EPD®

THE INTERNATIONAL EPD® SYSTEM

Environmental Product Declaration

In accordance with ISO 14025:2006 and
EN 15804:2012+A2:2019/AC:2021 for:

ARISE
OTIS ELEVATOR COMPANY

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Remark: 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

OTIS

About Otis

Otis Elevator (China) Co., Ltd. is an important part of Otis Global. Otis maintains more than 2.1 million elevators and escalators around the world, transporting approximately 2 billion passengers every day. Otis is headquartered in Connecticut, USA, and has 70,000 employees, including approximately 41,000 maintenance engineers, providing products and maintenance services to more than 200 countries and regions around the world.

Over the past 39 years, Otis Elevator (China) Co., Ltd. has strictly abided by relevant Chinese laws and regulations, deeply explored the Chinese market, and has become a leading manufacturer and maintenance service provider of elevators, escalators and moving walkways. Otis Elevator (China) Co., Ltd. has an elevator manufacturing base in TEDA, Binhai New Area, Tianjin, and an escalator and moving walkway manufacturing base in Jiaxing, Zhejiang. These two manufacturing bases are the world's largest Otis elevators, escalators and automatic walkways. In addition to serving Chinese customers, its products are also exported to all over the world. Otis Elevator (China) Co., Ltd. has a large branch service network in China, providing sales, installation, and maintenance services to our customers.

Otis Elevator (China) Co., Ltd. has been committed to promoting China's urbanization construction, providing Chinese customers with high-quality products and services with high-end manufacturing and technical capabilities, while constantly developing products that meet customer needs with its never-ending spirit of innovation. Innovative and revolutionary products provide professional solutions for construction. Many landmark buildings have adopted Otis elevator and escalator products, including the Oriental Pearl TV Tower, Guangzhou TV Tower, Tianjin Chow Tai Fook Financial Center, Shanghai World, Financial Center, Shenzhen Ping An Financial Center, Atlantis Sanya Hotel, Xiongan New Area Project, Shanghai Pudong International Airport, Shanghai Metro, Tianjin Metro, Shenzhen Metro, Chongqing Metro, Chengdu Metro, Xi’an Metro, Wuhan Metro, Qingdao Metro, Hefei Metro, etc.

ARISE

With a history of more than 170 years, Otis Elevator adheres to customer-centric values and leads the transformation of elevator technology with innovation. In order to better serve the Chinese market, OTIS has launched Arise, a wire rope product independently produced by OTIS TEDA factory in Tianjin. The product continues the consistent excellent quality of Otis products, adheres to the design concept of safety, comfort and durability, and provides a comprehensive solution to meet the market demand of commercial, residential and professional buildings in China.

PRODUCT INFORMATION

This Environmental Product Declaration for ARISE is developed according to the ISO 14040/44 & ISO 14025 guidelines and to the calculation rules specified in the C-PCR-008 Lifts (to PCR 2019:14), version 2024-04-30, thereby providing full compliance with the CEN standard EN 15804:2012 + A2:2019/AC:2021 (as the core PCR), as well as the PCR 2019:14 Construction products, version 1.3.4. The General Program Instructions of the International EPD System apply for the current EPD development too. We covered the whole life cycle of ARISE, manufactured in Tianjin TEDA manufacturing base, from the preparation of raw materials, its transport to manufacturing site and the manufacturing of the lift's components, through its installation, maintenance and use until each component end-of-life treatment. As specified in the C-PCR, the mandatory information of ARISE is presented in the following table. The figures correspond to a typical configuration, being the representative unit of the complete range of ARISE.

The products assessed in this report are ARISE elevator products produced from 2023-01-01 to 2023-12-31.

Comparability between EPDs based on this study is not conceivable and shall be avoided. Any comparability of this kind shall be considered as false and misleading the EPD user.

Comparability between EPDs based on this study is only achievable, if the following performance characteristics are equivalent: Functional unit, Reference Service Lifetime, Usage Category, travel height, number of stops, rated load, rated speed and geographic region.

INDEX	VALUES	REPRESENTATIVE VALUES CHOSEN IN CASE OF DECLARATION OF RANGES
COMMERCIAL NAME	ARISE	
Segment	Commercial	
Type of installation	New generic lift without modernization	
Main purpose	Transport of passengers	
Type of lift	Electric	
Type of drive system	Gearless traction	
Rated load (fixed or range)	550 - 1600 kg	1000kg
Rated speed (fixed or range)	1 - 2.5 m/s	1.75m/s
Number of stops (fixed or range)	2 - 36	19 Stops
Travelled height (fixed or range)	2.5 - 130 m	54 m
Number of operating days per year (fixed or range)	1 - 365	365
Applied Usage Category (UC) according to ISO 25745-2	UC1 to UC6	UC3
Designed Reference Service Life (RSL)	25 years	
Geographic region or intended installation region	China, Asia, Middle East and Latin America	
ADDITIONAL INFORMATION		
Recommended application (main market)		
Building rise (typical)	mid- (7-20 floors) / high- rise (> 20 floors)	
Building type	residential / commercial / office / administrative / hotel / hospital / shopping centre / transportation / industria	

The representative values chosen for this study correspond to typical configurations, and the results of the study are only limitedly representative of the results for that configuration.

The LCA was conducted for a lift with a lifetime of 25 years, without considering a modernization, installed in a 19 floors building, having a speed of 1.75 m/s and a travelling distance of 54 m. The number of trips per day for a lift with Usage Category 3 is 300, which was obtained from ISO 25745-2. The designed reference service life considered for the LCA study is a typical data.

PRODUCT FUNCTION UNIT

According to C-PCR-008 Lifts (Elevators), the functional unit is defined as the transportation of a load over a distance, expressed as one tonne [t] transported over one kilometre [km] i.e. tonne-kilometre [tkm] over a vertical (or inclined) trajectory. LCA results shall be presented per FU, i.e. per 1 tkm. To do so, first the total amount of tkm (called also transportation performance,TP for short) shall be calculated, followed by division of the respective inputs and outputs by the TP to obtain the LCA results per FU (Functional unit).

The Transportation Performance (TP) indicates the total amount of tkm performed by the elevator over the defined service life with an average load, according to ISO 25745-2. The term “transportation performance (TP)” is identical both in meaning and in calculation approach to the term “total number of FU” used in EPDs based on PCR 2015:05.

In conjunction with the parameters of the representative product, and in accordance with C-PCR-008 Lifts guidelines for the calculation of functional units, the total load distance over the life of the representative product is calculated to be 3220 tkm. Its calculation is shown in following table:

STEP 1: Calculation of the average car load %Q in [t]:

Parameters	Values	Unit
Q	1000	kg
Percentage Value (from Table 3 of ISO 25745 – 2)	4.5	%
%Q=Q* Percentage Value/1000	0.045	t

STEP 2: Calculation of the one-way average travel distance for target installation s_{av} [m]:

Parameters	Values	Unit
s_{rc}	53.35	m
Percentage Value (from Table 2 of ISO 25745 – 2)	49	%
s_{av}= s_{rc}* Percentage Value	26.1415	m

STEP 3: Calculation of the distance travelled by the lift during the service life s_{RSL}[km]:

Parameters	Values	Unit
s_{av}	26.1415	m
n_d	300	Times per day
d_{op}	365	days
RSL	25	years
s_{RSL}= s_{av}* n_d* d_{op}*RSL/1000	71562.3563	km

STEP 4: Ultimately, calculation of TP for obtaining of the results per FU:

Parameters	Values	Unit
TP=%Q* s_{RSL}	3220.3060	tkm

For the defined representative unit and a RSL of 25 years, the TP per applied usage category is:

Usage Category	Transportation Performance (TP)
3	3220.3060 tkm

Life Cycle Assessment of ARISE

We design our elevators with a life-cycle approach and ensure continual improvements by reducing their potential environmental impacts at each life cycle stage.

The product life cycle system boundary assessed in this study is cradle to grave, plus module D (A+B+C+D), wherein the construction and maintenance of capital equipment and indirect activities are excluded from the system boundary.

Elevators are products with a long operation time, during which not only preventive maintenance (covered by B2 Maintenance), but also corrective maintenance is needed. Corrective maintenance activities, i.e. such that are usually to be accounted in B3 Repair, are excluded, because these repair interventions cannot be programmed or foreseen; they depend on the building application and users´ behaviour and are not under the control of the company supplying the original elevator.

As regards B4 Replacement and B5 Refurbishment, a clear separation between the two modules when elevators are concerned is not necessary; they shall be merged and declared under B5 Refurbishment only.

Activities under B5 module are such that consider “modernization” of the elevator. Modernization is generally defined as a process of components’ exchange that leads to the extension of the designed lifetime of an elevator (according to EN 81-80 on Safety rules for the construction and installation of elevators). When extension of the lift’s designed lifetime is foreseen, B5 module should be included. In this study, the lifetime of the lift is 25 years and the extension of the lifetime is not considered, therefore module B5 is excluded.

LIFE CYCLE STAGE	INFORMATION MODULE		Modules declared	Geography
A1-A3* Product Stage (China)	A1	Raw material supply	X	CN
	A2	Transport	X	CN
	A3	Manufacturing	X	CN
A4-A5 Construction Process Stage (China,Singapore, Asia Dubai, Middle East Mexico, Latin America)	A4	Transport	X	GLO
	A5	Installation	X	GLO
B1-B7 Use Stage (China,Singapore, Asia Dubai, Middle East Mexico, Latin America)	B1	Use	ND	/
	B2	Maintenance	X	GLO
	B3	Repair	ND	/
	B4	Replacement	ND	/
	B5	Refurbishment	ND	/
	B6	Operational energy use	X	GLO
	B7	Operational water use	ND	/
C1-C4 End-of-life Stage (China,Singapore, Asia Dubai, Middle East Mexico, Latin America)	C1	Deconstruction	X	GLO
	C2	Transport	X	GLO
	C3	Waste processing	X	GLO
	C4	Waste disposal	X	GLO
D Benefits and loads beyond the system boundary (China,Singapore, Asia Dubai, Middle East Mexico, Latin America)	D	Reuse, recovery, recycling, potential	X	GLO

* The share of the GWP-GHG indicator results in A1-A3 (A1-A5 for services) is from product-specific LCI data is 2.76%. There is no variation of products and sites in this study.

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE		END OF LIFE STAGE				BENEFITS (Benefits and loads beyond the system boundary)
A1 Raw Material Supply	A2 Transport	A3 Manufacturing	A4 Transport	A5 Installation	B6 Operational Energy Use	B2 Maintenance	C1 Deconstruction	C2 Transport	C3 Waste processing	C4 Waste disposal	D Transport

In more detail

PRODUCT STAGE – MODULES A1- A3: RAW MATERIAL SUPPLY & OTIS MANUFACTURING

Raw material supply includes raw material extraction and production of materials, components and packaging materials from suppliers. The impacts for ARISE is driven primarily by materials manufacturing of ferrous components, which created approx. 26.79% of climate change GWP total. In all impact categories, the manufacturing in Otis factories (e.g. Cutting, Drilling, Bending, Punching, etc.) has a minor contribution to the impact categories. This limited impact from the manufacturing part is widely due to the continuous efforts to reduce its environmental footprint over the year through multi-channel initiatives such as: eliminating the painting and welding operations, having a positive impact on greenhouse gas emissions and wastes.

The data for generation of electricity applied in A3 module is the Electricity, medium voltage {CN-NCGC}| market for electricity, medium voltage | Cut-off, U in the Ecoinvent 3.9.1 (cut-off) database. The purchased electricity in manufacturing process belongs to d) Electricity consumption mix on the marketresidual electricity mixes on the market. Its GWP-GHG impact is 1.2038 kgCO2eq/kWh. The reference year of electricity dataset is 2020~2022.

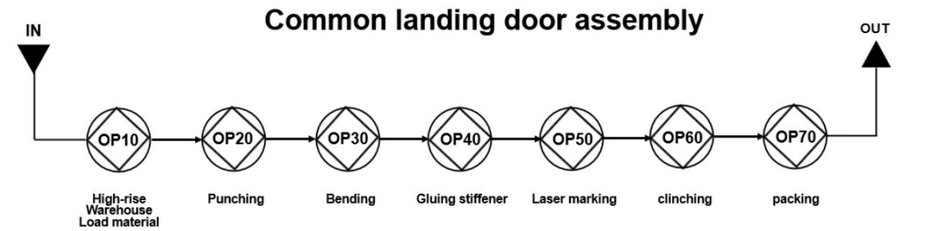
The production address of the product assessed in this report is No.71, 9th Avenue, Tianjin Economic Technology Development Area, Tianjin, China. The parts produced by the factory and the parts produced by the suppliers are uniformly boxed at this address and then distributed to the construction sites.

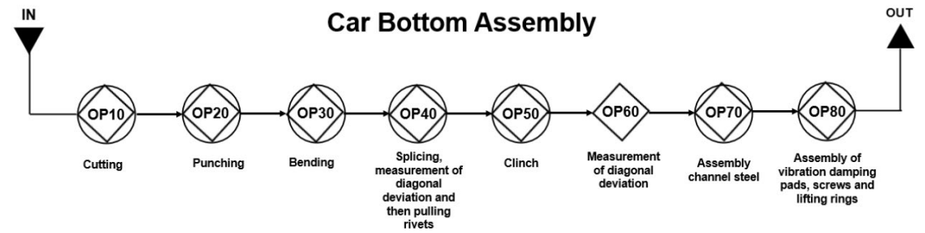
There are a lot of elevator parts, some of which are manufactured by suppliers and shipped to OTIS for direct re-boxing before being sent to the site for installation. Production at OTIS can be divided into two categories according to type:

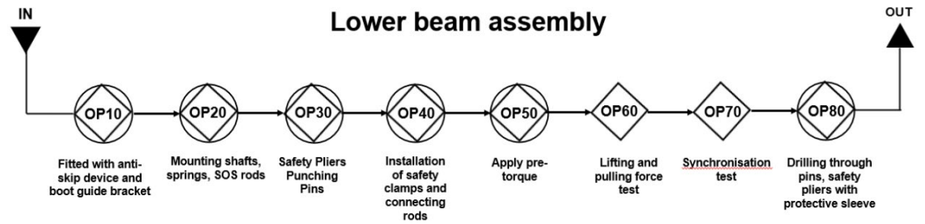
1) production by the plate through cutting, punching, bending as the main process, such as landing doors, car bottom, lower beam, and other components

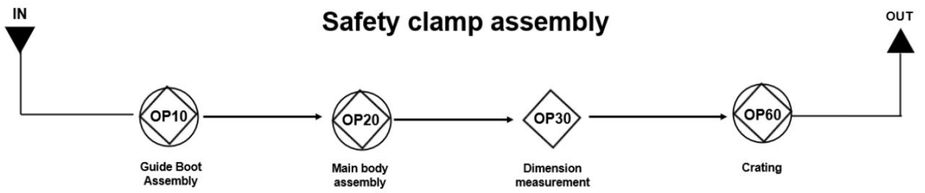
2) assembly production such as safety clamps, speed limiters, door sets, control cabinets, etc.

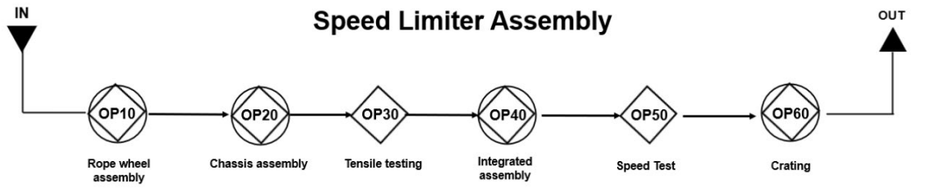
Following Figure shows the main production process:

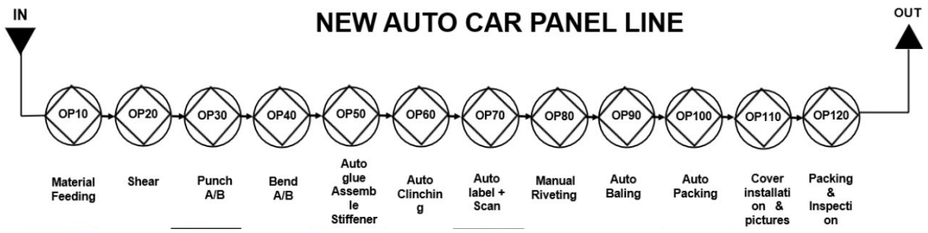












CONSTRUCTION PROCESS STAGE: MODULES A4-A5

Module A4 Transport relates to transportation of products from manufacturing site to the building site. In this study, the product is currently sold mainly in the China region and will be sold to other regions later, the China scenario is the main scenario. In addition, three other regional scenarios are also assessed in this study: Asia, the Middle East, and Latin America. Among them, Singapore, Dubai, and Mexico City are selected as representative cities for Asia, the Middle East, and Latin America, respectively.The transportation mode of product sold to China is factory-lorry transport - building site. The transportation mode of product sold to other countries is factory-lorry transport - port of exporting country - sea transport - port of importing country - lorry transport - building site.

In module A5 Construction installation, the lift installation process involves the use of auxiliary materials, the production and transport of energy, and the disposal of waste generated by the packaging materials of the lift. Packaging waste is generated during the installation process. Due to the difficulty of obtaining information on the actual treatment of packaging after abandonment, it is conservatively assumed that packaging materials will not be recycled after abandonment, but will be transported to incineration treatment directly.

USE STAGE: MODULES B1-B7

According to C-PCR-008 Lifts (Elevators), modules B1, B3, B4, B5, B7 are excluded in the scope of the system boundary (not considering the use of lifts beyond the 25-year lifespan), so the use stage assessed in this study are B2 Maintenance Stage and B6 Operational Energy Use Stage.

In the case of maintenance operations, the current practice is mainly based on observation by site staff, recommending the owner to replace the parts if they are old or worn out. Ultimately, the owner decides whether or not to replace them. Therefore, in this study, no parts replacement is considered in the maintenance phase, but the lubricating oil is applied during maintenance. The amount of lubricating oil used is 2L, which is based on the scenario used in the skyrise products EPD project implemented by OTIS France. In addition, the environmental impacts from transport over the lifetime are assessed on the basis of a scenario assumption of a 60-kilometre round-trip maintenance service by the maintenance staff at one visit per month by two persons.

The expected energy consumption of the Arise lift is calculated to be 47815.7793 kWh according to ISO 25745-2. This energy consumption is calculated based on the selection of the same performance eigenvalues as those used to calculate the functional units.

The electricity used at the sites of the four installation scenarios are shown in the following table. The selection relationships in the table below are also applied when other remaining life cycle stages are involved in the environmental impact assessment of electricity. The type of energy mix applied for each scenario is d) Electricity consumption mix on the market.

Location	Electricity factor	GWP-GHG impact $kgCO_2eq/kWh$)
China	Electricity, low voltage {CN}| market group for electricity, low voltage | Cut-off, U	0.9712
Singapore (Asia)	Electricity, low voltage {SG}| market for electricity, low voltage | Cut-off, U	0.5054
Dubai (Middle East)	Electricity, low voltage {AE}| market for electricity, low voltage | Cut-off, U	0.5874
Mexico (Latin America)	Electricity, low voltage {MX}| market for electricity, low voltage | Cut-off, U	0.6888

The impacts are driven primarily by the electricity consumption during use stage (25 years), creating approximately 50.44% of GWP total. There are no known releases of dangerous substances to indoor air, soil, and water during the use stage.

END-OF-LIFE (EOL) STAGE: MODULES C1-C4

The final disposal scenario for the products assessed in this study involves the transportation of disassembled products, pre-treatment and recycling processes and final waste disposal processes. In C1 module, the dismantling process required the use of power tools with a total power of 1000 W and a usage time of 8 hours. In C2 module, the dismantled product is transported from the building site to the waste disposal site. In the C3 and C4 module, the default recycling ratios of Annex G in EN50693: 2019 are applied to the recycling ratios for each component of the disassembled product, the end-of-life disposal scenario of the product is incineration. In addition, the end-of-life process for the product packaging is included in A5 Construction installation module of the product and is not double-counted in the end-of-life stage.

BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY: MODULE D

Module D assesses the environmental impact of the net flows of recovered materials (recycled or reused) or energyware leaving modules A-C. The loads and benefits related to the energy as a result of waste incineration in the A5, C3 and C4 stages are evaluated in module D.

Content Declaration

The tables below show a material summary of ARISE studied and its packaging, as delivered and installed in a building. Data are provided by Otis according to the cut-off rules described in the appropriate section. The biogenic carbon content of organic materials in products and packaging is derived from the default values in Ecoinvent 3.9.1 database. For other materials, according to EN 15804:2019 and PCR 2019:14 CONSTRUCTION PRODUCTS, since the biogenic carbon contained is unknown and significantly less than 5 % of the total mass, this part of the content declaration is declared as 0% as a conservative estimation.

Elevators are customized products, and additional features such as decoration can be added according to customer requirements. In this study, the impact of additional features is not assessed, i.e., optional components, decoration, etc., are not included in the assessment, and only the basic configuration of a representative model of elevator is used for the analysis of life cycle environmental impact.

The gross weight of ARISE is 8093.3386 kg, of which packaging materials 1169.4843 kg and account for 14.45%. The detailed content declaration of the product and packaging is shown in following table:

Content declaration of a product

Product components	Weight (kg)	Percentage of total weight	Post-consumer recycled material, weight-%	Biogenic material, weight-%	Biogenic material, kg C/product
Ferrous metals	6140.4509	88.68%	0.00	0.00	0.0000
Non-ferrous metals	58.1045	0.84%	0.00	0.00	0.0000
Plastic and rubbers	146.2853	2.11%	0.00	0.00	0.0000
Inorganic materials (e.g. concrete)	455.7000	6.58%	0.00	0.00	0.0000
Organic materials (e.g. paper or wood)	2.5059	0.04%	0.00	42.42	1.0630
Lubricants (e.g. oils and greases), paintings, coatings, adhesives and fillers	6.1832	0.09%	0.00	0.00	0.0000
Electric and electronic equipment	106.6745	1.54%	0.00	0.00	0.0000
Batteries and accumulators	0.9000	0.01%	0.00	0.00	0.0000
Other materials	7.0501	0.10%	0.00	0.00	0.0000
Total	6923.8543	100%	0.00	0.00	1.0630

Content declaration of packaging

Packaging components	Weight (kg)	Percentage of total weight	Post-consumer recycled material, weight-%	Biogenic material, weight-%	Biogenic material, kg C/product
Plastic and rubbers	12.6343	1.08%	0.00	0.00	0.0000
Organic materials (e.g. paper or wood)	1156.8500	98.92%	0.00	38.27	442.7600
Total	1169.4843	100%	0.00	37.86	442.7600

Environmental indicators

The results for the complete service lifetime of the ARISE was calculated according to the C-PCR and presented per functional unit (tkm). Assumptions are presented in the verified LCA Background report. The definition of the listed impact categories is given in the Glossary section of this declaration.

The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks. The results of the impact categories abiotic depletion of minerals and metals, land use, human toxicity (cancer), human toxicity, non-cancer and ecotoxicity (freshwater) may be highly uncertain in LCAs that include capital goods/infrastructure in generic datasets in case infrastructure/capital goods contribute greatly to the total results. This is because the LCI data of infrastructure/capital goods used to quantify these indicators in currently available generic datasets sometimes lack temporal, technological and geographical representativeness. Caution should be exercised when using the results of these indicators for decision-making purposes. The infrastructure has not been included within the system boundaries because it was considered not relevant in terms of environmental impacts but infrastructure was not substracted from the used LCI database for all upstream, core and downstream processes

This LCA analysis applied the EN 15804+A2(adapted) V1.00 as the calculation method. The mandatory environmental impact indicators and the associated impact methods listed in Annex C of EN 15804+A2 are declared (updated with EF 3.1). The characterization methodology referenced in EN15804+A2 is used for the calculation.

The following table shows the mandatory environmental impact indicators declared:

CORE ENVIRONMENTAL IMPACT INDICATORS	UNIT	REFERENCE
Global Warming Potential total (GWP-total)	kg CO_2 eq.	IPCC 2021 AR6
Global Warming Potential fossil fuels (GWP-fossil)	kg CO_2 eq.	IPCC 2021 AR6
Global Warming Potential biogenic (GWP-biogenic)	kg CO_2 eq.	IPCC 2021 AR6
Global Warming Potential land use and land use chage (GWP-luluc)	kg CO_2 eq.	IPCC 2021 AR6
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC-11 eq.	WMO 2014
Acidification potential, Accumulated Exceedance (AP)	mol H^+ eq.	Seppälä et al. 2006, Posch et al. 2008
Eutrophication potential, fraction of nutrients reaching freshwater end compartment (EP-freshwater)	kg P eq.	Struijs et al. 2009 as implemented in ReCiPe
Eutrophication potential, fraction of nutrients reaching freshwater end compartment (EP-marine)	kg N eq.	Struijs et al. 2009 as implemented in ReCiPe
Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	mol N eq.	Seppälä et al. 2006, Posch et al. 2008
Formation potential of tropospheric ozone (POCP)	kg NMVOC eq.	Van Zelm et al. 2008, ReCiPe 2008
Abiotic depletion potential for non-fossil resources (ADP- minerals & metals)	kg Sb eq.	Guinée et al. 2002, van Oers et al. 2002, CML 2001 baseline (Version: January 2016)
Abiotic depletion potential for fossil resources (ADP-fossil)	MJ	Guinée et al. 2002, van Oers et al. 2002, CML 2001 baseline (Version: January 2016)
Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	m^3 world eq. deprived	Boulay et al (2017)

MAIN SCENARIO (CHINA)

CORE ENVIRONMENTAL IMPACT INDICATORS

Results per functional unit											
Impact category	Unit	A1-A3	A4	A5	B2	B6	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq.	9.4264E+00	6.4484E-01	1.1812E+00	1.9098E+00	1.4423E+01	2.4131E-03	3.7880E-02	6.7937E-01	1.3727E-01	-1.3374E+00
GWP-fossil	kg CO_2 eq.	9.6822E+00	6.4432E-01	6.7634E-01	1.9078E+00	1.4414E+01	2.4117E-03	3.7844E-02	6.7883E-01	1.3603E-01	-1.3395E+00
GWP-biogenic	kg CO_2 eq.	-2.6647E-01	1.8698E-04	5.0449E-01	1.0742E-03	2.6158E-03	4.3764E-07	1.2781E-05	2.9794E-04	1.2324E-03	1.9517E-03
GWP-luluc	kg CO_2 eq.	1.0643E-02	3.3614E-04	3.2701E-04	9.4684E-04	5.8839E-03	9.8443E-07	2.3977E-05	2.3799E-04	1.0662E-05	9.0450E-05
ODP	kg CFC 11 eq.	1.9768E-07	1.0207E-08	1.2965E-08	3.9783E-08	3.0861E-08	5.1633E-12	5.4600E-10	1.1770E-09	2.8442E-10	-4.3036E-08
AP	mol H^+ eq.	5.7134E-02	2.8317E-03	2.8241E-03	7.7404E-03	7.9499E-02	1.3301E-05	2.0934E-04	7.5385E-04	7.1286E-05	-8.3453E-03
EP-freshwater	kg P eq.	6.3330E-03	5.2396E-05	1.0028E-04	2.7504E-04	2.8835E-03	4.8243E-07	3.6077E-06	5.5937E-05	7.7426E-06	-7.7887E-04
EP-marine	kg N eq.	1.1283E-02	1.0390E-03	7.9711E-04	2.1997E-03	1.6348E-02	2.7352E-06	8.1140E-05	2.1622E-04	3.3559E-05	-8.9662E-04
EP-terrestrial	mol N eq.	1.1785E-01	1.1113E-02	8.4293E-03	2.3350E-02	1.7445E-01	2.9187E-05	8.7398E-04	2.0526E-03	3.0621E-04	-1.4856E-02
POCP	kg NMVOC eq.	4.4158E-02	3.8147E-03	3.1780E-03	8.9349E-03	4.6217E-02	7.7325E-06	2.7615E-04	5.6228E-04	9.1256E-05	-8.3177E-03
ADP-minerals &metals	kg Sb eq.	4.5648E-04	2.0739E-06	6.5718E-06	2.0079E-05	5.8921E-05	9.8581E-09	1.5881E-07	9.8111E-07	2.4099E-08	-7.0452E-05
ADP-fossil	MJ	1.1142E+02	9.1226E+00	8.8835E+00	2.5755E+01	1.4045E+02	2.3498E-02	5.2103E-01	1.5284E+00	1.3058E-01	-1.2855E+01
WDP	m^3 world eq. deprived	9.6835E-01	4.0228E-02	5.8166E-02	1.7335E-01	1.6679E+00	2.7905E-04	2.3367E-03	2.8194E-02	-2.4777E-04	-2.0046E+00
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption *Disclaim: Regarding the indicators ADP-minerals&metals, ADP-fossil, WDP: The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicators. *Disclaim: The use of the results of modules A1-A3 (A1-A5 for services) without considering the results of module C is discouraged. *Disclaim: 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 GWP INDICATOR ACCORDING TO PCR FOR CONSTRUCTION PRODUCTS

Results per functional unit											
Impact category	Unit	A1-A3	A4	A5	B2	B6	C1	C2	C3	C4	D
GWP-GHG	kg CO_2 eq.	9.6929E+00	6.4465E-01	6.7667E-01	1.9087E+00	1.4420E+01	2.4127E-03	3.7868E-02	6.7907E-01	1.3604E-01	-1.3394E+00

ADDITIONAL IMPACT CATEGORIES AND INDICATORS

Results per functional unit											
Indicator	Unit	A1-A3	A4	A5	B2	B6	C1	C2	C3	C4	D
PM	Disease incidence	7.8597E-07	5.2754E-08	4.8881E-08	1.3958E-07	1.0794E-06	1.8059E-10	3.0463E-09	6.6739E-09	1.6410E-09	-6.3438E-08
IRP	kBg U235 eq.	4.9618E-01	7.7588E-03	1.5618E-02	4.1698E-02	6.2835E-01	1.0513E-04	5.1683E-04	1.4140E-02	1.7643E-04	1.3083E-02
ETP-fw	CTUe	9.2660E+01	5.0036E+00	5.6434E+00	1.6914E+01	4.3649E+01	7.3029E-03	3.0911E-01	6.4892E+00	4.3815E-01	9.6013E+00
HTP-c	CTUh	3.8085E-08	2.9311E-10	6.2643E-10	1.8862E-09	3.7239E-09	6.2305E-13	2.4841E-11	1.3626E-10	3.1867E-11	1.2794E-08
HTP-nc	CTUh	3.1144E-07	6.5439E-09	9.7865E-09	2.6371E-08	1.8384E-07	3.0758E-11	4.4226E-10	1.7270E-08	6.7508E-10	6.2983E-08
SQP	dimensionless	1.0717E+02	5.4381E+00	3.2095E+00	9.6725E+00	3.1981E+01	5.3507E-03	2.1645E-01	5.3066E-01	1.3650E-01	-5.9921E+00
Acronyms	PM=Potential incidence of disease due to PM emissions; IRP=Potential Human exposure efficiency relative to U235; ETP-fw= Potential Comparative Toxic Unit for ecosystems; HTP-c=Potential Comparative Toxic Unit for humans-cancer; HTP-nc=Potential Comparative Toxic Unit for humans-non-cancer; SQP= Potential soil quality index										

RESOURCES USE INDICATORS

Results per functional unit											
Indicator	Unit	A1-A3	A4	A5	B2	B6	C1	C2	C3	C4	D
PERE	MJ	2.2646E+01	1.1638E-01	2.6796E-01	6.4889E-01	1.6868E+01	2.8222E-03	1.7998E-01	3.3252E-03	-1.8058E+00	1.7998E-01
PERM	MJ	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
PERT	MJ	2.2646E+01	1.1638E-01	2.6796E-01	6.4889E-01	1.6868E+01	2.8222E-03	1.7998E-01	3.3252E-03	-1.8058E+00	1.7998E-01
PENRE	MJ	1.1141E+02	9.1226E+00	8.8834E+00	2.5755E+01	1.4045E+02	2.3498E-02	1.5284E+00	1.3058E-01	-1.2855E+01	1.5284E+00
PENRM	MJ	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
PENRT	MJ	1.1141E+02	9.1226E+00	8.8834E+00	2.5755E+01	1.4045E+02	2.3498E-02	1.5284E+00	1.3058E-01	-1.2855E+01	1.5284E+00
SM	kg	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
RSF	MJ	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NRSF	MJ	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
FW	m^3	4.2185E-02	1.3003E-03	1.9005E-03	5.6551E-03	4.0481E-02	6.7728E-06	1.0664E-03	5.1566E-05	-4.2954E-02	1.0664E-03
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy 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 re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water										

WASTE INDICATORS AND OUTPUT FLOWS INDICATORS

Results per functional unit											
Indicator	Unit	A1-A3	A4	A5	B2	B6	C1	C2	C3	C4	D
HWD	KG	9.3619E-04	5.8978E-05	6.0164E-05	1.8514E-04	1.0058E-04	1.6828E-08	3.3237E-06	4.0045E-06	7.3281E-07	-1.5353E-04
NHWD	KG	1.7548E+00	4.4295E-01	2.3742E-01	7.2023E-01	1.2034E+00	2.0134E-04	1.6247E-02	2.9864E-02	9.8205E-03	-5.9571E-01
RWD	KG	1.0859E-04	1.8435E-06	3.7916E-06	1.0139E-05	1.5126E-04	2.5307E-08	1.2358E-07	3.4592E-06	4.3406E-08	2.8325E-06
CRU	KG	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
MFR	KG	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.5372E+00	0.0000E+00	0.0000E+00
MER	KG	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
EEE	MJ	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
EET	MJ	0.0000E+00	0.0000E+00	3.2766E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	8.0736E-01	0.0000E+00
Acronyms	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy										

Results of additional scenario

The additional LCA results of scenario in Asia, the Middle East, and Latin America are shown below. These results are evaluated in the same methodology as the main environmental impact results, with the differences only from the geographical location.

ADDITIONAL SCENARIO: SINGAPORE (ASIA)

CORE ENVIRONMENTAL IMPACT INDICATORS

Results per functional unit											
Impact category	Unit	A1-A3	A4	A5	B2	B6	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq.	9.4264E+00	6.7465E-01	1.1571E+00	1.9098E+00	7.5052E+00	1.2557E-03	3.7880E-02	6.7937E-01	1.3727E-01	-1.3374E+00
GWP-fossil	kg CO_2 eq.	9.6822E+00	6.7409E-01	6.5232E-01	1.9078E+00	7.5036E+00	1.2554E-03	3.7844E-02	6.7883E-01	1.3603E-01	-1.3395E+00
GWP-biogenic	kg CO_2 eq.	-2.6647E-01	1.8604E-04	5.0449E-01	1.0742E-03	9.4891E-04	1.5876E-07	1.2781E-05	2.9794E-04	1.2324E-03	1.9517E-03
GWP-luluc	kg CO_2 eq.	1.0643E-02	3.7767E-04	3.0853E-04	9.4684E-04	5.6699E-04	9.4863E-08	2.3977E-05	2.3799E-04	1.0662E-05	9.0450E-05
ODP	kg CFC 11 eq.	1.9768E-07	1.0605E-08	1.3518E-08	3.9783E-08	1.8987E-07	3.1767E-11	5.4600E-10	1.1770E-09	2.8442E-10	-4.3036E-08
AP	mol H^+ eq.	5.7134E-02	5.6030E-03	2.5904E-03	7.7404E-03	1.2262E-02	2.0515E-06	2.0934E-04	7.5385E-04	7.1286E-05	-8.3453E-03
EP-freshwater	kg P eq.	6.3330E-03	4.9826E-05	9.1974E-05	2.7504E-04	4.9291E-04	8.2469E-08	3.6077E-06	5.5937E-05	7.7426E-06	-7.7887E-04
EP-marine	kg N eq.	1.1283E-02	1.6930E-03	7.4865E-04	2.1997E-03	2.4077E-03	4.0283E-07	8.1140E-05	2.1622E-04	3.3559E-05	-8.9662E-04
EP-terrestrial	mol N eq.	1.1785E-01	1.8392E-02	7.9151E-03	2.3350E-02	2.6515E-02	4.4362E-06	8.7398E-04	2.0526E-03	3.0621E-04	-1.4856E-02
POCP	kg NMVOC eq.	4.4158E-02	5.6873E-03	3.0766E-03	8.9349E-03	1.7044E-02	2.8517E-06	2.7615E-04	5.6228E-04	9.1256E-05	-8.3177E-03
ADP-minerals &metals	kg Sb eq.	4.5648E-04	1.9356E-06	6.5635E-06	2.0079E-05	5.6530E-05	9.4580E-09	1.5881E-07	9.8111E-07	2.4099E-08	-7.0452E-05
ADP-fossil	MJ	1.1142E+02	9.3457E+00	8.8009E+00	2.5755E+01	1.1671E+02	1.9526E-02	5.2103E-01	1.5284E+00	1.3058E-01	-1.2855E+01
WDP	m^3 world eq. deprived	9.6835E-01	3.8458E-02	5.3541E-02	1.7335E-01	3.3715E-01	5.6408E-05	2.3367E-03	2.8194E-02	-2.4777E-04	-2.0046E+00
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption *Disclaim: Regarding the indicators ADP-minerals&metals, ADP-fossil, WDP: The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicators. *Disclaim: The use of the results of modules A1-A3 (A1-A5 for services) without considering the results of module C is discouraged. *Disclaim: 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 GWP INDICATOR ACCORDING TO PCR FOR CONSTRUCTION PRODUCTS

Results per functional unit											
Impact category	Unit	A1-A3	A4	A5	B2	B6	C1	C2	C3	C4	D
GWP-GHG	kg CO_2 eq.	9.6929E+00	6.7446E-01	6.5263E-01	1.9087E+00	7.5042E+00	1.2555E-03	3.7868E-02	6.7907E-01	1.3604E-01	-1.3394E+00

ADDITIONAL IMPACT CATEGORIES AND INDICATORS

Results per functional unit											
Indicator	Unit	A1-A3	A4	A5	B2	B6	C1	C2	C3	C4	D
PM	Disease incidence	7.8597E-07	4.9732E-08	4.5312E-08	1.3958E-07	5.2752E-08	8.8259E-12	3.0463E-09	6.6739E-09	1.6410E-09	-6.3438E-08
IRP	kBg U235 eq.	4.9618E-01	7.4772E-03	1.3481E-02	4.1698E-02	1.3579E-02	2.2719E-06	5.1683E-04	1.4140E-02	1.7643E-04	1.3083E-02
ETP-fw	CTUe	9.2660E+01	5.0563E+00	5.5240E+00	1.6914E+01	9.3110E+00	1.5578E-03	3.0911E-01	6.4892E+00	4.3815E-01	9.6013E+00
HTP-c	CTUh	3.8085E-08	3.0433E-10	6.1923E-10	1.8862E-09	1.6547E-09	2.7685E-13	2.4841E-11	1.3626E-10	3.1867E-11	1.2794E-08
HTP-nc	CTUh	3.1144E-07	6.1581E-09	9.3827E-09	2.6371E-08	6.7666E-08	1.1321E-11	4.4226E-10	1.7270E-08	6.7508E-10	6.2983E-08
SQP	dimensionless	1.0717E+02	4.9064E+00	3.1324E+00	9.6725E+00	9.7930E+00	1.6385E-03	2.1645E-01	5.3066E-01	1.3650E-01	-5.9921E+00
Acronyms	PM=Potential incidence of disease due to PM emissions; IRP=Potential Human exposure efficiency relative to U235; ETP-fw= Potential Comparative Toxic Unit for ecosystems; HTP-c=Potential Comparative Toxic Unit for humans-cancer; HTP-nc=Potential Comparative Toxic Unit for humans-non-cancer; SQP= Potential soil quality index										

RESOURCES USE INDICATORS

Results per functional unit											
Indicator	Unit	A1-A3	A4	A5	B2	B6	C1	C2	C3	C4	D
PERE	MJ	2.2646E+01	1.1206E-01	2.1821E-01	6.4889E-01	2.5553E+00	4.2753E-04	8.4986E-03	1.7998E-01	3.3252E-03	-1.8058E+00
PERM	MJ	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
PERT	MJ	2.2646E+01	1.1206E-01	2.1821E-01	6.4889E-01	2.5553E+00	4.2753E-04	8.4986E-03	1.7998E-01	3.3252E-03	-1.8058E+00
PENRE	MJ	1.1141E+02	9.3457E+00	8.8009E+00	2.5755E+01	1.1671E+02	1.9526E-02	5.2103E-01	1.5284E+00	1.3058E-01	-1.2855E+01
PENRM	MJ	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
PENRT	MJ	1.1141E+02	9.3457E+00	8.8009E+00	2.5755E+01	1.1671E+02	1.9526E-02	5.2103E-01	1.5284E+00	1.3058E-01	-1.2855E+01
SM	kg	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
RSF	MJ	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NRSF	MJ	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
FW	m^3	4.2185E-02	1.2530E-03	1.8104E-03	5.6551E-03	1.4554E-02	2.4350E-06	7.4720E-05	1.0664E-03	5.1566E-05	-4.2954E-02
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy 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 re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water										

WASTE INDICATORS AND OUTPUT FLOWS INDICATORS

Results per functional unit											
Indicator	Unit	A1-A3	A4	A5	B2	B6	C1	C2	C3	C4	D
HWD	KG	9.3619E-04	5.8504E-05	6.1690E-05	1.8514E-04	5.3957E-04	9.0274E-08	3.3237E-06	4.0045E-06	7.3281E-07	-1.5353E-04
NHWD	KG	1.7548E+00	3.9517E-01	2.3431E-01	7.2023E-01	3.0794E-01	5.1521E-05	1.6247E-02	2.9864E-02	9.8205E-03	-5.9571E-01
RWD	KG	1.0859E-04	1.7708E-06	3.2777E-06	1.0139E-05	3.3965E-06	5.6826E-10	1.2358E-07	3.4592E-06	4.3406E-08	2.8325E-06
CRU	KG	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
MFR	KG	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.5372E+00	0.0000E+00	0.0000E+00
MER	KG	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
EEE	MJ	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
EET	MJ	0.0000E+00	0.0000E+00	3.2766E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	8.0736E-01	0.0000E+00
Acronyms	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy										

ADDITIONAL SCENARIO: DUBAI (MIDDLE EAST)

CORE ENVIRONMENTAL IMPACT INDICATORS

Results per functional unit											
Impact category	Unit	A1-A3	A4	A5	B2	B6	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq.	9.4264E+00	8.5226E-01	1.1614E+00	1.9098E+00	8.7223E+00	1.4593E-03	3.7880E-02	6.7937E-01	1.3727E-01	-1.3374E+00
GWP-fossil	kg CO_2 eq.	9.6822E+00	8.5152E-01	6.5655E-01	1.9078E+00	8.7206E+00	1.4590E-03	3.7844E-02	6.7883E-01	1.3603E-01	-1.3395E+00
GWP-biogenic	kg CO_2 eq.	-2.6647E-01	2.2207E-04	5.0449E-01	1.0742E-03	1.1048E-03	1.8484E-07	1.2781E-05	2.9794E-04	1.2324E-03	1.9517E-03
GWP-luluc	kg CO_2 eq.	1.0643E-02	5.1223E-04	3.0868E-04	9.4684E-04	6.0974E-04	1.0201E-07	2.3977E-05	2.3799E-04	1.0662E-05	9.0450E-05
ODP	kg CFC 11 eq.	1.9768E-07	1.3297E-08	1.3693E-08	3.9783E-08	2.4032E-07	4.0208E-11	5.4600E-10	1.1770E-09	2.8442E-10	-4.3036E-08
AP	mol H^+ eq.	5.7134E-02	1.0648E-02	2.5903E-03	7.7404E-03	1.2238E-02	2.0474E-06	2.0934E-04	7.5385E-04	7.1286E-05	-8.3453E-03
EP-freshwater	kg P eq.	6.3330E-03	5.6196E-05	9.1770E-05	2.7504E-04	4.3427E-04	7.2657E-08	3.6077E-06	5.5937E-05	7.7426E-06	-7.7887E-04
EP-marine	kg N eq.	1.1283E-02	2.9580E-03	7.4960E-04	2.1997E-03	2.6805E-03	4.4847E-07	8.1140E-05	2.1622E-04	3.3559E-05	-8.9662E-04
EP-terrestrial	mol N eq.	1.1785E-01	3.2381E-02	7.9258E-03	2.3350E-02	2.9589E-02	4.9505E-06	8.7398E-04	2.0526E-03	3.0621E-04	-1.4856E-02
POCP	kg NMVOC eq.	4.4158E-02	9.4777E-03	3.0861E-03	8.9349E-03	1.9777E-02	3.3089E-06	2.7615E-04	5.6228E-04	9.1256E-05	-8.3177E-03
ADP-minerals &metals	kg Sb eq.	4.5648E-04	2.1286E-06	6.5793E-06	2.0079E-05	6.1086E-05	1.0220E-08	1.5881E-07	9.8111E-07	2.4099E-08	-7.0452E-05
ADP-fossil	MJ	1.1142E+02	1.1538E+01	8.8715E+00	2.5755E+01	1.3700E+02	2.2921E-02	5.2103E-01	1.5284E+00	1.3058E-01	-1.2855E+01
WDP	m^3 world eq. deprived	9.6835E-01	4.3678E-02	5.3943E-02	1.7335E-01	4.5303E-01	7.5796E-05	2.3367E-03	2.8194E-02	-2.4777E-04	-2.0046E+00
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption *Disclaim: Regarding the indicators ADP-minerals&metals, ADP-fossil, WDP: The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicators. *Disclaim: The use of the results of modules A1-A3 (A1-A5 for services) without considering the results of module C is discouraged. *Disclaim: 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 GWP INDICATOR ACCORDING TO PCR FOR CONSTRUCTION PRODUCTS

Results per functional unit											
Impact category	Unit	A1-A3	A4	A5	B2	B6	C1	C2	C3	C4	D
GWP-GHG	kg CO_2 eq.	9.6929E+00	8.5204E-01	6.5686E-01	1.9087E+00	8.7212E+00	1.4591E-03	3.7868E-02	6.7907E-01	1.3604E-01	-1.3394E+00

ADDITIONAL IMPACT CATEGORIES AND INDICATORS

Results per functional unit											
Indicator	Unit	A1-A3	A4	A5	B2	B6	C1	C2	C3	C4	D
PM	Disease incidence	7.8597E-07	5.5442E-08	4.5318E-08	1.3958E-07	5.4297E-08	9.0843E-12	3.0463E-09	2.9794E-04	2.2042E-05	1.9517E-03
IRP	kBg U235 eq.	4.9618E-01	8.5802E-03	1.3496E-02	4.1698E-02	1.7856E-02	2.9874E-06	5.1683E-04	0.0000E+00	0.0000E+00	0.0000E+00
ETP-fw	CTUe	9.2660E+01	6.1460E+00	5.5272E+00	1.6914E+01	1.0232E+01	1.7119E-03	3.0911E-01	0.0000E+00	1.2103E-03	0.0000E+00
HTP-c	CTUh	3.8085E-08	3.8130E-10	6.1957E-10	1.8862E-09	1.7515E-09	2.9304E-13	2.4841E-11	2.9794E-04	1.2324E-03	1.9517E-03
HTP-nc	CTUh	3.1144E-07	6.8488E-09	9.3929E-09	2.6371E-08	7.0600E-08	1.1812E-11	4.4226E-10	2.9794E-04	2.2042E-05	1.9517E-03
SQP	dimensionless	1.0717E+02	5.1393E+00	3.1116E+00	9.6725E+00	3.8177E+00	6.3874E-04	2.1645E-01	0.0000E+00	0.0000E+00	0.0000E+00
Acronyms	PM=Potential incidence of disease due to PM emissions; IRP=Potential Human exposure efficiency relative to U235; ETP-fw= Potential Comparative Toxic Unit for ecosystems; HTP-c=Potential Comparative Toxic Unit for humans-cancer; HTP-nc=Potential Comparative Toxic Unit for humans-non-cancer; SQP= Potential soil quality index										

RESOURCES USE INDICATORS

Results per functional unit											
Indicator	Unit	A1-A3	A4	A5	B2	B6	C1	C2	C3	C4	D
PERE	MJ	2.2646E+01	1.2844E-01	2.1958E-01	6.4889E-01	2.9507E+00	4.9368E-04	8.4986E-03	1.7998E-01	3.3252E-03	-1.8058E+00
PERM	MJ	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
PERT	MJ	2.2646E+01	1.2844E-01	2.1958E-01	6.4889E-01	2.9507E+00	4.9368E-04	8.4986E-03	1.7998E-01	3.3252E-03	-1.8058E+00
PENRE	MJ	1.1141E+02	1.1538E+01	8.8714E+00	2.5755E+01	1.3700E+02	2.2921E-02	5.2103E-01	1.5284E+00	1.3058E-01	-1.2855E+01
PENRM	MJ	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
PENRT	MJ	1.1141E+02	1.1538E+01	8.8714E+00	2.5755E+01	1.3700E+02	2.2921E-02	5.2103E-01	1.5284E+00	1.3058E-01	-1.2855E+01
SM	kg	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
RSF	MJ	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NRSF	MJ	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
FW	m^3	4.2185E-02	1.4376E-03	1.8212E-03	5.6551E-03	1.7676E-02	2.9574E-06	7.4720E-05	1.0664E-03	5.1566E-05	-4.2954E-02
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy 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 re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water										

WASTE INDICATORS AND OUTPUT FLOWS INDICATORS

Results per functional unit											
Indicator	Unit	A1-A3	A4	A5	B2	B6	C1	C2	C3	C4	D
HWD	KG	9.3619E-04	6.9580E-05	6.2111E-05	1.8514E-04	6.6065E-04	1.1053E-07	3.3237E-06	4.0045E-06	7.3281E-07	-1.5353E-04
NHWD	KG	1.7548E+00	4.0694E-01	2.3425E-01	7.2023E-01	2.9204E-01	4.8860E-05	1.6247E-02	2.9864E-02	9.8205E-03	-5.9571E-01
RWD	KG	1.0859E-04	2.0236E-06	3.2814E-06	1.0139E-05	4.4684E-06	7.4760E-10	1.2358E-07	3.4592E-06	4.3406E-08	2.8325E-06
CRU	KG	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
MFR	KG	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.5372E+00	0.0000E+00	0.0000E+00
MER	KG	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
EEE	MJ	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
EET	MJ	0.0000E+00	0.0000E+00	3.2766E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	8.0736E-01	0.0000E+00
Acronyms	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy										

ADDITIONAL SCENARIO: MEXICO (LATAIN AMERICA)

CORE ENVIRONMENTAL IMPACT INDICATORS

Results per functional unit											
Impact category	Unit	A1-A3	A4	A5	B2	B6	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq.	9.4264E+00	1.2220E+00	1.1666E+00	1.9098E+00	1.0230E+01	1.7115E-03	3.7880E-02	6.7937E-01	1.3727E-01	-1.3374E+00
GWP-fossil	kg CO_2 eq.	9.6822E+00	1.2210E+00	6.6179E-01	1.9078E+00	1.0227E+01	1.7111E-03	3.7844E-02	6.7883E-01	1.3603E-01	-1.3395E+00
GWP-biogenic	kg CO_2 eq.	-2.6647E-01	3.2439E-04	5.0449E-01	1.0742E-03	1.8085E-03	3.0258E-07	1.2781E-05	2.9794E-04	1.2324E-03	1.9517E-03
GWP-luluc	kg CO_2 eq.	1.0643E-02	7.1830E-04	3.0984E-04	9.4684E-04	9.4278E-04	1.5774E-07	2.3977E-05	2.3799E-04	1.0662E-05	9.0450E-05
ODP	kg CFC 11 eq.	1.9768E-07	1.9112E-08	1.3560E-08	3.9783E-08	2.0212E-07	3.3816E-11	5.4600E-10	1.1770E-09	2.8442E-10	-4.3036E-08
AP	mol H^+ eq.	5.7134E-02	1.3624E-02	2.7174E-03	7.7404E-03	4.8811E-02	8.1666E-06	2.0934E-04	7.5385E-04	7.1286E-05	-8.3453E-03
EP-freshwater	kg P eq.	6.3330E-03	8.3684E-05	1.0022E-04	2.7504E-04	2.8640E-03	4.7917E-07	3.6077E-06	5.5937E-05	7.7426E-06	-7.7887E-04
EP-marine	kg N eq.	1.1283E-02	3.8643E-03	7.6737E-04	2.1997E-03	7.7915E-03	1.3036E-06	8.1140E-05	2.1622E-04	3.3559E-05	-8.9662E-04
EP-terrestrial	mol N eq.	1.1785E-01	4.2220E-02	8.1014E-03	2.3350E-02	8.0118E-02	1.3404E-05	8.7398E-04	2.0526E-03	3.0621E-04	-1.4856E-02
POCP	kg NMVOC eq.	4.4158E-02	1.2534E-02	3.1260E-03	8.9349E-03	3.1256E-02	5.2294E-06	2.7615E-04	5.6228E-04	9.1256E-05	-8.3177E-03
ADP-minerals &metals	kg Sb eq.	4.5648E-04	3.1979E-06	6.5810E-06	2.0079E-05	6.1562E-05	1.0300E-08	1.5881E-07	9.8111E-07	2.4099E-08	-7.0452E-05
ADP-fossil	MJ	1.1142E+02	1.6667E+01	8.9024E+00	2.5755E+01	1.4589E+02	2.4409E-02	5.2103E-01	1.5284E+00	1.3058E-01	-1.2855E+01
WDP	m^3 world eq. deprived	9.6835E-01	6.4886E-02	5.5727E-02	1.7335E-01	9.6632E-01	1.6167E-04	2.3367E-03	2.8194E-02	-2.4777E-04	-2.0046E+00
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption *Disclaim: Regarding the indicators ADP-minerals&metals, ADP-fossil, WDP: The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicators. *Disclaim: The use of the results of modules A1-A3 (A1-A5 for services) without considering the results of module C is discouraged. *Disclaim: 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 GWP INDICATOR ACCORDING TO PCR FOR CONSTRUCTION PRODUCTS

Results per functional unit											
Impact category	Unit	A1-A3	A4	A5	B2	B6	C1	C2	C3	C4	D
GWP-GHG	kg CO_2 eq.	9.6929E+00	1.2217E+00	6.6210E-01	1.9087E+00	1.0228E+01	1.7112E-03	3.7868E-02	6.7907E-01	1.3604E-01	-1.3394E+00

ADDITIONAL IMPACT CATEGORIES AND INDICATORS

Results per functional unit											
Indicator	Unit	A1-A3	A4	A5	B2	B6	C1	C2	C3	C4	D
PM	Disease incidence	7.8597E-07	8.2895E-08	4.6058E-08	1.3958E-07	2.6733E-07	4.4726E-11	3.0463E-09	6.6739E-09	1.6410E-09	-6.3438E-08
IRP	kBg U235 eq.	4.9618E-01	1.2701E-02	1.6394E-02	4.1698E-02	8.5169E-01	1.4250E-04	5.1683E-04	1.4140E-02	1.7643E-04	1.3083E-02
ETP-fw	CTUe	9.2660E+01	8.9238E+00	5.5986E+00	1.6914E+01	3.0752E+01	5.1451E-03	3.0911E-01	6.4892E+00	4.3815E-01	9.6013E+00
HTP-c	CTUh	3.8085E-08	5.4819E-10	6.2389E-10	1.8862E-09	2.9944E-09	5.0098E-13	2.4841E-11	1.3626E-10	3.1867E-11	1.2794E-08
HTP-nc	CTUh	3.1144E-07	1.0249E-08	9.4715E-09	2.6371E-08	9.3220E-08	1.5596E-11	4.4226E-10	1.7270E-08	6.7508E-10	6.2983E-08
SQP	dimensionless	1.0717E+02	7.8565E+00	3.1444E+00	9.6725E+00	1.3261E+01	2.2188E-03	2.1645E-01	5.3066E-01	1.3650E-01	-5.9921E+00
Acronyms	PM=Potential incidence of disease due to PM emissions; IRP=Potential Human exposure efficiency relative to U235; ETP-fw= Potential Comparative Toxic Unit for ecosystems; HTP-c=Potential Comparative Toxic Unit for humans-cancer; HTP-nc=Potential Comparative Toxic Unit for humans-non-cancer; SQP= Potential soil quality index										

RESOURCES USE INDICATORS

Results per functional unit											
Indicator	Unit	A1-A3	A4	A5	B2	B6	C1	C2	C3	C4	D
PERE	MJ	2.2646E+01	1.9021E-01	2.5423E-01	6.4889E-01	1.2919E+01	2.1614E-03	8.4986E-03	1.7998E-01	3.3252E-03	-1.8058E+00
PERM	MJ	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
PERT	MJ	2.2646E+01	1.9021E-01	2.5423E-01	6.4889E-01	1.2919E+01	2.1614E-03	8.4986E-03	1.7998E-01	3.3252E-03	-1.8058E+00
PENRE	MJ	1.1141E+02	1.6667E+01	8.9023E+00	2.5755E+01	1.4589E+02	2.4409E-02	5.2103E-01	1.5284E+00	1.3058E-01	-1.2855E+01
PENRM	MJ	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
PENRT	MJ	1.1141E+02	1.6667E+01	8.9023E+00	2.5755E+01	1.4589E+02	2.4409E-02	5.2103E-01	1.5284E+00	1.3058E-01	-1.2855E+01
SM	kg	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
RSF	MJ	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
NRSF	MJ	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
FW	m^3 world eq. deprived	4.2185E-02	2.1283E-03	1.8384E-03	5.6551E-03	2.2625E-02	3.7854E-06	7.4720E-05	1.0664E-03	5.1566E-05	-4.2954E-02
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy 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 re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water										

WASTE INDICATORS AND OUTPUT FLOWS INDICATORS

Results per functional unit											
Indicator	Unit	A1-A3	A4	A5	B2	B6	C1	C2	C3	C4	D
HWD	KG	2.2646E+01	1.9021E-01	2.5423E-01	6.4889E-01	1.2919E+01	2.1614E-03	8.4986E-03	4.0045E-06	7.3281E-07	-1.5353E-04
NHWD	KG	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	2.9864E-02	9.8205E-03	-5.9571E-01
RWD	KG	2.2646E+01	1.9021E-01	2.5423E-01	6.4889E-01	1.2919E+01	2.1614E-03	8.4986E-03	3.4592E-06	4.3406E-08	2.8325E-06
CRU	KG	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
MFR	KG	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.5372E+00	0.0000E+00	0.0000E+00
MER	KG	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
EEE	MJ	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
EET	MJ	0.0000E+00	0.0000E+00	3.2766E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	8.0736E-01	0.0000E+00
Acronyms	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy										

General information

Programme	The International EPD® System
Address	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website	www.environdec.com
E-mail	info@environdec.com

Accountabilities for PCR, LCA and independent, third-party verification

Product Category Rules (PCR)

CEN standard EN 15804:2012+A2:2019/AC:2021 serves as the Core Product Category Rules (PCR)

Product Category Rules (PCR): < C-PCR-008 Lifts (to PCR 2019:14), version 2024-03-08
UN CPC 4354 >< PCR 2019:14 Construction products, version 1.3.4>

PCR review was conducted by: The Technical Committee of the International EPD System. See www.environdec.com for a list of members. Review chair: Claudia A.Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact.

Life Cycle Assessment (LCA)

LCA accountability: <Abby Qin, TÜV SÜD Certification and Testing (China) Co., Ltd.>

Third-party verification

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

☒ EPD verification by individual verifier

Third-party verifier: < Leo Breedveld, 2B Srl, and signature of the third-party verifier>

Approved by: The International EPD® System

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

☐ Yes ☒ No

CONTACT INFORMATION:

EPD owner	Life Cycle Assessment (LCA)	LCA software and database	15804:2012+A2:2019/AC:2021reference package	Programme operator
OTIS	TÜV SÜD			EPD®
OTIS Elevator (China) Co., Ltd. No.71, 9th Avenue, Tianjin Economic Technology Development Area, Tianjin, China	Qin, Abby Abby.Qin@tuvsud.com TÜV SÜD Certification and Testing (China) Co., Ltd.	Simapro 9.6.0.1 and ecoinvent 3.9.1	EF 3.1	EPD International AB info@environdec.com

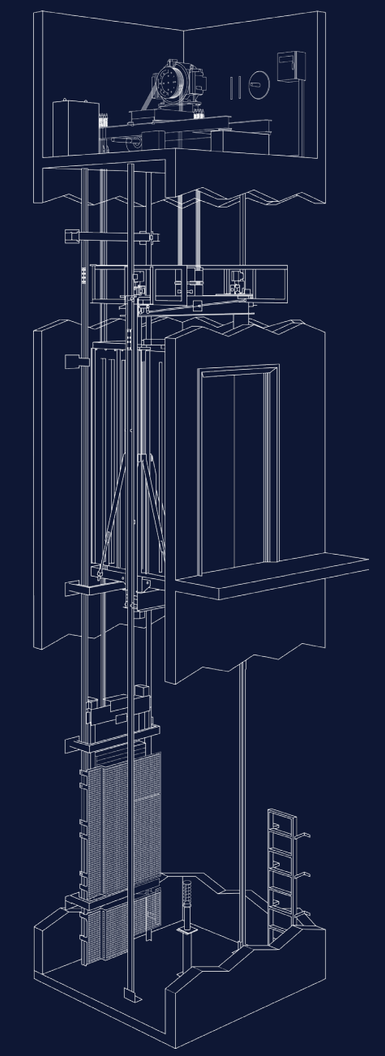
The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804:2012+A2:2019/AC:2021, 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.

ISO Certified Otis factories

Otis sustainable development and environment strategy, leading to more and more energy efficient elevators, incorporates also the production. Our manufacturing plants and facilities in China has taken their commitment to continuously improve their environmental performance.

TEDA manufacturing factory is already certified the ISO 9001, ISO 14001 and ISO 45001 in the scope of design, development, manufacture, installation and servicing of elevators. We have established and applied an Occupational Health and Safety management, Quality management system and also Environmental Management system. We are continuously and rigorously monitoring both recyclable and non recyclable waste, as well as hazardous waste, water consumption and greenhouse gas emissions. By moving progressively from supplied packaging and logistics to in-house, we are currently also dealing with packaging management. We are able to recycle such packaging material and use it again or as a box filling to secure the product. Our factory manages energy consumption following our “ Otis Global Standard 193” energy management system. Factory follows the Otis Global environmental, social and governance (ESG) Our major customers and as importantly Governments care about how the elevators are manufactured and are becoming more conscious about the energy performance and the environmental protection.



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3) ISO 14025:2006, Environmental labels and declarations – Type III environmental declarations – Principles and procedures

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

5) EPD International (2021) General Programme Instructions for the International EPD® System. Version 4.0

6) Product category rules (PCR): CONSTRUCTION PRODUCTS, PCR 2019:14, VERSION 1.3.4

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13) CEN (1998): EN-81 series, Safety rules for the construction and installation of lifts

14) DIRECTIVE 2008/98/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 19 November 2008 on waste and repealing certain Directives

15) Database for the physico-chemical composition of (treated) lignocellulosic biomass, micro- and macroalgae, various feedstocks for biogas production and biochar, https://phyllis.nl/.

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