophication potential-marine and Eutrophication-Potential terrestrial, accounting for 4.21% and 4.93% respectively.
- Contribution of remaining Modules (C1, C2 & C3) is rather negligible.

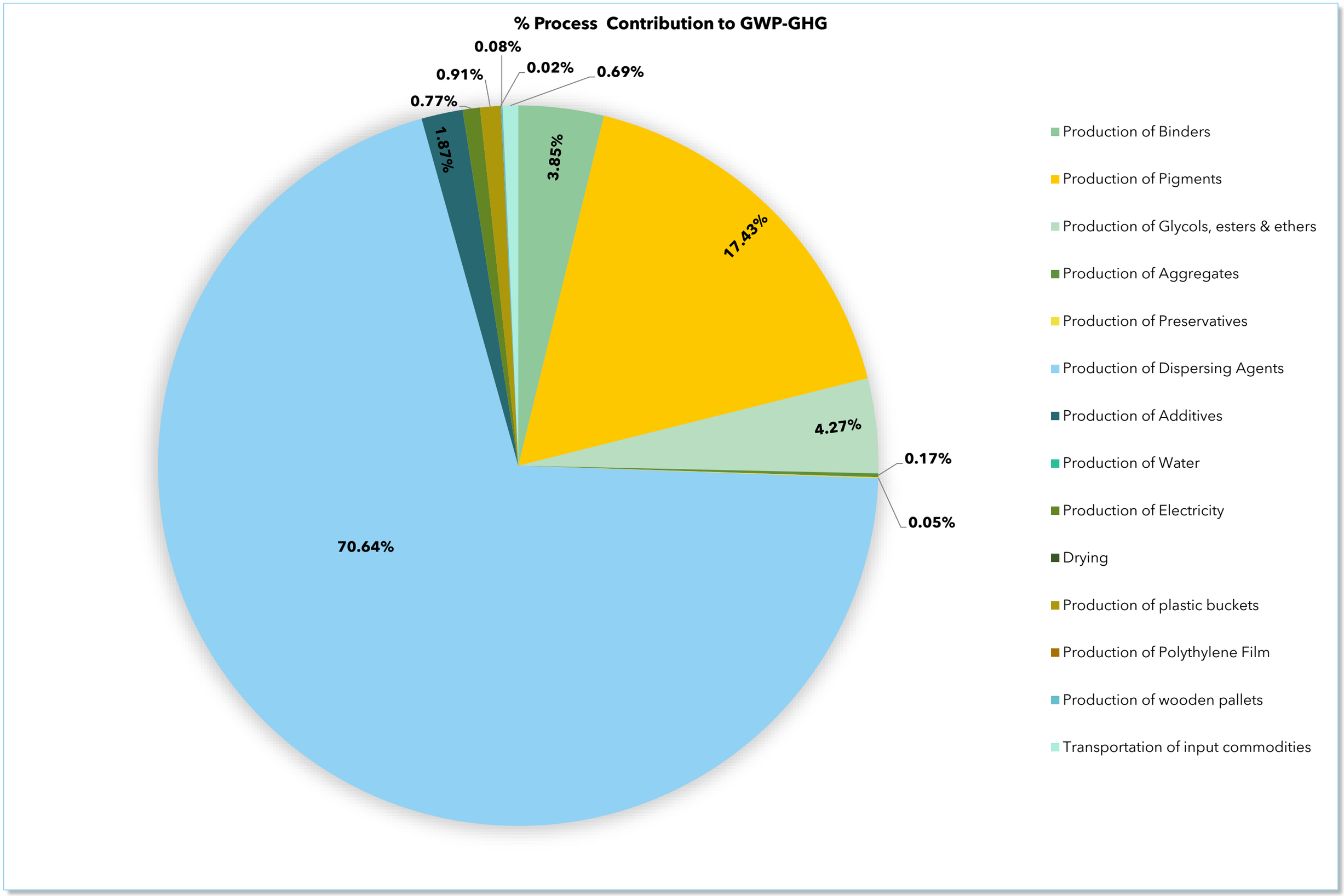
## % MODULES CONTRIBUTION TO THE ENVIRONMENTAL PERFORMANCE INDICATORS OF THE DECLARED PRODUCT



# INTERPRETATION

## PROCESS CONTRIBUTION TO GWP-GHG FOR MODULES A1-A3 FOR AN AVERAGE WATER-BASED PRIMER

Most of the examined impact indicators, including Global Warming Potential (GWP-GHG), are mainly influenced by Modules A1-A3. Specifically, 70.64% of the impact is due to the production of dispersing agents. The production of pigments and the production of aggregates also have significant impacts, contributing 17.43% and 4.27%, respectively. The production of binders accounts for 3.85% of the total GWP-GHG emissions, with the remaining processes contributing minimally to the overall impact.



# ADDITIONAL ENVIRONMENTAL INFORMATION

MARMOLINE

The following tables offer a detailed overview of the differences observed across all examined products, covering all considered environmental impact aspects. These differences are compared to the expected environmental impacts of an average product. The tables provide in-depth insight into how each product's environmental footprint diverges from the benchmark of an average product.

| CORE ENVIRONMENTAL INDICATORS | VARIATIONS FROM THE DECLARED AVERAGE (A-C) | |
|---|---|---|
| | MST 11 | MST 10C |
| Climate Change - Total (kg CO2 eq) | -95.27% | 30.95% |
| Climate Change - Fossil (kg CO2 eq) | -95.32% | 30.96% |
| Climate Change - Biogenic (kg CO2 eq) | - | - |
| Climate Change - Land Use and Land Use Change (kg CO2 eq) | -62.73% | 20.38% |
| Ozone Depletion (kg CFC-11 eq.) | -64.14% | 20.84% |
| Acidification (Mole of H+ eq.) | -93.62% | 30.41% |
| Eutrophication, fresh water (kg P eq.) | -96.68% | 31.41% |
| Eutrophication, marine (kg N eq.) | -91.35% | 29.67% |
| Eutrophication, terrestrial (Mole of N eq.) | -90.65% | 29.45% |
| Photochemical Ozone Formation, human health (kg NMVOC eq.) | -93.03% | 30.22% |
| Resource use, mineral and metals (kg Sb eq.) | -89.55% | 29.09% |
| Resource use, fossils (MJ) | -94.51% | 30.70% |
| Water Deprivation Potential (m3 world equiv.) | -90.28% | 29.33% |

| CLIMATE CHANGE | VARIATIONS FROM THE DECLARED AVERAGE (A-C) | |
|---|---|---|
| | MST 11 | MST 10C |
| Global Warming Potential- GWP-GHG (kg CO2 eq) | -95.27% | 30.95% |

# ADDITIONAL ENVIRONMENTAL INFORMATION

MARMOLINE

| RESOURCE USE | VARIATIONS FROM THE DECLARED AVERAGE (A-C) | |
|---|---|---|
| | MST 11 | MST 10C |
| (PERE) Use of renewable primary energy excluding renewable primary energy resources as raw materials (MJ) | -65.42% | 21.25% |
| (PERT) Total use of renewable primary energy resources (primary energy resources used as raw material and primary energy) (MJ) | -65.42% | 21.25% |
| (PENRE) Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (MJ) | -94.51% | 30.70% |
| (PENRT) Total use of non-renewable primary energy resources (MJ) | -94.51% | 30.70% |
| Use of net fresh water (m3) | -90.18% | 29.29% |

| WASTE CATEGORIES | VARIATIONS FROM THE DECLARED AVERAGE (A-C) | |
|---|---|---|
| | MST 11 | MST 10C |
| Hazardous waste disposed (kg) | -30.22% | 9.82% |
| Non-hazardous waste disposed (kg) | 61.04% | -19.83% |
| Radioactive waste disposed (kg) | -77.09% | 25.04% |

| ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS | VARIATIONS FROM THE DECLARED AVERAGE (A-C) | |
|---|---|---|
| | MST 11 | MST 10C |
| Particulate Matter emissions (Disease incidence) | -91.65% | 29.77% |
| Ionizing radiation human (kBq U235 eq.) | -94.97% | 30.85% |
| Eco-toxicity, freshwater (CTUe) | -96.57% | 31.37% |
| Human toxicity, cancer effects (CTUh) | 14.98% | -4.86% |
| Human toxicity, non-cancer effects (CTUh) | -96.04% | 31.20% |
| Land use related impacts/Soil quality (dimensionless) | -63.08% | 20.49% |

# REFERENCES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- International EPD® System, General Program Instructions for the International EPD System, version 4.01
- ISO 14020:2000- Environmental Labels and Declarations – General Principles
- ISO 14025:2006 - Environmental labels and declarations – Type III environmental declarations – Principles and procedures
- ISO 14040:2006 - Environmental management – Life Cycle assessment – Principles and framework
- ISO 14044:2006 - Environmental management – Life Cycle assessment – Requirements and guidelines
- The International EPD® System – The International EPD System is a programme for type III environmental declarations, maintaining a system to verify and register EPDs as well as keeping a library of EPDs and PCRs in accordance with ISO 14025. www.environdec.com
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