EPD®
THE INTERNATIONAL EDP® SYSTEM

TKE


# ENVIRONMENTAL PRODUCT DECLARATION

## VELINO 100/200

| | |
|---|---|
| EPD Owner | TK Elevator GmbH |
| Program | The International EPD® System EPD International AB www.environdec.com |
| EPD registration number | S-P-07963 |
| Published | 2023-07-26 |
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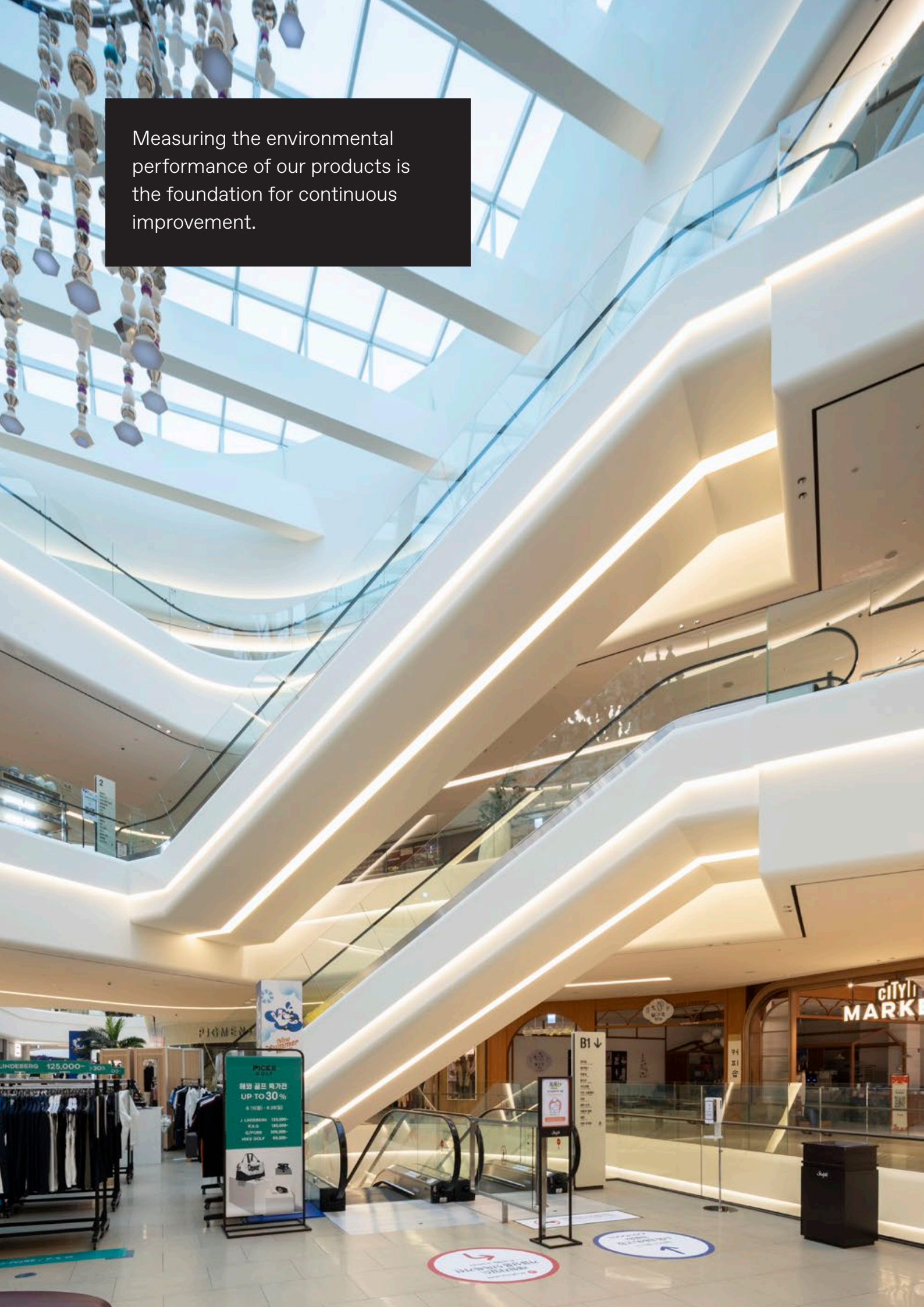
| Valid until | 2028-07-25 |

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**

ECO PLATFORM EPD VERIFIED

In accordance with ISO 14025:2006 and EN15804:2012+A2:2019

MOVE BEYOND


Measuring the environmental performance of our products is the foundation for continuous improvement.
B1
UP TO 30%

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## Program-related information & mandatory statement

**Program operator**
The International EPD® System

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2028-07-25

**Geographical scope of application**
Europe and North America

**Reference year for underlying data**
2022

**Reference years of datasets**
2017-2022

**Product category rules (PCR)**
EN15804:2012 + A2:2019 as core PCR
PCR 2019:14 Construction Products, version 1.2.2
C-PCR-025 (TO PCR 2019:14) ESCALATORS AND MOVING WALKS version 2023-06-12

**Verification**

Independent verification of the declaration and data, according to EN ISO 14025:2010

Covering: ☐ EPD process certification
☒ EPD verification by individual verifier

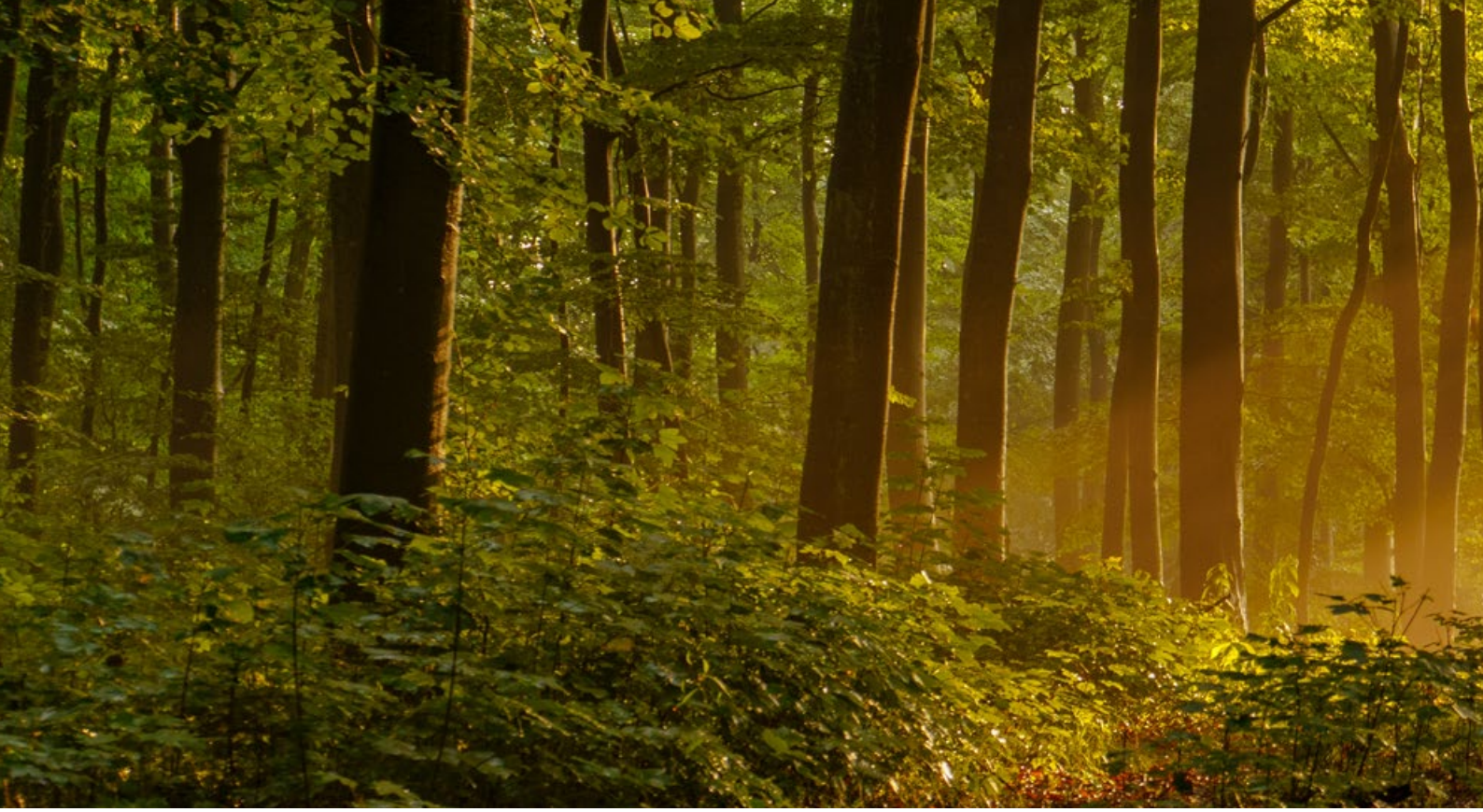
Procedure for follow-up during EPD validity involves third party verifier: ☐ Yes ☒ No

Third party verifier: Rubén Carnerero Acosta (individual verifier)
Approved by the International EPD® System
Contact: r.carnerero@ik-ingenieria.com

**Product classification**
UN CPC 4354 – Lifts, skip hoists, escalators and moving walkways
LCA accountability: Mario Mangas Suárez, TK Elevator Innovation center

**PCR review was conducted by**
The Technical Committee of the International EPD® System
See www.environdec.com/TC 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

The EPD owner has the sole ownership, liability, and responsibility for the EPD. within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.



# About this Environmental Product Declaration (EPD®)

At TK Elevator, we have a strong sense of responsibility towards our customers, employees, society and the environment. Our aim is always to develop solutions that go far beyond the industry standards in all these areas.

Within the context of sustainability, we want to understand the environmental performance of our products. That is why we develop Life Cycle Assessments (LCAs) to identify relevant fields of action and enhance the design process.

Our goal is to minimize the environmental impact of our products. To communicate the results of LCAs to the public and ensure transparency regarding the environmental impact of our products, we publish EPDs.

The benefit for our customers is solutions that fulfil the highest demands in terms of efficiency and product responsibility. In addition, they can use EPDs in the context of their green building certifications and introduce escalators into the life cycle assessment of their buildings.

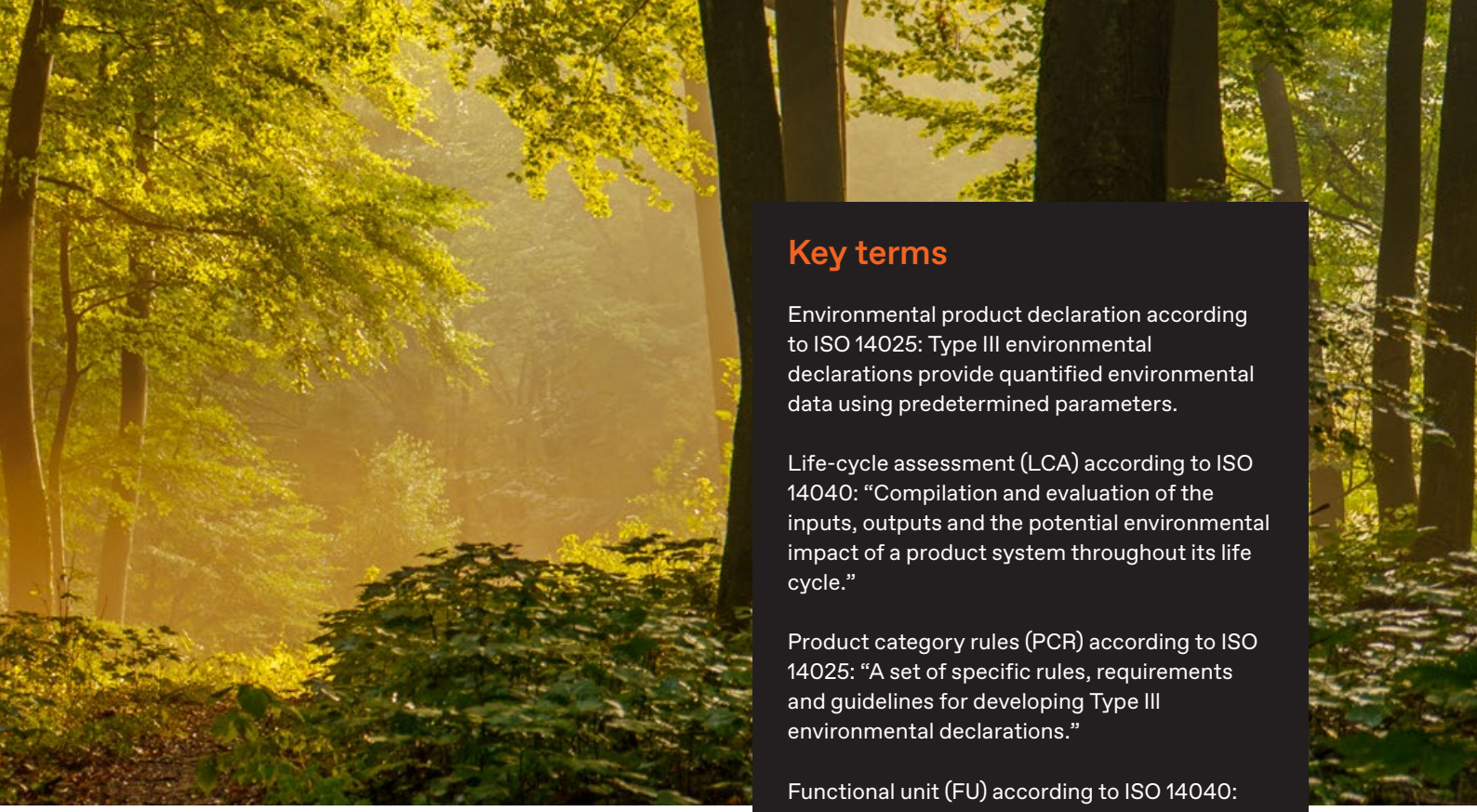
## What is an EPD®?

An EPD® provides information about the environmental performance of a product. In the case of this publication, the results refer to TKE velino 100/200 Escalator.

## Development of this EPD

Both the EPD® and the underlying LCA study have been developed and third-party-verified in accordance with the product category rules (PCRs) for escalators and moving walks within the framework of the International EPD® system and its general program instructions for type III environmental declarations according to ISO 14025.

Furthermore, development and verification also follow ISO 14040/44 and the calculation of the energy demand is carried out in accordance with ISO 25745-3. The characterization methodologies used to calculate impact categories on midpoint level are those recommended by EC-JRC, as requested by the PCRs.



## Key terms

Environmental product declaration according to ISO 14025: Type III environmental declarations provide quantified environmental data using predetermined parameters.

Life-cycle assessment (LCA) according to ISO 14040: “Compilation and evaluation of the inputs, outputs and the potential environmental impact of a product system throughout its life cycle.”

Product category rules (PCR) according to ISO 14025: “A set of specific rules, requirements and guidelines for developing Type III environmental declarations.”

Functional unit (FU) according to ISO 14040: “The quantified performance of a product system for use as a reference unit.”

## Data collection

The data used in the present study is a combination of measured, calculated and estimated data.
The main data sources are the internal data of TK Elevator, generic databases such as Sphera LCA for experts (version 10.7.0.183) and data from Tier 1 suppliers.

## Cut-off criteria

Cut-off criteria were applied in accordance with the PCR and EN 15804.
The evaluation was comprehensive, covering all mandatory inflows and outflows while also considering the quality and completeness of data.
For information module [A1-Raw material supply] the amount of input materials corresponds to 100% of the reference unit weight.
Production, maintenance and disposal of manufacturing infrastructure, indirect activities, business travel and all other non-mandatory processes were not included in the analysis.

## Description of functional unit (FU)

According to the PCRs for escalators, the functional unit is defined as “transportation of a load over a distance, expressed in tonne [t] over a kilometre [km] travelled, i.e. passengerkilometre [pkm]”.

## Comparability of results

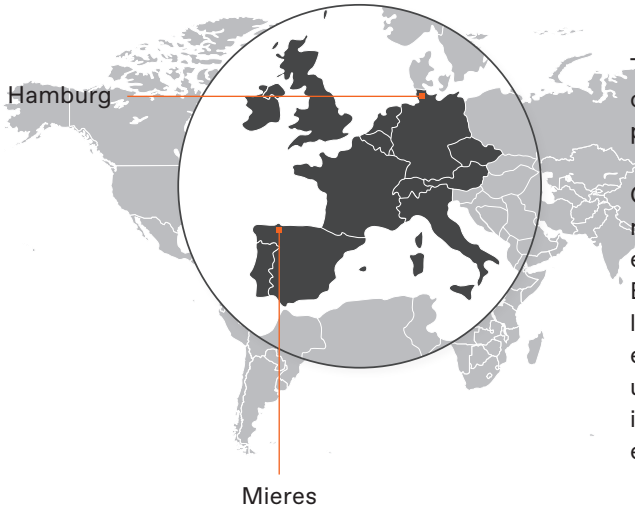
Comparability between EPDs based on this c-PCR- 025 (to PCR 2019:14) is only achievable, if the following performance characteristic are identical and the geographic regions are equivalent: Functional unit (FU) and Operation mode and usage class (UC).

## Reference standards

- ISO 14040 (2006). Environmental management. Life cycle assessment. Principles and framework.
- ISO 14044 (2006). Environmental management. Life cycle assessment. Requirements and guidelines.
- ISO 14025 (2006). Environmental labels and declarations. Type III environmental declarations. Principles and procedures.
- ISO 25745-3 (2015). Energy performance of lifts, escalators and moving walks. Part 3: Energy calculation and classification of escalators and moving walks.
- EN15804:2012+A2:2019 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.
- PCR 2019-14 Construction products.
- C-PCR-025 (TO PCR 2019:14) ESCALATORS AND MOVING WALKS version 2023-06-12

# About us

Mieres, Spain




TK Elevator serves customers in over 100 countries and employs more than 50,000 people across approximately 1,000 locations.

Our customers are around the world, and our manufacturing footprint reflects this reality, extending from North and South America to Europe and Asia Pacific. At each of these locations, we concentrate our expertise and experience on engineering and manufacturing urban mobility solutions, developing innovations and continuously optimising existing products.

As a part of this network, our plants in Mieres, Spain and Hamburg in Germany, produce velino escalators to the highest quality standards customers expect from TK Elevator.

Hamburg, Germany

**Commited to excellence**

We are also committed to achieving the highest standards in all our processes and operations with regard to health, safety, environmental protection and the responsible use of energy and resources. For this reason, all our operations are certified in accordance with the following international standards:

- ISO 9001 Quality Management System
- ISO 14001 Environmental Management System
- ISO 45001 Occupational Health and Safety Management System
- EN 1090-2 Welding Certificate for execution of structural steel components
- CSA Standard W47.1 Certification of Companies for Fusion Welding of Steel

# THE VELINO

# The velino 100/200 escalator system

The velino series – the velino 100 and 200 – is TK Elevator's most advanced range of escalators designed to fit the whole bandwidth of commercial applications. The velino series covers all commercial needs from standard to design-oriented applications and tailored projects.

Each and every velino makes a good choice:

- Smart product design paves the way for smooth operations.
- Superior product quality ensures durability.
- Multiple features offer sustainable performance.
- Focus on safety, with over 50 smart safety-enhancing features.

## Catering to every need

- **velino 100: Makes sound business sense**

High-quality technology based on German engineering expertise and components built for reliably sustainable operations make the velino 100 a great investment. TKE's value-for-money escalator makes business sense in commercial buildings where practical solutions are needed.

- **velino 200: Designed to stand out**

On top of the velino 100 benefits, velino 200 heightens building's premium appeal by offering the flexibility to design a one-of-a-kind escalator based on multiple design options and functions that suit every need.

The velino series complies with all relevant international standars and regulation:

- **2006/42/EC** New Machinery Directive of the European Parliament
- **EN115-1** Safety of escalators and moving walks
  - Part 1: Construction and Installation, and installation of lifts
- **ASME A17.1/CSA B44** Safety Code for Elevators and Escalators
- **CE marking** in compliance with EU legal requirements to guarantee health, safety and environmental protection
- **ISO 25754 – 1/2** Energy performance of lifts, escalators and moving walks

**Table 1: Specification of assessed escalator according to the PCRs**

| velino 100/200 | | |
|---|---|---|
| **Index** | **Representative values for the reference unit** | **Aplication range of the escalator model** |
| **Type of installation** | Escalator | |
| **Type of configuration** | New generic installation | |
| **Commercial name** | velino 100/200 | |
| **Recommended application (main market)** | Commercial | |
| **Main purpose** | Transport of passengers | |
| **Type of Escalator** | Electric | |
| **Type of drive system** | Traction drive | |
| **Capacity** | 6.000 persons/hour | 4.800 persons/hour or 6.000 persons/hour (width 800 or 1.000) |
| **Rated speed** | 0,5 m/s | 0,5 m/s – 0,65 m/s |
| **Rise** | 4,5m | Up to 15m |
| **Step width** | 1.000 | 800/1.000 |
| **Angle of inclination** | 30° | |
| **Operation Mode** | Slow speed | |
| **Number of operating days per year** | 315 | |
| **Applied usage categories (UC) acc. to ISO 25745-3** | 2 | 1 and 2 |
| **Designed reference service life (RSL)** | 15 years with no modernizations considered | |
| **Geographic region of installation** | Europe and North America | |
| **Functional units for selected usage categories according to the PCRs. FU (pkm)** | 295.785 | |

## Representative installation

The reference for the underlying life-cycle assessment (LCA) study is planning for a commercial escalator whose typical use is a department store or building with similar characteristics in Europe and North America. Its configuration corresponds to the typical application range of the velino 100/200 escalator. For energy consumption during operation, Europe have been considered as main scenario, being North America a second and additional scenario.

## Value and relevance of functional unit (FU)

The FU is determined by the physical characteristics of the assessed escalator (e.g. rated load, rated speed, travelled height) and parameters that are chosen based on its assumed use (e.g. use category, operating days per year). The usage categories included in the analysis reflect the use of this product in department stores or similar facilities.

## Content declaration

Almost 75% of the material the escalator belongs to the material category of ferrous metals, followed by non ferrous metal with 13%, glass with 8,42%, plastics and rubbers (2,05 %) and electrics and electronics (1,42 %). The rest of the material categories account each for less than 1%.

**Table 2: distribution materials**

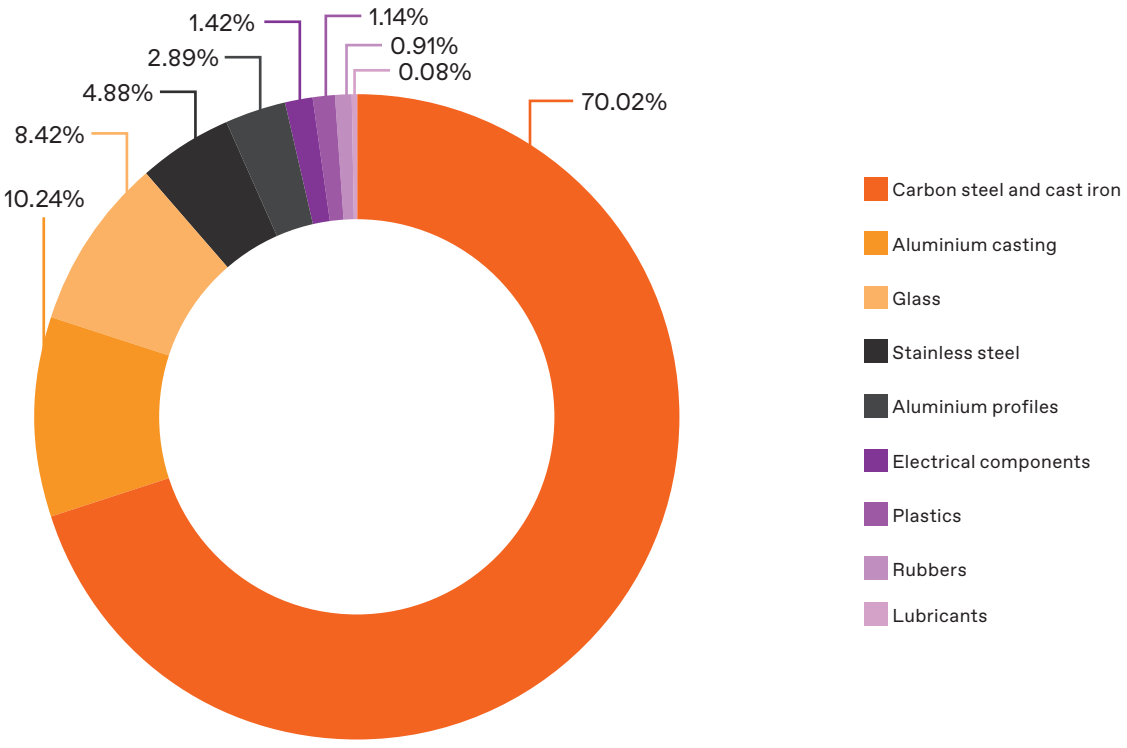
| | Escalator | | Packaging | |
|---|---|---|---|---|
| **Material category** | **Weight [kg]** | **Share [%]** | **Weight [kg]** | **Share [%]** |
| **Ferrous metals (carbon steel, stainless steel, galvanized steel and cast iron)** | 4.085 | 74,89% | | |
| **Non-ferrous metals (aluminium)** | 716 | 13,13% | | |
| **Plastics & rubbers** | 112 | 2,05% | 63,52 | 55,41% |
| **Inorganic materials (concrete, cardboard)** | | 0 | | |
| **Organic materials** | | 0 | 51,118 | 45% |
| **Lubricants & paintings** | 5 | 0,08% | | |
| **Electrics & electronics (electrical cables, printed boards and electronic elements)** | 77 | 1,42% | | |
| **Glass** | 459 | 8,42% | | |
| **Other materials** | 0 | 0,00% | | |
| **Total** | **5.455** | **100%** | **115** | **100%** |

Substances in the SVHC list according to REACH directive are avoided as far as possible. Nevertheless, lead (CAS number 7439-92-1) may be present above 0.1 % in weight in some articles used in the product.

The main material used for the packaging of the escalator is plastic, that represents close to 56% of the overall packaging weight and contain 24,7 kg C of biogenic carbon.

The product-specific content of recycled materials is undetermined. Generic percentages taken from Gabi databases (version 10.7.0.183) are used for calculations. A detailed composition of the reference escalator and packaging in quantitative terms according to the PCRs is set out in Figure 1. This content declaration considers all life-cycle phases and cut-off rules according to the PCRs.

**Figure 1: % of material distribution**

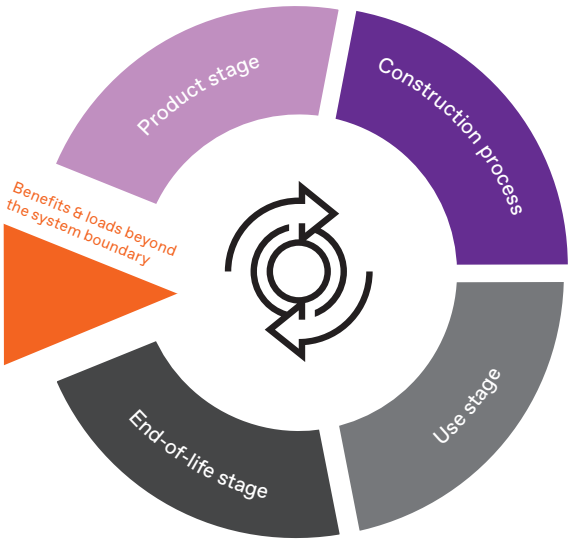


# Life cycle assessment

According to the applicable PCRs, this EPD has a cradle to grave scope plus module D. Therefore, it covers four main stages. The product stage (A1-A3) aggregates all processes related to the obtention of raw materials and their further transformation and processing to produce, assemble and pack all components for the assessed unit. Manufacturing activities take place at TKE site in Spain and Germany and suppliers located in Spain and China. The construction process stage (A4-A5) considers the road and sea transport from TKE to the installation site in Europe, the final assembly of the escalator, and the disposal of packaging. For product and construction stages, the percentage of specific data used is higher than 90%. The use stage (B1-B7) consists of all processes related to operation and preventive maintenance, mainly transport of workers to maintenance site, production of spare parts, energy and auxiliary materials used for maintenance and operational energy use. The end-of-life stage (C1-C4) considers all processes that take place at the end of the escalator service life, this is, the final disassembly, waste processing, and disposal of the escalator components and materials. Finally, module D includes the benefits derived from the recycling of metallic materials and energy recovery from the incineration of packaging materials. The geographical scope for all downstream processes is Europe.

TKE production plants in Germany (Hamburg) and Spain (Mieres) produces velino 100/200 escalator with similar material composition and production processes, in such way that the variation in environmental impacts remains below 10% for all categories declared in table 3. The resulting system boundaries are presented in the figure below.

**Figure 2: Escalator life cycle stages and respective information modules according to the PCRs**




| A1-A3 Product stage | | |
|---|---|---|
| **Information module** | | **Module declared** |
| **A1** | Raw material supply | x |
| **A2** | Transport | x |
| **A3** | Manufacturing | x |

| A4-A5 Construction process | | |
|---|---|---|
| **Information module** | | **Module declared** |
| **A4** | Transport | x |
| **A5** | Installation | x |

| B1-B7 Use stage | | |
|---|---|---|
| **Information module** | | **Module declared** |
| **B1** | Use | n.d. |
| **B2** | Maintenance | x |
| **B3** | Repair | n.d. |
| **B4** | Replacement | n.d. |
| **B5** | Refurbishment | n.d. |
| **B6** | Operational energy use | x |
| **B7** | Operational water use | n.d. |

| C1-C4 End-of-life stage | | |
|---|---|---|
| **Information module** | | **Module declared** |
| **C1** | Deconstruction | x |
| **C2** | Transport | x |
| **C3** | Waste processing | x |
| **C4** | Waste disposal | x |

| D Benefits & loads beyond system boundary | | |
|---|---|---|
| **Information module** | | **Module declared** |
| **D** | Reuse, recovery and recycling potential | x |

# Enviromental Performance

## Impact category results by life cycle stage per FU

The following section contains the results of the underlying LCA study according to the PCRs.

The disclosure of results is structured in three subsections: Potential environmental impacts, use of resources, waste categories and output flows.

## Potential enviromental impact per FU

**Table 3: Impact category results by information module**

| Information module | GWP total | GWP fossil | GWP biogenic | ODP | AP | EP freshwater | EP marine | EP terrestrial | POCP | ADP minerals and metals | ADP fossil | WDP | GWP 100* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | kg CO2 eq. | kg CO2 eq. | kg CO2 eq. | kg CFC-11 eq. | Mol of H+ eq. | kg P eq. | kg N eq. | Mol N eq. | kg NMVOC eq. | kg Sb eq. | MJ, net cal. value | $m^3$ world equiv. | kg CO2 eq |
| **A1** | 9,24E-02 | 9,23E-02 | 5,91E-05 | 1,68E-13 | 4,38E-04 | 4,06E-08 | 6,98E-05 | 7,48E-04 | 2,19E-04 | 5,38E-07 | 9,37E-01 | 1,90E-02 | 9,18E-02 |
| **A2** | 2,31E-03 | 2,29E-03 | 1,40E-05 | 1,32E-16 | 7,82E-05 | 1,23E-09 | 2,01E-05 | 2,20E-04 | 5,60E-05 | 9,60E-11 | 2,80E-02 | 5,97E-06 | 2,29E-03 |
| **A3** | 1,37E-02 | 1,40E-02 | -2,96E-04 | 3,88E-13 | 4,61E-05 | 3,04E-08 | 1,01E-05 | 1,08E-04 | 3,07E-05 | 1,01E-08 | 3,54E-01 | 4,12E-03 | 1,40E-02 |
| **Sum A1-A3** | 1,08E-01 | 1,09E-01 | -2,23E-04 | 5,56E-13 | 5,62E-04 | 7,22E-08 | 1,00E-04 | 1,08E-03 | 3,06E-04 | 5,48E-07 | 1,32E+00 | 2,31E-02 | 1,08E-01 |
| **A4** | 9,52E-04 | 9,07E-04 | 4,00E-05 | 5,39E-17 | 2,72E-06 | 2,69E-09 | 1,24E-06 | 1,39E-05 | 2,45E-06 | 7,53E-11 | 1,20E-02 | 8,07E-06 | 9,07E-04 |
| **A5** | 1,84E-03 | 1,46E-03 | 3,77E-04 | 1,38E-15 | 1,82E-06 | 1,50E-09 | 4,97E-07 | 5,24E-06 | 1,84E-06 | 1,73E-10 | 1,48E-02 | 9,07E-05 | 1,74E-03 |
| **B2** | 6,87E-03 | 6,85E-03 | 1,51E-05 | 6,43E-13 | 3,31E-05 | 4,40E-08 | 5,75E-06 | 6,04E-05 | 1,85E-05 | 1,35E-08 | 2,03E-01 | 1,02E-03 | 6,85E-03 |
| **B6** | 2,32E-01 | 2,30E-01 | 2,07E-03 | 3,37E-12 | 5,05E-04 | 6,71E-07 | 1,13E-04 | 1,19E-03 | 3,06E-04 | 6,10E-08 | 4,18E+00 | 5,25E-02 | 2,32E-01 |
| **C1** | 9,62E-04 | 9,59E-04 | 3,51E-06 | 2,57E-15 | 1,80E-06 | 1,15E-09 | 4,80E-07 | 4,88E-06 | 1,68E-06 | 1,89E-10 | 1,55E-02 | 5,83E-05 | 9,54E-04 |
| **C2** | 5,27E-05 | 5,01E-05 | 2,19E-06 | 4,92E-18 | 1,86E-07 | 1,79E-10 | 8,79E-08 | 9,64E-07 | 1,66E-07 | 5,05E-12 | 6,57E-04 | 5,61E-07 | 5,01E-05 |
| **C3** | 3,52E-05 | 3,50E-05 | 8,45E-08 | 9,46E-17 | 1,72E-07 | 8,02E-11 | 8,11E-08 | 8,86E-07 | 2,16E-07 | 3,97E-11 | 6,62E-04 | 5,94E-06 | 3,50E-05 |
| **C4** | 2,43E-04 | 1,12E-04 | 1,31E-04 | 6,97E-17 | 1,49E-07 | 1,07E-10 | 5,41E-08 | 6,83E-07 | 1,45E-07 | 9,63E-13 | 1,79E-04 | 4,02E-05 | 1,12E-04 |
| **D** | -2,49E-02 | -2,49E-02 | 5,52E-06 | -1,14E-14 | -9,44E-05 | -1,01E-08 | -1,61E-05 | -1,74E-04 | -4,86E-05 | -4,73E-08 | -2,95E-01 | -1,50E-03 | -2,50E-02 |

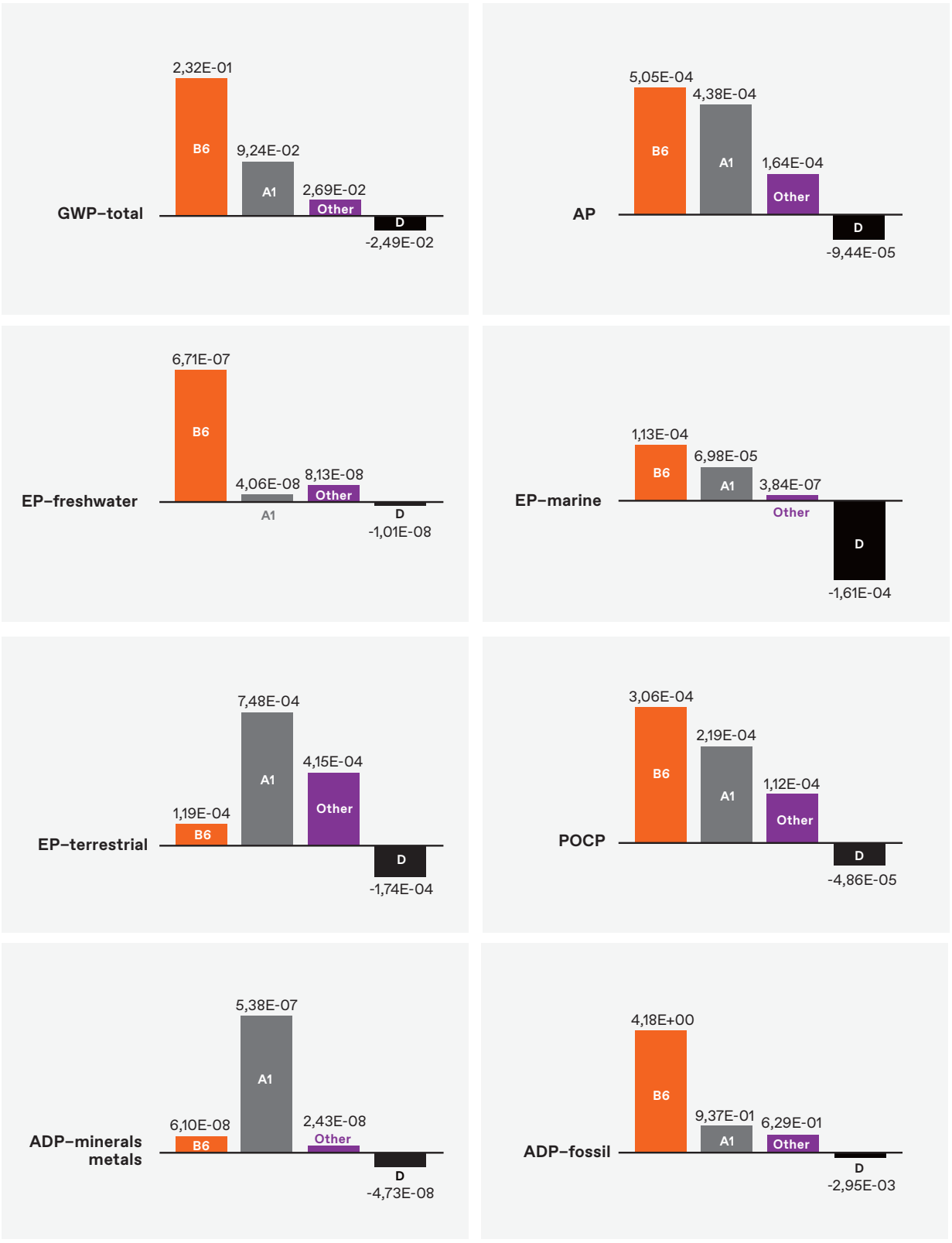
* GWP-100: IPCC AR5 GWP, excluded biogenic carbon.

The figure below shows the share of the different life-cycle stages for the most relevant impact categories in percentages, resulting in a sum of 100%. It is based in UC2.

**Figure 3: Impact category results by life-cycle stage (in %, UC2)**

In the figure below, the impact results of the three largest contributors (B6 and A1) to the overall UC2 results are compared with each other and the sum of the rest of the information modules.

**Figure 4: Comparison of impacts of main contributors**



# Use of resources per FU

The use of resources are divided into renewable and non-renewable energy resources, including primary energy and energy resources used as raw materials, secondary materials and fuels, and water.

**Table 4: Indicators describing resource use by information module**

| Indicator | PERE | PERM | PERT | PENRE | PENRM | PENRT | FW | SM | NRSF | RSF |
|---|---|---|---|---|---|---|---|---|---|---|
| Unit | MJ | MJ | MJ | MJ | MJ | MJ | $m^3$ | kg | MJ | MJ |
| **A1** | 5,79E-02 | 0,00E+00 | 5,79E-02 | 9,37E-01 | 0,00E+00 | 9,37E-01 | 4,71E-04 | 0.00E+00 | 1,27E-26 | 1,08E-27 |
| **A2** | 2,94E-04 | 0,00E+00 | 2,94E-04 | 2,81E-02 | 0,00E+00 | 2,81E-02 | 3,72E-07 | 0.00E+00 | 0,00E+00 | 0,00E+00 |
| **A3** | 1,93E-01 | 1,59E-03 | 1,95E-01 | 3,43E-01 | 1,10E-02 | 3,54E-01 | 1,06E-04 | 0.00E+00 | 0,00E+00 | 0,00E+00 |
| **Sum A1-A3** | 2,52E-01 | 1,59E-03 | 2,53E-01 | 1,31E+00 | 1,10E-02 | 1,32E+00 | 5,77E-04 | 0.00E+00 | 1,27E-26 | 1,08E-27 |
| **A4** | 6,84E-04 | 0,00E+00 | 6,84E-04 | 1,21E-02 | 0,00E+00 | 1,21E-02 | 7,74E-07 | 0.00E+00 | 0,00E+00 | 0,00E+00 |
| **A5** | 8,60E-04 | 0,00E+00 | 8,60E-04 | 1,48E-02 | 0,00E+00 | 1,48E-02 | 3,57E-06 | 0.00E+00 | 0,00E+00 | 0,00E+00 |
| **B2** | 1,34E-02 | 0,00E+00 | 1,34E-02 | 2,03E-01 | 0,00E+00 | 2,03E-01 | 4,11E-05 | 0.00E+00 | 0,00E+00 | 0,00E+00 |
| **B6** | 2,32E+00 | 0,00E+00 | 2,32E+00 | 4,18E+00 | 0,00E+00 | 4,18E+00 | 2,21E-03 | 0.00E+00 | 0,00E+00 | 0,00E+00 |
| **C1** | 1,72E-03 | 0,00E+00 | 1,72E-03 | 1,55E-02 | 0,00E+00 | 1,55E-02 | 3,16E-06 | 0.00E+00 | 0,00E+00 | 0,00E+00 |
| **C2** | 4,56E-05 | 0,00E+00 | 4,56E-05 | 6,60E-04 | 0,00E+00 | 6,60E-04 | 5,41E-08 | 0.00E+00 | 0,00E+00 | 0,00E+00 |
| **C3** | 6,49E-05 | 0,00E+00 | 6,49E-05 | 6,63E-04 | 0,00E+00 | 6,63E-04 | 1,72E-07 | 0.00E+00 | 0,00E+00 | 0,00E+00 |
| **C4** | 3,18E-05 | 0,00E+00 | 3,18E-05 | 1,79E-04 | 0,00E+00 | 1,79E-04 | 9,43E-07 | 0.00E+00 | 0,00E+00 | 0,00E+00 |
| **D** | -8,15E-02 | 0,00E+00 | -8,15E-02 | -2,96E-01 | 0,00E+00 | -2,96E-01 | -1,84E-04 | 0.00E+00 | 0,00E+00 | 0,00E+00 |

**PERE**
Use of renewable primary energy excluding renewable energy resources used as raw material

**PERM**
Use of renewable primary energy resources used as raw material

**PERT**
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw material)

**PENRE**
Use of non-renewable primary energy excluding non-renewable energy resources used as raw material

**PENRM**
Use of non-renewable primary energy resources used as raw material

**PENRT**
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw material)

**SM**
Use of secondary material

**RSF**
Use of renewable secondary fuels

**NRSF**
Use of non-renewable secondary fuels

**FW**
Net use of fresh water

# Waste categories and output flows per FU

The table below provides information about the amount of disposed waste by information module per tkm, according to the categories established in the reference PCRs.

**Table 5: Waste indicators by information module.**

| Indicator | HWD | NHWD | RWD |
|---|---|---|---|
| Unit | kg | kg | kg |
| **A1** | 2,87E-09 | 1,19E-02 | 4,22E-06 |
| **A2** | 1,17E-13 | 2,81E-06 | 3,38E-08 |
| **A3** | 5,73E-11 | 3,63E-04 | 7,89E-06 |
| **Sum A1-A3** | 2,92E-09 | 1,22E-02 | 1,21E-05 |
| **A4** | 5,77E-14 | 1,73E-06 | 1,35E-08 |
| **A5** | 1,09E-12 | 1,77E-04 | 1,76E-07 |
| **B2** | 3,90E-10 | 8,79E-04 | 8,11E-07 |
| **B6** | 3,61E-10 | 3,15E-03 | 6,68E-04 |
| **C1** | 1,15E-12 | 1,76E-05 | 4,43E-07 |
| **C2** | 3,49E-15 | 1,08E-07 | 1,23E-09 |
| **C3** | 8,93E-15 | 1,99E-07 | 6,76E-09 |
| **C4** | 1,27E-12 | 2,84E-04 | 6,76E-09 |
| **D** | -9,79E-12 | -4,26E-03 | -1,92E-05 |

**HWD**
Hazardous waste disposed

**NHWD**
Non hazardous waste disposed

**RWD**
Radioactive waste disposed

The amounts of materials leaving the system boundary after reaching the end-of-waste state is reported in table below.

Majority of the escalator materials are metals, with high recyclability. Organic materials used in packaging are considered to be directed to incineration.

**Table 6: Output flows.**

| Indicator | CRE | MFR | MER | EEE | EET |
|---|---|---|---|---|---|
| Unit | MJ | MJ | $m^3$ | kg | MJ |
| **A1** | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| **A2** | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| **A3** | 2,70E+00 | 2,73E-08 | 2,77E-08 | 8,03E-08 | 8,03E-08 |
| **SUM A1-A3** | 2,70E+00 | 2,73E-08 | 2,77E-08 | 8,03E-08 | 8,03E-08 |
| **A4** | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| **A5** | 0,00E+00 | 3,87E-04 | 3,92E-04 | 1,14E-03 | 1,14E-03 |
| **B2** | 4,85E-04 | 1,40E-05 | 1,42E-05 | 4,12E-05 | 4,12E-05 |
| **B6** | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| **C1** | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| **C2** | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| **C3** | 1,80E-02 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| **C4** | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |

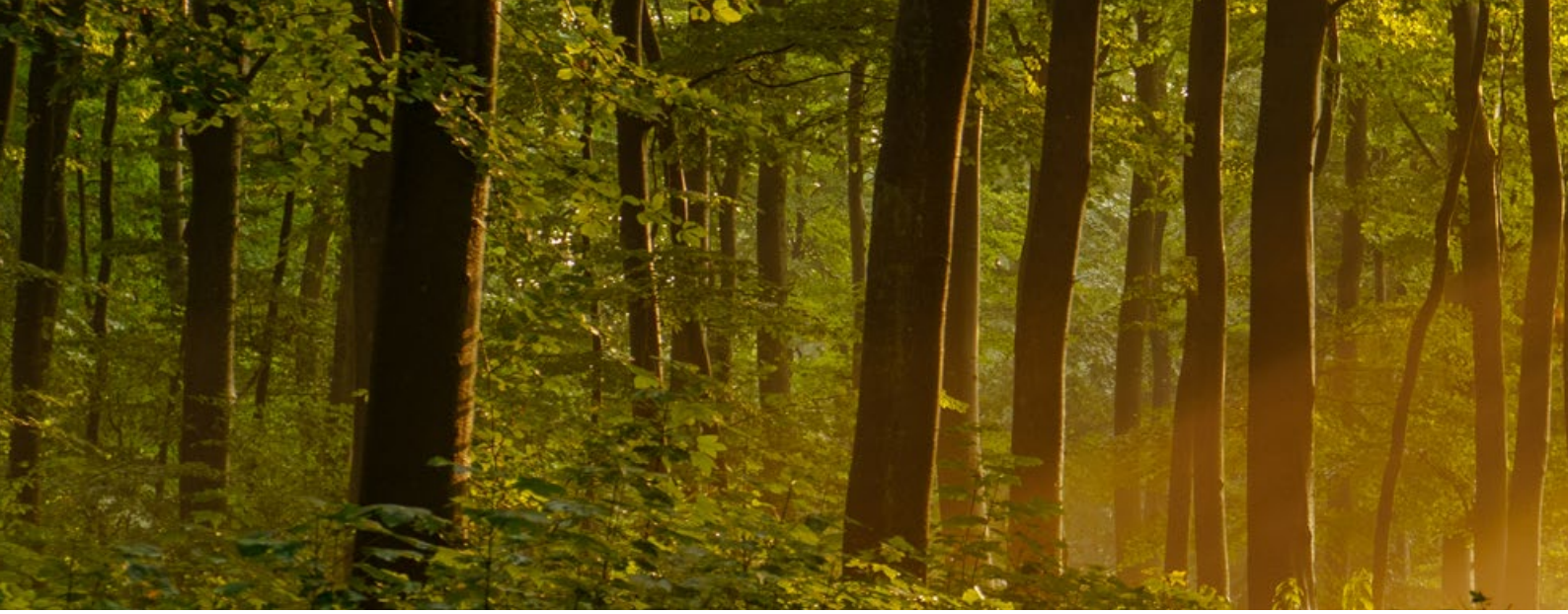
**CRE**
Components for reuse

**MFR**
Materials for recycling

**MER**
Materials for energy recovery

**EEE**
Exported energy Electrical

**EET**
Exported energy Thermal



## Absolute results for the reference unit

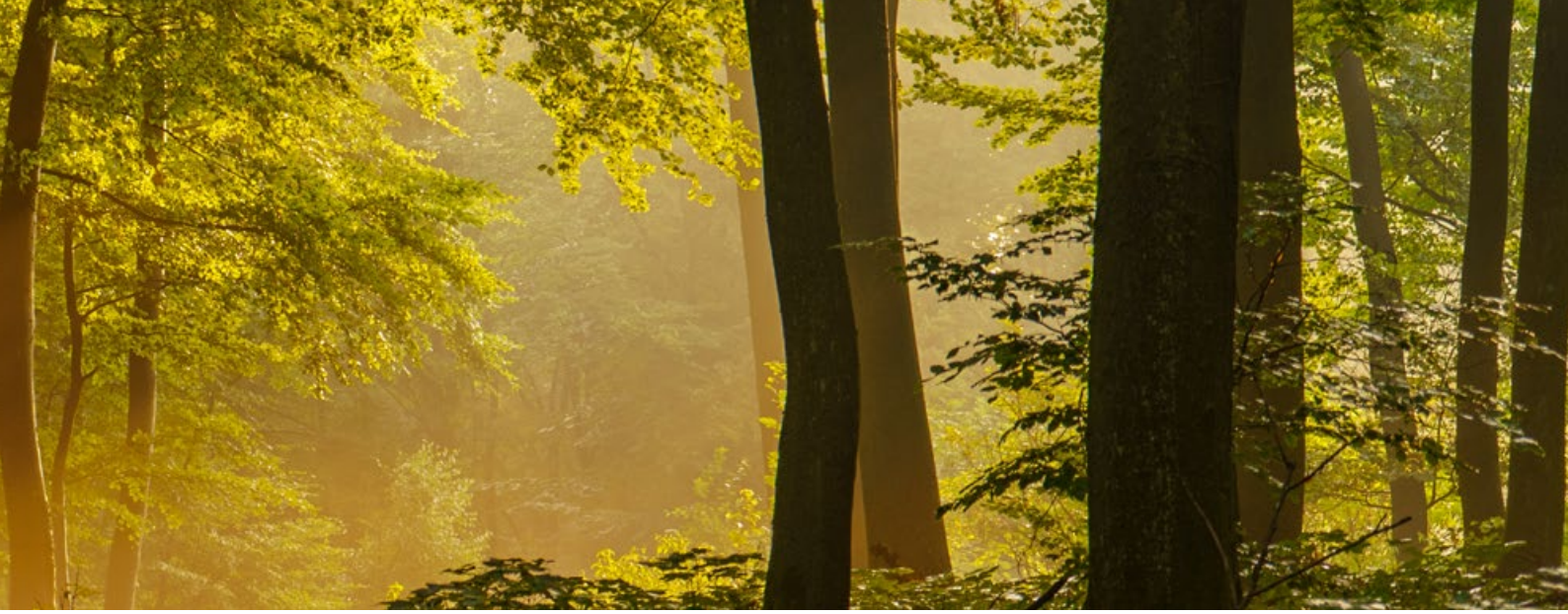
The following section contains the results of the underlying LCA study in absolute figures according to the PCRs. The disclosure of results is structured in three subsections: Potential environmental impacts, use of resources, waste categories and output flows.

## Potential environmental impact

**Table 7: Impact category results by information module (in absolute values)**

| Information module | GWP total | GWP fossil | GWP biogenic | ODP | AP | EP freshwater | EP marine | EP terrestrial | POCP | ADP minerals and metals | ADP fossil | WDP | GWP 100* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | kg CO2 eq. | kg CO2 eq. | kg CO2 eq. | kg CFC-11 eq. | Mol of H+ eq. | kg P eq. | kg N eq. | Mol N eq. | kg NMVOC eq. | kg Sb eq. | MJ, net cal. value | $m^3$ world equiv. | kg CO2 eq |
| **A1** | 2,73E+04 | 2,73E+04 | 1,75E+01 | 4,98E-08 | 1,29E+02 | 1,20E-02 | 2,07E+01 | 2,21E+02 | 6,48E+01 | 1,59E-01 | 2,77E+05 | 5,61E+03 | 2,71E+04 |
| **A2** | 6,83E+02 | 6,78E+02 | 4,14E+00 | 3,91E-11 | 2,31E+01 | 3,63E-04 | 5,93E+00 | 6,50E+01 | 1,66E+01 | 2,84E-05 | 8,28E+03 | 1,77E+00 | 6,78E+02 |
| **A3** | 4,04E+03 | 4,13E+03 | -8,75E+01 | 1,15E-07 | 1,36E+01 | 9,00E-03 | 2,99E+00 | 3,20E+01 | 9,09E+00 | 3,00E-03 | 1,05E+05 | 1,22E+03 | 4,13E+03 |
| **Sum A1-A3** | 3,21E+04 | 3,21E+04 | -6,59E+01 | 1,65E-07 | 1,66E+02 | 2,14E-02 | 2,96E+01 | 3,18E+02 | 9,05E+01 | 1,62E-01 | 3,90E+05 | 6,84E+03 | 3,19E+04 |
| **A4** | 2,82E+02 | 2,68E+02 | 1,18E+01 | 1,60E-11 | 8,04E-01 | 7,95E-04 | 3,68E-01 | 4,12E+00 | 7,24E-01 | 2,23E-05 | 3,56E+03 | 2,39E+00 | 2,68E+02 |
| **A5** | 5,43E+02 | 4,31E+02 | 1,12E+02 | 4,10E-10 | 5,37E-01 | 4,45E-04 | 1,47E-01 | 1,55E+00 | 5,45E-01 | 5,11E-05 | 4,37E+03 | 2,68E+01 | 5,16E+02 |
| **B2** | 2,03E+03 | 2,03E+03 | 4,46E+00 | 1,90E-07 | 9,79E+00 | 1,30E-02 | 1,70E+00 | 1,79E+01 | 5,47E+00 | 4,00E-03 | 6,00E+04 | 3,02E+02 | 2,03E+03 |
| **B6** | 6,87E+04 | 6,81E+04 | 6,13E+02 | 9,97E-07 | 1,49E+02 | 1,98E-01 | 3,35E+01 | 3,52E+02 | 9,06E+01 | 1,80E-02 | 1,24E+06 | 1,55E+04 | 6,85E+04 |
| **C1** | 2,85E+02 | 2,84E+02 | 1,04E+00 | 7,59E-10 | 5,31E-01 | 3,42E-04 | 1,42E-01 | 1,44E+00 | 4,98E-01 | 5,61E-05 | 4,58E+03 | 1,72E+01 | 2,82E+02 |
| **C2** | 1,56E+01 | 1,48E+01 | 6,47E-01 | 1,46E-12 | 5,50E-02 | 5,29E-05 | 2,60E-02 | 2,85E-01 | 4,90E-02 | 1,49E-06 | 1,94E+02 | 1,66E-01 | 1,48E+01 |
| **C3** | 1,04E+01 | 1,03E+01 | 2,50E-02 | 2,80E-11 | 5,10E-02 | 2,37E-05 | 2,40E-02 | 2,62E-01 | 6,40E-02 | 1,17E-05 | 1,96E+02 | 1,76E+00 | 1,03E+01 |
| **C4** | 7,18E+01 | 3,31E+01 | 3,87E+01 | 2,06E-11 | 4,40E-02 | 3,17E-05 | 1,60E-02 | 2,02E-01 | 4,30E-02 | 2,85E-07 | 5,30E+01 | 1,19E+01 | 3,31E+01 |
| **D** | -7,36E+03 | -7,36E+03 | 1,63E+00 | -3,38E-09 | -2,79E+01 | -3,00E-03 | 4,75E+00 | -5,14E+01 | -1,44E+01 | -1,40E-02 | -8,73E+04 | -4,42E+02 | -7,38E+03 |

* GWP-100: IPCC AR5 GWP, excluded biogenic carbon.



## Use of resources

At this point the results for the use of resources in absolute figures are presented. These are divided into renewable and non-renewable energy resources, including primary energy and energy resources used as raw materials, secondary materials and fuels, and water.

**Table 8: Indicators describing resource use by information module (in absolute values)**

| Indicator | PERE | PERM | PERT | PENRE | PENRM | PENRT | FW | SM | NRSF | RSF |
|---|---|---|---|---|---|---|---|---|---|---|
| Unit | MJ | MJ | MJ | MJ | MJ | MJ | m3 | kg | MJ | MJ |
| **A1** | 1,71E+04 | 0,00E+00 | 1,71E+04 | 2,77E+05 | 0,00E+00 | 2,77E+05 | 1,39E+02 | 0.00E+00 | 3,77E-21 | 3,21E-22 |
| **A2** | 8,70E+01 | 0,00E+00 | 8,70E+01 | 8,30E+03 | 0,00E+00 | 8,30E+03 | 1,10E-01 | 0.00E+00 | 0,00E+00 | 0,00E+00 |
| **A3** | 5,72E+04 | 4,69E+02 | 5,77E+04 | 1,02E+05 | 3,26E+03 | 1,05E+05 | 3,14E+01 | 0.00E+00 | 0,00E+00 | 0,00E+00 |
| **Sum A1-A3** | 7,44E+04 | 4,69E+02 | 7,49E+04 | 3,87E+05 | 3,26E+03 | 3,90E+05 | 1,71E+02 | 0.00E+00 | 3,77E-21 | 3,21E-22 |
| **A4** | 2,02E+02 | 0,00E+00 | 2,02E+02 | 3,57E+03 | 0,00E+00 | 3,57E+03 | 2,29E-01 | 0.00E+00 | 0,00E+00 | 0,00E+00 |
| **A5** | 2,54E+02 | 0,00E+00 | 2,54E+02 | 4,37E+03 | 0,00E+00 | 4,37E+03 | 1,06E+00 | 0.00E+00 | 0,00E+00 | 0,00E+00 |
| **B2** | 3,97E+03 | 0,00E+00 | 3,97E+03 | 6,01E+04 | 0,00E+00 | 6,01E+04 | 1,22E+01 | 0.00E+00 | 0,00E+00 | 0,00E+00 |
| **B6** | 6,86E+05 | 0,00E+00 | 6,86E+05 | 1,24E+06 | 0,00E+00 | 1,24E+06 | 6,54E+02 | 0.00E+00 | 0,00E+00 | 0,00E+00 |
| **C1** | 5,07E+02 | 0,00E+00 | 5,07E+02 | 4,58E+03 | 0,00E+00 | 4,58E+03 | 9,34E-01 | 0.00E+00 | 0,00E+00 | 0,00E+00 |
| **C2** | 1,35E+01 | 0,00E+00 | 1,35E+01 | 1,95E+02 | 0,00E+00 | 1,95E+02 | 1,60E-02 | 0.00E+00 | 0,00E+00 | 0,00E+00 |
| **C3** | 1,92E+01 | 0,00E+00 | 1,92E+01 | 1,96E+02 | 0,00E+00 | 1,96E+02 | 5,10E-02 | 0.00E+00 | 0,00E+00 | 0,00E+00 |
| **C4** | 9,40E+00 | 0,00E+00 | 9,40E+00 | 5,30E+01 | 0,00E+00 | 5,30E+01 | 2,79E-01 | 0.00E+00 | 0,00E+00 | 0,00E+00 |
| **D** | -2,41E+04 | 0,00E+00 | -2,41E+04 | -8,75E+04 | 0,00E+00 | -8,75E+04 | -5,44E+01 | 0.00E+00 | 0,00E+00 | 0,00E+00 |

**PERE**
Use of renewable primary energy excluding renewable energy resources used as raw material

**PERM**
Use of renewable primary energy resources used as raw material

**PERT**
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw material)

**PENRE**
Use of non-renewable primary energy excluding non-renewable energy resources used as raw material

**PENRM**
Use of non-renewable primary energy resources used as raw material

**PENRT**
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw material)

**SM**
Use of secondary material

**RSF**
Use of renewable secondary fuels

**NRSF**
Use of non-renewable secondary fuels

**FW**
Net use of fresh water

# Waste categories and output flows

The table below provides information about the amount of disposed waste by information module in absolute figures per tkm, according to the categories established in the reference PCRs.

**Table 9: Waste indicators by information module (in absolute values)**

| Indicator | HWD | NHWD | RWD |
|---|---|---|---|
| Unit | kg | kg | kg |
| **A1** | 8,48E-04 | 3,51E+03 | 1,25E+00 |
| **A2** | 3,46E-08 | 8,31E-01 | 1,00E-02 |
| **A3** | 1,70E-05 | 1,07E+02 | 2,33E+00 |
| **Sum A1-A3** | 8,65E-04 | 3,62E+03 | 3,59E+00 |
| **A4** | 1,71E-08 | 5,11E-01 | 4,00E-03 |
| **A5** | 3,22E-07 | 5,23E+01 | 5,20E-02 |
| **B2** | 1,15E-04 | 2,60E+02 | 2,40E-01 |
| **B6** | 1,07E-04 | 9,31E+02 | 1,97E+02 |
| **C1** | 3,39E-07 | 5,21E+00 | 1,31E-01 |
| **C2** | 1,03E-09 | 3,20E-02 | 3,62E-04 |
| **C3** | 2,64E-09 | 5,90E-02 | 2,00E-03 |
| **C4** | 3,75E-07 | 8,39E+01 | 2,00E-03 |
| **D** | -2,90E-06 | -1,26E+03 | -5,68E+00 |

**HWD**
Hazardous waste disposed

**NHWD**
Non hazardous waste disposed

**RWD**
Radioactive waste disposed

The amounts of materials leaving the system boundary after reaching the end-of-waste state in absolute figures is reported in table below.

Most part of the escalator materials are metals, with high recyclability. Organic materials used in packaging are considered to be directed to incineration.

**Table 10: Output flows (in absolute values)**

| Indicator | CRE | MFR | MER | EEE | EET |
|---|---|---|---|---|---|
| Unit | MJ | MJ | $m^3$ | kg | MJ |
| **A1** | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| **A2** | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| **A3** | 7,99E+05 | 8,08E-03 | 8,19E-03 | 2,37E-02 | 2,37E-02 |
| **SUM A1-A3** | 7,99E+05 | 8,08E-03 | 8,19E-03 | 2,37E-02 | 2,37E-02 |
| **A4** | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| **A5** | 0,00E+00 | 1,15E+02 | 1,16E+02 | 3,36E+02 | 3,36E+02 |
| **B2** | 1,43E+02 | 4,14E+00 | 4,20E+00 | 1,22E+01 | 1,22E+01 |
| **B6** | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| **C1** | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| **C2** | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| **C3** | 5,32E+03 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| **C4** | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |

**CRE**
Components for reuse

**MFR**
Materials for recycling

**MER**
Materials for energy recovery

**EEE**
Exported energy Electrical

**EET**
Exported energy Thermal

# Analysis of results / conclusion

## General observations

The usage stage is the most important contributor to the overall burden of the assessed escalator over its entire life cycle in six out of twelve analyzed categories (GWP-biogenic excluded).

The product stage represents the second highest impact area, being the largest contributor to the remaining five categories. Module [D] results in benefits for almost all impact categories. In contrast, the construction and end-of-life stage have little relevance in terms of the environmental burden.

## [B6] Operational energy use

This information module is the information module with the highest contribution to the overall environmental burden of the assessed escalator for all categories except ADP-Minerals and metals. As a result, operation during the use phase thus also significantly influences overall environmental impact due to the consumed energy.

Analysis of alternative use scenarios, in which the assessed escalator is operated in different locations, showed substantial differences in the overall results for most impact categories (ADP-fossil, PCOP, EP- terrestrial, EP-marine, AP, GWP-fossil and GWP-total). These differences can be attributed to the variations between energy sources for different grid mixes. As a consequence, the choice of grid mix needs to be carefully considered.

## Product stage [A1] – Raw material supply

This information module is the information module with the highest contribution to the overall environmental burden of the assessed escalator in the category ADP -minerals and metals.

Additionally is the second most important one in all the other categories. It´s high impacts is mainly caused by energy intensive extraction and production processes of raw materials used for the different components of the escalator. The high level of the results is primarily produced by components made out of carbon steel due to their weight, or “ferrous metals” which represent more than 75% of the total weight of the assessed escalator.

Nevertheless, in relative terms components with a high share of Electric and Electronics (based on their specific impact per kg) have the highest impact on the results and are therefore of major relevance in the product life cycle.

## Potential for improvements

The use of Aluminum and ferrous metals, especially carbon steel, has a major effect on the [A1]. In context of truss, step&step chain, cladding and guiding system, components with optimized geometries could be developed in order to provide a weigh reduction and therefore lower impacts. With reference to the Aluminum, it would be interesting to promote the use of recycled aluminum. With reference to the ferrous metals, components made of organics, plastics and rubbers show lower impacts than of ferrous metals due to a major weight reduction.

As a result, using these materials as an alternative – if feasible for their application – may achieve improved results.

In the design of the escalator and depending on the load cases, operational modes such as standby or sleep mode and the regenerative drive option can help make the escalator more energy-efficient and in consequence an optimization of B6 values. Additionally, state- of- the -art LED technology lasts longer than conventional lighting and is up to 80% more energy -efficient than halogen lighting.

# Scenarios and additional technical information

## Allocations in [A3]

At TKE production sites in Spain and Germany, the share of resources (energy and materials) and waste that is used for the production of a velino 100/200 escalator as specified in table 1 cannot be measured or calculated.

The consumptions, inflows, and outflows associated with their manufacturing activity are allocated on a per-unit basis. This allocation is determined by considering the annual figures for the overall facility and the number of units produced within a year. To derive the values for the assessed unit, a weighed average approach is employed, taking into account the production volume of both manufacturing centers.

## Electricity grid mix in manufacturing [A3] and operation [B6]

**Table 11: Reflects their environmental impact expressed in kg $CO_2$-eq/* kWh.**

| Country | $CO_2$-eq/kWh |
|---|---|
| China | 0.811 |
| Europe (average) | 0.372 |
| Europe (renewable) | 0.0278 |
| US (average) | 0.5154 |

Information on electricity grid mixes

Electricity datasets for China and European average, European renewable electricity and US have been used in the study.

The Velino 100/200 escalator is produced at TKE Manufacturing site in Spain and Hamburg, and both European escalator factories use 100% renewable electricity , with escalator components and materials coming from suppliers located in Spain and China. For the operational energy use, the average European and USA grid mix are considered.

## Transport to installation site [A4]

**Table 12: Data in context of transport to installation site summarizes A4 data**

| Type of vehicle | Distance Europe | Distance Noth America | Capacity utilisation | Bulk density |
|---|---|---|---|---|
| Truck, Euro 5, 12 - 14t gross weight / 9.3t payload capacity | 643 km | 2.033 km | 85% | 26,16 kg/m3 |
| Container ship, 5,000 to 200,000 dwt payload capacity, ocean going | 0 | 7.460 km | 48% | 26,16 kg/m3 |

Road and sea transport are used to deliver the escalators to European and North America destinations. For Europe, an average of the road distance has been calculated taking into account the locations and the sales distribution. For North America and average of the road and sea distances have been calculated following the same criteria with the locations and sales distribution.

## Maintenance

Preventive maintenance activities are scheduled activities, which ensure the proper operation of the escalator during its reference service life. The main inputs in this module are the transport of workers to the installation site, the electricity consumption during maintenance activities and the raw material extraction for spare parts.

The tables 13 and 14 summarize these inputs.

**Table 13: Data in context of preventive maintenance**

| Data | Value | Unit |
|---|---|---|
| **Maintenance cycle and process** | As in maintenance manual | |
| **Annual oil consumption** | 117 | kg |
| **Annual gasoline consumption** | 74 | l |
| **Transportation Distance to Disposal Site (packaging materials)** | 35 | km |
| **Annual diesel consumption for transport of workers** | 2 | l |

**Table 14: Material content. Spare parts**

| Material type | Weight in kg | Share of total in % |
|---|---|---|
| **Ferrous metals** | 47.60 | 23.96% |
| **Electric & Electronics** | 2.00 | 1.01% |
| **Plastic&Rubbers** | 9.63 | 4.85% |
| **Non-ferrous metals** | 61.72 | 31.07% |
| **Stainless Steel** | 23.70 | 11.93% |
| **Lubricants** | 54.00 | 27.18% |
| **Overall** | **198.65** | **100.00%** |

## Energy consumption in operation (B6 )

**Table 15: Calculated annual energy consumption**

| Usage category (acc to ISO 25745-3) | Travelling direction | Calculated annual energy consumption [kWh] |
|---|---|---|
| 1 | UPWARD | 10.521 |
| | DOWNWARD | 9.529 |
| 2 | UPWARD | 12.307 |
| | DOWNWARD | 9.529 |

The velino 100/200 escalator annual energy consumption during operation has been calculated acc. to ISO 25745-3. For this study usage category 2 with escalator travelling upwards (as it is established in the C-PCR-025 to PCR 2019:14) with annual energy consumption of 12.307 KWh, have been considered.

As additional information, energy consumptions for UC1, UC2, with the escalator travelling upwards and downwards are indicated in below table 15.

## End-of-life C2-C4

**Table 16: Information about end-of-life processes**

| Processes | Unit | Amount kg/kg |
|---|---|---|
| **Collection process** | Kg collected separately | 1 |
| | Kg collected with mixed construction waste | 0 |
| **Recovery system** | kg for reuse | 0 |
| | kg for recycling | 0.97 |
| | Kg for energy recovery | 0.011 |
| **Disposal** | Kg for final deposition | 0.013 |

The escalator is mainly composed by metallic materials, with high recyclability and high recycling ratios in European countries. Plastics are considered to be disposed at waste incineration facilities, and the rest of materials are considered as landfilled.

Net benefits in module D are calculated based on the metals directed to recovery using a net flow calculation acc. to EN15804, taking into account the input and outflows of recycled materials.

# Additional enviromental information

## North America impact category results scenario

The following section contains the results of the underlying LCA study according to the PCRs for North America scenario. The changes compared to the EU scenario are due the change in the grid mix and A4 transport.

The disclosure of results is structured in three subsections: Potential environmental impacts, use of resources, waste categories and output flows. For this case of output flows, the information remains the same as in the general analysis scenario, therefore this information is not included again in this chapter.

## North America Potential environmental impact

**Table 17: North America Impact category results by information module**

| Information module | GWP total | GWP fossil | GWP biogenic | ODP | AP | EP freshwater | EP marine | EP terrestrial | POCP | ADP minerals and metals | ADP fossil | WDP | GWP 100* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | kg CO2 eq. | kg CO2 eq. | kg CO2 eq. | kg CFC-11 eq. | Mol of H+ eq. | kg P eq. | kg N eq. | Mol N eq. | kg NMVOC eq. | kg Sb eq. | MJ, net cal. value | $m^3$ world equiv. | kg CO2 eq |
| **A1** | 9,24E-02 | 9,23E-02 | 5,91E-05 | 1,68E-13 | 4,38E-04 | 4,06E-08 | 6,98E-05 | 7,48E-04 | 2,19E-04 | 5,38E-07 | 9,37E-01 | 1,90E-02 | 9,18E-02 |
| **A2** | 2,31E-03 | 2,29E-03 | 1,40E-05 | 1,32E-16 | 7,82E-05 | 1,23E-09 | 2,01E-05 | 2,20E-04 | 5,60E-05 | 9,60E-11 | 2,80E-02 | 5,97E-06 | 2,29E-03 |
| **A3** | 1,37E-02 | 1,40E-02 | -2,96E-04 | 3,88E-13 | 4,61E-05 | 3,04E-08 | 1,01E-05 | 1,08E-04 | 3,07E-05 | 1,01E-08 | 3,54E-01 | 4,12E-03 | 1,40E-02 |
| **Sum A1-A3** | 1,08E-01 | 1,09E-01 | -2,23E-04 | 5,56E-13 | 5,62E-04 | 7,22E-08 | 1,00E-04 | 1,08E-03 | 3,06E-04 | 5,48E-07 | 1,32E+00 | 2,31E-02 | 1,08E-01 |
| **A4** | 4,79E-03 | 4,77E-03 | 1,29E-04 | 2,80E-16 | 8,12E-05 | 8,92E-09 | 2,24E-05 | 2,46E-04 | 5,95E-05 | 3,08E-10 | 6,10E-02 | 2,90E-05 | 4,15E+08 |
| **A5** | 1,84E-03 | 1,46E-03 | 3,77E-04 | 1,38E-15 | 1,82E-06 | 4,61E-09 | 4,97E-07 | 5,24E-06 | 1,84E-06 | 1,73E-10 | 1,48E-02 | 9,07E-05 | 1,74E-03 |
| **B2** | 6,87E-03 | 6,85E-03 | 1,51E-05 | 6,43E-13 | 3,31E-05 | 4,40E-08 | 5,75E-06 | 6,04E-05 | 1,85E-05 | 1,35E-08 | 2,03E-01 | 1,02E-03 | 6,85E-03 |
| **B6** | 3,22E-01 | 3,21E-01 | 1,42E-04 | 1,24E-12 | 4,76E-04 | 1,80E-07 | 1,03E-04 | 1,11E-03 | 2,93E-04 | 5,84E-08 | 5,01E+00 | 6,02E-02 | 2,77E+10 |
| **C1** | 9,62E-04 | 9,59E-04 | 3,51E-06 | 2,57E-15 | 1,80E-06 | 1,15E-09 | 4,80E-07 | 4,88E-06 | 1,68E-06 | 1,89E-10 | 1,55E-02 | 6,57E-05 | 1,08E-03 |
| **C2** | 5,27E-05 | 5,01E-05 | 2,19E-06 | 4,92E-18 | 1,86E-07 | 1,79E-10 | 8,79E-08 | 9,64E-07 | 1,66E-07 | 5,05E-12 | 6,57E-04 | 5,61E-07 | 5,01E-05 |
| **C3** | 3,52E-05 | 3,50E-05 | 8,45E-08 | 9,46E-17 | 1,72E-07 | 8,02E-11 | 8,11E-08 | 8,86E-07 | 2,16E-07 | 3,97E-11 | 6,62E-04 | 5,94E-06 | 3,50E-05 |
| **C4** | 2,43E-04 | 1,12E-04 | 1,31E-04 | 6,97E-17 | 1,49E-07 | 1,07E-10 | 5,41E-08 | 6,83E-07 | 1,45E-07 | 9,63E-13 | 1,79E-04 | 4,02E-05 | 1,12E-04 |
| **D** | -2,49E-02 | -2,49E-02 | 5,52E-06 | -1,14E-14 | -9,44E-05 | -1,01E-08 | -1,61E-05 | -1,74E-04 | -4,86E-05 | -4,73E-08 | -1,50E-03 | -1,50E-03 | -2,50E-02 |

* GWP-100: IPCC AR5 GWP, excluded biogenic carbon.

# North America Use of resources

The use of resources are divided into renewable and non-renewable energy resources, including primary energy and energy resources used as raw materials, secondary materials and fuels, and water.

**Table 18: North America Indicators describing resource use by information module**

| Indicator | PERE | PERM | PERT | PENRE | PENRM | PENRT | FW | SM | NRSF | RSF |
|---|---|---|---|---|---|---|---|---|---|---|
| Unit | MJ | MJ | MJ | MJ | MJ | MJ | m3 | kg | MJ | MJ |
| **A1** | 5,79E-02 | 0,00E+00 | 5,79E-02 | 9,37E-01 | 0,00E+00 | 9,37E-01 | 4,71E-04 | 0.00E+00 | 1,27E-26 | 1,08E-27 |
| **A2** | 2,94E-04 | 0,00E+00 | 2,94E-04 | 2,81E-02 | 0,00E+00 | 2,81E-02 | 3,72E-07 | 0.00E+00 | 0,00E+00 | 0,00E+00 |
| **A3** | 1,93E-01 | 1,59E-03 | 1,95E-01 | 3,43E-01 | 1,10E-02 | 3,54E-01 | 1,06E-04 | 0.00E+00 | 0,00E+00 | 0,00E+00 |
| **Sum A1-A3** | 2,52E-01 | 1,59E-03 | 2,53E-01 | 1,31E+00 | 1,10E-02 | 1,32E+00 | 5,77E-04 | 0.00E+00 | 1,27E-26 | 1,08E-27 |
| **A4** | 2,25E-03 | 2,25E-03 | 6,12E-02 | 6,12E-02 | 0,00E+00 | 0,00E+00 | 2,77E-13 | 0.00E+00 | 0,00E+00 | 2,59E-06 |
| **A5** | 8,60E-04 | 0,00E+00 | 8,60E-04 | 4,14E-02 | 0,00E+00 | 1,48E-02 | 3,57E-06 | 0.00E+00 | 0,00E+00 | 0,00E+00 |
| **B2** | 1,34E-02 | 0,00E+00 | 1,34E-02 | 2,03E-01 | 0,00E+00 | 2,03E-01 | 4,11E-05 | 0.00E+00 | 0,00E+00 | 0,00E+00 |
| **B6** | 1,24E-12 | 4,76E-04 | 1,80E-07 | 1,03E-04 | 1,11E-03 | 2,93E-04 | 6,79E-02 | 0.00E+00 | 5,01E+00 | 5,84E-08 |
| **C1** | 1,72E-03 | 0,00E+00 | 1,72E-03 | 1,55E-02 | 0,00E+00 | 1,55E-02 | 3,16E-06 | 0.00E+00 | 0,00E+00 | 0,00E+00 |
| **C2** | 4,56E-05 | 0,00E+00 | 4,56E-05 | 6,60E-04 | 0,00E+00 | 6,60E-04 | 5,41E-08 | 0.00E+00 | 0,00E+00 | 0,00E+00 |
| **C3** | 6,49E-05 | 0,00E+00 | 6,49E-05 | 6,63E-04 | 0,00E+00 | 6,63E-04 | 1,72E-07 | 0.00E+00 | 0,00E+00 | 0,00E+00 |
| **C4** | 3,18E-05 | 0,00E+00 | 3,18E-05 | 1,79E-04 | 0,00E+00 | 1,79E-04 | 9,43E-07 | 0.00E+00 | 0,00E+00 | 0,00E+00 |
| **D** | -8,15E-02 | 0,00E+00 | -8,15E-02 | -2,96E-01 | 0,00E+00 | -2,96E-01 | -1,84E-04 | 0.00E+00 | 0,00E+00 | 0,00E+00 |

**PERE**
Use of renewable primary energy excluding renewable energy resources used as raw material

**PERM**
Use of renewable primary energy resources used as raw material

**PERT**
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw material)

**PENRE**
Use of non-renewable primary energy excluding non-renewable energy resources used as raw material

**PENRM**
Use of non-renewable primary energy resources used as raw material

**PENRT**
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw material)

**SM**
Use of secondary material

**RSF**
Use of renewable secondary fuels

**NRSF**
Use of non-renewable secondary fuels

**FW**
Net use of fresh water

## North America Waste categories and output flows

The table below provides information about the amount of disposed waste by information module per tkm, according to the categories established in the reference PCRs.

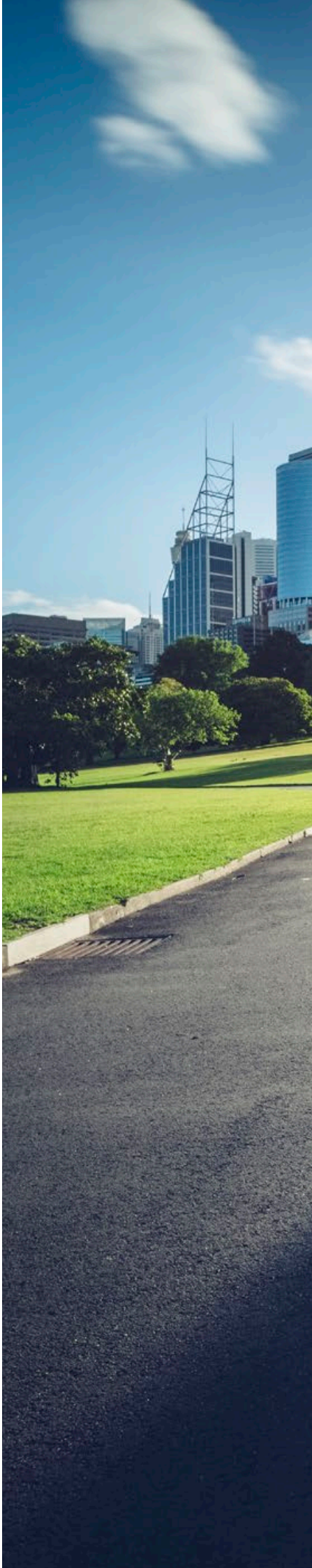
**Table 19: North America Waste indicators by information module**

| Indicator | HWD | NHWD | RWD |
|---|---|---|---|
| Unit | kg | kg | kg |
| **A1** | 2,87E-09 | 1,19E-02 | 4,22E-06 |
| **A2** | 1,17E-13 | 2,81E-06 | 3,38E-08 |
| **A3** | 5,73E-11 | 3,63E-04 | 7,89E-06 |
| **Sum A1-A3** | 2,92E-09 | 1,22E-02 | 1,21E-05 |
| **A4** | 2,77E-13 | 7,63E-06 | 7,32E-08 |
| **A5** | 1,09E-12 | 1,77E-04 | 1,76E-07 |
| **B2** | 3,90E-10 | 8,79E-04 | 8,11E-07 |
| **B6** | 1,97E-10 | 1,69E-03 | 4,88E-04 |
| **C1** | 1,15E-12 | 1,76E-05 | 4,43E-07 |
| **C2** | 3,49E-15 | 1,08E-07 | 1,23E-09 |
| **C3** | 8,93E-15 | 1,99E-07 | 6,76E-09 |
| **C4** | 1,27E-12 | 2,84E-04 | 6,76E-09 |
| **D** | -9,79E-12 | -4,26E-03 | -1,92E-05 |

**HWD**
Hazardous waste disposed

**NHWD**
Non hazardous waste disposed

**RWD**
Radioactive waste disposed

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# Glossary

| Glossary | | | | |
|---|---|---|---|---|
| Impact category | Abbreviation | Unit | Characterisation method | Description |
| Global Warming Potential (100 years) | GWP-total | kg $CO_2$-eq. | Baseline model of 100 years of the IPCC based on IPCC2013 | The global warming potential (GWP) is a relative measure of how much heat a greenhouse gets trapped in the atmosphere. It is indicated in kg of $CO_2$-equivalents for a specified time horizon. |
| Global Warming Potential biogenic, fossil, land use and land use change | GWP-fossil<br>GWP-biogenic<br>GWP-luluc | | | These are subsets of the total GWP covering the biogenic, fossil, and land use related part of the GWP. These three add up to the main climate change impact. |
| Ozone depletion potential | ODP | kg CFC-11 eq. | Steady-state ODPs, WMO 2014 | Ozone Depletion Potential characterizes the destructive effects on the stratospheric ozone layer of anthropogenic emissions of ozone depleting substances (ODS), mainly chlorofluorocarbons (CFCs) and nitrogen oxides (NOX). It is calculated over a time horizon of 100 years |
| Acidification potential | AP | Mol of H+ eq | Accumulated Exceedance, Seppäla et al., 2008 | The acidification potential describes the acid deposition in plants, soils and surface waters caused by the conversion of air pollutants in acid. It is calculated as Mol of H+ eq |
| Eutrophication aquatic freshwater | EP-freshwater | kg P eq | EUTREND model, Struijs et al., 2009b as implemented in ReCiPe | Aquatic eutrophication is the undesired enrichment of waters with nutrients. It induces the growth of plants and algae, which may result in oxygen depletion. At an excessive level it affects the biological balance of affected waters Aquatic eutrophication potential is measured in kg of PO4-eq (freshwater) and kg of N eq (marine water). |
| Eutrophication aquatic marine | EP-marine | kg N eq. | | |
| Eutrophication, terrestrial | EP terrestrial | Mol N eq. | Accumulated Exceedance, Seppäla et al., 2008 | Terrestrial eutrophication is the undesired enrichment of soils with nutrients. It may increase the susceptibility of plants to diseases and pests, as cause degradation of plant stability. If the nitrification level exceeds the amounts of nitrogen necessary for a maximum harvest, it can lead to an enrichment of nitrate which can cause increased nitrate content in groundwater. Terrestrial eutrophication is expressed as Accumulated Exceedance in MOL N. |
| Photochemical ozone formation | POCP | kg NMVOC eq. | LOTOS-EUROS, Van Zelm et al., 2008, as applied in ReCiPe | Photochemical ozone creation potential (also referred to as photochemical smog) quantifies the creation of ozone on ground-level where it is considered as a pollutant, while in the high levels of the atmosphere it protects against ultraviolet (UV) light. Ozone on lower levels is a harm to human health and can for example cause inflamed airways or damage lungs. It is expressed in kg of NMVOC -equivalents. |
| Abiotic depletion potential for non fossil resources | ADP-minerals and metals | kg Sb eq | CML 2002, Guinée et al., 2002 and van Oers et al 2002 | Abiotic resources are natural resources which are regarded as non-living. Their current rate of depletion by humans is not considered sustainable and is cause for concern due to their scarcity. The depletion of abiotic resources is reflected in two separate impact categories: Elements, such as iron ore, indicated in kg of Sb-equivalents; and Fossil fuels, for example, crude oil indicated in MJNCV. |
| Abiotic depletion for fossil resources potentia | ADP-fossil | MJ, net calorific value | | |

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