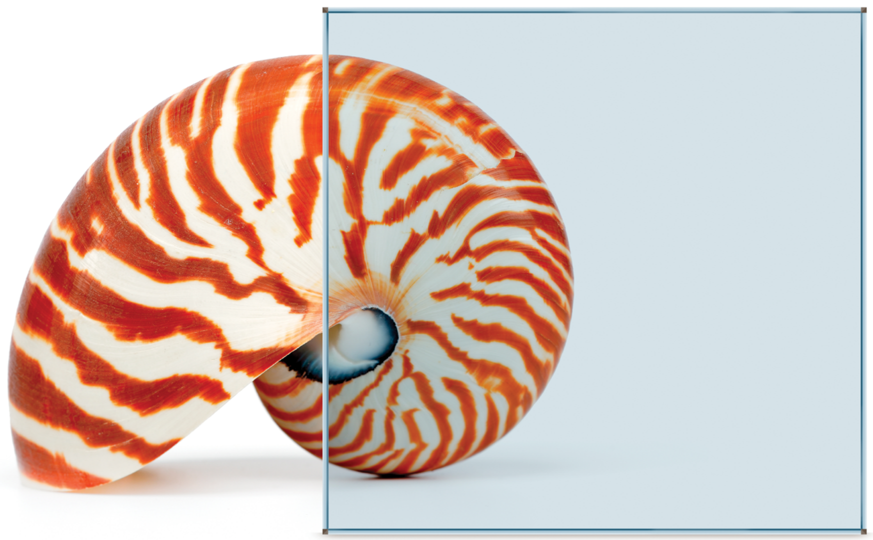

Environmental Product Declaration

In accordance with ISO 14025 and EN 15804:2012+A2:2019 for

Tinted Float Glass

Programme: The International EPD® System	Programme Operator: EPD Turkey	S-P Code: S-P-04811
Publication Date: 2022-10-01	Validity Date: 2027-09-30	Geoprahical Scope: Global

THE INTERNATIONAL EPD® SYSTEM

TURKEY ENVIRONMENTAL PRODUCT DECLARATIONS

ECO PLATFORM EPD VERIFIED

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.

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CEN standard EN 15804 serves as the core Product Category Rules (PCR)

Product Category Rules (PCR): 2019:14 Version 1.11, 2021-02-05, Construction Products and CPC 54 Construction Services, EN 15804:2012 + A2:2019 Sustainability of Construction Works

PCR review was conducted by:
The Technical Committee of the International EPD® System. See www.environdec.com/TCfor a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile

Independent third-party verification of the declaration and data, according to ISO 14025:2006:

EPD process certification   EPD verification X

Third party verifier: Prof. Vladimír Koci

Approved by: The International EPD® System Technical Committee, supported by the Secretariat

Procedure for follow-up of data during EPD validity involves third party verifier:

Yes   No X

The EPD owner has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804.

Care for Next

Our Sustainability Strategy

We see sustainability as the focal point of our operations and a core element of our business model. To that end, we plan and carry out all our investment decisions as well as product and process development activities in consideration of social and environmental impacts. We aim to disseminate our sustainability vision to include all our stakeholders in every aspect of our value chain from raw material supply to post-consumer recycling.

Sisecam Sustainability Goals cover 5-year periods within the framework of CareforNext and are established in a way that contributes to the Sustainable Development Goals (SDGs) of the United Nations Development Programme. Focal points for the Preserve pillar are Use of Natural Resource Uses, Corporate Heritage and Product Liability. Focal points for the Empower pillar are Diversity and Inclusion, Talent Management, Occupational Health and Safety and Contribution to Social Development.

Focal points for the Progress pillar are R&D and Digitalization, Innovative Products and Combating Climate Change.

About the Company

Sisecam was established in 1935 to meet Türkiye's need for base glass products and is among the most distinguished global manufacturers as the only company operating in every field of glass today.

Founded in 1935 by Isbank at the directive of Atatürk, the founder and the first President of the Republic of Türkiye, Sisecam is one of the most established industrial enterprises in Türkiye with a corporate history spanning more than 85 years. Today, Sisecam ranks among the world's most prestigious manufacturers thanks to its exceptional expertise and highly competitive operations.

Sisecam was founded to meet Türkiye's need for basic glass products. As one of the most powerful industrial conglomerates in the country today, Sisecam has also transformed into a global player in all key areas of the glass industry, as well as in soda and chromium compounds business lines.

Sisecam has undertaken major efforts to become an international success with its ever-growing production power, highly reputable brand image, superior product quality and value-creating sustainable growth approach. It is currently one of the world's leading glass producers with production operations located in 14 countries on four continents and some 22,000 employees. Sisecam records sales in over 150 countries around the globe.

In addition, Sisecam is the only global producer operating in all three key areas of the global glass industry: flat glass, glassware and glass packaging. It ranks among the world's top two producers in glassware, and among the top five global producers in glass packaging and flat glass. Sisecam is also worlds one of top three largest producers of soda and a world leader in chromium chemicals.

Sisecam is a global player in the key areas of the glass industry, such as flat glass, glassware, glass packaging, automotive glasses and glass fiber as well as in soda and chromium compounds. Additionally, Sisecam assumes a pioneering role in mining, energy and recycling business lines. It is taking further steps toward achieving its ambitious goals across the globe.

14
Countries

43
Facilities

4.9
Million tons of glass production

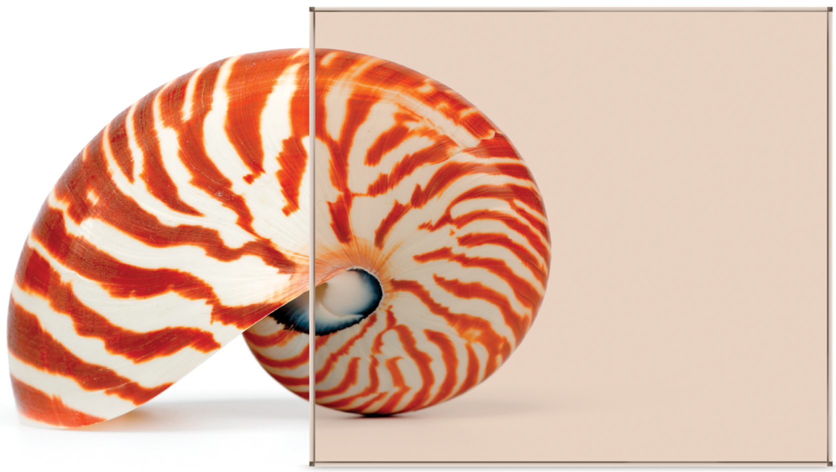
About the Product

Sisecam Tinted Float Glass is body tinted float glass of Sisecam Flat Glass. Manufactured by adding colouring agents to the raw batch before melting process. Sisecam Tinted Float Glass offers solutions to non-residential buildings with curtain walls, windows, spandrels, facade claddings, overhead glazing, and balustrades.

Also, alternative choices for interior applications such as tabletops, shelves, doors, shower cabins and partitions. Green, grey, bronze, blue, turquoise, and dark grey colors are available. Sisecam Tinted Float Glass range is manufactured in accordance with EN 572-2 Glass in Building-Basic Soda Lime Silicate Glass Products - Part 2: Float glass.

Advantages

- Offers wide options to designers and customers to create aesthetic and stylish places with its different color alternatives.
- If used in exterior, it limits solar heat input into the building, control the extreme brightness of the sun, offers a comfortable working and living environment.
- By its solar control it reduces the cooling costs.
- Supply opportunities is available in different sizes and colors.



Technical Specification

Sisecam produces tinted float glass in various thicknesses. The table below shows some of the important parameters of the related product for 4 mm thickness.

Single Glazing - 4 mm

	Daylight (EN 410)		Solar Energy (EN 410)				Thermal Conductivity (U Value)
	Transmittance (%)	Reflectance Outdoor (%)	Direct Transmittance (%)	Reflectance Outdoor (%)	Solar Factor	Shading Coefficient	
Green	79	7	54	6	63	0,73	5,8
Grey	57	6	58	6	67	0,77	5,8
Bronze	62	6	60	6	68	0,78	5,8
Blue	66	6	54	6	63	0,73	5,8
Dark Grey	16	4	15	4	34	0,39	5,8

Product Composition

Sisecam produces tinted float glass at four plants: Kırklareli and Mersin in Türkiye, Alabuga in Russia, Targovishte in Bulgaria. The raw materials used in the production are silica sand, soda ash, dolomite, limestone, feldspar, cullet, anthracite, and minor materials. Below figure shows the composition breakdown of Sisecam's tinted float glass.

Raw Materials	Content, %
Silica Sand	50 - 65
Soda Ash	15 - 20
Dolomite	13 - 15
Limestone	2 - 4
Cullet	20 - 35
Others	0 - 5

Conversion Factors

The LCA study included in this EPD has been declared for 1 m^2 tinted flat glass of 4 mm thickness with a weight of 9.62 kg. In the LCA study, the allocations were made based on weight. For this reason, the following conversion factors can be used to calculate the environmental impacts of other thicknesses.

Thickness (mm)	3 mm	4 mm	5 mm	6 mm	8 mm	10 mm
Multiplication Factor	0.753	1	1.26	1.52	2.04	2.56

LCA Information

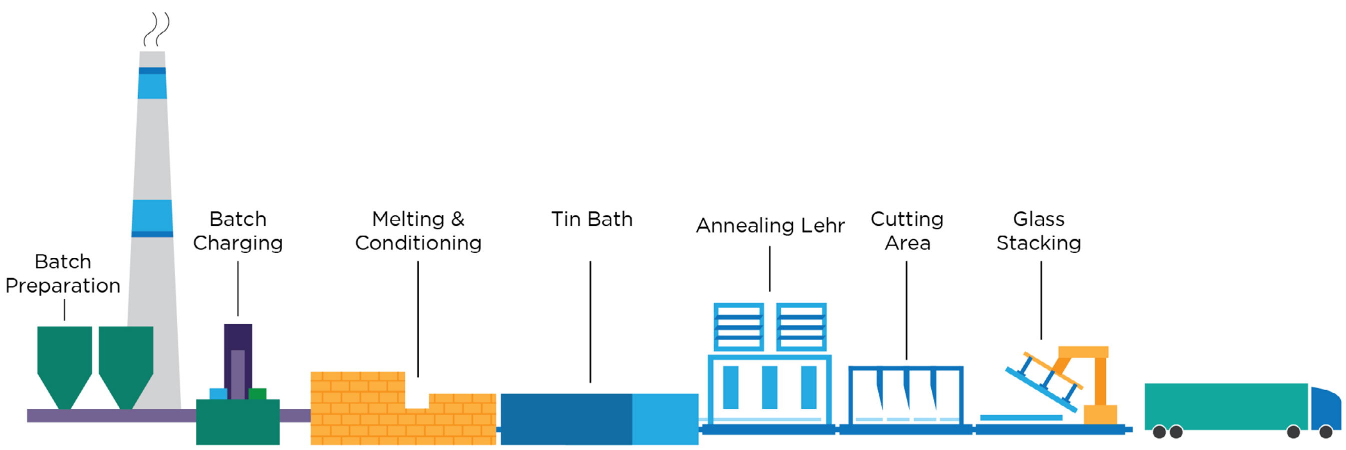
Declared Unit	1 m^2 of Tinted Float Glass with 9.62 kg/m^2
Time Representativeness	2020
Database and LCA Software	Ecoinvent 3.8 and SimaPro 9.3
System Boundaries	Cradle to gate with modules C1–C4 and module D (A1–A3 + C + D)
Inventory	The inventory for the LCA study is based on the 2020 production figures for Tinted Float Glass products by Sisecam production plant in Kırklareli, Mersin, Russia and Bulgaria. This EPD's system boundary is cradle to gate. The system boundary covers A1 - A3 product stages, C1 - C4 end of life and D stages.
Allocations	Water consumption, energy consumption and raw material transportation were weighted according to 2020 production figures. In addition, hazardous and non-hazardous waste amounts were also allocated from the 2020 total waste generation.
Packaging	Products are delivered to end-users with packaging includes plastic film packaging, and corrugated board. The packaging of the final product is included in the LCA.
Cut-off Criteria	1% cut-off is applied. Data for elementary flows to and from the product system contributing to a minimum of 99% of the declared environmental impacts have been included.
Assumptions	Raw materials, transport and production data are collected from each production plants but packaging materials are assumed the same.
REACH	No substances included in the Candidate List of Substances of Very High Concern for authorization under the REACH regulations are present in this product either above the threshold for registration with the European Chemicals Agency or above 0.1% (wt/wt).
Geographical Scope	The geographical scope of this EPD is global.
LCA Modelling, Calculation and Data Quality	The results of the LCA with the indicators as per EPD requirement are given in the LCA result tables. According to the PCR, all energy calculations were obtained using Cumulative Energy Demand (LHV) methodology, while freshwater use is calculated with selected inventory flows in SimaPro. There are no co-product allocations within the LCA study underlying this EPD.

System Boundary

The system boundaries in tabular form for all modules are shown in the table below.

	Product Stage			Construction Process Stage		Use Stage							End of Life Stage				Benefits and Loads
	Raw Material Supply	Transport	Manufacturing	Transport	Construction Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	Deconstruction. demolition	Transport	Waste Processing	Disposal	Future 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	GLO	GLO	-	-	-	-	-	-	-	-	-	GLO	GLO	GLO	GLO	GLO
Specific Data Used	>90%	>90%	>90%	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation - products	<10%					-	-	-	-	-	-	-	-	-	-	-	-
Variation - Sites	<10%					-	-	-	-	-	-	-	-	-	-	-	-

X = Included in LCA, ND = Not Declared



System Boundary Descriptions

A1: Raw Material Supply

This stage includes the extraction and processing of all raw materials used in the production of Sisecam's tinted float glass. The main raw materials in the product are silica sand, soda ash, dolomite, limestone, feldspar and cullet. Sisecam has its own quarries for silica sand, dolomite, limestone, and feldspar production throughout Turkey. Thus, the company supply many of its raw materials from their mines and quarries.

A1

A2: Raw Material Transport

This stage considers the transport of raw materials to manufacturing plants. There are four different plants considered in this EPD. Transport of raw materials to these four production sites are taken as the weight average values for transport distances from raw materials suppliers in 2020.

Scenario Information	Value per declared unit
Type of the Vehicle	Road, Lorry, 16-32 metric ton, Euro6 motor
Data Source	Transport data from Ecoinvent 3.8
Distance	408 km average road distance

A2

A3: Manufacturing

The manufacturing of clear float glass consists of several steps. First, glass batch, which is a mixture of sand, soda ash, limestone, coloring agents and some additional raw materials of specific specialties and quantities, is melted at approximately 1600 °C in the furnace. Molten glass is poured from the furnace on to the surface of a bath of molten tin at 1100 °C. Tinted glass is made by adding coloring agents to the batch mix. As glass spreads and floats on the tin, the two surfaces of glass become flat and parallel, and the thickness and width of glass ribbon is formed. As the glass ribbon moves further along the bath, it is progressively cooled and internal stress of the glass is eliminated at the annealing lehr. Consequently, glass is cut into required sizes and stacked, ready for dispatch.

A3

C1: Deconstruction/Demolition

This stage considers the environmental impacts generated from deconstruction/ demolition of the investigated product. For the analyzed product, the impacts of this model is taken as zero since small hand-tool equipments and manpower is sufficient.

C2: Transport

This stage includes the transportation effects of demolished waste to a waste processing area.100 km distance is assumed that the distance between demolishing area to a waste processing area.

C3: Waste Processing Area

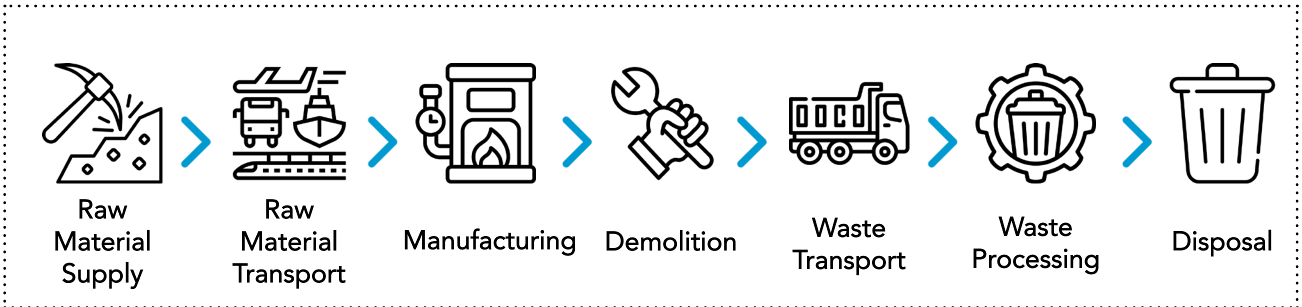
The effects of any treatment process to the demolished waste is included in this stage. It is assumed that no treatment is needed as 100 % of the material goes to a landfill.

C4: Disposal

Disposal stage is the final stage of the life cycle of the product. Since the worst-case scenario is considered, no recycling is considered.

D: Future reuse, recyling or energy recovery potentials

Since the recycling rate is considered as 0 %, no benefit is generated.



System Boundary

Environmental Impacts for 1 m² of Tinted Glass Float

Impact	Unit	A1-A3	C1	C2	C3	C4	D
GWP - Fossil	kg CO_2 eq	13.6	0	0.157	0	0.089	0
GWP - Biogenic	kg CO_2 eq	0.011	0	421E-6	0	0.001	0
GWP - Luluc	kg CO_2 eq	0.017	0	62.6E-6	0	83.3E-6	0
GWP - Total	kg CO_2 eq	13.6	0	0.157	0	0.091	0
ODP	kg CFC-11 eq	1.13E-6	0	36.3E-9	0	30.3E-9	0
AP	mol H+ eq	0.039	0	445E-6	0	0.001	0
*EP - Freshwater	kg P eq	0.003	0	10.3E-6	0	9.07E-6	0
EP - Freshwater	kg (PO_4) eq	0.010	0	31.4E-6	0	27.7E-6	0
EP - Marine	kg N eq	0.014	0	90.4E-6	0	285E-6	0
EP - Terrestrial	mol N eq	0.083	0	0.001	0	0.003	0
POCP	kg NMVOC	0.020	0	256E-6	0	0.001	0
ADPE	kg Sb eq	64E-6	0	555E-9	0	291E-9	0
ADPF	MJ	163	0	2.38	0	2.23	0
WDP	m^3 depriv.	2.86	0	0.007	0	0.101	0
PM	disease inc.	260E-9	0	9.94E-9	0	16.4E-9	0
IR	kBq U-235 eq	0.360	0	0.012	0	0.010	0
ETP - FW	CTUe	152	0	1.86	0	1.59	0
HTTP - C	CTUh	4.1E-9	0	59.9E-12	0	64.9E-12	0
HTTP - NC	CTUh	95.5E-9	0	1.88E-9	0	884E-12	0
SQP	Pt	31.8	0	1.72	0	5.85	0

Acronyms	GWP-total: Climate change, GWP-fossil: Climate change- fossil, GWP-biogenic: Climate change - biogenic, GWP-luluc: Climate change - land use and transformation, ODP: Ozone layer depletion, AP: Acidification terrestrial and freshwater, EP-freshwater: Eutrophication freshwater, EP-marine: Eutrophication marine, EP-terrestrial: Eutrophication terrestrial, POCP: Photochemical oxidation, ADPE: Abiotic depletion - elements, ADPF: Abiotic depletion - fossil resources, WDP: Water scarcity, PM: Respiratory inorganics - particulate matter, IR: Ionising radiation, ETP-FW: Ecotoxicity freshwater, HTP-c: Cancer human health effects, HTP-nc: Non-cancer human health effects, SQP: Land use related impacts, soil quality.
Legend	A1: Raw Material Supply, A2: Transport, A3: Manufacturing, A1-A3: Sum of A1, A2, and A3, C1: Demolition, C2: Waste Transport, C3: Waste Processing, C4: Disposal, D: Benefits and Load. Click for detail information about system boundary and their descriptions.
Disclaimer 1	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.
Disclaimer 2	The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.
*Disclaimer 3	EP-freshwater: This indicator is calculated both in kg PO_4 eq and kg P eq as required in the charactarization model. (EUTREND model, Struijs et al, 2009b, as implemented in ReCiPe; http://eplca.jrc.ec.europa.eu/LCDN/developerEF.xhtml)

ŞİŞECAM

Resource use for 1 m² of Tinted Glass Float

Impact	Unit	A1-A3	C1	C2	C3	C4	D
PERE	MJ	7.61	0	0.034	0	0.147	0
PERM	MJ	0	0	0	0	0	0
PERT	MJ	7.61	0	0.034	0	0.147	0
PENRE	MJ	163	0	2.38	0	3.25	0
PENRM	MJ	0	0	0	0	0	0
PENRT	MJ	163	0	2.38	0	3.25	0
SM	kg	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0
FW	m^3	0.047	0	398E-6	0	0.003	0
Acronyms	PERE: Use of renewable primary energy excluding resources used as raw materials, PERM: Use of renewable primary energy resources used as raw materials, PERT: Total use of renewable primary energy, PENRE: Use of non-renewable primary energy excluding resources used as raw materials, PENRM: Use of non-renewable primary energy resources used as raw materials, PENRT: Total use of non-renewable primary energy, SM: Secondary material, RSF: Renewable secondary fuels, NRSF: Non-renewable secondary fuels, FW: Net use of fresh water.						

Waste&Output Flows for 1 m² of Tinted Glass Float

Impact	Unit	A1-A3	C1	C2	C3	C4	D
HWD	kg	429E-6	0	0	0	0	0
NHWD	kg	15E-3	0	0	0	0	0
RWD	kg	0	0	0	0	0	0
CRU	kg	0	0	0	0	0	0
MFR	kg	0	0	0	0	0	0
MER	kg	0	0	0	0	0	0
EE (Electrical)	MJ	0	0	0	0	0	0
EE (Thermal)	MJ	0	0	0	0	0	0
Acronyms	HWD: Hazardous waste disposed, NHWD: Non-hazardous waste disposed, RWD: Radioactive waste disposed, CRU: Components for reuse, MFR: Material for recycling, MER: Materials for energy recovery, EE (Electrical): Exported energy electrical, EE (Thermal): Exported energy, Thermal.						

Climate Impact for 1 m² of Tinted Glass Float

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
*GHG-GWP	kg CO_2 eq	13.4	0	0.155	0	0.089	0
Acronyms	GWP-GHG = Global Warming Potential total excl. biogenic carbon following IPCC AR5 methodology * The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus equal to the GWP indicator originally defined in EN 15804:2012+A1:2013						
Legend	A1: Raw Material Supply, A2: Transport, A3: Manufacturing, A1-A3: Sum of A1, A2, and A3, C1: Demolition, C2: Waste Transport, C3: Waste Processing, C4: Disposal, D: Benefits and Load. Click for detail information about system boundary and their descriptions.						

References

/GPI/ General Programme Instructions of the International EPD® System. Version 4.0.

/EN ISO 9001/ Quality Management Systems - Requirements

/EN ISO 14001/ Environmental Management Systems - Requirements

/EN ISO 50001/ Energy Management Systems - Requirements

/ISO 14020:2000/ Environmental Labels and Declarations — General principles

/EN 15804:2012+A2:2019/ Sustainability of construction works - Environmental Product Declarations — Core rules for the product category of construction products

/ISO 14025/ DIN EN ISO 14025:2009-11: Environmental labels and declarations - Type III environmental declarations — Principles and procedures

/ISO 14040/44/ DIN EN ISO 14040:2006-10, Environmental management - Life cycle assessment - Principles and framework (ISO14040:2006) and Requirements and guidelines (ISO 14044:2006)

/PCR for Construction Products and CPC 54 Construction Services/ Prepared by IVL Swedish Environmental Research Institute, Swedish Environmental Protection Agency, SP Trä, Swedish Wood Preservation Institute, Swedisol, SCDA, Svenskt Limträ AB, SSAB, The International EPD System, 2019:14 Version 1.11 DATE 2019-12-20

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/Ecoinvent / Ecoinvent Centre, www.ecoinvent.org

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Glassory

Acidification Potential

The acidification of soils and waters occurs predominantly through the transformation of air pollutants into acids. This leads to a decrease in the pH-value of rainwater and fog from 5.6 to 4 and below. Sulphur dioxide and nitrogen oxide and their respective acids (H2SO4 und HNO3) produce relevant contributions. This damages ecosystems, whereby forest dieback is the most well-known impact. Acidification has direct and indirect damaging effects (such as nutrients being washed out of soils or an increased solubility of metals into soils). But even buildings and building materials can be damaged. Examples include metals and natural stones which are corroded or disintegrated at an increased rate. When analysing acidification, it should be considered that although it is a global problem, the regional effects of acidification can vary. The acidification potential is given in sulphur dioxide equivalents (SO2-Eq.). The acidification potential is described as the ability of certain substances to build and release H+ - ions. Certain emissions can also be considered to have an acidification potential, if the given S-, N- and halogen atoms are set in proportion to the molecular mass of the emission. The reference substance is sulphur dioxide.

Global Warming Potential

The mechanism of the greenhouse effect can be observed on a small scale, as the name suggests, in a greenhouse. These effects are also occurring on a global scale. The occurring short-wave radiation from the sun comes into contact with the earth's surface and is partly absorbed (leading to direct warming) and partly reflected as infrared radiation. The reflected part is absorbed by so-called greenhouse gases in the troposphere and is re-radiated in all directions, including back to earth. This results in a warming effect at the earth's surface. In addition to the natural mechanism, the greenhouse effect is enhanced by human activities. Greenhouse gases that are caused, or increased, anthropogenically are, for example, carbon dioxide, methane, and CFCs. An analysis of the greenhouse effect should consider the possible long term global effects. The global warming potential is calculated in carbon dioxide equivalents (CO2-Eq.). This means that the greenhouse potential of an emission is given in relation to CO2. Since the residence time of the gases in the atmosphere is incorporated into the calculation, a time range for the assessment must also be specified. A period of 100 years is customary.

Ozone Depletion

Because of ozone depletion, a larger fraction of UV-B radiation reaches the earth surface. This can have harmful effects upon human health, animal health, terrestrial and aquatic ecosystems, biochemical cycles and on materials. This category calculates the destructive effects on the stratospheric ozone layer over a time horizon of 100 years. The characterization model is developed by the World Meteorological Organization (WMO).

Aquatic Eutrophication

Eutrophication (also known as nutrification) includes all impacts due to excessive levels of macro-nutrients in the environment caused by emissions of nutrients to air, water, and soil. With respect to terrestrial eutrophication, only the concentration of nitrogen is the limiting factor and hence important, therefore, original data sets include CFs for NH3, NO2 emitted to air. In freshwater environments, phosphorus is considered the limiting factor. Therefore, only P-compounds are provided for assessment of freshwater eutrophication. In marine water environments, nitrogen is the limiting factor, hence the method's inclusion of only N compounds in the characterization of marine eutrophication. The characterisation of impact of N-compound emitted into rivers that subsequently may reach the sea has to be further investigated.

Photochemical Ozone Creation Potential (POCP)

Photochemical Ozone Creation Potential (POCP) is the potential of ozone creation at ground level (i.e., tropospheric ozone) through photochemical transformation of ozone precursor emissions. The main ozone precursor compounds are nitrogen oxides (NOx) and non-methane volatile organic compounds (NMVOC). Mass of non-methane volatile organic compound equivalents, e.g. [kg NMVOC eq / FU] calculated using the "photochemical oxidant formation potential" indicator at a midpoint level, as described in the ReCiPe impact assessment methodology.

Ecotoxicity Freshwater:

Ecotoxicity is currently only represented by toxic effect on aquatic freshwater species in the water column. Impacts on other ecosystems, including sediments, are not reflected in current general practice. The characterization factor for aquatic ecotoxicity impacts (ecotoxicity potential) is expressed in comparative toxic units (CTUe).

Resource Use, Energy Carriers:

As suggested by van Oers et al. (2002), and implemented in CML method since 2009 version, a separate impact category for fossil fuels is defined, based on their similar function as energy carriers. CFs for fossil fuels are expressed as MJ/MJ, i.e., the CF is equal to 1 for all fossil resources.

Resource Use, Minerals and Metals:

For resources depletion at midpoint, the model recommended is the Abiotic Resource Depletion, "ultimate reserves" version, described in van Oers et al. (2002), based on the methods of Guinée et al. (2002). CFs are given as Abiotic Depletion Potential (ADP), quantified in kg of antimony-equivalent (Sb-eq) per kg extraction.

Human Toxicity Potential (cancer & non-cancer):

The characterization factor for human toxicity impacts (human toxicity potential) is expressed in comparative toxic units (CTUh), the estimated increase in morbidity in the total human population, per unit mass of a chemical emitted.

www.sisecam.com.tr/en