ENVIRONMENTAL PRODUCT DECLARATION

KONE MonoSpace® 500 elevator for mid-rise residential and office buildings

EPD®

Registration number: S-P-01063
Published: 2017-10-02
Valid until: 2020-04-10
Revision number: 1.0

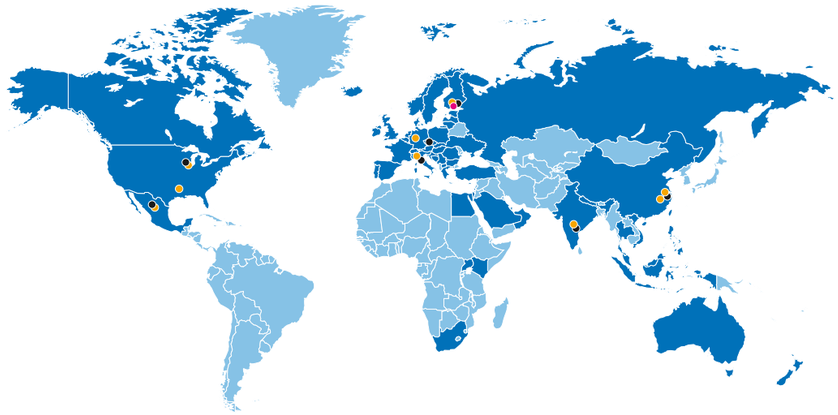
KONE IN BRIEF

At KONE, our mission is to improve the flow of urban life. As a global leader in the elevator and escalator industry, we provide elevators, escalators, and automatic building doors, as well as solutions for modernization and maintenance that add value to buildings throughout their life cycle.

Our solutions move more than a billion people every day. We serve more than 450,000 customers across the globe, with the majority being maintenance customers. Our maintenance base covers over one million elevators and escalators. Our key customer groups include builders, building owners, facility managers, and developers. We also work closely with architects, authorities, and consultants.

By enabling more effective People Flow®, we make people's journeys safe, convenient, and reliable in taller, smarter buildings. In 2016, KONE had annual net sales of EUR 8.8 billion and employed more than 52,000 people.

KONE worldwide



SUSTAINABILITY AT KONE

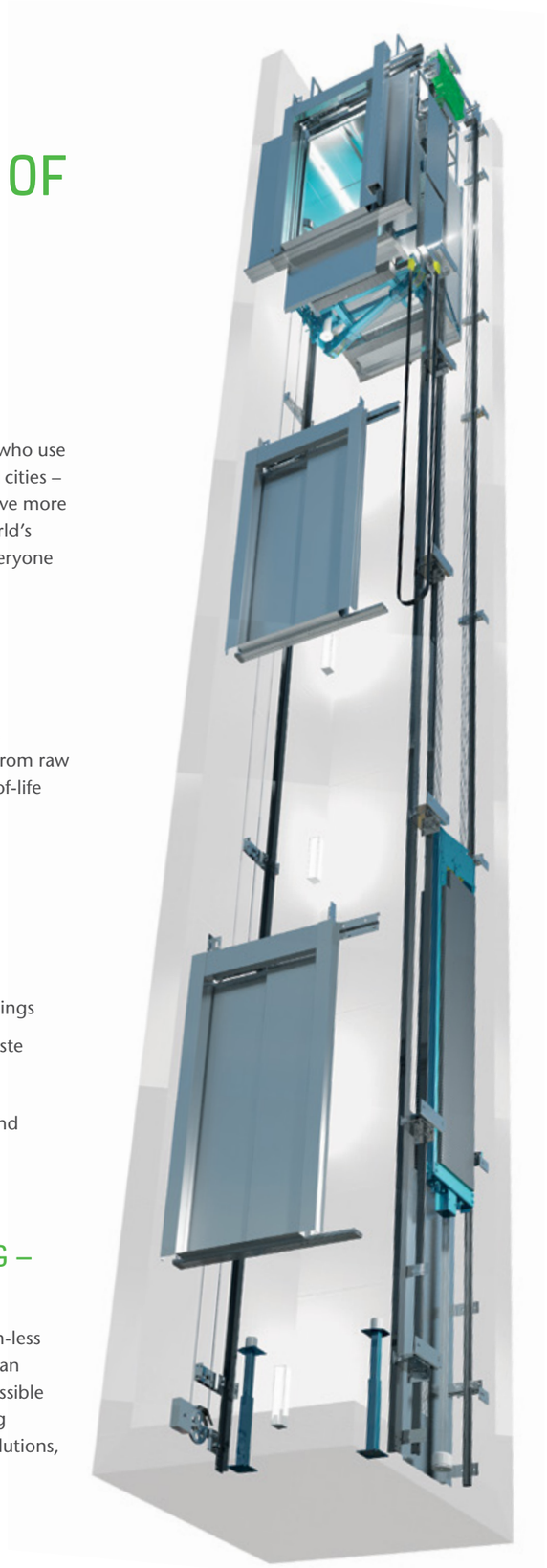
At KONE, sustainability is embedded in our organizational culture. It is how we treat each other and our stakeholders, how we take the environment into account in all of our actions, and how we foster economic performance now and in the future. Our vision is to deliver the best People Flow experience. Sustainability is a source of innovation and a competitive advantage for us. KONE is committed to conducting our business in a responsible and sustainable way and we expect the same commitment from our partners.

DRIVING INNOVATION AND IMPROVING RESOURCE EFFICIENCY

At KONE, we believe that innovations in urban development play an important role in tackling issues like social progress, economic prosperity, and climate change. For example, cities today take up about 2% of the world's land mass but account for 75% of global energy consumption and 80% of man-made carbon emissions. Reducing the impact of urban areas on the environment is essential for a more sustainable future.

We aim to be a leader in sustainability, and we strive for continuous improvement in all our business activities. Increasing resource efficiency is among our top priorities and we are constantly looking for smarter and more efficient ways to do things throughout the whole value chain.

PRODUCTS THAT IMPROVE THE FLOW OF URBAN LIFE



At KONE, our vision is to deliver the best People Flow® experience. This means we make sure that the people who use our products and services – the residents of towns and cities – can move around more easily, more effectively, and have more enjoyable experiences. Our job is to help make the world's cities, buildings, and public spaces better places for everyone by improving the flow of urban life.

FOCUS ON THE ENVIRONMENT

Our R&D processes aim to maximize the positive environmental impacts and minimize the adverse ones throughout the life cycle of our solutions. This begins from raw material extraction and extends right through to end-of-life treatment such as recycling of materials.

We focus on:

- reducing energy consumption
- ensuring that our products meet green building requirements
- developing new smart technologies for green buildings
- reducing material use, including packaging and waste
- avoiding the use of hazardous substances
- maximizing material durability, recycled content, and recyclability
- minimizing water consumption

THE GREEN HEART OF YOUR BUILDING – KONE MONOSPACE® 500

The KONE MonoSpace 500, our current machine-room-less volume elevator, is up to 90% more energy efficient than the elevators we manufactured in the 1990s. This is possible because of the energy efficient KONE EcoDisc® hoisting machine, a highly efficient drive, enhanced standby solutions, and LED lighting.

PRODUCT DESCRIPTION

The data for this Environmental Product Declaration (EPD) is based on an ISO 14044 based Life Cycle Assessment for the KONE MonoSpace 500 elevator. Product Category Rules of Lifts (Elevators) Product classification: UN CPC 4354 according to ISO 14025 (PCR 2015) ("PCR") was used as a guideline in the calculation process. The following summarizes the mandatory information of the MonoSpace 500 as specified in the PCR. The information refers to a typical configuration representative of the complete range of parameters.

PRODUCT SPECIFICATIONS

Table 1. Mandatory information required for the specification of the product.

Index	Values	Representative values chosen in case of declaration of ranges
Type of installation	New generic lift	
Commercial name	KONE MonoSpace® 500	
Main purpose	Transport of passengers	
Type of lift	Electric	
Type of drive system	Gearless traction	
Rated load (fixed or range)	320…1,150 kg	630 kg
Rated speed (fixed or range)	0,63 – 1,0 – 1,6 – 1,75 m/s	1,0 m/s
Number of stops (fixed or range)	Up to 24 floors	5 floors
Traveled height (fixed or range)	Up to 75 m	12 m
Number of operating days per year (fixed or range)	365	
Applied usage category (UC), according to ISO 25745-2	UC1 … UC6	UC3
Designed reference service life (RSL)	25 years	
Geographic region of intended installation	Europe	
Recommended application (main market) • Building rise and type (typical) • Building type	Recommended building type in Table A.1, Annex A, ISO 25745-2	
Optional equipment		No regenerative drive

The designed reference service life claimed by KONE is aligned with the typical service life data published by elevator manufacturers. Regarding technological innovations, market transformation is usually slow, as elevators are products with a long service lifetime. For elevators, it may take up to 20–30 years before major retrofitting is necessary. (Sachs, Harvey M. (2005): Opportunities for Elevator Energy Efficiency Improvements, ACEEE)

The functional unit for the study is defined as the transportation of a load over distance, expressed in tonne [t] over a kilometre [km] traveled, i.e. tonne-kilometer [tkm] as defined in the PCR. The results for the complete service lifetime of the elevator were also calculated for an elevator with a lifetime of 25 years, installed in a 5 floors building, and a traveling distance of 12 m. The number of trips per day was 125, which was obtained from Annex A, table A.1, ISO 25745-2. The annual electricity consumption was 781 kWh and the functional unit 761 tkm.

The energy efficiency information is based on a third-party report on a KONE MonoSpace 500 elevator installed at customer reference location in Finland.

A GLOBAL INNOVATOR

In 2016, KONE was ranked as one of the top 100 most innovative companies in the world in a list complied by business magazine Forbes. KONE was included for the sixth consecutive year and was the only elevator and escalator company to make the list in 2016.

HELPING THE MALL OF SCANDINAVIA ACHIEVE SUSTAINABILITY EXCELLENCE

Opened in November 2015, the Mall of Scandinavia is located a few kilometers north of Stockholm's city center and is Scandinavia's largest shopping center.

The mall puts particular emphasis on energy efficiency and has been certified according to BREEAM, the global environmental and sustainability assessment method for buildings, with an Excellent rating in the Design phase. This is the first time a Swedish shopping center project has achieved an Excellent rating, and the Mall of Scandinavia is one of only a handful of shopping center projects in Europe to have done so.

The Mall of Scandinavia features several KONE solutions, including KONE MonoSpace 500 elevators. "KONE is at the forefront of energy efficiency," says Jaakko Kaivonen, Managing Director of KONE Scandinavia. "The MonoSpace elevators installed at the mall improve on our already industry-leading energy consumption by a further 35%," he adds.

TOP-CLASS ENERGY EFFICIENCY

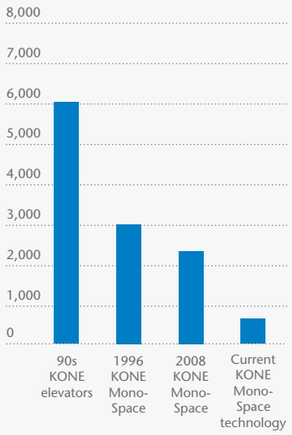
We are a pioneer in developing eco-efficient solutions in the elevator and escalator industry. In 2014 we were the first company to achieve an A-class energy efficiency classification according to the new international standard ISO 25745 – Energy performance of lifts, escalators, and moving walks.

In 2016, we extended the classification coverage of our product range according to the ISO 25745 standard. KONE E MonoSpace and KONE Z MiniSpace™ elevators achieved A-class classification in addition to ten elevators classified earlier. All the ratings have been granted and measurements made by external third parties at customer reference locations. In addition, KONE is the first elevator company to offer a volume elevator range with a VDI 4707 A-class energy efficiency rating.

The biggest environmental impact of our solutions stems from the amount of electricity elevators and escalators use over their lifetime. This underlines the importance of focusing on energy efficiency innovations.

ENERGY CONSUMPTION OF KONE ELEVATORS

Annual energy consumption (kWh/year)



Calculation is based on: Speed: 1 m/s, load: 630 kg and, since 2008, also: 150,000 starts per year, travel height 9 m, 4 floors Due to historical reasons, the data for starts, travel height and floors is not available for the 1990s elevators.

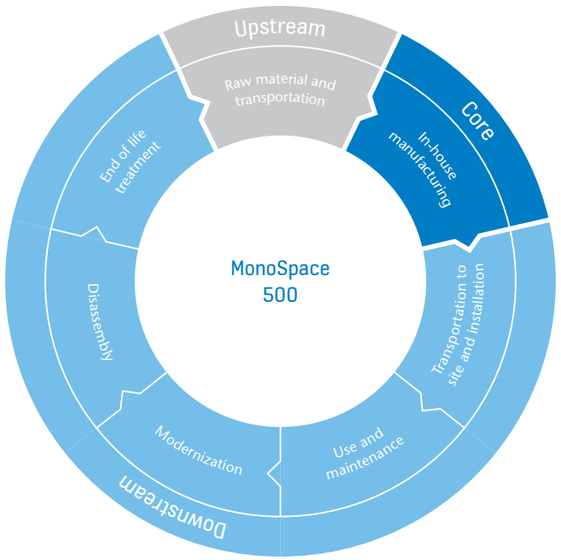
OUR LIFE-CYCLE APPROACH

Our business model is based on a life-cycle approach. This means that we provide value for our customers every step of the way, for the entire lifespan of their building. We offer innovative and sustainable new equipment solutions, ensure the safety and availability of equipment in operation, and offer modernization solutions for aging equipment.

The life cycle stages used in this study are listed below:

Upstream			Core	Downstream		
Raw material supply	Transport	Outsourced manufacturing	In-house manufacturing	Transport and Installation	Use (Operation)	End-of-life treatment
U-1 Materials manufacturing	U-2 Transport to manufacturing site	U-3 Out-sourced manufacturing	C-1 Own materials manufacturing	D-1 Transport from manufacturing to building site	D-3 Maintenance	D-5 Waste processing
			C-2 In-house manufacturing	D-2 Installation	D-4 Energy consumption	D-6 Disposal

Figure 1. KONE MonoSpace 500® life cycle stages



We are proud to be the first elevator company to issue Environmental Product Declarations for the European market that comply with Product Category Rules (PCR).

The data used for raw material and energy production and modes of transportation in this Life Cycle Assessment were from Ecoinvent v3.2 with “allocation, cut-off by classification”. The MonoSpace® 500 modules and the representative components in each functional group are listed below together with their production locations and life cycle stages according to the PCR.

Life cycle stage	C-2 inhouse manufacturing				
Manufacturing country	Finland	Italy			Italy/Finland
Module	Module 1 Machinery	Module 7 Electrical systems	Module 8 Signalization, 5 floors	Module 9 Door	Module 6 Car 1,100 x 1,400 x 1,200 mm

Life cycle stage	U-3 Outsourced manufacturing				
Manufacturing country	Czech Republic/ Italy	Czech Republic	Austria		Italy/Poland
Module	Module 2 Guide rail 630 kg, 1.0 m/s	Module 3 Shaft equipment 630 kg, 1.0 m/s	Module 4 Slings and safeties 630 kg, 1.0 m/s	Module 10 Door operator, normal operator	Module 5 Filler bit 630 kg, 1.0 m/s

The elevator in this study is in use in Brussels, Belgium. The Belgian average mix of energy was used when calculating emissions resulting from energy consumption during the use stage. The maintenance stage includes rope replacement. For the KONE MonoSpace 500, the typical rope replacement interval is eight (8) years, meaning it is expected that the ropes will be replaced twice during the elevator’s 25-year life cycle.

CONTENT DECLARATION

The table below shows a material summary of the elevator studied, as delivered and installed in a building and handed over to a customer. The summary is calculated from data provided by KONE.

Table 2. Material summary of KONE MonoSpace® 500 as one unit of product (excluding spare parts packaging) and with a full life cycle approach (including spare parts packaging)*.

	MonoSpace 500, [kg]	MonoSpace 500, [w-%]	Full Life Cycle, [kg]	Full Life Cycle, [w-%]
Ferrous metals (zinc-coated steel, stainless steel, cold rolled steel, cast iron, NdFeB magnet)	1760	65.50%	1910	59.00%
Non-ferrous metals (aluminum, copper)	32.7	1.20%	32.7	1.00%
Plastics & rubbers (acrylonitrile butadiene styrene, polyamide, polycarbonate, polypropylene, polyurethane, polyethylene, pnidentified plastics, polyester resin, polystyrene, poly vinyl chloride, ethylene propylene rubber)	15.5	0.60%	39.5	1.20%
Inorganic materials (concrete, glass)	786	29.20%	786	24.30%
Organic materials (wood, plywood, cardboard)	0	0.00%	378	11.70%
Lubricants, paintings, coatings, adhesives and fillers (glues)	1	0.00%	1	0.00%
Electric and electronic equipment	90	3.30%	90	2.80%
Batteries and accumulators	2.46	0.10%	2.46	0.10%
Refrigerants in car air conditioners	0	0.00%	0	0.00%
Other materials	0.29	0.00%	0.29	0.00%
Total	2690	100%	3240	100%

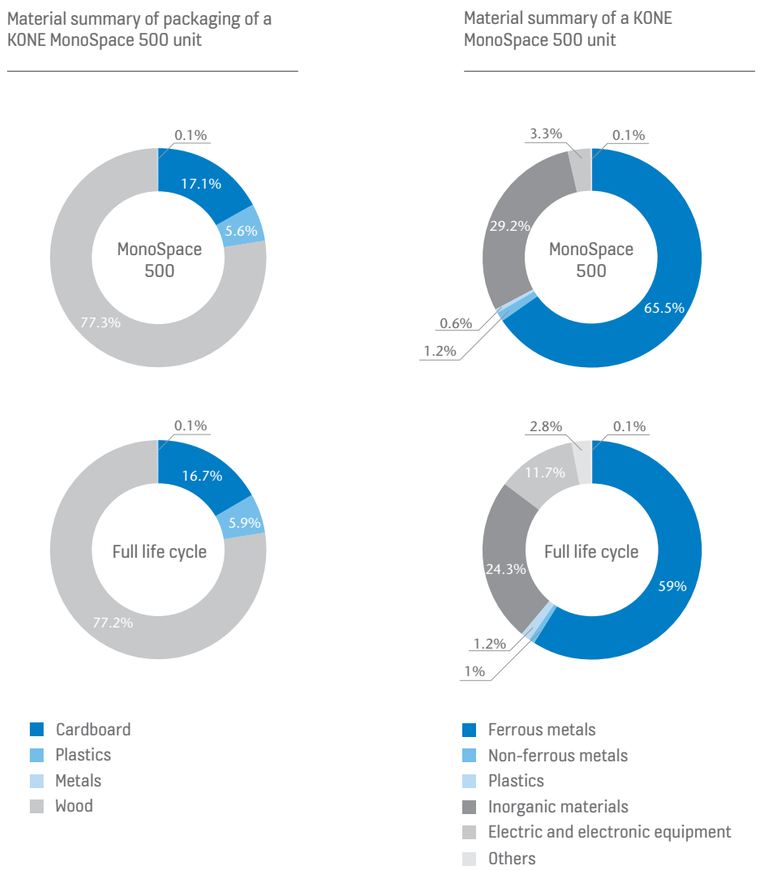
This figure describes the material composition of the elevator. The recycled material content of incoming materials could not be specified by KONE and its suppliers.

Table 3. Material summary of packaging of KONE MonoSpace 500 for one unit of product (excluding spare parts packaging) and with a full life cycle approach (including spare parts packaging)*.

	MonoSpace 500, [kg]	MonoSpace 500, [w-%]	Full Life Cycle, [kg]	Full Life Cycle, [w-%]
Cardboard	67.3	17.10%	67.3	16.70%
Metals	0.5	0.10%	0.5	0.10%
Plastic (PE-LD)	17.9	4.50%	19.9	4.90
Plastic (PET)	1.5	0.40%	1.5	0.40%
Plastic (PS)	2.6	0.70%	2.6	0.60%
Plywood	29	7.40%	29	7.20%
Wood	275	69.90%	281	70.00%
Total	394	100%	402	100%

*Actual figures may differ due to rounding.

Figure 2. Material summary of a KONE MonoSpace 500 unit and its packaging



PRODUCT MATERIAL CONTENT

The KONE MonoSpace 500 elevator is mainly composed of steel and concrete. The product does not contain:

- asbestos
- paints containing lead or cadmium pigments
- plastics containing cadmium stabilizers
- capacitors containing PCBs or PCTs
- ozone-depleting substances such as CFCs
- chlorinated solvents
- mercury in other components than lighting

100%

of the electricity consumed at our corporate head offices and our manufacturing and R&D sites in Finland, Italy, and the Netherlands is produced from renewable sources. Many of our other country organizations also purchase renewable energy, and we have some onsite renewable energy production in the US, Italy, Norway, Finland, and China.

0%

landfill waste at our manufacturing units in China, the Czech Republic, Finland, India, Italy, the Netherlands, and AllenPlace in the US.

SOLAR PANELS INSTALLED AT NORWAY HEAD OFFICE

Our Norway head office in Oslo moved into a passive energy building in 2012. The solar panels were installed in May 2016, and they produce around 40,000 kWh annually, which equals to 20% of electricity consumption of all lighting in the building. The KONE Oslo head office is currently one of the most energy efficient buildings in Norway.

The life cycle inventory provides a list of energy recources, emissions, wastes, and raw materials for the whole life cycle of the product. The assumptions for resource use calculations are presented in the MonoSpace® 500 LCA report. Data for secondary materials or energy and recovered energy flows were not available (marked N.A. in the following tables). The use of resources is reported in the following tables per entire elevator life cycle and per tkm.

Table 4. The use of resources per entire elevator life cycle

	Non-renewable energy resources (energy) [MJ]	Non-renewable material resources (materials) [kg]	Renewable energy resources (energy) [MJ]	Renewable material resources (materials) [kg]	Secondary energy resources [MJ] ***	Secondary material resources [kg] ****	Recovered energy [MJ] *****
U-1 Materials manufacturing	8.33E+04	5.15E+03	7.71E+03	5.88E+02	N.A.	8.91E+02	N.A.
U-2 Transport to manufacturing site	2.25E+03	9.19E+01	2.42E+01	1.87E+00	N.A.	N.A.	N.A.
U-3 Outsourced manufacturing	7.79E+01	3.81E-01	1.28E+01	7.21E-01	1.16E-01	N.A.	N.A.
C-1 Own materials manufacturing	-	-	-	-	-	-	-
C-2 In-house manufacturing	4.43E+03	2.59E+01	1.66E+03	1.23E+02	2.03E+01	N.A.	0.00E+00
D-1 Transport from manufacturing to building site	1.07E+04	7.96E+02	1.15E+04	1.61E+03	N.A.	2.55E-01	N.A.
D-2 Installation	2.50E+03	8.62E+01	6.63E+01	8.44E+00	1.26E+00	N.A.	N.A.
D-3 Maintenance	3.79E+03	1.25E+02	1.33E+02	1.62E+01	5.57E+00	N.A.	N.A.
D-4 Energy consumption	7.06E+04	3.98E+02	1.53E+04	1.55E+03	1.64E+03	N.A	N.A
D-5 Waste processing	1.06E+03	4.36E+01	1.65E+01	1.35E+00	N.A.	N.A.	N.A.
D-6 Disposal	**	**	**	**	**	**	**
Total life cycle	1.79E+05	6.71E+03	3.64E+04	3.91E+03	1.67E+03	8.91E+02	0.00E+00

RESULTS INTERPRETATION

The potential environmental impacts studied in this case were defined by the PCR. The impact assessment method used was CML 2001 and the impact classes were global warming potential (GWP), acidification potential (AP), eutrophication potential (EP), photochemical ozone creation potential (POCP), and abiotic depletion potential (ADP) of elements and fossil fuels. The biggest share of impacts was created in the U-1 Materials manufacturing stage, which created approximately half of GWP and ADP of fossil fuels, and 80-85% of AP, EP, and POCP in Usage category 3 (UC3). 99% of the ADP of elements was created within the U-1 Materials manufacturing stage. The D-4 Energy consumption stage was the second most important life cycle stage, creating c. 40% of GWP and ADP of fossil fuels in UC3, and c. 10% of AP, EP, and POCP. In recent years, the energy consumption of elevators in the use stage has been actively reduced as a result of development work by KONE, so the results can also be seen as reasonable in this sense. D-1 Transport from manufacturing to building site stage created 5–7% of GWP and ADP of fossil fuels. The rest of the life cycle stages were of minor importance. It is important to bear in mind that the results of different impact categories cannot be compared in this study since the calculation was performed on a midpoint level that aims to illustrate the potential environmental impacts. Thus it cannot be said that e.g. the result of climate change is more important than the result of acidification or eutrophication in this study.

Table 5. The use of resources per tkm

	Non-renewable energy resources (energy) [MJ]	Non-renewable material resources (materials) [kg]	Renewable energy resources (energy) [MJ]	Renewable material resources (materials) [kg]	Secondary energy resources [MJ] ***	Secondary material resources [kg] ****	Recovered energy [MJ] *****
U-1 Materials manufacturing	1.09E+02	6.76E+00	1.01E+01	7.72E-01	N.A.	1.17E+00	N.A.
U-2 Transport to manufacturing site	2.96E+00	1.21E-01	3.18E-02	2.45E-03	N.A.	N.A.	N.A.
U-3 Outsourced manufacturing	1.02E-01	5.00E-04	1.68E-02	9.48E-04	1.52E-04	N.A.	N.A.
C-1 Own materials manufacturing	-	-	-	-	-	-	-
C-2 In-house manufacturing	5.82E+00	3.41E-02	2.18E+00	1.62E-01	2.67E-02	N.A.	0.00E+00
D-1 Transport from manufacturing to building site	1.40E+01	1.05E+00	1.51E+01	2.12E+00	N.A.	3.35E-04	N.A.
D-2 Installation	3.28E+00	1.13E-01	8.71E-02	1.11E-02	1.65E-03	N.A.	N.A.
D-3 Maintenance	4.98E+00	1.64E-01	1.75E-01	2.13E-02	7.32E-03	N.A.	N.A.
D-4 Energy consumption	9.27E+01	5.23E-01	2.01E+01	2.04E+00	2.15E+00	N.A.	N.A.
D-5 Waste processing	1.39E+00	5.73E-02	2.16E-02	1.78E-03	N.A.	N.A.	N.A.
D-6 Disposal	**	**	**	**	**	**	**
Total life cycle	2.35E+02	8.82E+00	4.78E+01	5.13E+00	2.19E+00	1.17E+00	0.00E+00

*Actual figures may differ due to rounding.

**KONE instructions state that each material and component is collected and recycled separately in Europe, thus no processes were listed for stage D-6 Disposal.

***Secondary energy resources include only the amount of waste incineration in each country where electricity is used directly. The energy consumption within the Ecoinvent LCI datasets is not considered. The rest of the life cycle stages cannot be defined with full certainty. They are thus marked as not available (N.A.)

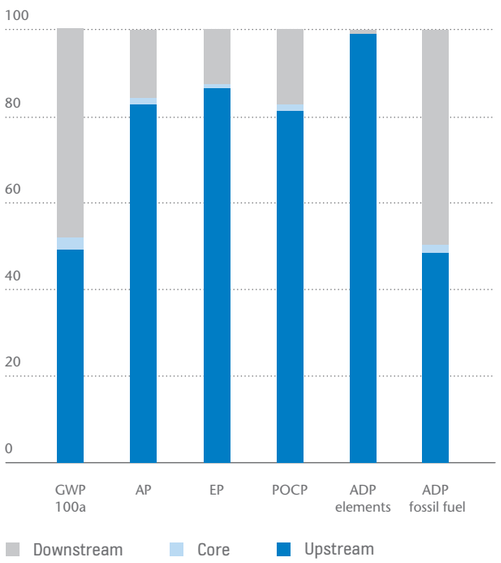
****Secondary material resources consider only the amount of iron scrap and copper scrap that are used for steel production, copper production, or cast iron production. Other possible secondary material uses could not be found from the Ecoinvent LCI datasets. They are thus marked as not available (N.A.)

*****Possible recovered energy is not reported in the Ecoinvent LCI datasets. There is no recovered energy in KONE's own processes in C-2, In house manufacturing. The rest of the life cycle stages cannot be defined with full certainty. They are thus marked as not available (N.A.)

POTENTIAL ENVIRONMENTAL IMPACT

In the LCA, impact assessment method CML 2001 and its related characterization factors were employed at the midpoint level as requested in the PCR (Environdec 2015, version 1.0), i.e. without normalization and weighting. Selected environmental impact categories for this study were global warming (CML 2001, August 2016 version, IPCC 2013 100 year horizon), acidification (CML 2001 non-baseline, August 2016 version), eutrophication (CML 2001 baseline, August 2016 version), photochemical ozone creation (CML 2001, baseline, high NOx, August 2016 version), abiotic depletion of elements (CML 2001, baseline, August 2016 version), and abiotic depletion of fossil fuels (CML 2001, baseline, August 2016 version). The results of the environmental impact assessment are divided by life cycle stage per entire life cycle (Table 6) and per tkm (Table 7). The share of each life cycle step is presented in Figure 3, below.

Figure 3: The environmental impact share of each life cycle stage described in Figure 1.



GWP 100a: Global warming potential 100 years, as kg CO_2 eq.
AP: Acidification potential as kg SO_2 eq.
EP: Eutrophication potential as kg $PO_4$3 eq.
POCP: Photochemical ozone-creation potential as kg ethylene eq.
ADP elements: Abiotic depletion potential elements as kg Sb eq.
ADP fossil fuel: Abiotic depletion potential fossil fuels as MJ

Table 6: Potential environmental impacts per entire life cycle

	GWP 100a	AP	EP	POCP	ADP elements	ADP fossil fuel
U-1 Materials manufacturing	6.20E+03	7.08E+01	3.10E+01	3.46E+00	7.58E-01	8.79E+04
U-2 Transport to manufacturing site	1.60E+02	6.94E-01	1.23E-01	2.86E-02	3.23E-04	2.34E+03
U-3 Outsourced manufacturing	5.06E+00	2.42E-02	1.94E-02	1.06E-03	1.80E-06	6.71E+01
C-1 Own materials manufacturing	-	-	-	-	-	-
C-2 In-house manufacturing	3.78E+02	1.42E+00	3.05E-01	6.15E-02	1.33E-04	3.50E+03
D-1 Transport from manufacturing to building site	6.63E+02	2.74E+00	6.64E-01	1.40E-01	1.31E-03	1.11E+04
D-2 Installation	1.79E+02	6.26E-01	1.77E-01	4.48E-02	1.96E-03	2.60E+03
D-3 Maintenance	2.73E+02	9.35E-01	2.70E-01	6.76E-02	2.96E-03	3.95E+03
D-4 Energy consumption	5.04E+03	9.33E+00	3.65E+00	4.90E-01	3.46E-03	7.46E+04
D-5 Waste processing	7.45E+01	2.61E-01	5.75E-02	1.33E-02	3.97E-04	1.11E+03
D-6 Disposal*	*	*	*	*	*	*
Total life cycle	1.30E+04	8.68E+01	3.62E+01	4.31E+00	7.68E-01	1.87E+05

Table 7: Potential environmental impacts per tkm

	GWP 100a	AP	EP	POCP	ADP elements	ADP fossil fuel
U-1 Materials manufacturing	8.15E+00	9.30E-02	4.07E-02	4.55E-03	9.96E-04	1.15E+02
U-2 Transport to manufacturing site	2.10E-01	9.12E-04	1.61E-04	3.76E-05	4.24E-07	3.08E+00
U-3 Outsourced manufacturing	6.64E-03	3.18E-05	2.55E-05	1.40E-06	2.37E-09	8.81E-02
Upstream total	-	-	-	-	-	-
C-1 Own materials manufacturing	4.96E-01	1.86E-03	4.00E-04	8.07E-05	1.74E-07	4.60E+00
C-2 In-house manufacturing	8.71E-01	3.59E-03	8.72E-04	1.84E-04	1.72E-06	1.46E+01
Core total	2.36E-01	8.23E-04	2.33E-04	5.89E-05	2.58E-06	3.41E+00
D-1 Transport from manufacturing to building site	3.59E-01	1.23E-03	3.55E-04	8.89E-05	3.89E-06	5.19E+00
D-2 Installation	6.62E+00	1.23E-02	4.80E-03	6.43E-04	4.55E-06	9.80E+01
D-3 Maintenance	9.80E-02	3.42E-04	7.55E-05	1.74E-05	5.21E-07	1.45E+00
D-4 Energy consumption	*	*	*	*	*	*
D-5 Waste processing	1.70E+01	1.14E-01	4.76E-02	5.66E-03	1.01E-03	2.46E+02
D-6 Disposal*	*	*	*	*	*	*
Downstream total	8.13E+00	1.81E-02	6.57E-03	9.86E-04	1.18E-05	1.23E+02
Total life cycle	1.70E+01	1.14E-01	4.78E-02	5.65E-03	1.01E-03	2.46E+02

*KONE instructions state that each material and component is collected and recycled separately in Europe, thus no processes were listed for stage D-6 Disposal.

VEHICLE FLEET

Our global vehicle fleet is one of the biggest contributors to our operational greenhouse gas emissions, so we are continuously searching for new and innovative ways to reduce the carbon footprint of our fleet. We have been further exploring the use of alternative fuels and aim to shift from fuel cars to electric cars as soon as the leasing contract renewal periods allow and the infrastructure needed is in place in the different countries where we operate.

ELECTRIC VEHICLES

At the end of 2016, we received our first electric vehicle in France, a Renault Zoe. This is part of our car-sharing pool based in Nice.

We continue to work towards an environmentally sound fleet composition. We expect more electric vehicles to be integrated into the car-sharing pool of our offices close to Paris. In addition, there is a growing customer interest in using electric vehicles in our service fleet and we plan to respond to this demand.

ISO CERTIFICATIONS

- All our corporate, manufacturing, and R&D units are ISO 14001 and ISO 9001 certified.
- 20 major country organizations are ISO 14001 certified, and our manufacturing units in the Czech Republic and Italy are ISO 50001 certified.
- At the end of 2016, 97% of our strategic suppliers were ISO 9001 certified and 93% were ISO 14001 certified.

WASTE PRODUCTION

As with resource use, data on the amount of waste disposed were not available (marked N.A. in the following tables) from the Ecoinvent LCI datasets. The calculations of waste flows are therefore based on information collected from KONE only, i.e. specific data. The average data from Ecoinvent is marked as N.A. The amount of waste produced during the life cycle is shown in Table 8 per entire life cycle and in Table 9 per tkm. The waste from D-1 Transport from manufacturing to building site represents the material losses from the production processes of packaging materials with an assumed material loss of 5%. The waste from D-2 Installation describes the packaging materials, which can be recycled or incinerated, but since KONE prefers recycling, that process is not included in the study as recommended in the PCR. Finally, the waste from D-5 waste processing describes the elevator components and materials that are recycled in accordance with KONE's instructions. However, the lubricants (1.0 kg in Table 2) and batteries (2.46 kg in Table 2) are reported as hazardous waste in the tables below.

Table 8. Waste production and output flows per entire life cycle

	Hazardous waste disposed [kg]	Non-hazardous waste disposed [kg]
U-1 Materials manufacturing	N.A.	N.A.
U-2 Transport to manufacturing site	N.A.	N.A.
U-3 Outsourced manufacturing	2.75E-01	1.36E+02
C-1 Own materials manufacturing	-	-
C-2 In-house manufacturing	1.27E-01	7.01E+01
D-1 Transport from manufacturing to building site	0.00E+00	2.02E+01
D-2 Installation	0.00E+00	3.94E+02
D-3 Maintenance	0.00E+00	1.58E+02
D-4 Energy consumption	N.A.	N.A.
D-5 Waste processing	3.46E+00	2.69E+03
D-6 Disposal*	N.A.	N.A.
Total life cycle	3.86E+00	3.46E+03

Table 9. Waste production and output flows per tkm.

	Hazardous waste disposed [kg]	Non-hazardous waste disposed [kg]
U-1 Materials manufacturing	N.A.	N.A.
U-2 Transport to manufacturing site	N.A.	N.A.
U-3 Outsourced manufacturing	3.61E-04	1.78E-01
C-1 Own materials manufacturing	N.A.	N.A.
C-2 In-house manufacturing	1.66E-04	9.21E-02
D-1 Transport from manufacturing to building site	0.00E+00	2.65E-02
D-2 Installation	0.00E+00	5.18E-01
D-3 Maintenance	0.00E+00	2.08E-01
D-4 Energy consumption	N.A.	N.A.
D-5 Waste processing	4.55E-03	3.53E+00
D-6 Disposal*	N.A.	N.A.
Total life cycle	5.07E-03	4.55E+00

*KONE instructions state that each material and component is collected and recycled separately in Europe, thus no processes were listed for stage D-6 Disposal.

KONE A WORLD LEADER IN CDP 2016 CLIMATE CHANGE REPORTING

2016 marks the second year KONE has earned a place on the A List – this year as one of the only 193 companies from thousands of others independently assessed against CDP's scoring methods. The company's score has risen for seven consecutive years. The Climate A List comprises companies from around the world that have been identified as leaders in their efforts and actions to combat climate change during the past CDP reporting year. The Climate A List constitutes the baseline for corporate climate action and includes companies identified as leaders in the transition towards a low-carbon economy.

During 2016, KONE also received recognition as a leading supplier for action on climate change and was recognized on the new global CDP Supplier A List.

In 2016, KONE created externally verified Environmental Product Declarations for all our 11 building door models, published on www. ibu-epd.com.

Institut Bauen und Umwelt (IBU) is the program operator for building door EPDs.

PROGRAM-RELATED INFORMATION AND VERIFICATION

Program:	**The International EPD® System** **EPD International AB** Box 210 60 SE-100 31 Stockholm Sweden www.environdec.com
EPD registration number:	S-P-01063
Published:	2017-10-02
Valid until:	2020-04-10
Product Category Rules:	PCR 2015 Product Category Rules According to ISO 14025. Lifts (Elevators) Product classification: UN CPC 4354. Version 1.0
Product group classification:	UN CPC 4354
Reference year for data:	2015-2016
Geographical scope:	Europe

Product category rules (PCR):	PCR 2015 Product Category Rules According to ISO 14025. Lifts (Elevators) Product classification: UN CPC 4354. 2015:05. Version 1.0
PCR review was conducted by:	"The Technical Committee of the International EPD® System. Review chair: Maurizio Fieschi. Contact via info@environdec.com.
Independent verification of the declaration and data, according to ISO 14025:2006:	☐ EPD Process certification (internal) ■ EPD Verification (external)
Third party verifier:	Panu Pasanen, Bionova Ltd.
Accredited by:	Approved by the International EPD® System

CONTACT INFORMATION

EPD owner:	**KONE Corporation** Corporate Offices Keilasatama 3 P.O. Box 7 FI-02150 Espoo Finland www.kone.com
LCA author:	**VTT Technical Research Centre of Finland (VTT)** P.O. Box 1000 FI-02044 VTT Finland www.vtt.fi
Program operator:	**EPD International AB** info@environdec.com

Comparability: EPDs are not comparative assertions and are either not comparable or have limited comparability when they cover different life cycle stages, are based on different product category rules, or are missing relevant environmental impacts. EPDs within the same product category but from different programmes may not be comparable.

APPENDICES

GLOSSARY

Abiotic depletion potential (ADP)
Expressed in kg antimony (Sb) eq. for non-fossil resources and in MJ for fossil resources. In the CML method the non-fossil resources include e.g. silver, gold, copper, lead, zinc, and aluminum.

Acidification potential (AP)
Chemical alternation of the environment, resulting in hydrogen ions being produced more rapidly than they are dispersed or neutralized; occurs mainly through fallout of sulfur and nitrogen compounds from combustion processes. Acidification can be harmful to terrestrial and aquatic life.

CML Impact Assessment Method
The CML methodology is based on midpoint modeling (problem-oriented method). Pollutants are allocated to impact categories.

Environmental Product Declaration (EPD)
An EPD provides numerical data about a product's environmental performance and facilitates comparison between different products with the same function. KONE EPDs are based on life cycle assessments.

Eutrophication Potential (EP)
The enrichment of bodies of water by nitrates and phosphates from organic material or the surface run-off; increases the growth rate of aquatic plants and can produce algal blooms that deoxygenate water and smother other aquatic life.

Exponential notation (E)
A way of writing numbers that accommodates values too large or small to be conveniently written in standard decimal notation, e.g. 7.21E-04 kg is equal to 0.000721 kg.

Functional unit
The quantified performance of a product system for use as a reference unit.

Global Warming Potential (GWP100)
The index used to translate the level of emissions of various gases into a common measurement in order to enable comparison of their contributions to the absorption by the atmosphere of infrared radiation. Greenhouse gases are converted to CO2 equivalents with GWP factors, using factors for a 100-year interval (GWP100).

ISO 25745
ISO 25745-2:2015 specifies a method of estimating energy consumption based on measured values, calculation, or simulation on an annual basis for traction, hydraulic, and positive drive elevators on a single-unit basis, and an energy classification system for new, existing, and modernized traction, hydraulic, and positive drive elevators on a single-unit basis.

Life Cycle Assessment (LCA)
LCA is a method that quantifies the total environment impact of products or activities over their entire life cycle and life cycle thinking. Life cycle assessment is based on ISO 14040 and ISO 14044 standards and comprises four phases: goal and scope definition, inventory data collection and analysis, environmental impact assessment, and interpretation of results. The results of LCA are used in communication and product development purposes, for example.

Life Cycle Inventory (LCI)
The phase of life cycle assessment involving the compilation and quantification of inputs and outputs for a product system throughout its life cycle.

Life Cycle Impact Assessment (LCIA)
The phase of life cycle assessment aimed at understanding and evaluating the magnitude and significance of the potential environmental impacts of a product system throughout the life cycle of the product.

Product Category Rules (PCR)
Product Category Rules (PCR) define the rules and requirements for EPDs of a certain product category. They are a key part of ISO 14025 as they enable transparency and comparability between EPDs.

Photochemical Ozone Creation Potential (POCP)
The index used to translate the level of emissions of various gases into a common measurement in order to enable comparison their contributions to the change in ground-level ozone concentration. Photochemical ozone creation potentials are calculated as the change that would result from the emission of 1kg of a gas to that from the emission of 1 kg of ethylene.

REFERENCES

General Programme Instructions of the International EPD® System. Version 2.5.

PCR 2015 Product Category Rules According to ISO 14025. Lifts (Elevators) Product classification: UN CPC 4354. Version 1.0.

Ecoinvent 2016. Ecoinvent 3.2. Swiss Centre of Life Cycle Inventories. Commercial database. Access to data requires a license. Available: http://www.ecoinvent.ch/. [Accessed on 16.08.2016].

Source: Sachs, Harvey M. (2005): Opportunities for Elevator Energy Efficiency Improvements, ACEEE.

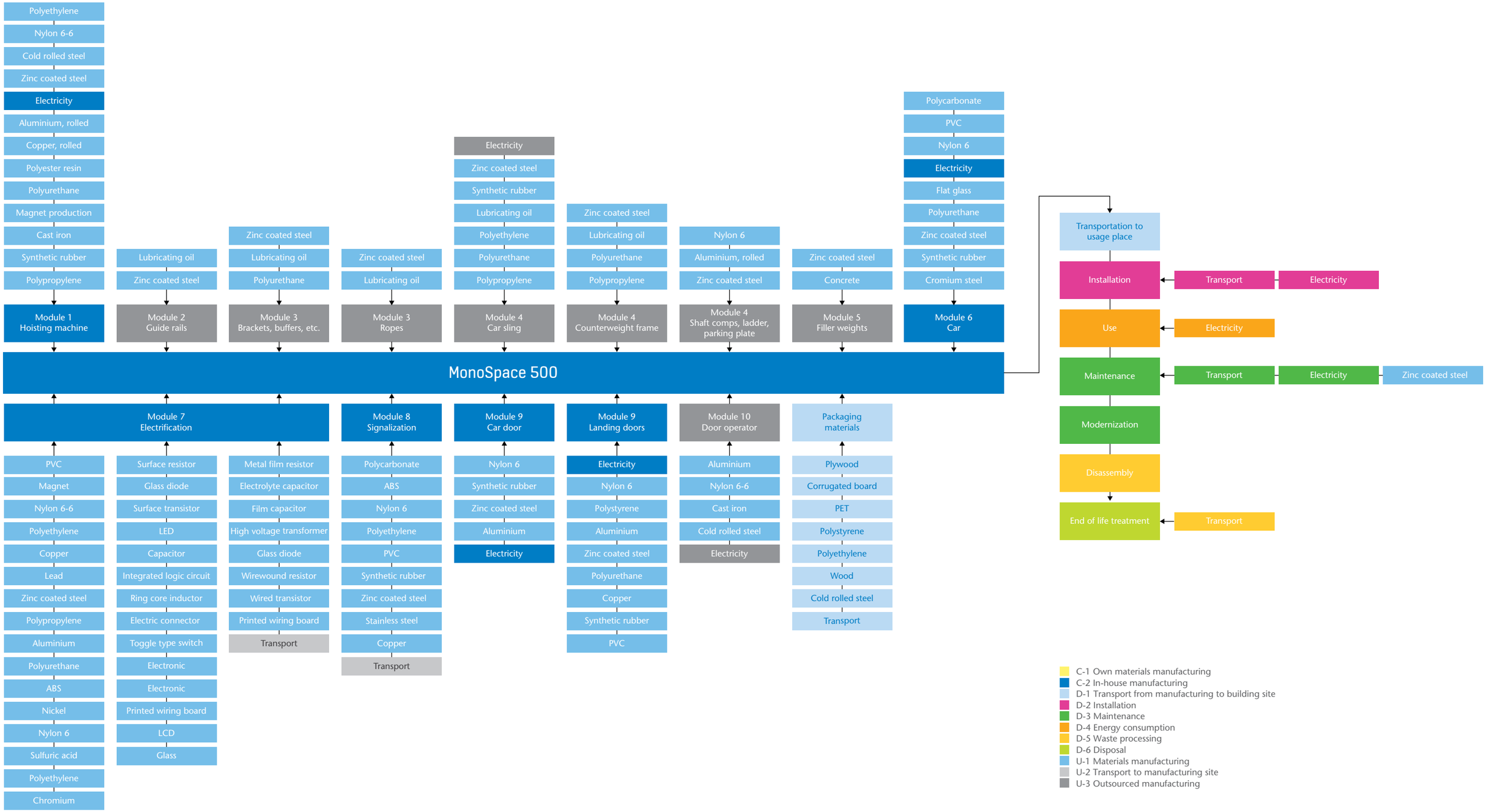
KONE Sustainability Report 2016.

MEMBERSHIPS AND POSITIONS OF TRUST

KONE is an active participant in organizations developing codes, standards, and guidelines for improving safety, accessibility, and energy efficiency, as well as other organizations advancing sustainable development. In 2016, KONE continued to be a member or joined the following organizations:

- United Nations Global Compact
- The International Organization for Standardization (ISO)
- Standardization Administration of China (SAC)
- The European Committee for Standardization (CEN)
- International Trade Associations, such as the European Lift Association (ELA), the Pacific Asia Lift and Escalator Association (PALEA), and the National Elevator Industry, Inc. (NEII) in North America
- World Business Council for Sustainable Development (WBCSD)
- Green building councils in the United States, Finland, India, Italy, Romania, Singapore, the Netherlands, Sweden, Vietnam, and the Czech Republic
- World Alliance of Low Carbon Cities (WALCC)
- European Round Table of Industrialists' Energy and Climate Change Working Group (ERT)
- Cleantech Finland
- Climate Leadership Council and Smart & Clean foundation
- Council on Tall Buildings and Urban Habitat (CTBUH)
- FIBS Finnish corporate responsibility network

Figure 4. Flowsheet of KONE MonoSpace 500 in entire life cycle



KONE provides innovative and eco-efficient solutions for elevators, escalators, automatic building doors and the systems that integrate them with today's intelligent buildings.

We support our customers every step of the way; from design, manufacturing and installation to maintenance and modernization. KONE is a global leader in helping our customers manage the smooth flow of people and goods throughout their buildings.

Our commitment to customers is present in all KONE solutions. This makes us a reliable partner throughout the life cycle of the building. We challenge the conventional wisdom of the industry. We are fast, flexible, and we have a well-deserved reputation as a technology leader, with such innovations as KONE MonoSpace®, KONE NanoSpace™ and KONE UltraRope®.

KONE employs over 52,000 dedicated experts to serve you globally and locally.

KONE CORPORATION

Corporate Offices
Keilasatama 3
P.O. Box 7
FI-02150 Espoo
Finland

www.kone.com