ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO 14025:2006 and EN 15804+A2:2019/AC:2021

EASYMIX READY-MIX ADHESIVES

of

STAGAKIS COMPANIES

easy mix

EPD REGISTRATION NUMBER			
	S-P-12670		
PUBLICATION DATE	**DATE OF VALIDITY**	**PROGRAM OPERATOR**	**PROGRAM**
2024-04-11	2029-04-10	EPD International AB	The International EPD® System www.environdec.com

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

PROGRAM INFORMATION

DETAILS OF PROGRAM OPERATOR

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

PRODUCT CATEGORY RULES (PCR)	▪ CEN Standard EN 15804 serves as the Core Product Category Rules (PCR) ▪ PCR 2019:14 Construction products version 1.3.2 (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 **SustChem Technical Consulting S.A.** www.sustchem.gr
THIRD-PARTY VERIFICATION	▪ Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: **EPD verification by accredited certification body** ▪ Third-party verification: **Business Quality Verification P.C.** is an approved certification body accountable for third-party verification www.bqv.gr – info@bqv.gr ▪ Approved by: **Hellenic Accreditation System ESYD with accreditation number 1218**
PROCEDURE FOR FOLLOW-UP OF DATA DURING EPD VALIDITY INVOLVED THIRD PARTY VERIFIER	✓YES NO

Michail I. Stagaki A.E.V.E 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.

COMPANY INFORMATION

EPD OWNER

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DESCRIPTION OF THE ORGANIZATION

Michail I. Stagaki A.E.V.E is a well-known firm for its cementitious products, with a history dating back to 1978, when the firm started as a single person company.

The initial factory had been settled near the Atsipopoulo Interchange, close to the city of Rethymno, and commenced production of Concrete Blocks, pumice Blocks and other similar cementitious products as well as lime slurry.

Over the years, **Michail I. Stagaki A.E.V.E** has steadily expanded evolving from a small local producer to a significant industry player. With its wealth of expertise, the experience, and infrastructure, the company specializes in manufacturing a wide range of construction and building products based mainly on cement.

Today, the company's portfolio includes various categories:

- Cement, marketed under the brand name CEMENT OF CRETE®
- Mortars and plasters under the brand name EASYMIX®
- Ready-mix concrete sold as: BETON OF CRETE®
- Precast concrete products, branded as STAGAKIS PRECAST ®
- Lime slurry under the brand name STAGAKIS LIME®

PRODUCTION SITE:

The Manufacturing site for the products examined in this EPD is located in Latzimas, 741 50, Rethymno, Greece.

PRODUCT INFORMATION

The products covered in this EPD include cement-based adhesives, marketed under the trade name "**EASYMIX**", presented below:

EXTRA 300

This cement-based tile adhesive offers extended open time and reduced slip, suitable for indoor and outdoor use on various surfaces such as concrete, cement mortars, plaster, mosaic or ceramic tiles, lightweight building materials, and plasterboards. It is ideal for areas with high demands on temperature and humidity, like bathrooms and balconies. The product ensures stable industrial production, high quality, and ease of preparation with just water required. It boasts strong adhesion to substrates and building materials, zero slip, and extended processing time. Additionally, it provides high mechanical strength, resistance to environmental factors, temperature changes, and humidity variations, while safeguarding against color changes and efflorescence formation in bonding materials.

SUPER EXTRA 400

This white marble and granite adhesive is designed for installing slabs and tiles made of marble, granite, and other natural building materials, as well as ceramic tiles with low porosity, both indoors and outdoors. It is suitable for various substrates such as concrete, lightweight concrete, cement mortars, plasters, and cement boards, making it suitable for high-traffic public areas and high-quality construction projects. The product offers stable industrial production, high quality, and easy preparation with only water required. It provides strong adhesion to substrates and building materials, high mechanical strength, resistance to environmental factors, temperature changes, and humidity fluctuations. Additionally, it prevents color changes and rash formation in bonding materials.

SUPER ELASTIC 500

This highly resilient and elastic resin tile adhesive is versatile, suitable for installing tiles of any type and size, whether ceramic, synthetic, or natural stone, on both indoor and outdoor surfaces. It adheres well to various substrates including concrete, lightweight concrete, cement mortar, plaster, existing tiles or mosaics, and plasterboards, making it ideal for areas prone to temperature and humidity fluctuations such as underfloor heating, swimming pools, bathrooms, and balconies. The product offers stable industrial production, high quality, and easy preparation with water only. It provides excellent adhesion, zero slippage, extended processing time, and increased elasticity, ensuring durability even in challenging constructions, while also protecting against color changes and efflorescence formation in bonding materials.

ULTRA ELASTIC S2

This white resinous super elastic tile adhesive is versatile, suitable for laying tiles and slabs of any type, whether absorbent or non-absorbent, ceramic, synthetic, or natural, both indoors and outdoors on floors and walls. It bonds well to various substrates including concrete, cement mortar, plastered surfaces, existing tiles or mosaic, wooden floors, lightweight building materials, and dry construction surfaces like plywood or plasterboard. It meets high demands for temperature and humidity changes in areas such as swimming pools, spas, bathrooms, balconies, terraces, and building facades. It offers stable industrial production, high quality, and easy preparation with just water required, while boasting excellent elasticity, zero slippage, extended application time, and micro-adjustments, making it suitable for challenging constructions.

- For the placement on the market within the European Union/European Free Trade Association (EU/EFTA), Regulation No 305/2011 (CPR) is applicable. All products are accompanied by a Declaration of Performance (DoP) in compliance with EN 12004:2007+A1:2012.

Essential Properties Based On En 12004:2007+a1:2012				
Essential Properties	**Extra 300**	**Super Extra 400**	**Super Elastic 500**	**Ultra Elastic S2**
Reaction to fire	E	E	E	E
Adhesion Initial Tensile Strength	≥1.0 N/mm2	≥1.0 N/mm2	≥1.0 N/mm2	≥1.0 N/mm2
Resistance to Tensile strength after temperature effect	≥1.0 N/mm2	≥1.0 N/mm2	≥1.0 N/mm2	≥1.0 N/mm2
Resistance to Tensile strength after water immersion	≥1.0 N/mm2	≥1.0 N/mm2	≥1.0 N/mm2	≥1.0 N/mm2
Resistance to Tensile strength after freeze-thaw cycles	≥1.0 N/mm2	≥1.0 N/mm2	≥1.0 N/mm2	≥1.0 N/mm2
Content in hazardous substances	NPD	NPD	NPD	NPD

- More Information regarding the technical characteristics of the products can be acquired from the respective Technical Data Sheets (TDSs)
- According to the UN CPC classification system, these products can be classified under the UN CPC code: 375 – Articles of concrete, cement, and plaster.

CONTENT DECLARATION

- 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 Ready-mix Adhesive Expressed In Kg Per D.U. (Kg/Kg)

Product Components	Weight Kg/Kg	Range	Post-consumer Recycled Material (%)	Biogenic Material, Weight- % And Kg C/Kg
Portland Cement I 52.1N	0.3770	0.2560 – 0.386	0%	0
Silica Sand	0.0031	0 – 0.308	0%	0
Limestone	0.5945	0.3550 – 0.6	0%	0
Additives*	0.0296	0 – 0.0765	0%	0
Total	**1.00**	**-**	**0%**	**0**
Packaging Materials	**Weight Kg/Kg**	**Range**	**Weight (%) Versus The Product**	**Weight, Biogenic Carbon, Kg C/Kg**
Polyethylene film	0.0002	0 – 0.0002	0.02%	-
Strech film	0.0003	0 – 0.0003	0.03%	-
Kraft Paper	0.0033	0 – 0.0032	0.33%	-
Wooden Pallet	0.0165	0.0167 – 0.0168	1.64%	-
Plastic Bag	0.0038	0 – 0.0060	0.38%	-
Carton Box	0.0105	0 – 0.0173	1.04%	-
Total	**0.035**	**-**	**3.45%**	**-**

**As per guidance provided in the PCR 2019:14 "Construction Products", setting the biogenic content as 0, when the share of it in the product is unknown ensures conservative estimation, transparency, and avoids potential overestimation in environmental declarations.*

Carbon Electricity Intensity

Environmental Effects	Co2 Emissions (Kg Co2/Kwh)*
	0.535

** Residual Greek Mix: DAPEEP Report 2022 In accordance with section 1.4 of PCR 2019: 14 "Construction Products" version 1.3.2, it is required to disclose the climate impact (measured in kilograms of CO_2 eq. per kilowatt-hour (kWh) using the GWP-GHG indicator) associated with the electricity acquisition during the manufacturing process in A3*

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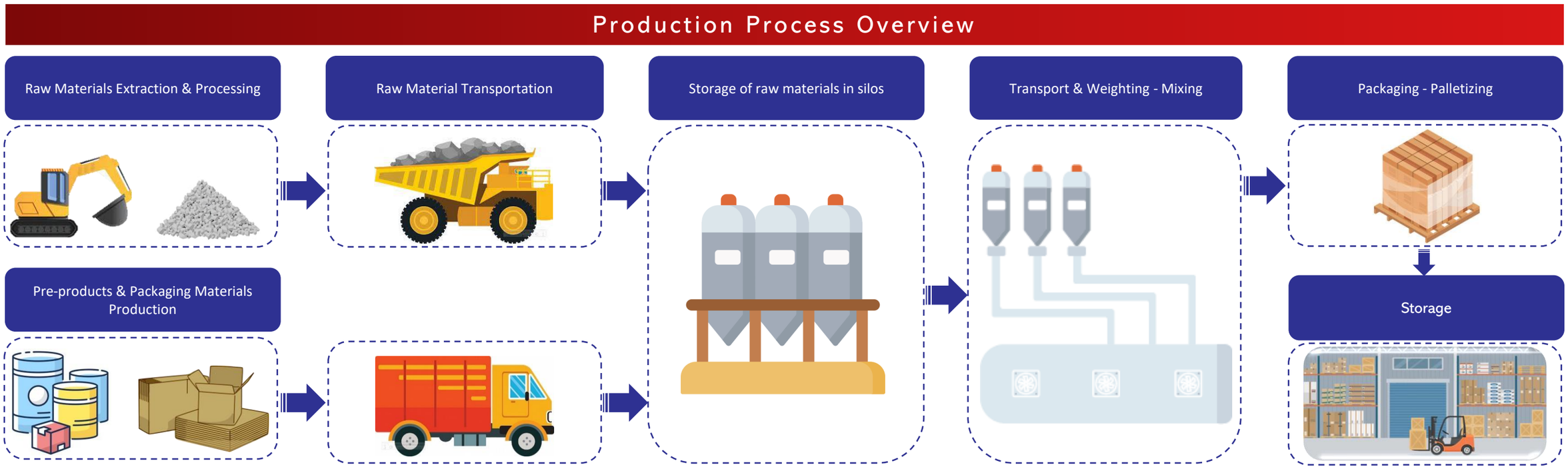
PRODUCTION PROCESS

THE PROCESSES OF THE PRODUCTION PROCEDURE ARE DEPICTED IN THE FLOWCHART.

The production process starts with the delivery of necessary raw materials, which are stored in designated silos equipped with screw mechanisms and connected to weighing systems. These systems ensure precise measurement of raw materials according to set specifications stored electronically. The entire process is centrally controlled and monitored from a production control room. Once the raw materials are dispensed into the mixer, blending occurs according to a preset program tailored to the product group. The mixed product is then discharged into a hopper and continuously supplied. A robotic packaging system facilitates bagging, with filled bags moving along a belt for printing of traceability data. To prevent cross-contamination, the company schedules specific days of the week for mortar packaging and reserves the remaining days for cement packaging. Between the packaging of different products, a fraction of fine aggregates is utilized for cleaning the packaging line. Bags are transferred to pallets, arranged electronically, and enclosed with stretch film for protection. Prepared pallets are then stored and transported to clients via trucks.



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LCA INFORMATION

SYSTEM BOUNDARIES	DECLARED UNIT	TIME REPRESENTATIVENESS	GEOGRAPHICAL SCOPE	DATABASES USED	SOFTWARE USED
This LCA study follows a “cradle-to-gate” approach with modules C1-C4 & module D.	The declared unit used in this EPD is **one (1) kilogram (kg) of an average ready-mix adhesive.**	The data used for the analysis are based on one-year average production data, from 1st of January 2022 to 31st of December 2022.	For Modules A1-A2, the geographic scope is global. Module A3 focuses on Greece, while Module C encompasses the Eastern Mediterranean region (EMED).	Ecoinvent 3.8.1 & Professional 2021	LCA for experts (GaBi)

	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
MODULES	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										EMED	EMED	-	EMED	-
SPECIFIC DATA USED	<77%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
VARIATION - PRODUCTS	<10%*			-	-	-	-	-	-	-	-	-	-	-	-	-	-
VARIATION - SITES	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

- The variation above corresponds to the difference in GWP-GHG indicator results in A1-A3 between an average ready-mix adhesive and products examined

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SYSTEM DIAGRAM

PRODUCT STAGE: MODULES A1 – A3

RAW MATERIALS

Portland CEM I 52.5N, Limestone, Silica Sand, Additives

PACKAGING MATERIALS

Kraft Paper, Polyethylene Film, Strech Film, Wooden Pallets, Carton Box, Plastic Bag

Transport of input commodities from production facilities to Stagakis' manufacturing plant

Diesel Mix

Easymix ready-mix adhesive manufacturing

Electricity

&

Limestone aggregates (for cleaning)

END-OF-LIFE STAGE: MODULES C1, C2, C3, C4

C4 Landfilling of 100% of adhesive waste

C3 Treatment of deconstructed product

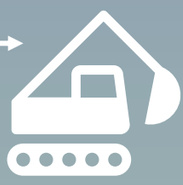
C2 Transport of deconstructed product to waste handling facilities

C1 Demolition – deconstruction of the building

Diesel Mix

Deconstructed adhesive

Diesel Mix



RECOVERY STAGE: MODULE D

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

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DESCRIPTION OF EXAMINED MODULES

As depicted in the preceding diagram, the study encompasses specific Life Cycle stages: **Product, End-of-life,** and **Resource - Recovery**. Information modules that have been excluded (construction and use stages) are scenario-driven. The main aim of this Environmental Product Declaration (EPD) is to communicate the environmental factors associated with the real data that the company can manage during the production of ready-mix adhesives.

PRODUCT STAGE

MODULES A1-A3

These aggregated modules (Modules A1-A3), provide a comprehensive evaluation of the entire life cycle of raw materials and packaging components, encompassing their production, transportation to Stagakis' facilities, and the usage of associated utilities. Specifically, Module A1 rigorously examines the production of raw materials, utilizing data sourced from an existing EPD and dedicated Life Cycle Inventory (LCI) datasets. This module entails modeling the production processes of cement and imported electrical energy, with electricity sourced from the Greek electricity grid. Module A2 then shifts its focus to transportation, thoroughly considering the logistics involved in transporting input materials to the manufacturing plant. Detailed calculations take into account transportation modes and distances, ensuring precision based on the actual locations of producers. Importantly, transportation routes are meticulously modeled, encompassing scenarios where suppliers may be retailers rather than direct manufacturers. Furthermore, Module A3 concentrates on the production of packaging materials and the processes involved in waste treatment. It meticulously quantifies packaging materials for adhesives, providing detailed insights into waste treatment procedures until achieving end-of-waste status.

END-OF-LIFE STAGE

The end-of-life phase of the construction product commences when it is replaced, dismantled, or removed from the building or construction site, or when the building itself reaches the end of its life, depending on the chosen scenario for the product's life cycle termination. In this study, we consider the end-of-life stage for floor screed products to begin when the building is deconstructed or demolished, as these ready-mix adhesives cannot be separated from the building's structure once installed.

Regarding the various end-of-life scenarios, we examined the emissions associated with disposing of 100% of ready-mix adhesive waste during this phase. We selected the most probable approach, which in this case is landfilling, due to uncertainties surrounding specific disposal methods. Our practical approach acknowledges landfilling as the primary disposal option.

Ready-mix Adhesive	
Processes	**Unit (Expressed Per Declared Unit)**
Collection process specified by type	0kg collected separately 1kg collected with mixed construction waste
Recovery system specified by type	0kg for re-use 0kg for recycling 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

Module C1 concentrates on quantifying emissions linked to extracting the product from the building during the deconstruction phase. Within this investigation, a pragmatic scenario has been developed based on literature findings. The removal of ready-mix adhesives is presumed to occur through mechanical methods, specifically utilizing a 100kW diesel excavator.

MODULE C2

Within this module, we investigate the transportation of disassembled ready-mix adhesives to waste treatment facilities. We establish specific assumptions regarding the typical distance between construction sites and waste management facilities, as well as the transportation methods employed.

MODULE C3

In this module, it is assumed the 100% of the ready-mix adhesive waste will be landfilled and hence the environmental impact is considered equal to zero.

MODULE C4

This module considers the emissions associated with the disposal of all waste generated from ready-mix adhesives. We have opted for the most realistic and viable method, which in this case is landfilling.

DISCLAIMER: Considering that Module C is included in this EPD, is discouraged to use the results of modules A1-A3 without considering the results of module C.

RESOURCE/ RECOVERY STAGE

MODULE D

As specified in the PCR for "Construction products," this module assesses the environmental implications of net flows involving reclaimed materials (those reused or recycled) or the energy output exiting modules A-C. Since all deconstructed waste will be disposed of in a landfill without any recovery, reuse, or recycling processes, this module is deemed to have no impact.

ADDITIONAL LCA INFORMATION

ALLOCATIONS:

- The amount of limestone utilized weekly for cleaning the packaging line is determined based on the total mortar production throughout the reference year. Consequently, a mass allocation method was employed to calculate the limestone quantity per unit of mortar produced, expressed in kg of aggregates per kg of product. Additionally, a mass allocation approach has been employed to attribute the share of each product to the consumption of electricity and utilities of the manufacturing process.

ASSUMPTIONS:

- Road transports are conducted using Euro-6 trucks with a total gross weight of 12-14 tonnes and an average payload capacity of 9.3 metric tons. These assumptions are considered reasonably accurate approximations of real-world scenarios, given the variability in cargo density and unspecified truck volume capacity. Details regarding transportation routes, truck or vessel types, technology, fuel used, payload capacity, and utilization ratio for aggregates were approximated based on guidelines provided in the Life Cycle Assessment (LCA) of Granite, Limestone, and Marble Stone Flooring by POLYCOR report by Sustainable Minds.
- The study's calculations consider a distance of 100 kilometers (km) to reach treatment facilities. This assumption accounts for the hypothetical distance materials would need to be transported to access necessary treatment facilities for processing or disposal, serving as a baseline assumption for logistical planning and environmental impact assessments.
- All waste generated from the deconstruction process is assumed to be disposed of in landfills as part of its disposal procedure.
- The disposal of ready-mix adhesives in landfills follows a process known as "Treatment of waste concrete inert material landfill." This method is employed under the assumption that after building demolition, adhesives will not be separated from the entirety of the deconstructed waste.

CUT-OFFS:

The combined disregarded input flows for each module, such as A1-A3, C1-C4, and module D, should not exceed 5% of the total energy usage and mass. These guidelines were adhered to in order to assess the influence of including or excluding inventory flows. All key raw materials, components, and necessary energy inputs are accounted for within the system boundaries. The study incorporates data for basic flows to and from the product system, accounting for at least 99% of the stated environmental impacts. The only processes not considered in this study are:

- Wooden pallets management is not included in this discussion since these pallets are designed for reuse, thereby minimizing the need for specific management practices.
- The study does not account for the infrastructure and capital goods.
- End-of-Life of packaging waste from raw materials
- Emission from diesel combustion during dryers' and construction work machines' operation
- An insignificant fraction of problematic batches of paper bags, not measured inseparably and disposed alongside solid waste from the manufacturing plant.

ENVIRONMENTAL PERFORMANCE INDICATORS

Ready-mix Adhesives

Core Environmental Impact Indicators / 1kg Of An Average Ready-mix Adhesive

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Global Warming Potential – total	kg $CO_{2\ eq.}$	4.53E-01	6.18E-04	1.22E-02	0.00E+00	5.30E-03	0.000E+00
Global Warming Potential – fossil	kg $CO_{2\ eq.}$	4.53E-01	6.41E-04	1.21E-02	0.00E+00	5.27E-03	0.000E+00
Global Warming Potential – biogenic[3]	kg $CO_{2\ eq.}$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.000E+00
Global Warming Potential – land use and land use transformation	kg $CO_{2\ eq.}$	3.69E-04	5.06E-06	9.91E-05	0.00E+00	5.07E-06	0.000E+00
Global Warming Potential – GWP-GHG[1]	kg $CO_{2\ eq.}$	4.53E-01	6.18E-04	1.22E-02	0.00E+00	5.30E-03	0.000E+00
Ozone Depletion Potential	Kg $CFC^{-11}{}_{eq.}$	1.70E-08	7.89E-20	1.55E-18	0.00E+00	2.13E-09	0.000E+00
Acidification Potential	Mole of $H^{+}{}_{eq.}$	1.24E-03	3.04E-06	1.17E-05	0.00E+00	4.95E-05	0.000E+00
Eutrophication aquatic freshwater	kg $P_{eq.}$	5.46E-05	1.83E-09	3.59E-08	0.00E+00	4.82E-07	0.000E+00
Eutrophication aquatic marine	kg $N_{eq.}$	3.30E-04	1.43E-06	3.69E-06	0.00E+00	1.72E-05	0.000E+00
Eutrophication terrestrial	mol $N_{eq.}$	3.55E-03	1.58E-05	4.45E-05	0.00E+00	1.89E-04	0.000E+00
Photochemical Ozone Formation	kg NMVOC $_{eq.}$	9.57E-04	4.03E-06	1.01E-05	0.00E+00	5.49E-05	0.000E+00
Depletion of abiotic resources. minerals and metals [2]	kg $Sb_{eq.}$	9.18E-07	4.70E-11	9.21E-10	0.00E+00	1.20E-08	0.000E+00
Depletion of abiotic resources. fossils [2]	MJ net calorific value	4.33E+00	8.22E-03	1.61E-01	0.00E+00	1.48E-01	0.000E+00
Water Use [2]	m^3 world $_{eq.}$ deprived	1.14E-01	5.36E-06	1.05E-04	0.00E+00	6.77E-03	0.000E+00

[1] 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 CO_2 is set to zero

[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.

[3] Actually, this indicator is negative due to an uptake of biogenic carbon in packaging materials. Considering that module A5 is not declared, the correlated emissions due to end-of-life of packaging, are balanced-out already in Module A1-A3, hence resulting in a total value of zero. In terms of the biogenic carbon content of the product, the amount of carbon uptake and degradation throughout the life cycle of the product can be found in the table above. This value was calculated and added manually in A1-A3 (uptake) and C4 where degradation of product occurs.

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 ready-mix adhesive.

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ENVIRONMENTAL PERFORMANCE INDICATORS

Ready-mix Adhesives

Use Of Resources / 1kg Of An Average Ready-mix Adhesive

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ. net calorific value	1.00E+00	4.59E-04	8.99E-03	0.00E+00	1.28E-03	0.000E+00
Use of renewable primary energy resources used as raw materials	MJ. net calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.000E+00
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ. net calorific value	1.00E+00	4.59E-04	8.99E-03	0.00E+00	1.28E-03	0.000E+00
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ. net calorific value	4.33E+00	8.23E-03	1.61E-01	0.00E+00	1.48E-01	0.000E+00
Use of non-renewable primary energy resources used as raw materials	MJ. net calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.000E+00
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ. net calorific value	4.33E+00	8.23E-03	1.61E-01	0.00E+00	1.48E-01	0.000E+00
Use of secondary materials	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.000E+00
Use of renewable secondary fuels	MJ. net calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.000E+00
Use of non-renewable secondary fuels	MJ. net calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.000E+00
Use of net fresh water	m^3	2.69E-03	5.25E-07	1.03E-05	0.00E+00	1.58E-04	0.000E+00

ENVIRONMENTAL PERFORMANCE INDICATORS

Ready-mix Adhesives

Waste Categories / 1kg An Average Ready-mix Adhesive

INDICATOR	UNIT	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	8.92E-11	4.15E-13	8.13E-12	0.00E+00	0.00E+00	0.000E+00
Non-hazardous waste disposed	kg	1.81E-04	1.22E-06	2.40E-05	0.00E+00	0.00E+00	0.000E+00
Radioactive waste disposed	kg	1.10E-05	9.96E-09	1.95E-07	0.00E+00	0.00E+00	0.000E+00

Output Flows / 1kg An Average Ready-mix Adhesive

INDICATOR	UNIT	A1-A3	C1	C2	C3	C4	D
Components for re-use (CRU)	kg	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Material for recycling (MFR)	kg	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Materials for energy recovery (MER)	kg	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Exported energy, electricity (EEe)	MJ	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Exported energy, thermal (EEt)	MJ	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

ENVIRONMENTAL PERFORMANCE INDICATORS

Ready-mix Adhesives

Additional Environmental Impact Indicators – Impact/ 1kg Of An Average Ready-mix Adhesive

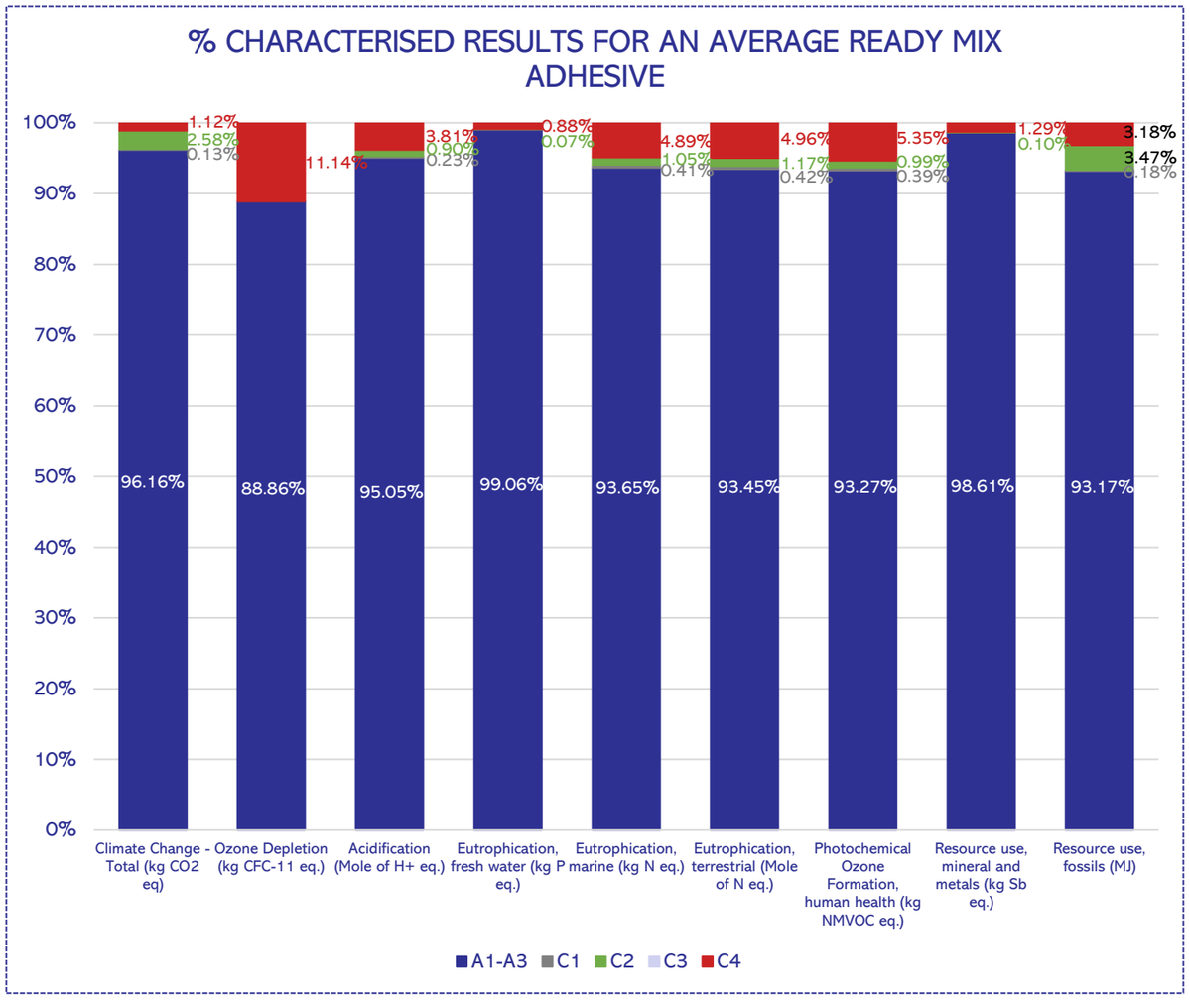
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Particulate matter emissions (PM)	Disease incidence	9.87E-09	3.45E-11	7.03E-11	0.00E+00	9.70E-10	0.000E+00
Ionizing radiation human (IRP) [4]	kBq U235 eq.	2.19E-02	1.43E-06	2.79E-05	0.00E+00	6.53E-04	0.000E+00
Eco-toxicity, freshwater (ETP-fw) [2]	CTUe	3.80E+00	5.94E-03	1.16E-01	0.00E+00	9.35E-02	0.000E+00
Human toxicity, cancer effects (HTP-c) [2]	CTUh	1.24E-10	1.20E-13	2.35E-12	0.00E+00	2.36E-12	0.000E+00
Human toxicity, non-cancer effects (HTP-nc) [2]	CTUh	3.97E-09	7.21E-12	1.21E-10	0.00E+00	6.10E-11	0.000E+00
Land use related impacts/Soil quality (SQP) [2]	-	4.92E+00	2.82E-03	5.53E-02	0.00E+00	3.09E-01	0.000E+00

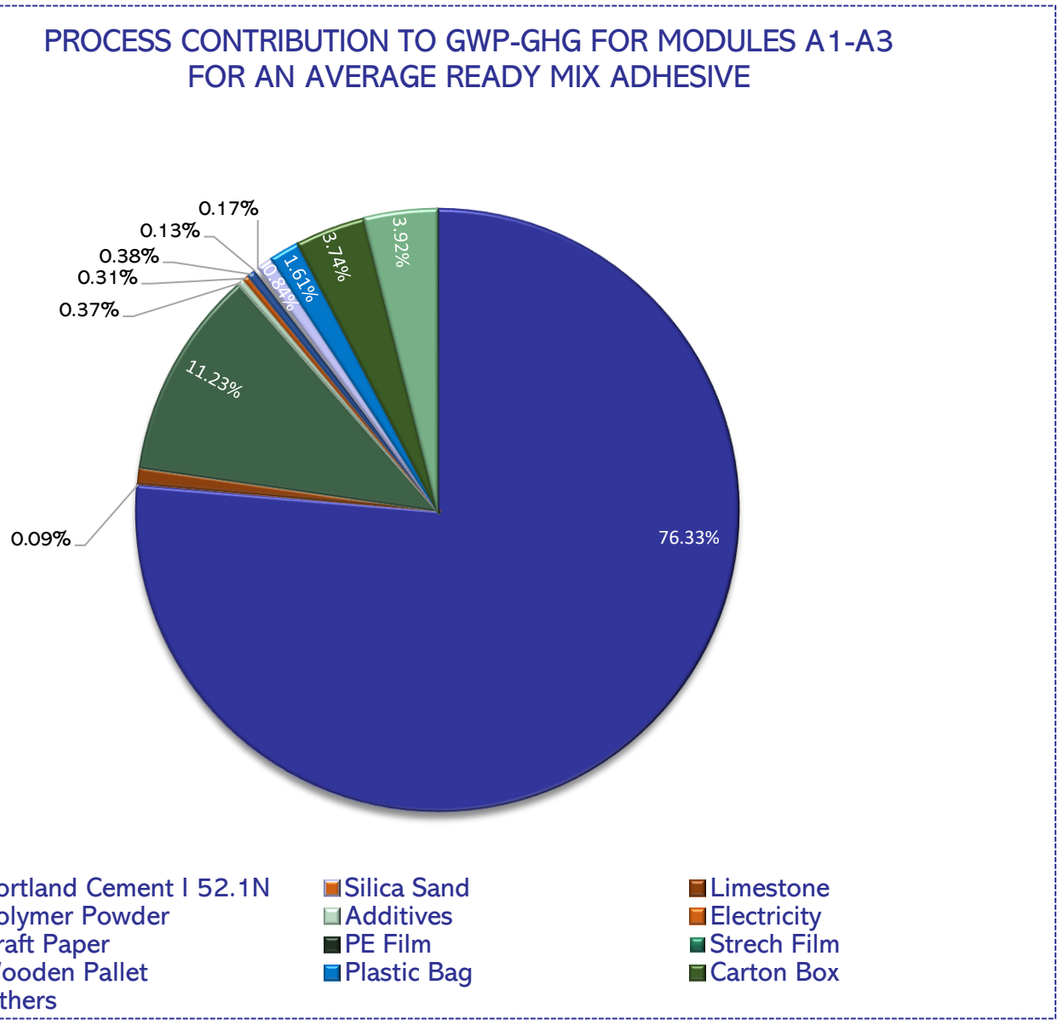
[2] The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

[4] This impact category deals manly with 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

- The accompanying diagram demonstrates the proportional impacts of the assessed modules (A1-A3 & C1-C4) on key environmental indicators. Through a dominance analysis, the evaluation reveals that modules A1-A3 significantly influence the majority of the examined impact categories. Notably, in terms of Global Warming Potential (GWP), modules A1-A3 emerge as the most impactful phases in the lifecycle, collectively contributing to approximately 96.2% of the total impact. While Modules C1, C2, and C4 also contribute to GWP, their roles are comparatively minor, accounting for 0.13%, 2.58%, and 1.12%, respectively. This distribution highlights the hierarchical importance of different phases in influencing GWP throughout the product's lifecycle.





- The bulk of the total Global Warming Potential (GWP) stems from the extraction and manufacturing of raw materials, notably highlighted by the production of Portland Cement I 52.5N. This substantial influence is clearly illustrated in the presentation's pie chart, where Portland Cement I 52.5N production alone represents 76.33% of the entire GWP-GHG. This underscores that the environmental impact, particularly concerning global warming potential, is largely shaped by the processes involved in acquiring and manufacturing raw materials, with Portland Cement I 52.5N production serving as a focal point. The chart visually emphasizes the central role of this specific aspect in determining the overall carbon footprint.

ENVIRONMENTAL PERFORMANCE INDICATORS

% VARIATIONS OF INCLUDED PRODUCTS
Environmental Impact Indicators - Use of Resources

% Variations From The Average Ready-mix Adhesive

Indicator	Extra 300	Super Extra 400	Super Elastic 500	Ultra Elastic S2
Climate Change – Total	-6.49%	-4.89%	3.57%	5.36%
Climate Change – Fossil	-6.47%	-4.88%	3.55%	5.36%
Climate Change – Biogenic	NA	NA	NA	NA
Climate Change - Land Use and Land Use Change	-27.51%	-23.03%	15.91%	10.86%
Global Warming Potential- GWP-GHG	-6.49%	-4.89%	3.57%	5.36%
Ozone Depletion	-8.60%	-6.85%	4.85%	4.94%
Acidification	-10.76%	-8.08%	5.79%	16.00%
Eutrophication, fresh water	-18.32%	-15.57%	10.91%	-7.88%
Eutrophication, marine	-9.17%	-7.77%	5.29%	5.55%
Eutrophication, terrestrial	-7.61%	-6.29%	4.32%	6.68%
Photochemical Ozone Formation, human health	-9.29%	-6.08%	4.57%	25.07%
Resource use, mineral and metals	-20.13%	-7.32%	8.01%	76.68%
Resource use, fossils	-21.22%	-10.96%	9.39%	74.83%
Water Use	-19.51%	-11.60%	8.80%	82.16%

% Variations From The Average Average Ready-mix Adhesive

Indicator	Extra 300	Super Extra 400	Super Elastic 500	Ultra Elastic S2
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	-26.23%	-25.68%	16.79%	-28.92%
Use of renewable primary energy resources used as raw materials	0.00%	0.00%	0.00%	0.00%
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	-26.23%	-25.68%	16.79%	-28.92%
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	-21.22%	-10.96%	9.39%	74.83%
Use of non-renewable primary energy resources used as raw materials	0.00%	0.00%	0.00%	0.00%
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	-21.22%	-10.96%	9.39%	74.82%
Use of secondary materials	0.00%	0.00%	0.00%	0.00%
Use of renewable secondary fuels	0.00%	0.00%	0.00%	0.00%
Use of non-renewable secondary fuels	0.00%	0.00%	0.00%	0.00%
Use of net fresh water	-20.31%	-12.46%	9.35%	80.36%

ENVIRONMENTAL PERFORMANCE INDICATORS

% VARIATIONS OF INCLUDED PRODUCTS
Environmental Impact Indicators - Use of Resources

% Variations From The Average Ready-mix Adhesive

Indicator	Extra 300	Super Extra 400	Super Elastic 500	Ultra Elastic S2
Hazardous waste disposed	-40.41%	-39.64%	25.80%	-39.07%
Non-hazardous waste disposed	-36.37%	-34.95%	22.94%	-29.62%
Radioactive waste disposed	-18.13%	-18.23%	11.84%	-26.29%

% VARIATIONS FROM THE AVERAGE READY-MIX ADHESIVE

Indicator	Extra 300	Super Extra 400	Super Elastic 500	Ultra Elastic S2
Particulate Matter emissions	-23.87%	-20.55%	13.82%	17.22%
Ionizing radiation human	-23.63%	-20.83%	11.45%	157.81%*
Eco-toxicity, freshwater	-19.83%	-17.32%	11.16%	37.23%
Human toxicity, cancer	-18.15%	-15.58%	3.79%	412.98%*
Human toxicity, non-cancer effects	-12.60%	-10.84%	7.36%	5.44%
Land use related impacts/Soil quality	-25.76%	-25.52%	16.61%	-30.77%

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