



ENVIRONMENTAL PRODUCT DECLARATION

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

CHRYSO: SUPER PLASTICIZERS - VISCOSITY MODIFYING AGENTS 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 & 14. 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 - 11776	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[®]Optima 74** **CHRYSO[®]Optima G 91**
- CHRYSO[®]Optima 76** **CHRYSO[®]Optima G 92**
- CHRYSO[®]Optima 94** **CHRYSO[®]Optima G 9168**
- CHRYSO[®]Optima 95** **CHRYSO[®]Optima G 9450**
- CHRYSO[®]Optima 96** **CHRYSO[®]Optima G 9610**
- CHRYSO[®]Optima 145** **CHRYSO[®]Optima G 9680**
- CHRYSO[®]Optima 206** **CHRYSO[®]Optima G 9690**
- CHRYSO[®]Optima 210** **CHRYSO[®]Premia 168**
- CHRYSO[®]Optima 234** **CHRYSO[®]Premia 184**
- CHRYSO[®]Optima G 90** **CHRYSO[®]Nanosilica**

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CHRYSO®Optima 74

CHRYSO®Optima G 91

CHRYSO®Optima 76

CHRYSO®Optima G 92

CHRYSO®Optima 94

CHRYSO®Optima G 9168

CHRYSO®Optima 95

CHRYSO®Optima G 9450

CHRYSO®Optima 96

CHRYSO®Optima G 9610

CHRYSO®Optima 145

CHRYSO®Optima G 9680

CHRYSO®Optima 206

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CHRYSO®Optima 210

CHRYSO®Premia 168

CHRYSO®Optima 234


CHRYSO®Premia 184

CHRYSO®Optima G 90

CHRYSO®Nanosilica



PROGRAM INFORMATION

PROGRAM OPERATOR: EPD International AB 
THE INTERNATIONAL EPD® SYSTEM

ADDRESS: Box 210 60, SE-100 31 Stockholm, Sweden

WEBSITE: www.environdec.com

E-MAIL ADDRESS: info@environdec.com

EPD OWNER: Nordia S.A

FACILITY - PRODUCTION SITE & HEADQUARTERS: 1km of provincial road Markopoulos - Oropos, Polydendri, 1901 , Greece

TELEPHONE: +30 (0) 22950 22225

WEBSITE: www.nordia.gr

EMAIL ADDRESS: info@nordia.gr

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

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.

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

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

Stavros Niarchos Foundation Cultural Center

Basil & Elise Goulandris Foundation

Tae Kwo Do Arena

Megaron the Athens Concert Hall

■ The New Acropolis Museum

■ Athens Conservatoire

■ Ayia Sofia Arena Stadium - AEK

■ Olympic Velodrom

■ 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

NORDIA



The Environmental Product Declaration (EPD) primarily aims to convey the environmental impacts linked to the manufacturing of the **Chryso Admixtures for Concrete C** by **Nordia 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 Super plasticizers - Viscosity modifying agents' category and they contribute to the improvement of pumpability, workability and increase of mechanical strength of the concrete

All the examined 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

OPTIMA SERIES			PREMIA SERIES	OTHER
CHRYSO OPTIMA 145	CHRYSO OPTIMA 94	CHRYSO OPTIMA G9168	CHRYSO PREMIA 168	CHRYSO Nanosilica
CHRYSO OPTIMA 206	CHRYSO OPTIMA 95	CHRYSO OPTIMA G9450	CHRYSO PREMIA 184	
CHRYSO OPTIMA 210	CHRYSO OPTIMA 96	CHRYSO OPTIMA 9610		
CHRYSO OPTIMA 234	CHRYSO OPTIMA G90	CHRYSO OPTIMA 9680		
CHRYSO OPTIMA 74	CHRYSO OPTIMA G91	CHRYSO OPTIMA 9690		
CHRYSO OPTIMA 76	CHRYSO OPTIMA G92			

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

NORDIA

CHRYSO
SAINT-GOBAIN

TECHNICAL PROPERTIES

PRODUCT TYPE	STANDARDS	DENSITY	pH	Cl ⁻	Na ₂ O
CHRYSO OPTIMA 74	EN 934-2+ A1 : 2012	1.02 ± 0.02 gr/cm ³	4-5	≤ 0.1 %	≤ 1 %
CHRYSO OPTIMA 76	EN 934-2+ A1 : 2012	1.05+0.02 gr/cm ³	4-5	≤ 0.1 %	≤ 1 %
CHRYSO OPTIMA 94	EN 934-2+ A1 : 2012	1.05+0.02 gr/cm ³	4.0-5.0	≤ 0.1 %	≤ 1 %
CHRYSO OPTIMA 95	EN 934-2+ A1 : 2012	1.03+0.02 gr/cm ³	4.0-5.0	≤ 0.1 %	≤ 1 %
CHRYSO OPTIMA 96	EN 934-2+ A1 : 2012	1.03+0.02 gr/cm ³	4.0-5.0	≤ 0.1 %	≤ 1 %
CHRYSO OPTIMA 145	EN 934-2+ A1 : 2012	1.06+0.02 gr/cm ³	4.0-6.0	≤ 0.1 %	≤ 1 %
CHRYSO OPTIMA 206	EN 934-2+ A1 : 2012	1.02+0.02 gr/cm ³	4.0-5.0	≤ 0.1 %	≤ 1 %
CHRYSO OPTIMA 210	EN 934-2+ A1 : 2012	1.03+0.02 gr/cm ³	4.0-5.0	≤ 0.1 %	≤ 1 %
CHRYSO OPTIMA 234	EN 934-2+ A1 : 2012	1.05 ± 0.02 gr/cm ³	4.0-6.0	≤ 0.1 %	≤ 1 %



CHRYSO® Optima 74

CHRYSO® Optima 74 is a water-reducing superplasticizer based on being polycarboxylate polymers. It allows the reduction of mixing water and significantly increases the initial and final strengths. CHRYSO® Optima 74 does not contain chlorine, and is especially recommended for industrial flooring.



CHRYSO® Optima 76

CHRYSO® Optima 76 is a new generation superplasticizer – a powerful water reducer based on modified polycarboxylate polymers. CHRYSO® Optima 76 allows the reduction of mixing water compared to traditional fluidizers and significantly increases early and final strengths. CHRYSO® Optima 76 is recommended for concretes with high rheological requirements (without segregation).

CHRYSO® Optima 94

CHRYSO® Optima 94 is a new generation superplasticizer – a powerful wide range water reducer, based on modified polycarboxylate polymers. CHRYSO® Optima 94 is particularly recommended for concretes with low water/cement ratios (N/T), with high rheology and workability retention requirements



CHRYSO® Optima 95

CHRYSO® Optima 95 is a new generation superplasticizer - powerful broad-spectrum water reducer, based on modified polycarboxylate polymers. Due to its chemical characteristics, it allows at the same time the strong reduction of water and the optimal maintenance of workability even at high concrete temperatures, without any effect on the development of early mechanical strengths.



CHRYSO® Optima 96

CHRYSO® Optima 96 is a new generation superplasticizer - powerful water reducer widely spectrum, based on modified polycarboxylate polymers. CHRYSO® Optima 96 is recommended for production of concrete with workability retention requirements



CHRYSO® Optima 145

CHRYSO® Optima 145 is a new generation concrete fluidizer / water reducer, based on modified polycarboxylates and phosphonates especially designed for CEM III. Thanks to its special molecular structure, it contributes to the production of cohesive concrete mixtures, low viscosity and with prolonged retention of workability. Using CHRYSO® Optima 145 can be produced with a reduced N/T ratio, but also prolonged workability retention.



CHRYSO® Optima 206

CHRYSO® Optima 206 is a superplasticizer – highly active water reducer, based on modified polycarboxylate polymers. Its use is particularly recommended in ready-mixed concrete, in high water reduction and/or in increase the workability of concrete. It allows long retention of workability without the detrimental setting delay. For this reason, CHRYSO® Optima 206 has a wide range of applications. CHRYSO® Optima 206 is suitable to produce super-flowable and self-leveling concretes of great homogeneity.



CHRYSO® Optima 210

CHRYSO® Optima 210 is a new generation – broad spectrum superplasticizer based on modified polycarboxylate. Due to its specifically designed molecular structure CHRYSO® Optima 210 enables its slow absorption from cement particles enabling them to efficiently disperse. CHRYSO® Optima 210 is especially designed for concrete with composite cements type CEM II to CEM V CHRYSO® Optima 210 enables the production of high-quality concrete with low W/C ratios and extended workability retention with no setting retardation effect.



CHRYSO® Optima 234

CHRYSO Optima 234 is a wide range superplasticizer. Its main feature is that it allows the regulation of the maintenance of workability, without great variation of the initial setting, with a wide range of dosage, according to needs. CHRYSO® Optima 234 can be used in a wide range of concretes. It is particularly suitable for the preparation of homogeneous, self-compacting concrete, with a high capacity to fill the formulas.



PRODUCT INFORMATION

NORDIA

CHRYSO
SAINT-GOBAIN

TECHNICAL PROPERTIES

PRODUCT TYPE	PROTOTYPE	DENSITY	pH	Cl ⁻	Na ₂ O
CHRYSO OPTIMA G90	EN 934-2+ A1 : 2012	>1 gr/cm ³	4.50	≤ 0.1 %	≤ 1 %
CHRYSO OPTIMA G91	EN 934-2+ A1 : 2012	>1 gr/cm ³	4.50	≤ 0.1 %	≤ 1 %
CHRYSO OPTIMA G9168	EN 934-2+ A1 : 2012	>1 gr/cm ³	6.80	≤ 0.1 %	≤ 1 %
CHRYSO OPTIMA G92	EN 934-2+ A1 : 2012	>1 gr/cm ³	4.40	≤ 0.1 %	≤ 1 %
CHRYSO OPTIMA G9450	EN 934-2+ A1 : 2012	>1 gr/cm ³	4.20	≤ 0.1 %	≤ 2 %
CHRYSO OPTIMA 9610	EN 934-2+ A1 : 2012	>1 gr/cm ³	4.00	≤ 0.1 %	≤ 1 %
CHRYSO OPTIMA 9680	EN 934-2+ A1 : 2012	>1 gr/cm ³	3.80	≤ 0.1 %	≤ 1 %
CHRYSO OPTIMA 9690	EN 934-2+ A1 : 2012	>1 gr/cm ³	4.10	≤ 0.1 %	≤ 1 %

CHRYSO® Optima G90

CHRYSO® Optima G90 is a new generation superplasticizer based on polycarboxylate ether. Due to its chemical characteristics, it allows at the same time the strong reduction of water and the optimal maintenance of workability even at high concrete temperatures, without any effect on the development of premature mechanical strengths. The distinct structure of the chains of the modified polycarboxylic ether allows delaying the absorption of CHRYSO® Optima G90 by the cement grains, thus achieving its effective dispersion.



CHRYSO® Optima G91

CHRYSO® Optima G91 is a superplasticizer based on polycarboxylate ether. Due to its chemical characteristics, it simultaneously allows the powerful reduction of water and optimal maintenance of workability even in high concrete temperatures, none effect on the development of early mechanical strength. The effectiveness of the force dispersion of the molecules of CHRYSO® Optima G91 has optimized to such an extent as to guarantee the necessary transport and concreting time even at high ambient temperatures. Especially designed for concrete with composite cements type CEM II to CEM V.



CHRYSO® Optima G9168

CHRYSO® Optima G9168 is a superplasticizer based on the latest technology of polycarboxylate polymers. Due to its chemical characteristics, it allows at the same time the strong reduction of water and the optimal maintenance of workability even at high concrete temperatures, without any effect on the development of early mechanical strengths. CHRYSO® Optima G9168, is specially designed for concrete with all types of composite cements (CEM II to CEM V).



CHRYSO® Optima G92

CHRYSO® Optima G92 is a superplasticizer based on polycarboxylic ether polymers. Its special constitution allows for its delay its absorption by the cement grains, achieving their effective dispersion. Specially designed for concretes with composite cements type (CEM II to CEM V). Mixtures are achieved with CHRYSO® Optima G92 of high-quality concrete, with a low ratio of water to cement, rapid development of tolerances and prolonged workability, without delaying them coagulation characteristics.



CHRYSO® Optima G9450

CHRYSO® Optima G9450 is a superplasticizer-water reducer used to produce concretes with a long workability retention time. CHRYSO® Optima G9450 can be used in a wide range of applications and compared to other superplasticizers, it exhibits a much better dispersion in the cement grains which has the effect of extending the workability time of the concrete. CHRYSO® Optima G9450 allows maintaining workability, without much initial set variation. CHRYSO® Optima G9450 can be used in a wide range of concretes. Specially designed for concretes with composite cements type (CEM II to CEM V).



CHRYSO® Optima G9680

CHRYSO® Optima G9680 is a superplasticizer - water reducer of high activity, suitable for the production of concrete mixtures with requirements of prolonged workability. CHRYSO® Optima G9680 is particularly suitable for concretes where the aggregates present peculiarities in their characteristics. CHRYSO® Optima G9680 can be used in concrete with all types of cements, achieving high quality mixes, with a low water-to-cement ratio, rapid strength development and prolonged workability. Specially formulated to be used in concrete with composite cements type CEM II to CEM IV



CHRYSO® Optima G9690

CHRYSO® Optima G9690 is a superfluidizer - highly active water reducer, suitable for production of concrete mixes with requirements prolonged maintenance of employability. CHRYSO® Optima G9690 is particularly suitable for concrete where the aggregates present particularities in the natural, their geometric and mechanical characteristics. CHRYSO® Optima G9690 is especially designed to can be used in concrete with composite cements type CEM II to CEM IV. Furthermore, increases the uptake of early strengths, as soon as the mix pass into the stiffness phase.



CHRYSO® Optima G9610

Chryso Optima G9610 is a highly active water-reducing superplasticizer, suitable to produce concrete mixtures with requirements for prolonged workability retention with aggregates that present particularities in their characteristics (physical, geometric, and mechanical). In addition, it increases early strength acquisition once the mixture enters the stiffness phase. Specially formulated to be used in concrete with composite cements type CEM II to CEM IV



PRODUCT INFORMATION

NORDIA



— TECHNICAL PROPERTIES

PRODUCT TYPE	PROTOTYPE	DENSITY	pH	Cl ⁻	Na ₂ O
CHRYSO PREMIA 168	EN 934-2+ A1 : 2012	1.06+-0.02 gr/cm ³	4.0-5.0	≤ 0.1 %	≤ 1 %
CHRYSO PREMIA 184	EN 934-2+ A1 : 2012	1.04+-0.02 gr/cm ³	4.0-5.0	≤ 0.1 %	≤ 1 %
CHRYSO NANOSILICA	EN 934-2+ A1 : 2012	1.06+-0.02 gr/cm ³	8.0-10.0	≤ 0.1 %	≤ 1 %

PRODUCT INFORMATION

CHRYSO® Premia 184

CHRYSO® Premia 184 is a superplasticizer – highly active water reducer, based on modified polycarboxylate polymers. It is particularly recommended in concretes with high-strength cheats, while maintaining workability. The results of early strengths are impressive, combined with steam curing concrete.



CHRYSO® Premia 168

CHRYSO® Premia 168 is a new generation superplasticizer-high range water reducer, based on modified polycarboxylate. The molecular configuration of CHRYSO® Premia 168 accelerates the cement hydration. CHRYSO® Premia 168 is especially recommended for concrete requiring high early age and long-term strengths, whilst maintaining workability. CHRYSO® Premia 168 enables the production of concrete with very low W/C ratios. CHRYSO® Premia 168 enables the production of self-consolidating concrete.



CHRYSO® Nanosilica

CHRYSO® Nanosilica is a concrete admixture based on amorphous silica in suspension form. CHRYSO® Nanosilica closes the pores of the concrete reducing the appearance of capillaries, while offering excellent adhesion to both aggregates and reinforcement. In addition, it increases the cohesiveness of the mixture and at the same time reduces the porosity and segregation phenomena. CHRYSO® Nanosilica offers a solution to mixtures with a lack of fine grains in the mixture, reduces the pressure during pumping, while increasing the initial and final strengths of the concrete.

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 **Super Plasticizers - Viscosity Modifying Agents** products expressed by declared unit (kg).

**The variations correspond to the differences in GWP-GHG indicator results in A1-A3 between an average of Super plasticizers - Viscosity modifying agents' products*

CONTENT DECLARATION OF SUPER PLASTICIZERS - VISCOSITY MODIFYING AGENTS' PRODUCTS PER D.U (KG)

RAW MATERIAL PRODUCT COMPONENTS	WEIGHT KG/KG	VARIATIONS	POST CONSUMER RECYCLED MATERIAL, WEIGHT (%)	BIOGENIC MATERIAL, WEIGHT % & KG C/KG
Water	6.27E-01	0.284-0.737	0 %	0
Gluconate salts	3.74E-02	0.000-0.035	0 %	0
Lignosulfonate salts	1.40E-02	0.000-0.070	0 %	0
Molasse	0.00E+00	0.000-0.000	0 %	0
Sucrose	1.83E-02	0.000-0.030	0 %	7.905E-03
Modified Polycarboxylate A0	1.01E-02	0.000-0.400	0 %	0
Modified Polycarboxylate B4	1.84E-01	0.000-0.420	0 %	0
Modified Polycarboxylate B6	1.65E-02	0.000-0.180	0 %	0
Modified Polycarboxylate C	6.94E-02	0.000-0.2670	0 %	0
Modified Polycarboxylate G	5.02E-03	0.000-0.150	0 %	0
Modified Phosphonate E2	1.24E-03	0.0000-0.338	0 %	0
Defoamer 2	1.82E-03	0.000-0.006	0 %	0
Defoamer 4	1.83E-04	0.000-0.001	0 %	0
Special Additives	3.81E-04	0.00-0.4400	0 %	0
TOTAL	1.00E+00		0 %	7.905E-03

PACKAGING MATERIALS	WEIGHT KG/KG	VARIATIONS	WEIGHT % (VERSUS THE PRODUCT)	WEIGHT BIOGENIC CARBON KG C/KG
IBC Pallets 1000 lt	0.0160	0.000-0.0160	0	0
Plastic bottles 200 lt	0.0720	0.000-0.0720	0	0
Plastic bottles 10 lt	0.0690	0.000-0.0690	0	0
TOTAL	0.1570		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

NORDIA

CHRYSO
SAINT-GOBAIN

SYSTEM BOUNDARIES

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

DECLARED UNIT

1 kg of **Super Plasticizers - Viscosity Modifying Agents' 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)

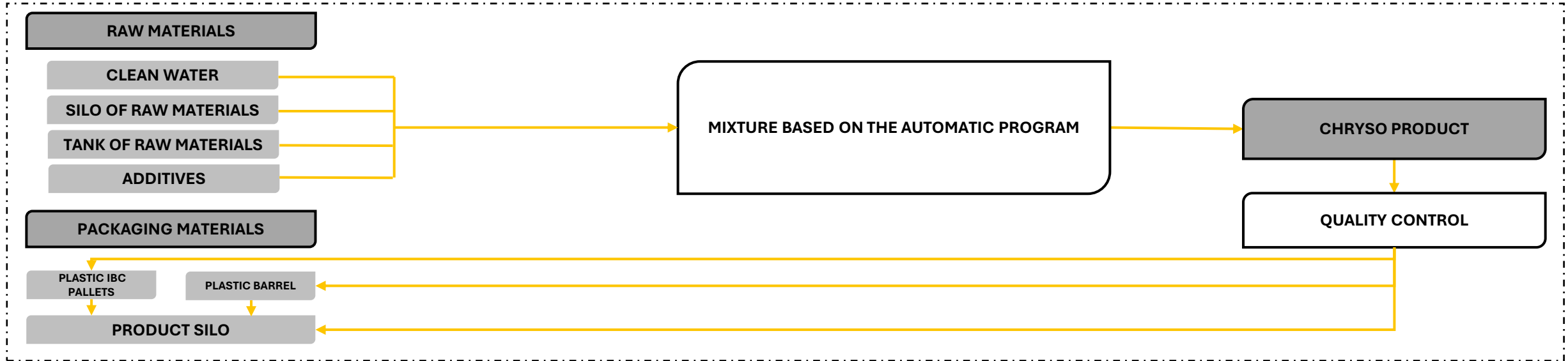
**Due to consistency of inputs irrespective of examined products X: module Declared, ND: Not Declared*

MODULE	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	X	X	X
GEOGRAPHY	GLO		GR										EU-27	EU-27	EU-27	EU-27	EU-27
SPECIFIC DATA	>80%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
VARIATION PRODUCTS (1)	Variation products -4.91 – 1179,97%					-	-	-	-	-	-	-	-	-	-	-	-
VARIATION SITES	0%					-	-	-	-	-	-	-	-	-	-	-	-

(1) The variation of the products referred to the two different types. Specifically, the min value refers to the Chryso Optima G91 product and the max value to the Chryso Nanosilica 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 **Super Plasticizers - Viscosity Modifying Agents Chryso 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 Chryso 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 Super plasticizers - Viscosity modifying agents 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.

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.

PROCESSES	KG/TN
Collection process specified by type	0kg collected separately 1kg collected with mixed construction waste 100 km distance between the two facilities
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 m

MODULE C3

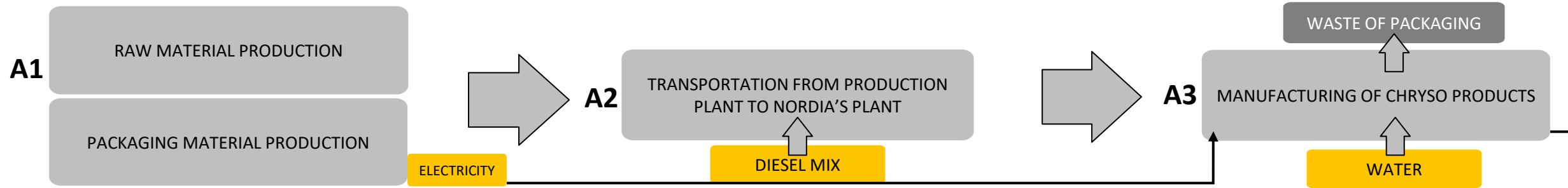
In this module, it is assumed the 100% of the cement waste product will be landfilled and hence the environmental impact is considered equal to zero.

MODULE C4

This module takes into account the emissions linked to the disposal of all waste generated from the final products. 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.

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 from 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 OFF 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 PLASTICIZERS PRODUCT

POTENTIAL ENVIRONMENTAL IMPACTS / 1 kg OF AN AVERAGE SUPER PLASTICIZERS - VISCOSITY MODIFYING AGENTS

CORE ENVIRONMENTAL IMPACT INDICATORS	UNIT	A1-A3 	C1 	C2 	C3 	C4 	D 	
Global Warming Potential – total	GWP-total	kg CO2 eq.	6.51E-01	5.15E-04	9.78E-03	0.00E+00	4.24E-03	0.00E+00
Global Warming Potential – fossil	GWP-fossil	kg CO2 eq.	6.48E-01	5.15E-04	9.70E-03	0.00E+00	4.23E-03	0.00E+00
Global Warming Potential – biogenic[3]	GWP-biogenic	kg CO2 eq.	-5.89E-03	0.00E+00	0.00E+00	0.00E+00	5.89E-03	0.00E+00
Global Warming Potential – land use and land use change	GWP-luluc	kg CO2 eq.	2.83E-03	4.06E-06	7.96E-05	0.00E+00	6.51E-06	0.00E+00
Global Warming Potential – GHG[1]	GWP-GHG	kg CO2 eq.	6.51E-03	5.15E-04	9.78E-03	0.00E+00	6.51E-06	0.00E+00
Ozone Depletion Potential	ODP	kg CFC 11 eq.	1.86E-06	6.34E-20	1.24E-18	0.00E+00	1.71E-09	0.00E+00
Acidification Potential	AP	Mole of H+ eq.	2.44E-03	2.45E-06	1.80E-05	0.00E+00	3.98E-05	0.00E+00
Eutrophication Potential – freshwater	EP-freshwater	kg P eq.	3.29E-05	1.47E-09	2.88E-08	0.00E+00	3.87E-07	0.00E+00
Eutrophication Potential – marine	EP-marine	kg N eq.	9.95E-05	1.15E-06	7.41E-06	0.00E+00	1.38E-05	0.00E+00
Eutrophication Potential – terrestrial	EP-terrestrial	mol N eq.	3.63E-04	1.27E-05	8.45E-05	0.00E+00	1.52E-04	0.00E+00
Photochemical Oxidant Formation Potential	POCP	kg NMVOC eq.	4.06E-03	3.24E-06	1.61E-05	0.00E+00	4.41E-05	0.00E+00
Abiotic Depletion Potential – elements[2]	ADPe	kg Sb eq.	1.86E-02	3.78E-11	7.40E-10	0.00E+00	9.65E-09	0.00E+00
Abiotic Depletion Potential. fossil resources[2]	ADPf	MJ net calorific value	1.45E-05	6.61E-03	1.29E-01	0.00E+00	1.19E-01	0.00E+00
Water Deprivation Potential[2]	WDP	m3 world eq. deprived	1.55E+01	4.31E-06	8.44E-05	0.00E+00	5.44E-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 CO₂ 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 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.

	A1-A3	C4
GWP-biogenic	-5.89E-03	5.89E-03

ENVIRONMENTAL PERFORMANCE INDICATORS

NORDIA S.A. – CHRYSO PLASTICIZERS PRODUCT







POTENTIAL ENVIRONMENTAL IMPACTS / 1 kg OF AN AVERAGE SUPER PLASTICIZERS - VISCOSITY MODIFYING AGENTS

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	6.11E-01	3.69E-04	7.22E-03	0.00E+00	1.03E-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	6.11E-01	3.69E-04	7.22E-03	0.00E+00	1.03E-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	1.55E+01	6.62E-03	1.29E-01	0.00E+00	1.19E-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	1.55E+01	6.62E-03	1.29E-01	0.00E+00	1.19E-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	5.70E-03	4.22E-07	8.26E-06	0.00E+00	1.27E-04	0.00E+00

ENVIRONMENTAL PERFORMANCE INDICATORS

— NORDIA S.A. – CHRYSO PLASTICIZERS PRODUCT

POTENTIAL ENVIRONMENTAL IMPACTS / 1 kg OF AN AVERAGE CHRYSO PLASTICIZERS PRODUCT

WASTE INDICATORS		UNIT	A1-A3 	C1 	C2 	C3 	C4 	D 
Hazardous waste disposed	HWD	kg	1.95E-10	3.33E-13	6.52E-12	0.00E+00	0.00E+00	0.00E+00
Non-hazardous waste disposed	NHWD	kg	6.27E-04	9.83E-07	1.92E-05	0.00E+00	0.00E+00	0.00E+00
Radioactive waste disposed	RWD	kg	5.11E-06	8.00E-09	1.57E-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	7.29E-07	2.77E-11	1.07E-12	0.00E+00	7.80E-10	0.00E+00
Ionizing radiation human[4]	IRP	kBq U235 eq.	1.20E-02	1.15E-06	2.24E-05	0.00E+00	5.25E-04	0.00E+00
Eco-toxicity, Freshwater[2]	ETP-fw	CTUe	3.81E+00	4.77E-03	9.35E-07	0.00E+00	7.51E-02	0.00E+00
Human toxicity, cancer effects[2]	HTP-c	CTUh	1.79E-08	9.63E-14	1.89E-12	0.00E+00	1.90E-12	0.00E+00
Human toxicity, non-cancer effects (CTUh)	(CTUh)		1.03E-07	5.79E-12	1.00E-10	0.00E+00	4.90E-11	0.00E+00
Land use related impacts / Soil quality (dimensionless)	(dimensionless)		1.56E+00	2.27E-03	0.00E+00	0.00E+00	2.48E-01	0.00E+00

DISCLAIMERS:

[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.

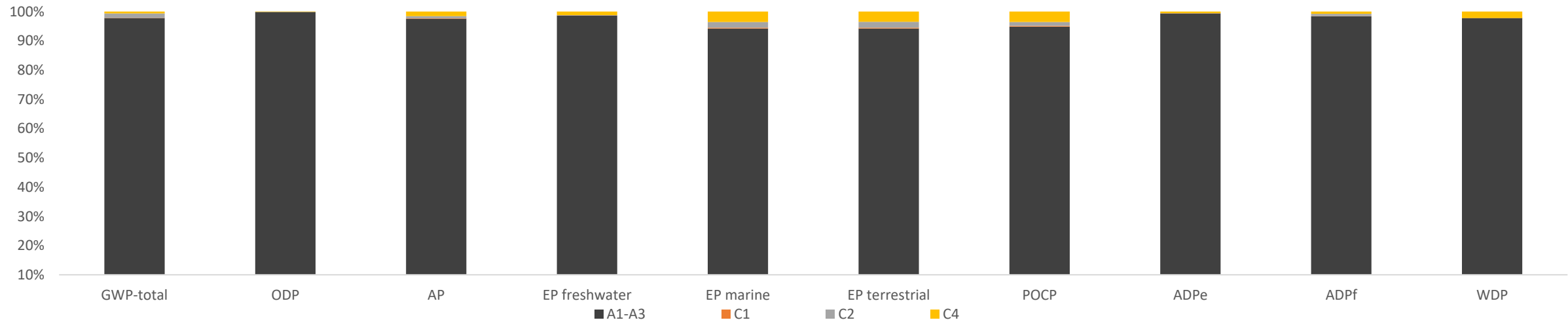
[4] This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing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

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 with the module D4 shows the second greatest contribution. Regarding, the Global Warming Potential Indicator (GWP) it is observed that the module A1-A3 contribute almost 100%.
- The module C4 show a noticeable contribution to the eutrophication indicators, to the acidification potential and to the water deprivation potential.

INDICATORS	A1-A3	C1	C2	C3	C4
GWP-total	97.85%	0.08%	1.48%	0.00%	0.65%
ODP	99.91%	0.00%	0.00%	0.00%	0.09%
AP	97.59%	0.10%	0.72%	0.00%	1.59%
EP freshwater	98.75%	0.00%	0.09%	0.00%	1.16%
EP marine	94.19%	0.30%	1.92%	0.00%	3.59%
EP terrestrial	94.23%	0.30%	1.96%	0.00%	3.52%
POCP	94.66%	0.26%	1.30%	0.00%	0.24%
ADPe	99.93%	0.00%	0.04%	0.00%	0.07%
ADPf	98.39%	0.04%	0.82%	0.00%	0.75%
WDP	97.83%	0.00%	0.03%	0.00%	2.13%

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



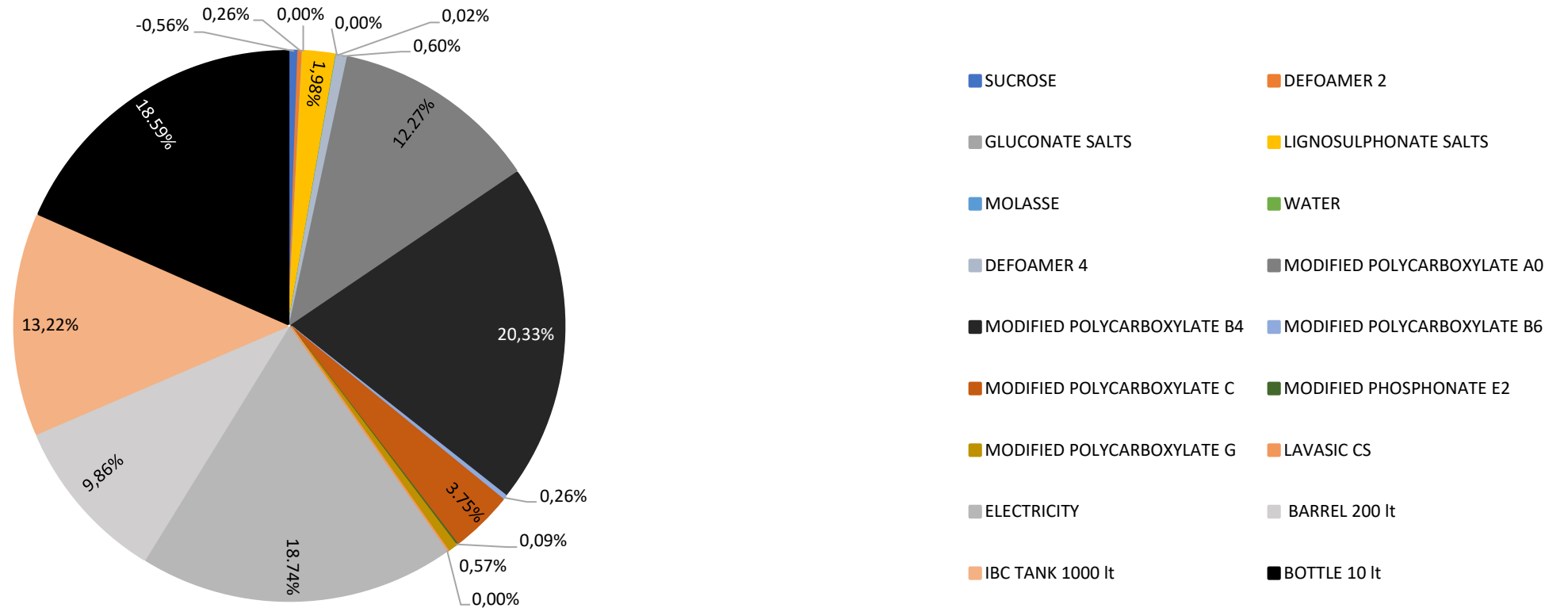
DISCLAIMER:

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.

INTERPRETATION

- The most influenced indicators of the total Global Warming Potential (GWP) are associated with the extraction and production of raw materials, with a notable focus on the main influence of the Chryso B24 product, where it accounts for the almost 21% of the GWP-total. The water and the electricity following with around 18% of the each of the GWP-total. This emphasizes that the environmental impact, especially in terms of global warming potential, is greatly driven by the raw materials and second role have the transportation part in the production area.

CONTRIBUTION GWP AVERAGE PRODUCT SUPER PLASTIZER AGENT



DISCLAIMER:

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.

ADDITIONAL ENVIRONMENTAL INFORMATION

NORDIA



— % VARIATIONS OF INCLUDED PRODUCTS

	CHRYSO OPTIMA 145	CHRYSO OPTIMA 206	CHRYSO OPTIMA 210	CHRYSO OPTIMA 234	CHRYSO OPTIMA 74
ENVIRONMENTAL IMPACTS					
Climate Change - Total (kg CO2 eq)	65.92%	29.59%	22.99%	33.70%	11.50%
Climate Change - Fossil (kg CO2 eq)	68.02%	30.11%	23.70%	33.75%	12.07%
Climate Change - Biogenic (kg CO2 eq)	N/A	N/A	N/A	N/A	N/A
Climate Change - Land Use and Land Use Change (kg CO2 eq)	174.19%	15.00%	24.67%	-18.73%	-
Global Warming Potential- GWP-GHG (kg CO2 eq)	6.13%	29.34%	22.68%	33.60%	11.24%
Ozone Depletion (kg CFC-11 eq.)	-99.31%	21.23%	-99.30%	110.42%	-99.75%
Acidification (Mole of H+ eq.)	-	-11.78%	-14.71%	122.55%	-19.71%
Eutrophication, fresh water (kg P eq.)	78.04%	10.43%	-0.03%	107.15%	-11.26%
Eutrophication, marine (kg N eq.)	76.41%	17.70%	17.13%	24.66%	-
Eutrophication, terrestrial (Mole of N eq.)	31.42%	9.13%	6.28%	21.59%	-
Photochemical Ozone Formation, human health (kg NMVOC eq.)	63.67%	-91.84%	-92.12%	-90.31%	-92.70%
Resource use, mineral and metals (kg Sb eq.)	61.10%	-76.54%	-77.85%	-57.35%	-79.21%
Resource use, fossils (MJ)	31.36%	30.48%	24.88%	30.94%	16.81%
Water Use (m3 world equiv.)	184.28%	21.95%	23.46%	16.80%	16.56%
WATER USE					
Use of net fresh water (m3)	90.87%	22.48%	23.92%	17.29%	16.31%
ENERGY USE					
(PERE) Use of renewable primary energy excluding renewable primary energy resources as raw materials (MJ)	798.04%	-	10.94%	-	-
(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)	798.04%	-	10.65%	-	-
(PENRE) Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (MJ)	29.66%	30.48%	24.89%	30.94%	16.81%
(PENRM) Use of non-renewable primary energy resources used as raw materials (MJ)	-	-	-	-	-
(PENRT) Total use of non-renewable primary energy resources (MJ)	29.66%	30.51%	24.89%	30.94%	16.81%
Use of renewable secondary fuels (MJ)	-	-	-	-	-
Use of non-renewable secondary fuels (MJ)	-	-	-	-	-
Use of secondary materials (kg)	-	-	-	-	-

ADDITIONAL ENVIRONMENTAL INFORMATION

NORDIA

CHRYSO
SAINT-GOBAIN

— % VARIATIONS OF INCLUDED PRODUCTS

	CHRYSO OPTIMA 145	CHRYSO OPTIMA 206	CHRYSO OPTIMA 210	CHRYSO OPTIMA 234	CHRYSO OPTIMA 74
WASTE					
Hazardous waste disposed (kg)	63.52%	-98.80%	-98.83%	-98.79%	-99.00%
Non-hazardous waste disposed (kg)	54.56%	21.53%	26.00%	27.55%	-24.44%
Radioactive waste disposed (kg)	60.07%	-19.34%	-21.26%	-18.88%	-31.97%
ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS					
Particulate Matter emissions (Disease incidence)	-96.68%	-100.00%	-52.19%	-100.00%	-100.00%
Ionizing radiation human (kBq U235 eq.)	84.55%	24.35%	-49.71%	85.77%	-
Eco-toxicity, freshwater (CTUe)	-	-	-51.55%	68.59%	-12.53%
Human toxicity, cancer effects (CTUh)	25.01%	-100.00%	-52.19%	-100.00%	-100.00%
Human toxicity, non-cancer effects (CTUh)	30.31%	-	-49.71%	-91.93%	-
Land use related impacts / Soil quality (dimensionless)	30.95%	15.88%	-51.55%	-	-

ADDITIONAL ENVIRONMENTAL INFORMATION

NORDIA

CHRYSO
SAINT-GOBAIN

— % VARIATIONS OF INCLUDED PRODUCTS

	CHRYSO OPTIMA 76	CHRYSO OPTIMA 94	CHRYSO OPTIMA 95
ENVIRONMENTAL IMPACTS			
Climate Change - Total (kg CO2 eq)	-	-	13.50%
Climate Change - Fossil (kg CO2 eq)	10.25%	10.25%	12.94%
Climate Change - Biogenic (kg CO2 eq)	0%	0%	N/A
Climate Change - Land Use and Land Use Change (kg CO2 eq)	15.28%	15.28%	16.74%
Global Warming Potential- GWP-GHG (kg CO2 eq)	-	-	11.90%
Ozone Depletion (kg CFC-11 eq.)	-99.60%	-99.60%	-99.76%
Acidification (Mole of H+ eq.)	-10.31%	-10.31%	-19.99%
Eutrophication, fresh water (kg P eq.)	-21.48%	-21.48%	-16.59%
Eutrophication, marine (kg N eq.)	15.56%	15.56%	-
Eutrophication, terrestrial (Mole of N eq.)	26.95%	26.95%	10.38%
Photochemical Ozone Formation, human health (kg NMVOC eq.)	-92.83%	-92.83%	-0.37%
Resource use, mineral and metals (kg Sb eq.)	-80.53%	-80.53%	-92.69%
Resource use, fossils (MJ)	13.68%	13.68%	-79.89%
Water Use (m3 world equiv.)	16.91%	16.91%	16.12%
WATER USE			
Use of net fresh water (m3)	16.88%	16.88%	19.18%
ENERGY USE			
(PERE) Use of renewable primary energy excluding renewable primary energy resources as raw materials (MJ)	20.36%	20.36%	-
(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)	20.36%	20.36%	-
(PENRE) Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (MJ)	13.57%	13.57%	16.00%
(PENRM) Use of non-renewable primary energy resources used as raw materials (MJ)	-	-	-
(PENRT) Total use of non-renewable primary energy resources (MJ)	13.57%	13.57%	16.00%
Use of renewable secondary fuels (MJ)	-	-	-
Use of non-renewable secondary fuels (MJ)	-	-	-
Use of secondary materials (kg)	-	-	-

ADDITIONAL ENVIRONMENTAL INFORMATION

NORDIA



— % VARIATIONS OF INCLUDED PRODUCTS

	CHRYSO OPTIMA 76	CHRYSO OPTIMA 94	CHRYSO OPTIMA 95
WASTE			
Hazardous waste disposed (kg)	-98.93%	-98.93%	-98.92%
Non-hazardous waste disposed (kg)	17.24%	17.24%	19.50%
Radioactive waste disposed (kg)	-27.42%	-27.42%	-26.47%
ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS			
Particulate Matter emissions (Disease incidence)	-100.00%	-100.00%	-100.00%
Ionizing radiation human (kBq U235 eq.)	-15.11%	-15.11%	-
Eco-toxicity, freshwater (CTUe)	-6.66%	-6.66%	-
Human toxicity, cancer effects (CTUh)	-100.00%	-100.00%	-100.00%
Human toxicity, non-cancer effects (CTUh)	28.75%	28.75%	28.92%
Land use related impacts / Soil quality (dimensionless)	14.12%	14.12%	10.53%

ADDITIONAL ENVIRONMENTAL INFORMATION

— % VARIATIONS OF INCLUDED PRODUCTS

NORDIA



CHRYSO OPTIMA 96 CHRYSO OPTIMA G90 CHRYSO OPTIMA G91 CHRYSO OPTIMA G92

ENVIRONMENTAL IMPACTS

Climate Change - Total (kg CO2 eq)	-	44.60%	46.27%	44.60%
Climate Change - Fossil (kg CO2 eq)	-	45.27%	45.26%	45.27%
Climate Change - Biogenic (kg CO2 eq)	0%	N/A	N/A	N/A
Climate Change - Land Use and Land Use Change (kg CO2 eq)	85.69%	47.02%	24.67%	47.02%
Global Warming Potential- GWP-GHG (kg CO2 eq)	-	44.31%	61.26%	44.31%
Ozone Depletion (kg CFC-11 eq.)	-99.73%	-99.70%	-99.70%	-99.70%
Acidification (Mole of H+ eq.)	-	-	-	-
Eutrophication, fresh water (kg P eq.)	-18.16%	47.02%	19.39%	24.65%
Eutrophication, marine (kg N eq.)	34.00%	24.65%	30.19%	30.07%
Eutrophication, terrestrial (Mole of N eq.)	30.85%	30.07%	19.42%	19.32%
Photochemical Ozone Formation, human health (kg NMVOC eq.)	-92.54%	19.32%	-91.14%	-91.12%
Resource use, mineral and metals (kg Sb eq.)	-80.18%	-91.12%	-86.71%	-74.83%
Resource use, fossils (MJ)	-	-74.83%	41.04%	40.98%
Water Use (m3 world equiv.)	44.21%	40.98%	25.98%	29.47%

WATER USE

Use of net fresh water (m3)	-44.38%	29.34%	-30.86%	30.89%
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ENERGY USE

(PERE) Use of renewable primary energy excluding renewable primary energy resources as raw materials (MJ)	-	24.57%	24.57%	24.57%
(PERM) Use of renewable primary energy resources used as raw materials (MJ)	54.20%	-	-	-
(PERT) Total use of renewable primary energy resources (primary energy resources used as raw material and primary energy) (MJ)	-	24.57%	24.57%	24.57%
(PENRE) Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (MJ)	-	40.99%	41.02%	41.02%
(PENRM) Use of non-renewable primary energy resources used as raw materials (MJ)	-	-	-	-
(PENRT) Total use of non-renewable primary energy resources (MJ)	-	40.99%	41.02%	41.02%
Use of renewable secondary fuels (MJ)	-	-	-	-
Use of non-renewable secondary fuels (MJ)	-	-	-	-
Use of secondary materials (kg)	-	-	-	-

ADDITIONAL ENVIRONMENTAL INFORMATION

NORDIA

CHRYSO
SAINT-GOBAIN

— % VARIATIONS OF INCLUDED PRODUCTS

	CHRYSO OPTIMA 96	CHRYSO OPTIMA G90	CHRYSO OPTIMA G91	CHRYSO OPTIMA G92
WASTE				
Hazardous waste disposed (kg)	-99.02%	-98.59%	-98.59%	-98.59%
Non-hazardous waste disposed (kg)	10.44%	45.74%	45.74%	45.74%
Radioactive waste disposed (kg)	-32.52%	-	-	-
ADDITIONAL ENVIRONMENTAL INDICATORS				
Particulate Matter emissions (Disease incidence)	-100.00%	-100.00%	-97.15%	-100.00%
Ionizing radiation human (kBq U235 eq.)	-17.67%	40.52%	40.52%	40.52%
Eco-toxicity, freshwater (CTUe)	-	33.14%	33.13%	33.14%
Human toxicity, cancer effects (CTUh)	-100.00%	-100.00%	-100.00%	-100.00%
Human toxicity, non-cancer effects (CTUh)	213.70%	30.50%	30.45%	30.50%
Land use related impacts / Soil quality (dimensionless)	50.30%	41.00%	41.00%	41.00%

ADDITIONAL ENVIRONMENTAL INFORMATION

NORDIA

CHRYSO
SAINT-GOBAIN

— % VARIATIONS OF INCLUDED PRODUCTS

	CHRYSO OPTIMA G9168	CHRYSO OPTIMA G9450	CHRYSO OPTIMA G9610	CHRYSO OPTIMA G9680	CHRYSO OPTIMA G9690
ENVIRONMENTAL IMPACTS					
Climate Change - Total (kg CO2 eq)	-	106.56%	55.75%	55.75%	55.78%
Climate Change - Fossil (kg CO2 eq)	-	108.09%	57.06%	57.06%	57.09%
Climate Change - Biogenic (kg CO2 eq)	0%	N/A	N/A	N/A	N/A
Climate Change - Land Use and Land Use Change (kg CO2 eq)	85.69%	181.39%	106.48%	106.48%	107.10%
Global Warming Potential- GWP-GHG (kg CO2 eq)	-	108.41%	55.23%	55.23%	55.26%
Ozone Depletion (kg CFC-11 eq.)	-99.73%	-99.56%	-99.65%	-99.65%	-99.65%
Acidification (Mole of H+ eq.)	-	26.37%	-	-	-
Eutrophication, fresh water (kg P eq.)	-18.16%	114.93%	49.00%	49.00%	48.25%
Eutrophication, marine (kg N eq.)	34.00%	90.08%	51.92%	51.92%	51.89%
Eutrophication, terrestrial (Mole of N eq.)	30.85%	64.75%	31.37%	31.37%	31.36%
Photochemical Ozone Formation, human health (kg NMVOC eq.)	-92.54%	-87.52%	-90.14%	-90.14%	-90.15%
Resource use, mineral and metals (kg Sb eq.)	-80.18%	-63.82%	-71.88%	-71.88%	-71.97%
Resource use, fossils (MJ)	-	89.52%	50.63%	50.63%	50,52%
Water Use (m3 world equiv.)	44.21%	78.58%	53.39%	53.38%	53.15%
WATER USE					
Use of net fresh water (m3)	-44.38%	82.99 %	55.49%	55.49%	55.27 %
ENERGY USE					
(PERE) Use of renewable primary energy excluding renewable primary energy resources as raw materials (MJ)	54.20%	101.41%	56.54%	56.54%	56.64%
(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)	54.20%	101.41%	56.54%	56.54%	56.64%
(PENRE) Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (MJ)	-	89.51%	50.71%	50.71%	50.52%
(PENRM) Use of non-renewable primary energy resources used as raw materials (MJ)	-	-	-	-	-
(PENRT) Total use of non-renewable primary energy resources (MJ)	-	89.51%	50.71%	50.71%	50.52%
Use of renewable secondary fuels (MJ)	-	-	-	-	-
Use of non-renewable secondary fuels (MJ)	-	-	-	-	-
Use of secondary materials (kg)	-	-	-	-	-

ADDITIONAL ENVIRONMENTAL INFORMATION

NORDIA

CHRYSO
SAINT-GOBAIN

— % VARIATIONS OF INCLUDED PRODUCTS

	CHRYSO OPTIMA G9168	CHRYSO OPTIMA G9450	CHRYSO OPTIMA G9610	CHRYSO OPTIMA G9680	CHRYSO OPTIMA G9690
WASTES					
Hazardous waste disposed (kg)	-99.02%	-97.98%	-98.51%	-98.51%	-98.50%
Non-hazardous waste disposed (kg)	10.44%	94.30%	51.56%	51.69%	52.21%
Radioactive waste disposed (kg)	-32.52%	31.42%	-	-	-
ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS					
Particulate Matter emissions (Disease incidence)	-100.00%	-100.00%	-100.00%	-100.00%	-100.00%
Ionizing radiation human (kBq U235 eq.)	-17.67%	142.35%	65.29%	65.29%	64.42%
Eco-toxicity, freshwater (CTUe)	-	128.97%	61.05%	61.05%	61.37%
Human toxicity, cancer effects (CTUh)	-100.00%	-100.00%	-100.00%	-100.00%	-100.00%
Human toxicity, non-cancer effects (CTUh)	213.70%	218.78%	154.52%	154.52%	154.53%
Land use related impacts / Soil quality (dimensionless)	50.30%	141.52%	78.19%	78.19%	78.67%

ADDITIONAL ENVIRONMENTAL INFORMATION

NORDIA

CHRYSO
SAINT-GOBAIN

— % VARIATIONS OF INCLUDED PRODUCTS

CHRYSO PREMIA 168 CHRYSO PREMIA 184 CHRYSO NANOSILICA

ENVIRONMENTAL IMPACTS			
Climate Change - Total (kg CO2 eq)	63.60%	34.30%	721.38%
Climate Change - Fossil (kg CO2 eq)	64.21%	34.99%	700.77%
Climate Change - Biogenic (kg CO2 eq)	N/A	N/A	N/A
Climate Change - Land Use and Land Use Change (kg CO2 eq)	75.21%	42.54%	25.57%
Global Warming Potential- GWP-GHG (kg CO2 eq)	63.32%	34.01%	1170.29%
Ozone Depletion (kg CFC-11 eq.)	-99.69%	-99.73%	1067.48%
Acidification (Mole of H+ eq.)	0.91%	-11.14%	2536.28%
Eutrophication, fresh water (kg P eq.)	35.03%	-	4959.38%
Eutrophication, marine (kg N eq.)	40.66%	23.34%	2567.74%
Eutrophication, terrestrial (Mole of N eq.)	30.38%	12.82%	1526.77%
Photochemical Ozone Formation, human health (kg NMVOC eq.)	-90.41%	-91.72%	1683.17%
Resource use, mineral and metals (kg Sb eq.)	-73.60%	-77.30%	34588.60%
Resource use, fossils (MJ)	53.19%	31.91%	490.16%
Water Use (m3 world equiv.)	31.20%	23.71%	676.01%
WATER USE			
Use of net fresh water (m3)	33.76%	24.88%	665.76%
ENERGY USE			
(PERE) Use of renewable primary energy excluding renewable primary energy resources as raw materials (MJ)	38.11%	18.88%	651.06%
(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)	38.11%	18.88%	651.06%
(PENRE) Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (MJ)	53.20%	31.92%	490.05%
(PENRM) Use of non-renewable primary energy resources used as raw materials (MJ)	-	-	-
(PENRT) Total use of non-renewable primary energy resources (MJ)	53.20%	31.92%	490.05%
Use of renewable secondary fuels (MJ)	-	-	-
Use of non-renewable secondary fuels (MJ)	-	-	-
Use of secondary materials (kg)	-	-	-

ADDITIONAL ENVIRONMENTAL INFORMATION

NORDIA

CHRYSO
SAINT-GOBAIN

— % VARIATIONS OF INCLUDED PRODUCTS

	CHRYSO PREMIA 168	CHRYSO PREMIA 184	CHRYSO NANOSILICA
WASTE			
Hazardous waste disposed (kg)	-98.27%	-98.63%	-99.88%
Non-hazardous waste disposed (kg)	72.02%	41.88%	-
Radioactive waste disposed (kg)	13.06%	-	-28.54%
ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS			
Particulate Matter emissions (Disease incidence)	-100.00%	-100.00%	-35.97%
Ionizing radiation human (kBq U235 eq.)	53.58%	16.90%	2306.81%
Eco-toxicity, freshwater (CTUe)	60.20%	23.63%	12988.92%
Human toxicity, cancer effects (CTUh)	-100.00%	-100.00%	62.53%
Human toxicity, non-cancer effects (CTUh)	31.60%	30.09%	371.05%
Land use related impacts / Soil quality (dimensionless)	66.73%	35.20%	755.11%

- International EPD® System, PCR 2019:14 Construction Products, version 1.3.1
- EN 15804:2012+A2:2019/AC 2021 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
- 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 program 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
- Sphera - GaBi Product Sustainability software - www.sphera.com
- Ecoinvent/ Ecoinvent Centre - www.Eco-invent.org
- Mavridou, Sofia. (2018). Construction and Demolition (C&D) Waste: Potential uses and current situation in Greece and Cyprus.