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EXCLUSIVE LICENCEE NORDIA

CHRYSO SAINT-GOBAIN

ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH ISO14025:2006 & EN 15804:2012+A2:2019/AC:2021

CHRYSO: CHRYSO: RETARDERS - PLASTICIZERS BY NORDIA S.A.

EPD of multiple products based on the average results of the product group. This EPD covers more than 10 products. A detailed list of products can be found between pages 4 & 9. 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	PUBLICATION DATE	DATE OF VALIDITY
S - P - 11777	2023/12/15	2028/12/14

PROGRAM	PROGRAM OPERATOR	UN CPC
The International EPD® System www.environdec.com	EPD International AB	35499: Other chemical products

CHRYSO®Plast GR 120
CHRYSO®Plast GR 132
CHRYSO®Plast GR 134
CHRYSO®Plast GR 160
CHRYSO®Plast GR 180
CHRYSO®Plast GR 200
CHRYSO®Plast GR 220
CHRYSO®Plast GR 300
CHRYSO®Plast GR 80
CHRYSO®Plast GR CEL
CHRYSO®Tard LWR

PROGRAM INFORMATION

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- THE EPD OWNER HAS THE SOLE OWNERSHIP, LIABILITY AND RESPONSIBILITY FOR THE EPD.

PRODUCT CATEGORY RULES (PCR)	▪ CEN Standard EN 15804 serves as the Core Product Category Rules (PCR) ▪ PCR 2019:14 Construction products version 1.3.1 (EN 15804:A2)
PCR REVIEW WAS CONDUCTED BY	The technical Committee of the International EPD ® System. See www.environdec.com/TC for a list of members. Chair: No Chair Appointed Contact via: info@environdec.com
LCA ACCOUNTABILITY	SustChem Technical Consulting S.A. www.sustchem.gr
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 the third-party verification www.bqv.gr – info@bqv.gr
THE CERTIFICATION BODY IS ACCREDITED BY	Hellenic Accreditation System ESYD with accreditation number 1218
PROCEDURE FOR FOLLOW-UP OF DATA DURING EPD VALIDITY INVOLVES THIRD PARTY VERIFIER	YES ✓ NO

EPDs within the same product category but registered in different EPD programs, 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

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.

EMBLEMATIC CONSTRUCTIONS

- *The New Acropolis Museum*
- *Stavros Niarchos Foundation Cultural Center*
- *Athens Conservatoire*
- *Basil & Elise Goulandris Foundation*
- *Ayia Sofia Arena Stadium - AEK*
- *Tae Kwo Do Arena*
- *Olympic Velodrom*
- *Megaron the Athens Concert Hall*
- *Grand Resort Lagonissi*

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.

PRODUCT INFORMATION

The Environmental Product Declaration (EPD) primarily aims to convey the environmental impacts linked to the manufacturing of **Retarders – Plasticizers** for **Concrete Chryso** by the Marmoline S.A in Greece.

AN OVERVIEW OF THE EXAMINED PRODUCTS

The main application of the products is in concrete production where they are used as admixtures resulting the improvement of the rheological and mechanical properties of the final product. Specifically, the examined products belong to the Retarders-Plasticizers category, and they contribute to the retardation of concrete as well as they improve the pumpability of the concrete.

All the examinded products are highly active superfluidizer-water reducers with differences in their composition which determined their technical characteristics. The three main characteristics of all the examined products are the follow:

- The product is physically integrated with the other product during the installation so they cannot be separated in a physical way at the end of life
- The product of material is no longer identifiable at the end of life as a result of a physical or chemical transformation process
- The products contain biogenic carbon

CHRYSO PRODUCTS	
CHRYSO PLAST GR 120	**CHRYSO PLAST GR 220**
CHRYSO PLAST GR 132	**CHRYSO PLAST GR 300**
CHRYSO PLAST GR 134	**CHRYSO PLAST GR 80**
CHRYSO PLAST GR 160	**CHRYSO PLAST CEL**
CHRYSO PLAST GR 180	**CHRYSO TARD LWR**
CHRYSO PLAST GR 200	

ACCORDING TO THE UN CPC CLASSIFICATION SYSTEM, THE ADMIXTURES FOR CONCRETE PRODUCTS CAN BE CLASSIFIED UNDER THE UN CPC CODE: 35499 OTHER CHEMICAL PRODUCTS.

PRODUCT INFORMATION

CHRYSO® Plast GR 120
Retarder-Concrete plasticizer

CHRYSO®Plast GR 120 is an admixture that reduces the initial final setting ofconcrete, maintaining its workability for a long time. The retardation depends on the dosage of the additive (0.2 – 0.35 kg /100 kg of concrete), the thermo-hygrometric ambient conditions, the type of cement and the mode of its transport.

Packaging: Unpackaged cargo, Barrel, IBC tank

CHRYSO® Plast GR 132
Retarder - Water reducer - Plasticizer

CHRYSO®Plast GR 132 is a liquid admixture based on synthetic sodium salts that reduces the initial and final setting of concrete. Its dosage is between 0.15-0.55 kg/100 kg of cement. Combined with the appropriate superplasticizer maintains the workability of the concrete for a long time. It is specially designed for concrete with all types of composite cements (CEM II to CEM V), having requirements to maintain extended workability.

Packaging: Unpackaged cargo, Barrel, IBC tank

CHRYSO® Plast GR 134
Retarder - Water reducer - Plasticizer

It is a concrete additive based on synthetic products and modified salts. CHRYSO® Plast GR 134 reduces the initial hydration of the cement, resulting in the beginning coagulation to delay and prolong the workability of concrete. In addition, because of its chemical composition acts as a small water reducer scale and plasticizer.

PRODUCT INFORMATION

CHRYSO® Plast GR 160
Water reducer - Retarder - Plasticizer

CHRYSO®Plast GR 160 is additive concrete based on synthetic products and modified lignosulfonates. Its composition allows the dispersion of cement grains, with result in facilitating the flow of the grains and achieving greater fluidity. The dosage is between 0.2-0.55/100 kg of cement. It reduces the initial hydration of the cement, as a result of which the beginning of setting is delayed and the workability of the concrete is extended..

Packaging: Unpackaged cargo, Barrel

CHRYSO® Plast GR 180
Water reducer - Retarder - Plasticizer

CHRYSO®Plast GR 180 is a concrete additive based on modified lignosulfonate salts. When added to concrete is absorbed into the cement grains facilitating its dispersion, resulting in greater fluidity. It reduces the initial hydration of the cement during the first hours and this causes a delay in the initial setting and prolongation of workability. The dosage ranges from 0.2-0.8 kg/100 kg of cement, and also acts as a plasticizer
Packaging: Unpackaged cargo, IBC tank

PRODUCT INFORMATION

CHRYSO® Plast GR 80
Superplasticizer - Plasticizer - Retarder

CHRYSO®Plast GR 80 is a concrete additive that allows the dispersion of cement grains. This facilitates the flow of the grains and consequently achieves greater fluidity. It maintains the workability of the concrete for a long time, slowing down the initial hydration of the cement, thus the beginning of setting. The dosage ranges from 0.2-0.85 kg/100 kg of cement
Packaging: Unpackaged cargo, IBC tank

CHRYSO® Plast GR 200
Water reducer - Retarder - Platicizer

CHRYSO®Plast GR 200 is a concrete additive based on organic salts. Its composition allows the dispersion of cement grains, with result in facilitating the flow of the grains and achieving greater fluidity. CHRYSO® Plast GR 200 slows down the initial hydration of the cement, as a result of which the beginning of setting is delayed and prolonged workability of concrete. Water reduction results in an increase in mechanical strength (5-10% depending on the dose of CRYSO® Plast GR 200). The dosage of the product is between 0.2-0.55/100 kg of cement

Packaging: Unpackaged cargo, IBC tank

CHRYSO® Plast GR 220
Water reducer - Retarder - Plasticizer

CHRYSO® Plast GR 220 is a concrete additive based on synthetic products and modified salts. CHRYSO® Plast GR 220 reduces the initial hydration of cement, as a result of which the beginning of setting is delayed and prolongation of workability of concrete. In addition, due to its chemical composition it acts as a plasticizer. The dosage of the product is between 0.2-0.55/100 kg of cement.

Packaging: Unpackaged cargo, IBC tank

CHRYSO® Plast GR 300
Water resisting- Plasticizer-Water reducer

CHRYSO® Plast GR 300 is an additive in liquid form, which is used as a sealant concrete mass but also as a liquidizer. CHRYSO® Plast GR 300 is a capillary absorption reducer in hardened concrete, thus improving the watertightness of the concrete. It also acts as a water reducer for the production of replastic concretes, to achieve concretes with greater workability. The dosage of the product is between 0.5-0.8 kg of cement

Packaging: Unpackaged cargo, Barrel, IBC tank

PRODUCT INFORMATION

CHRYSO® Plast CEL
Water reducer - Retarder - Plasticizer

CHRYSO® Plast CEL is a chloride-free, ready-to-use liquid concrete additive. By adding it to concrete, it is absorbed by the cement grains facilitating its dispersion. This facilitates the flow of the grains and achieves greater fluidity in the mixture (ease and speed in pumping). CHRYSO® Plast CEL reduces the initial hydration of the cement, during the first hours, delaying the beginning of setting and prolonging the workability of the concrete. The dosage of the product is between 0.2-0.5 kg/100 kg cement.

Packaging: Unpackaged cargo, IBC tank

CHRYSO® Tard LWR
Retarder –Plasticizer-Water reducer

CHRYSO®Tard LWR is an admixture that reduces the mixing water, varies the hydration reaction and mainly slows down the setting of concrete, maintaining its workability for a long time. It does not increase the time between the start and end of coagulation, and it also improves the pumpability of concrete. The retardation depends on the dosage of the additive, the thermo-hygrometric ambient conditions, the type of cement and the mode of its transport The dosage of the product is between 0.2-0.4 kg/100 kg cement.

Packaging: Unpackaged cargo, IBC tank

PRODUCT INFORMATION

TECHNICAL PROPERTIES

PRODUCT TYPE	PROTOTYPE	DENSITY	pH	CL-	Na_2O
CHRYSO PLAST GR 120	EN 934-2+ A1 : 2012	1.15±0.03 gr/cm3	6-9	≤0.15%	≤ 5%
CHRYSO PLAST GR 132	EN 934-2+ A1 : 2012	1.15±0.03 gr/cm3	7-8	≤0.15%	≤ 5%
CHRYSO PLAST GR 134	EN 934-2+ A1 : 2012	1.15±0.03 gr/cm3	8-10	≤0.1%	≤ 5%
CHRYSO PLAST GR 160	EN 934-2+ A1 : 2012	1.15±0.03 gr/cm3	6.0-9.5	≤0.1%	≤ 5%
CHRYSO PLAST GR 180	EN 934-2+ A1 : 2012	1.16±0.03 gr/cm3	8.0-10.0	≤0.1%	≤ 5%
CHRYSO PLAST GR 200	EN 934-2+ A1 : 2012	1.11±0.03 gr/cm3	5.5-7.5	≤0.1%	≤ 5%
CHRYSO PLAST GR 220	EN 934-2+ A1 : 2012	1.14±0.03 gr/cm3	8.0-10.0	≤0.1%	≤ 5%
CHRYSO PLAST GR 300	EN 934-2+ A1 : 2012	1.11±0.03 gr/cm3	6.5-10.0	≤0.1%	≤ 7%
CHRYSO PLAST GR 80	EN 934-2+ A1 : 2012	1.19±0.03 gr/cm3	6.0-9.5	≤0.1%	≤ 7%
CHRYSO PLAST CEL	EN 934-2+ A1 : 2012	1.11±0.03 gr/cm3	7.0-10.0	≤0.1%	≤ 5%
CHRYSO TARD LWR	EN 934-2+ A1 : 2012	1.15±0.03 gr/cm3	7.0-9.5	≤0.18%	≤ 5%

CONTENT DECLARATION INFORMATION

This is a multi-product EPD, declaring the results of the average products. The content declaration depicts the composition of the average of included of **Retarders - Plasticizers products** expressed by declared unit (kg). **The variations correspond to the differences in GWP-GHG indicator results in A1-A3 between an average of Retarders - Plasticizers products*

CONTENT DECLARATION OF RETARDERS - PLASTICIZERS PRODUCTS PER D.U (KG)

RAW MATERIAL PRODUCT COMPONENTS	WEIGHT KG/KG	VARIATIONS	POST CONSUMER RECYCLED MATERIAL, WEIGHT (%)	BIOGENIC MATERIAL, WEIGHT % AND KG C/KG
Water	5.26E-01	0.193-0.669	0	0
Sodium gluconate salts	1.66E-01	0.000-0.450	0	0
Sodium Lignosulfonate salts	9.14E-02	0.000-0.800	0	0
Molasse	2.21E-01	0.000-0.353	0	8.76E-02
Sucrose	1.77E-03	0.000-0.150	0	7.67E-04
Defoamer 4	7.24E-05	0.0000-0.0001	0	0
Special Additives	4.50E-04	0.000-0.4400	0	0
TOTAL	**1.01E+00**	-	**0**	**8.83E-02**
PACKAGING MATERIALS	**WEIGHT KG/KG**	**VARIATIONS**	**WEIGHT % (VERSUS THE PRODUCT)**	**WEIGHT BIOGENIC CARBON KG C/KG**
IBC Pallets 1000 lt (HDPE)	0.0531	0.0000-0.0531	0	0
Plastic bottles 200 lt (HDPE)	0.0475	0.0000-0.0475	0	0
Plastic bottles 10 lt (HDPE)	0.0243	0.000-0.0243	0	0
TOTAL	**0.1250**		**0**	**0**

CARBON ELECTRICITY INTENSITY (2022)

ENVIRONMENTAL EFFECTS	CO2 EMISSIONS (KGCO2/KWH)
	0.6259

Residual Greek Mix: DAPEEP Report 2022: Based on the PCR 2019:14 "Construction Products" version 1.3.1, it is required to disclose the climate impact (measured on kilograms of CO2 eq per kilowatt-hour (kWh) using the GWP-GHG indicator) associated with the electricity acquisition during the manufacturing process in A3

IMPORTANT

No substances included in the Candidate List of Substances of Very High Concern 2023 for authorization under the REACH Regulations that exceed 0.1% of the total weight are present in EPS products. Also, no additional chemicals are used by the company.

LCA INFORMATION

SYSTEM BOUNDARIES

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

DECLARED UNIT

1 kg of **Chryso Products** based on the average product.

TIME REPRESENTATIVENESS

The data used for the analysis are based on one-year average production data, from 1.8.2022 - 31.7.2023.

GEOGRAPHICAL SCOPE

Global

DATABASES USED

Ecoinvent 3.8.1 & Professional 2021

SOFTWARE USED

LCA for experts (GaBi)

	PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				RESOURCE RECOVERY STAGE
	Raw Material	Transportation	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction. demolition	Transport	Waste processing	Disposal	Reuse. recycling or energy recovery potentials
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	ND	X	ND
GEOGRAPHY	GLO		GR										EU-27	EU-27	EU-27	EU-27	EU-27
SPECIFIC DATA	>80%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
VARIATION PRODUCTS (1)	Variation products -47.17%- 45.06%					-	-	-	-	-	-	-	-	-	-	-	-
VARIATION SITES	0%					-	-	-	-	-	-	-	-	-	-	-	-

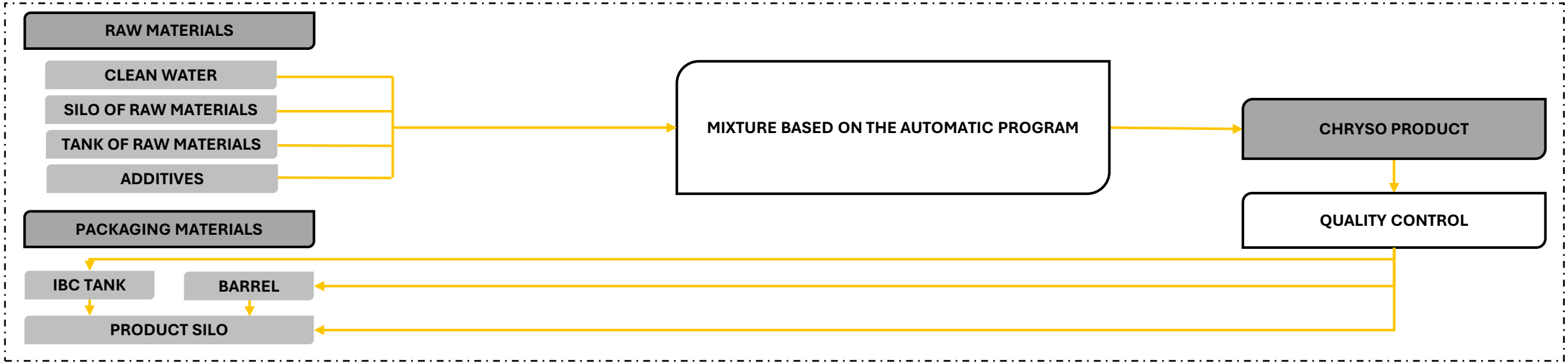
X: module Declared, ND: Not Declared

**Due to consistency of inputs irrespective of examined products*

(1) The variation of the products referred to the two different types based on the Global Warming Potential- GWP-GHG (kg CO2 eq) indicator. Specifically, the min value refers to the Chryso Plast 120 product and the max value to the Chryso 80 product.

DESCRIPTION OF EXAMINED MODULES

The current study encompasses in the specific Life Cycle stages as it is presented in the following diagram. The Life Cycle stages which are under consideration is about the production process. The primary objective of this EPD is to convey the environmental aspects related to the actual data that the company can control during the manufacturing of the super plasticizer's products



PRODUCT STAGE

In these aggregated modules (Modules A1-A3), the entire lifecycle of raw materials and packaging materials, including their production, transportation to Nordia's facilities and associated utilities like electricity usage, are considered.

MODULE A1

The production of all Retarders - Plasticizers products, examining every step regarding from the raw and the packaging materials utilized in the production of each product.

MODULE A2

It is addressed to the transportation of all raw and packaging materials to the main facilities.

MODULE A3

It depicts the environmental impact potentials attributed to all processes taking place at the manufacturing plant of Marmoline - Nordia. It deals with the Greek grid.

DESCRIPTION OF EXAMINED MODULES

END-OF-LIFE STAGE

The end-of-life phase for the construction product initiates when it's either replaced, dismantled, or removed from the building or construction site, no longer serving any purpose. Alternatively, it can commence when the building itself reaches its end-of-life, depending on the chosen scenario for how the product's life ends. In this study, we take the perspective that the end-of-life stage for Retarders-plasticizers products begins when the building is deconstructed or demolished, as these plasticizers cannot be separated from the building's structure once installed.

In terms of the different end-of-life scenarios, it is taken under consideration the landfill approach. Due to uncertainties regarding the specific disposal methods used, we've taken a practical approach and considered landfilling as the sole disposal option.

MODULE C1

Module C1 focuses on calculating emissions associated with removing the product from the building during the deconstruction process. In this study, the deconstruction of Retarders-plasticizers is assumed to be carried out using mechanical means, specifically employing a 100kW diesel excavator.

MODULE C2

Within this module, we examine the transport of disassembled Retarders-plasticizers to waste treatment facilities. We make certain assumptions regarding the average distance between construction sites and waste management facilities, as well as the modes of transportation involved.

PROCESSES	KG/TN
Collection process specified by type	0kg collected separately 1kg collected with mixed construction waste
Recovery system specified by type	0 kg for re-use
Disposal specified by type	0 kg for recycling
Assumptions for scenario development (transportation)	0 kg for energy recovery 100 km truck

MODULE C3

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

MODULE C4

This module takes into account the emissions linked to the disposal of all waste generated from Retarders-plasticizers . The most realist and plausible method, was adopted which in this instance, is landfilling.

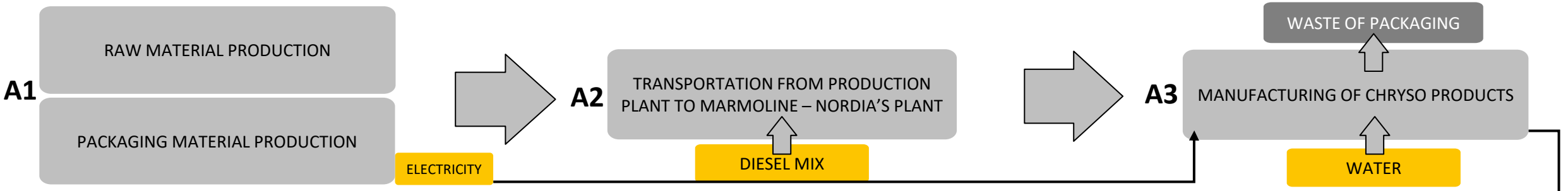
DISCLAIMER: *Considering that Module C is included in this EPD, is discouraged to use the results of modules A1-A3 without considering the results of module C.*

RESOURCE / RECOVERY STAGE: MODULE D

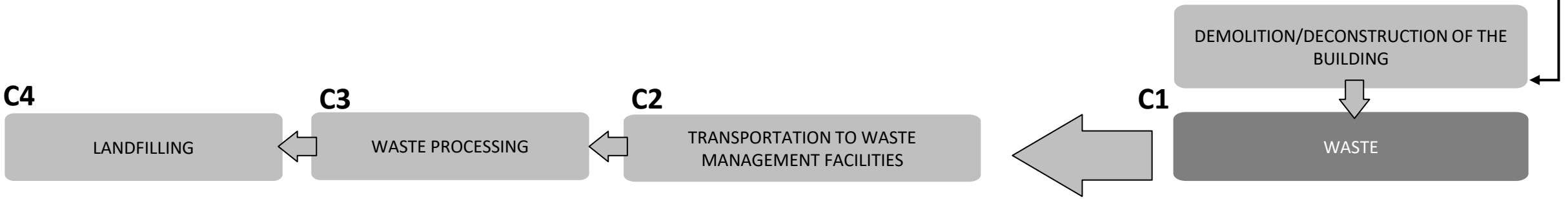
As outlined in the PCR for "Construction products," this module evaluates the environmental consequences of net flows involving reclaimed materials (those that are reused or recycled) or the energy output exiting modules A-C. Given that all deconstructed waste will be sent to a landfill without any recovery, reuse, or recycling processes, this module is considered to have zero impact.

SYSTEM DIAGRAM

PRODUCT STAGE: MODULES A1 - A3



END-OF-LIFE STAGE: MODULES C1 - C4



ADDITIONAL LCA INFORMATION

ASSUMPTIONS:

- Assumptions were employed when selecting the modes of transportation for road routes, considering factors such as technology, fuel type, and payload capacity. An average mode of transportation was chosen for each route to offer a reasonable approximation for all transported goods. It is assumed that a diesel-powered truck with Euro 6 emissions standards, a gross weight of 12-14 tons, and a payload capacity of 9.3 tons is used.
- Regarding the waste of packaging form this process their amount is quite low. Plus, there is only one waste contractor manager, so it is assumed that the whole amount of all the packaging material transferred directly to the waste contractor and there the short and sharing processes take place.
- An assumption regarding the proximity of waste treatment facilities to construction sites was made. Namely, it was assumed that the treatment facilities would be located within a distance of 100 kilometers from the construction sites
- Disposal of the total deconstructed waste produced is assumed to be landfilled. The scenario is based on the fact that the examined products are not separated from the final product during the installation stage. Plus, they are not identifiable in end of life of the main product because of a physical or chemical transformation.
- Considering the disposal stage, the treatment to the landfill which is used in this LCA study is “Europe without Switzerland: treatment of waste concrete, inert material landfill Ecoinvent 3.8”.

ALLOCATIONS:

- Electricity usage for the process is 10% of the total consumption of the facility.
- From January of 2023 until the end of July the facility put in order photovoltaic panels for electricity purposes.
- To determine the amount of waste produced during the manufacturing process, a mass allocation method was employed. This was chosen because the total waste volumes referred to the overall waste generated within the facility for the reference year.

CUT-OFFS RULES:

The combined disregarded input flows for each module, such as A1-A3 C1-C2 and C4 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 is certain primary flows, i.e., special chemical additives, which were determined to be considerably less than 1% of the declared environmental impacts.

ENVIRONMENTAL PERFORMANCE INDICATORS

NORDIA S.A. – CHRYSO RETARDERS PRODUCT

POTENTIAL ENVIRONMENTAL IMPACTS/ 1 KG OF AN AVERAGE RETARDERS PLASTICIZERS PRODUCT								
CORE ENVIRONMENTAL IMPACT INDICATORS		UNIT	A1-A3	C1	C2	C3	C4	D
Global Warming Potential – total	GWP-total	kg CO_2 eq.	1.62E+00	6.46E-04	1.22E-02	0.00E+00	5.30E-03	0.00E+00
Global Warming Potential – fossil	GWP-fossil	kg CO2 eq.	1.46E+00	6.41E-04	1.21E-02	0.00E+00	5.27E-03	0.00E+00
Global Warming Potential – biogenic [3]	GWP-biogenic	kg CO2 eq.	-3.93E-02	0.00E+00	0.00E+00	0.00E+00	3.93E-02	0.00E+00
Global Warming Potential – land use and land use change	GWP-luluc	kg CO2 eq.	1.62E-01	6.18E-06	1.22E-05	0.00E+00	5.07E-06	0.00E+00
Global Warming Potential – GHG[1]	GWP-GHG	kg CO2 eq.	1.26E+00	6.46E-04	1.22E-02	0.00E+00	5.30E-03	0.00E+00
Ozone Depletion Potential	ODP	kg CFC 11 eq.	1.94E-01	7.89E-20	1.54E-18	0.00E+00	2.13E-09	0.00E+00
Acidification Potential	AP	Mole of H+ eq.	2.11E-01	3.04E-06	2.23E-05	0.00E+00	4.95E-05	0.00E+00
Eutrophication Potential – freshwater	EP-freshwater	kg P eq.	1.94E-01	1.83E-09	3.59E-08	0.00E+00	4.82E-07	0.00E+00
Eutrophication Potential – marine	EP-marine	kg N eq.	1.95E-01	1.43E-06	9.22E-06	0.00E+00	1.72E-05	0.00E+00
Eutrophication Potential – terrestrial	EP-terrestrial	mol N eq.	2.05E-01	1.58E-05	1.05E-04	0.00E+00	1.89E-04	0.00E+00
Photochemical Oxidant Formation Potential	POCP	kg NMVOC eq.	1.97E-01	4.03E-06	2.00E-05	0.00E+00	5.49E-05	0.00E+00
Abiotic Depletion Potential – elements[2]	ADPe	kg Sb eq.	1.94E-01	4.70E-11	9.20E-10	0.00E+00	1.20E-08	0.00E+00
Abiotic Depletion Potential. fossil resources[2]	ADPf	MJ net calorific value	3.16E+01	8.22E-03	1.61E-01	0.00E+00	1.48E-01	0.00E+00
Water Deprivation Potential[2]	WDP	m3 world eq. deprived	8.13E-01	5.36E-06	1.05E-04	0.00E+00	6.77E-03	0.00E+00

DISCLAIMERS:

[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]. 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 following table. This value was calculated and added manually in A1-A3 (uptake) and C4 where degradation of product occurs.

GWP-biogenic	A1-A3	C4
	-3.93E-02	3.93E-02

ENVIRONMENTAL PERFORMANCE INDICATORS

NORDIA S.A. – CHRYSO RETARDERS PRODUCT

POTENTIAL ENVIRONMENTAL IMPACTS/ 1 KG OF AN AVERAGE RETARDERS PLASTICIZERS PRODUCT								
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	1.72E+00	4.59E-04	8.98E-03	0.00E+00	1.28E-03	0.00E+00
Use of renewable primary energy resources used as raw materials	PERM	MJ. net calorific value	3.00E+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	1.72E+00	4.59E-04	8.98E-03	0.00E+00	1.28E-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	3.16E+01	8.23E-03	1.61E-01	0.00E+00	1.48E-01	0.00E+00
Use of non-renewable primary energy resources used as raw materials	PENRM	MJ. net calorific value	3.00E+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	3.16E+01	8.23E-03	1.61E-01	0.00E+00	1.48E-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	m^3	2.08E-01	5.25E-07	1.03E-05	0.00E+00	1.58E-04	0.00E+00

ENVIRONMENTAL PERFORMANCE INDICATORS

NORDIA S.A. – CHRYSO RETARDERS PRODUCT

POTENTIAL ENVIRONMENTAL IMPACTS/ 1 KG OF AN AVERAGE RETARDERS PLASTICIZERS PRODUCT								
WASTE INDICATORS		**UNIT**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	HWD	kg	1.94E-01	4.15E-13	8.12E-12	0.00E+00	0.00E+00	0.00E+00
Non-hazardous waste disposed	NHWD	kg	1.94E-01	1.22E-06	2.39E-05	0.00E+00	0.00E+00	0.00E+00
Radioactive waste disposed	RWD	kg	1.94E-01	9.96E-09	1.95E-07	0.00E+00	0.00E+00	0.00E+00
OUTPUT FLOWS		**UNIT**						
Components for re-use	HWD	CRU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for recycling	NHWD	MFR	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	RWD	MER	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS		**UNIT**						
Particulate matter emissions	PM	Disease incidence	1.94E-01	3.45E-11	1.33E-10	0.00E+00	9.70E-10	0.00E+00
Ionizing radiation human[4]	IRP	kBq U235 eq.	2.44E-01	1.43E-06	2.79E-05	0.00E+00	6.53E-04	0.00E+00
Eco-toxicity. Freshwater[2]	ETP-fw	CTUe	1.60E+01	5.94E-03	1.16E-01	0.00E+00	9.35E-02	0.00E+00
Human toxicity. cancer effects[2]	HTP-c	CTUh	1.94E-01	1.20E-13	2.35E-12	0.00E+00	2.36E-12	0.00E+00

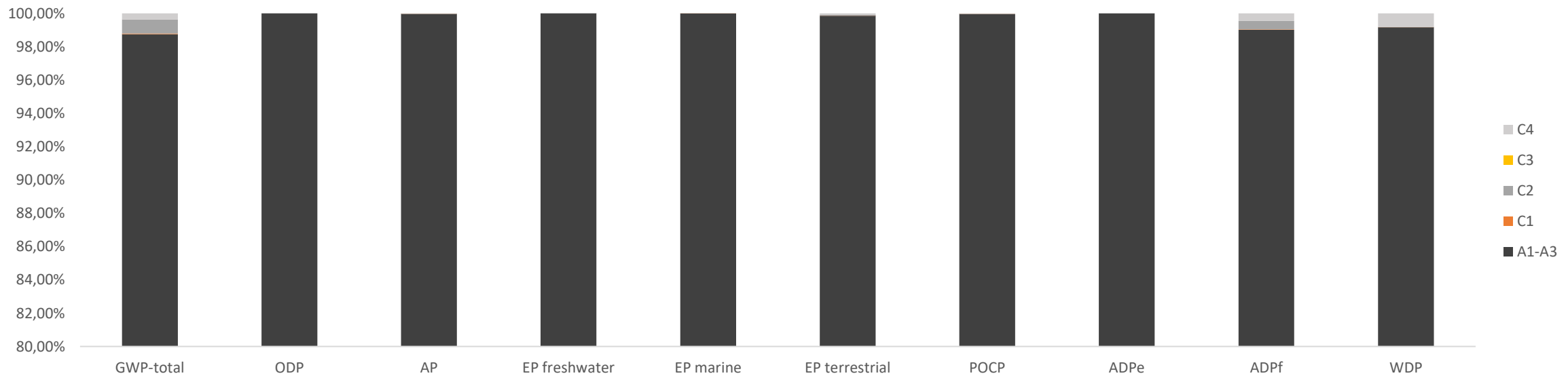
INTERPRETATION

- The following diagram illustrates the respective contributions of the assessed modules (A1-A3 & C1-C4) to the fundamental environmental impact indicators. The evaluation of the outcomes took the form of a dominance analysis focused on these key environmental impacts. Evidently, the modules A1-A3 exert a predominant influence on the majority of the scrutinized impact categories.

- In general, the product stage contribution presents the most significant influence in all environmental indicators. Regarding, the Global Warming Potential Indicator (GWP) it is observed that the module A1-A3 contribute almost 100%.

INDICATORS	A1-A3	C1	C2	C3	C4
GWP-total	98.74%	0.04%	0.76%	0.00%	0.33%
ODP	100.00%	0.00%	0.00%	0.00%	0.00%
AP	99.96%	0.00%	0.01%	0.00%	0.02%
EP freshwater	100.00%	0.00%	0.00%	0.00%	0.00%
EP marine	99.99%	0.00%	0.00%	0.00%	0.01%
EP terrestrial	99.85%	0.01%	0.05%	0.00%	0.09%
POCP	99.96%	0.00%	0.01%	0.00%	0.03%
ADPe	100.00%	0.00%	0.00%	0.00%	0.00%
ADPf	99.01%	0.03%	0.50%	0.00%	0.46%
WDP	99.16%	0.00%	0.01%	0.00%	0.83%

% LIFE CYCLE STAGE CONTRIBUTION (FOR AN AVERAGE RETARDERS CHRYSO PRODUCT)

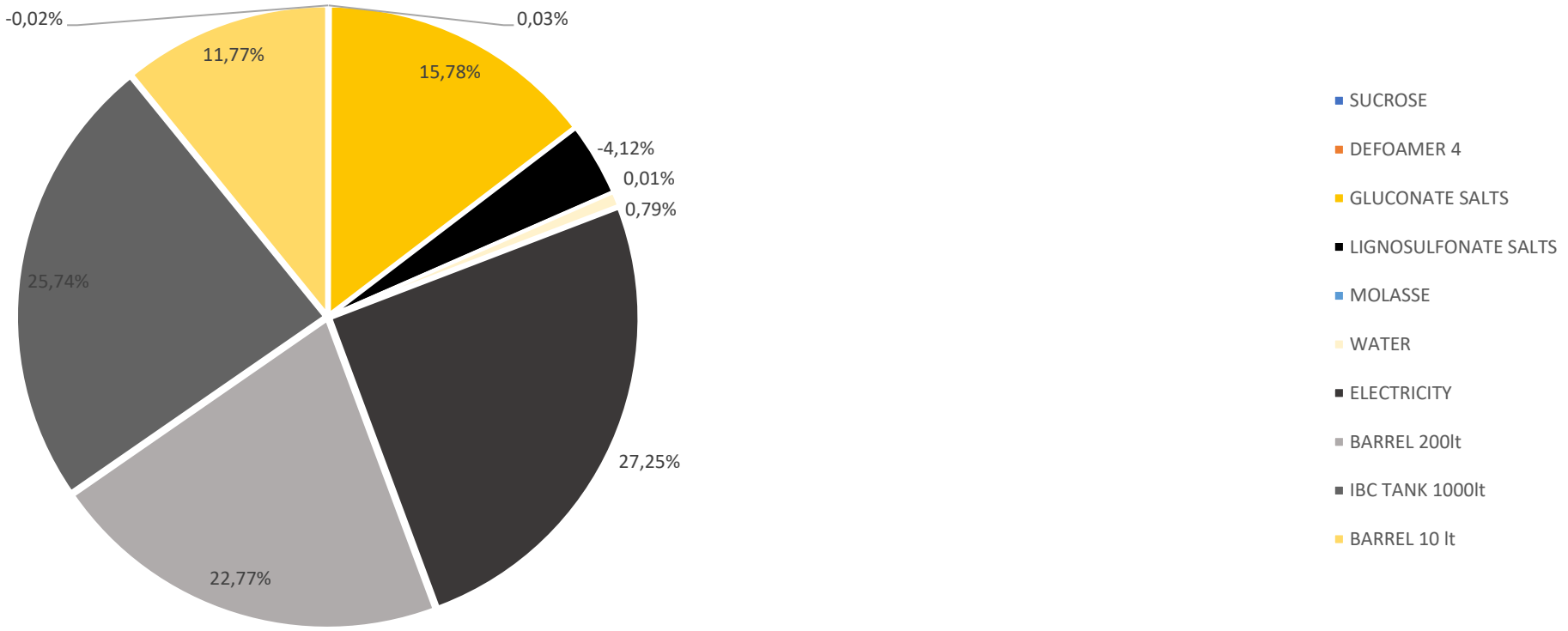


INTERPRETATION

- The most influenced indicators of the total Global Warming Potential (GWP) are associated with the electricity and the transportation and some of raw materials. Specially, the electricity has an influenced of 27% almost of the GWP-total and the IBC tank follows with 25%. The transportation of barrel with 200 lt volume is following with around 22% and the last most influenced factor is the sodium gluconate with 15% more or less.

- The chart in the left part shows the contribution of the all materials of the GWP- total indicator which is visually underscores the pivotal role of this aspect in the overall carbon footprint of the product.

CONTRIBUTION GWP AVERAGE PRODUCT RETARDER - PLASTIZER



ADDITIONAL ENVIRONMENTAL INFORMATION

% VARIATIONS OF INCLUDED PRODUCTS

	CHRYSO PLAST GR 120	CHRYSO PLAST GR 132	CHRYSO PLAST GR 134	CHRYSO PLAST GR 160	CHRYSO PLAST GR 180
ENVIRONMENTAL IMPACTS					
Climate Change - Total (kg CO2 eq)	-51.05%	-45.59%	-15.19%	84.78%	14.76%
Climate Change - Fossil (kg CO2 eq)	-42.82%	-42.82%	-	102.57%	24.83%
Climate Change - Biogenic (kg CO2 eq)	0%	0%	0%	0%	0%
Climate Change - Land Use and Land Use Change (kg CO2 eq)	-99.37%	-99.37%	-14.16%	40.57%	-97.53%
Global Warming Potential- GWP-GHG (kg CO2 eq)	-47.17%	-47.17%	-	75.07%	15.45%
Ozone Depletion (kg CFC-11 eq.)	-100.00%	-100.00%	-100.00%	283.97%	-100.00%
Acidification (Mole of H+ eq.)	-98.45%	-98.45%	-92.51%	278.55%	-84.98%
Eutrophication, fresh water (kg P eq.)	-99.99%	-99.99%	-99.92%	283.94%	-99.81%
Eutrophication, fresh water (kg PO4 -3 eq.)	-99.99%	-99.99%	-99.92%	283.94%	-99.81%
Eutrophication, marine (kg N eq.)	-99.66%	-99.66%	-99.52%	283.03%	-99.29%
Eutrophication, terrestrial (Mole of N eq.)	-96.18%	-96.18%	-94.99%	273.32%	-92.80%
Photochemical Ozone Formation, human health (kg NMVOC eq.)	-99.15%	-99.15%	-98.25%	281.34%	-97.18%
Resource use. mineral and metals (kg Sb eq.)	-100.00%	-100.00%	-99.99%	283.97%	-99.99%
Resource use, fossils (MJ)	-23.34%	-23.34%	-	53.69%	27.45%
Water Use (m3 world equiv.)	-52.23%	-52.23%	-32.94%	157.15%	-
WATER USE					
Use of net fresh water (m3)	-95.60%	-95.60%	-93.77%	272.22%	-90.46%
ENERGY USE					
(PERE) Use of renewable primary energy excluding renewable primary energy resources as raw materials (MJ)	-66.65%	-66.65%	-64.01%	79,13%	-47.27%
(PERM) Use of renewable primary energy resources used as raw materials (MJ)	-	-	-	-	-
(PERT) Total use of renewable primary energy resources (primary energy resources used as raw material and primary energy) (MJ)	-66.65%	-66.65%	-64.01%	79,13%	-47.27%
(PENRE) Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (MJ)	-17.73%	-17.73%	-	52,75%	35.01%
(PENRM) Use of non-renewable primary energy resources used as raw materials (MJ)	-	-	-	-	-
(PENRT) Total use of non-renewable primary energy resources (MJ)	-17.71%	-17.71%	-	52.75%	35.01%
Use of renewable secondary fuels (MJ)	-	-	-	-	-
Use of non-renewable secondary fuels (MJ)	-	-	-	-	-
Use of secondary materials (kg)	-	-	-	-	-

ADDITIONAL ENVIRONMENTAL INFORMATION

% VARIATIONS OF INCLUDED PRODUCTS

	CHRYSO PLAST GR 120	CHRYSO PLAST GR 132	CHRYSO PLAST GR 134	CHRYSO PLAST GR 160	CHRYSO PLAST GR 180
WASTE					
Hazardous waste disposed (kg)	0.00%	0.00%	0.00%	60.70%	0.00%
Non-hazardous waste disposed (kg)	-15.24%	-15.17%	-15.41%	-98.15%	-15.41%
Radioactive waste disposed (kg)	-36.44%	-36.64%	-36.70%	-99.04%	-36.70%
ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS					
Particulate Matter emissions (Disease incidence)	-	-	-	-99.90%	-
Ionizing radiation human (kBq U235 eq.)	-44.42%	-	71.32%	29.29%	220.92%
Eco-toxicity, freshwater (CTUe)	-	-	-	-97.44%	-
Human toxicity, cancer effects (CTUh)	-99.92%	-99.92%	-99.92%	-76.73%	-99.92%
Human toxicity, non-cancer effects (CTUh)	-	-	-	-99.83%	-
Land use related impacts/Soil quality (dimensionless)	-14.77%	-13.62%	-14.74%	-93.51%	-12.73%

ADDITIONAL ENVIRONMENTAL INFORMATION

% VARIATIONS OF INCLUDED PRODUCTS

	CHRYSO PLAST GR 200	CHRYSO PLAST GR 220	CHRYSO PLAST GR 300	CHRYSO PLAST GR 80	CHRYSO PLAST CEL	CHRYSO TARD LWR
ENVIRONMENTAL IMPACTS						
Climate Change - Total (kg CO2 eq)	-35.30%	-45.46%	-35.30%	45.34%	-36.1%	-41.5%
Climate Change - Fossil (kg CO2 eq)	-30.05%	-38.03%	-30.05%	56.81%	-27.6%	-35.4%
Climate Change - Biogenic (kg CO2 eq)	N/A	0%	N/A	0.00%	0%	-0%
Climate Change - Land Use and Land Use Change (kg CO2 eq)	-98,49%	-99.05%	-98.49%	-96.57%	-99.1%	-99.3%
Global Warming Potential- GWP-GHG (kg CO2 eq)	-35,28%	-42.71%	-35.28%	45.06%	-33.1%	-15.7%
Ozone Depletion (kg CFC-11 eq.)	-100,00%	-100.00%	-100.00%	-100.00%	-100.0%	-100.0%
Acidification (Mole of H+ eq.)	-98,65%	-98.50%	-98.65%	-79.16%	-93.8%	-94.8%
Eutrophication. fresh water (kg P eq.)	-100,00%	-100.00%	-100.00%	-99.73%	-99.9%	-100.0%
Eutrophication. marine (kg N eq.)	-99,73%	-99.67%	-99.73%	-99.11%	-99.6%	-99.5%
Eutrophication, terrestrial (Mole of N eq.)	-97,08%	-96.41%	-97.08%	-91.12%	-93.2%	-89.6%
Photochemical Ozone Formation. human health (kg NMVOC eq.)	-99,10%	-99.13%	-99.10%	-96.31%	-98.6%	-99.9%
Resource use. mineral and metals (kg Sb eq.)	-100,00%	-100.00%	-100.,00%	-99.98%	-100.0%	-100.0%
Resource use. fossils (MJ)	-15,37%	-20.34%	-15.37%	51.08%	-11.20%	-12.3%
Water Use (m3 world equiv.)	-64,83%	-55.04%	-64.85%	28.66%	-44.20%	-60.0%
WATER USE						
Use of net fresh water (m3)	-96,69%	-95.84%	-96.69%	-88.06%	-94.90%	-95.7%

ADDITIONAL ENVIRONMENTAL INFORMATION

% VARIATIONS OF INCLUDED PRODUCTS

	CHRYSO PLAST GR 200	CHRYSO PLAST GR 220	CHRYSO PLAST GR 300	CHRYSO PLAST GR 80	CHRYSO PLAST CEL	CHRYSO TARD LWR
ENERGY USE						
(PERE) Use of renewable primary energy excluding renewable primary energy resources as raw materials (MJ)	-64,80%	-39,46%	-64,80%	34,26%	-21,0%	-45,2%
(PERM) Use of renewable primary energy resources used as raw materials (MJ)						
(PERT) Total use of renewable primary energy resources (primary energy resources used as raw material and primary energy) (MJ)	-64,80%	-39,46%	-64,80%	34,26%	-21,0%	-45,2%
(PENRE) Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (MJ)	-15,37%	-20,34%	-15,37%	51,09%	-11,2%	-11,6%
(PENRM) Use of non-renewable primary energy resources used as raw materials (MJ)	-					
(PENRT) Total use of non-renewable primary energy resources (MJ)	-15.37%	-20,34%	-15,37%	51,09%	-	-11,6%
Use of renewable secondary fuels (MJ)	-	-	-	-	-	-
Use of non-renewable secondary fuels (MJ)	-	-	-	-	-	-
Use of secondary materials (kg)	-	-	-	-	-	-
WASTES						
Hazardous waste disposed (kg)	-100,00%	-100,00%	-100,00%	-100,00%	-100,0%	-99,8%
Non-hazardous waste disposed (kg)	-99,50%	-99,65%	-99,50%	-99,33%	-99,7%	-99,7%
Radioactive waste disposed (kg)	-100,00%	-100,00%	-100,00%	-99,99%	-100,0%	-100,0%
ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS						
Particulate Matter emissions (Disease incidence)	-100,00%	-100,00%	-100,00%	-100,00%	-100,0%	-100,0%
Ionizing radiation human (kBq U235 eq.)	-99,28%	-98,62%	-99,28%	-41,20%	-86,8%	-92,2%
Eco-toxicity, freshwater (CTUe)	-70,93%	-76,06%	-70,93%	158,60%	-39,6%	-56,9%
Human toxicity, cancer effects (CTUh)	-100,00%	-100,00%	-100,00%	-100,00%	-100,0%	-100,0%
Human toxicity, non-cancer effects (CTUh)	-100,00%	-100,00%	-100,00%	-100,00%	-100,0%	-100,0%
Land use related impacts/Soil quality (dimensionless)	-47,05%	-41,40%	41,62%	89,73%	-34,6%	-13,1%

REFERENCES

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- EN 15804:2012+A2:2019/AC 2021 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
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- 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
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