ecolizer 2.0

ecodesign tool

Make the difference with this guide to ecodesign!
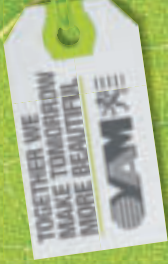
TOGETHER WE MAKE TOMORROW MORE BEAUTIFUL

OVAM

How · what · why

Make an inventory and limit the use of energy-intensive materials.

Avoid scarce materials.

Make a product as light as technically possible.

Give all components the same lifespan or make sure they can be replaced separately.

Simplify repairs and reuse.

Estimate the duration of the product warranty.

Make a sound analysis of the real need without considering the product as the answer to that need.

Perhaps the product can be used by various people; perhaps a service is a better solution for fulfilment of the need.

This Ecolizer was developed for designers who wish to analyse the environmental impact of their product. It contains tens of sheets with hundreds of eco-indicators.

Eco-indicators are numbers that reflect the environmental burden of materials, processing procedures, transport, energy, recycling and waste treatment. The higher the score, the bigger the environmental impact.

The first Ecolizer was developed in 2005. Eco-indicators were then calculated using the "Eco-indicator '99 method". Four years later, an update is required. Not only have new data become available, the calculation method has improved as well. As a result, the Ecolizer 2.0 uses both recalculated eco-indicators and the most recent scientific method. This means that you can't use it for comparisons to, or for combining numbers with, data published earlier in the first Ecolizer version.

For calculation of the data, we opted for the "ReCiPe method", the logical and updated successor of the "Eco-indicator '99 method". Environmental impact categories (mid point) and damage categories (end point) were defined and weighed further into one single indicator. For more information on the Ecolizer please visit www.ovam.be/ecolizer.

The data in this Ecolizer are based on the Eco-invent 2.0 database. Using the software programme SimaPro, VITO performed the calculations at the end of 2009.
Although OVAM supports the work method used for the Ecolizer 2.0, not all results or indicators should be considered approved OVAM's point of view.

The Ecolizer 2.0 is meant for internal use, e.g. for product development; it is not intended for environmental marketing, for environmental labels or to publicly prove the advantages of product A over B, nor is it meant for use in the governmental issue of standards and directives.

The Ecolizer 2.0 is primarily a tool for designers, helping them to assess environmental product impact and to choose the proper material for each individual application. It is a first step towards ecodesign, but not the only one. Defining a life cycle scenario and determining a functional unit of your product/design are particularly important when using the Ecolizer. For some, the Ecolizer will prove too complex and time-consuming, for others it may not be sophisticated enough. Alternatives are available to fulfil the needs of both types of users.

The Ecolizer 2.0 is particularly suitable for calculating the product's environmental impact. A few other ecodesign guidelines, such as nested packaging, modular construction, timeless design, etc., are not taken into account. The Ecolizer 2.0 uses European data only. This must be taken into consideration in case part of a product chain falls outside this scope.

To meet the broad range of materials included in your work as a designer, we also added materials and processes from other disciplines, such as a series of building materials for stand construction and exhibitions. Calculating the environmental impact of a building is, however, not the purpose of the Ecolizer 2.0. Other, more suitable instruments are available for that purpose.

Some materials, such as very specific metal alloys, plastics and textile products, are not included because they are not available in the European databases. In those cases, an estimate on the basis of comparable indicators has preference over omitting the indicator altogether.

Further research on the basis of designers' own findings and feedback will lead to more additions and improvements of the Ecolizer.

With the Ecolizer 2.0, OVAM offers you a scientifically well-founded tool that can help to increase the environmental safety of your design/product. We have tried to make the Ecolizer 2.0 as complete as possible, however, we call on designers and producers availing of more accurate data to have those incorporated in central databases such as Eco-invent and databases under construction in the EU.

Ferrous metals

Minimise the number of components, materials and processes.

Use materials to maximum efficiency and minimise production waste.

PRODUCTION	mPt/kg
Cast iron/kg**	173
Iron scrap/kg	dna

PROCESSING	mPt
Zinc coating (coils)/m²	735 (!)
Drilling, CNC*/kg	311
Drilling, conventional/kg	293
Turning, CNC*/kg	357
Turning, conventional/kg	300
Enamelling/m²	841 (!)
Milling/kg	310
Zinc coating, pieces/m²	671 (!)
Casting, mechanical/kg	168
Casting (sand, mechanical)/kg	77

RECYCLING	mPt/kg
Proces	76
Primary material saved	-173
Total	-97

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	26 (!)

 * Computer Numerical Control.
** Cast iron, consisting of 35% secondary material.

Black indicator: trustworthy data
Grey indicator: less trustworthy data/ limited data
(!): generic data for this group of materials
dna: data not available
na: not applicable

PRODUCTION	mPt/kg
Stainless Steel 18/8 (converter, primary)/kg	551
Stainless electric Steel 18/8 (secundary)/kg	511

PROCESSING	mPt
Drilling, CNC*/kg	708
Drilling, conventional/kg	672
Bending/cm	2
Chemical staining	dna
Deep drawing, automode operation/kg	26 (!)
Deep drawing, 650 kN press, single stroke operation/kg	28 (!)
Deep drawing, 3500 kN press, single stroke operation/kg	30 (!)
Deep drawing, 10000 kN press, single stroke operation/kg	36 (!)
Deep drawing, 38000 kN press, single stroke operation/kg	38 (!)
Turning, CNC*/kg	789
Turning, conventional/kg	682
Electrolytic staining	dna
Elektrochemical polishing	dna
Enamelling/m²	841 (!)
Milling/kg	704
Stamping/kg	40 (!)
Polishing	dna
Spot welding/pt	1 (!)
Abrade	dna
Punching/cutting/cm²	0,0154
TIG welding	dna
Black chrome coating, plate/m² (only Cr3 tolerated)	58
Sheet rolling/kg	59

RECYCLING	mPt/kg
Proces	76 (!)
Primary material saved	-551
Total	-475 (!)

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	26 (!)

*Computer Numerical Control.

No data available of the processes: folding, orbital revetting, clinching, floating and profiling.

Black indicator: trustworthy data
Grey indicator: less trustworthy data/ limited data
(!): generic data for this group of materials
dna: data not available
na: not applicable

PRODUCTION	mPt/kg
Primary	
Low-alloyed (converter)**	231
Un- alloyed (converter)	165
High-alloyed	dna
High strength steel	dna
Secundary	
Low-alloyed (average)	195
Un-alloyed or low-alloyed (elektrosteel)	61

PROCESSING	mPt
Zinc coating, coils (continuous)/m²	735 (!)
Welding/m	15
Drilling, CNC*/kg	340
Drilling, conventional/kg	311
Bending/cm	1,4
Deep drawing, automode operation/kg	26
Deep drawing, 650 kN press, single stroke operation/kg	28
Deep drawing, 3500 kN press, single stroke operation/kg	30
Deep drawing, 10000 kN press, single stroke operation/kg	36
Deep drawing, 38000 kN press, single stroke operation/kg	38
Wire drawing/kg	40
Turning, CNC*/kg	398
Turning, conventional/kg	318
Sheet rolling/kg	11 (!)
Enamelling/m²	841 (!)
Milling/kg	337
Welding, gas (autogenous)/m	dna
Hardening/kg	9
Sheet rolling, steel/kg	35
Laser cutting/m (4 mm steel)	17
Stamping/kg	40 (!)
Plasma cutting	dna
Powder coating/m²	424
Section bar rolling/kg	20
Spot welding/pt	1
Forge	dna
Punching/cutting/cm²	0,0107
Drawing of pipes/kg	44
Ultrasonic welding/m	dna
Black chrome coating, plate/m²(only Cr3 tolerated)	dna
Zinc coating, pieces/m²	671 (!)
Zinc coating (extra thickness)/m²	dna
Hot rolling/kg	27
Waterjet cutting	dna

RECYCLING	mPt/kg
Proces	76 (!)
Primary material saved	-231
Total	-155 (!)

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	26 (!)

 * Computer Numerical Control.
** Primary material + 1% Cr, 1% Mn, 1% Mo, 1% Ni.

No data available for tin-plate.

Ferrochromium 01.04

PRODUCTION	mPt/kg
Ferrochromium (primary)/kg	**379**

PROCESSING	mPt
Zinc coating, coils/m²	**735** (!)
Drilling, CNC*/kg	311 (!)
Drilling, conventional/kg	293 (!)
Turning, CNC*/kg	357 (!)
Turning, conventional/kg	300 (!)
Enamelling/m²	**841** (!)
Milling/kg	310 (!)
Industrial Casting/kg (casting, sand, mechanized)	77 (!)
Zinc coating, pieces/m²	**671** (!)
Casting (sand), mechanical/kg	168 (!)

RECYCLING	mPt/kg
Proces	**76** (!)
Primary material saved	**-379**
Total	**-303** (!)

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	**26** (!)

*Computer Numerical Control.

Ferronickel 01.05

PRODUCTION	mPt/kg
Ferronickel/kg	1105

PROCESSING	mPt
Zinc coating (coils)/m²	**735** (!)
Drilling, CNC*/kg	311 (!)
Drilling, conventional/kg	293 (!)
Turning, CNC/kg	357 (!)
Turning, conventional/kg	300 (!)
Enamelling/m²	**841** (!)
Milling/kg	310 (!)
Industrial Casting/kg (casting, sand, mechanized)	77 (!)
Zinc coating, pieces/m²	**671** (!)
Casting (sand)/kg	168 (!)

RECYCLING	mPt/kg
Proces	**76** (!)
Primary material saved	**-1105**
Total	**-1029** (!)

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	**26** (!)

*Computer Numerical Control.

Non-ferrous metals

Make an inventory and limit the use of energy-intensive materials.

Avoid scarce materials.

Make a product as light as technically possible.

PRODUCTION	mPt/kg
Aluminium, primary/kg	
Aluminium**	1045
Aluminium alloy EN AW5754, (AlMg3)/kg	439
100% recycled	
Secondary, from old scrap	134
Secondary, from new scrap	45

PROCESSING	mPt
Anodising/m²	338
Welding/m	18
Drilling, CNC*/kg	868
Drilling, conventional/kg	848
Bending/cm	0,8
Gravity die-casting	dna
Deep drawing, automode operation/kg	26 (!)
Deep drawing, 650 kN press, single stroke operation/kg	28 (!)
Deep drawing, 3500 kN press, single stroke operation/kg	30 (!)
Deep drawing, 10000 kN press, single stroke operation/kg	36 (!)
Deep drawing, 38000 kN press, single stroke operation/kg	38 (!)
Turning, CNC*/kg	942
Turning, conventional/kg	861
Sheet rolling/kg	11 (!)
Enamelling/m²	841 (!)
Milling/kg	874
Friction stir welding	dna
Casting, continuous casting/kg	382
Casting, sand, low pressure/kg	27
Pultrusion/kg	dna
Laser cutting/m (4 mm steel)	dna
Stamping/kg	40 (!)
Precipitation hardening	dna
Powder coating/m²	337
Section bar extrusion/kg	92
Spot welding/pt	4,7
Cold impact extrusion, 1 stroke/kg	75
Cold impact extrusion, every extra stroke/kg	27
Forge	dna
Selective coating of plate – nickle-aluminium oxide/m²	550
Punching/cutting/cm²	0,0064
Sheet rolling/kg	53
Ultrasonic welding/m	0,17 (!)
Contour	dna

RECYCLING	mPt/kg
Proces	130
Primary material saved	-1045
Total	-915 (!)

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	26 (!)

 * Computer Numerical Control.
** Primary material + 1% Cr, 1% Mn, 1% Mo, 1% Ni.

PRODUCTION	mPt/kg
Bronze/kg**	**938**

PROCESSING	mPt
Drilling, CNC*/kg	787 (!)
Drilling, conventional/kg	772 (!)
Turning, CNC*/kg	830 (!)
Turning, conventional/kg	780 (!)
Sheet rolling/kg	11 (!)
Enamelling/m²	**841** (!)
Milling/kg	dna
Casting/kg	**dna**
Stamping/kg	40 (!)
Contour/kg	**dna**
Ultrasonic welding/m	0,17 (!)

RECYCLING	mPt/kg
Proces	**76** (!)
Primary material saved	**-938**
Total	**-862** (!)

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	**26** (!)

 * Computer Numerical Control.
** Material consisting of 95% Cu and 5% Sn.

PRODUCTION	mPt/kg
Copper**	**774**

PROCESSING	mPt
Drilling, CNC*/kg	787 (!)
Drilling, conventional/kg	772 (!)
Selective coating of plate- titanium nitride oxide/m²	69
Wire drawing/kg	**209**
Turning, CNC*/kg	830 (!)
Turning, conventional/kg	780 (!)
Sheet rolling/kg	11 (!)
Enamelling/m²	**841** (!)
Milling/kg	**dna**
Stamping/kg	40 (!)
Ultrasonic welding/m	0,17 (!)
Black chrome coating, plate/m²	237
Sheet rolling/kg	**127**

RECYCLING	mPt/kg
Proces	**76** (!)
Primary material saved	**-774**
Total	**-698** (!)

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	**26** (!)

 * Computer Numerical Control.
** 44% secundary material.

PRODUCTION	mPt/kg
Brass**	683
Brazing solder, cadmium free***	646

PROCESSING	mPt
Drilling, CNC*/kg	787
Drilling, conventional/kg	772
Turning, CNC*/kg	830
Turning, conventional/kg	780
Sheet rolling/kg	11 (!)
Enamelling/m²	841 (!)
Milling/kg	dna
Casting/kg	dna
Stamping/kg	40 (!)
Contour/kg	dna
Forging	dna
Ultrasonic welding/m	0,17 (!)

RECYCLING	
Proces	76 (!)
Primary material saved	-683
Total	-607 (!)

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	26 (!)

* Computer Numerical Control.
** 70% Cu and 30% Zn.
*** 60% Cu and 40% Zn.

PRODUCTION	mPt/kg
Soft solder/kg**	3347
Tin (primary)/kg	dna

PROCESSING	mPt
Drilling, CNC*/kg	787 (!)
Drilling, conventional/kg	772 (!)
Turning, CNC*/kg	830 (!)
Turning, conventional/kg	780 (!)
Sheet rolling/kg	11 (!)
Enamelling/m²	841 (!)
Milling/kg	dna
Stamping/kg	40 (!)
Ultrasonic welding/m	0,17 (!)

RECYCLING	mPt/kg
Proces	76 (!)
Primary material saved	-3347
Total	-3271 (!)

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	26 (!)

* Computer Numerical Control.
** 97% Sn, 3% Cu.

PRODUCTION	mpt/kg
Chromium (primary)	dna
Cobalt	dna
Coltan	dna
Mercury, liquid	1163775
Lead (primary)	135
Magnesium	3768
Manganese (primary)	dna
Nickel*	2653
Palladium primary (3% secundary)	7119111
Palladium (secondary)	63054
Platinum (5% secundary)	4661326
Platinum, secondary	63042
Rhodium (15% secundary)	9558421
Rhodium (secundary)	63545
Titanium zinc plate	551
Titanium dioxide	466
Zinc, for coating (primary)	390 (!)

* Minimum 99,5% nickel.

Black indicator: trustworthy data
Grey indicator: less trustworthy data/ limited data
(!): generic data for this group of materials
dna: data not available
na: not applicable

Plastics

Use a limited number of various materials and choose materials that could get a new life in other products at a later stage.

Use plastics at maximum purity to enable recycling at a later stage.

Only combine plastics that don't render the recycling process impossible.

Ensure the material doesn't contain any toxic or "suspicious" substances.

Design in function of assembly and disassembly and mark the individual materials to enable easier recycling.

Use fastening techniques that allow for easy separation of the individual materials at a later stage.

PRODUCTION	mPt/kg
ABS/kg	431

PROCESSING	mPt
Revolving, milling, drilling/cm³	0,01 (!)
Hot element welding (30sec) /welding	2 (!)
Hot element welding (45min) /welding	155 (!)
Extrusion, plastic film/kg	49 (!)
Extrusion, plastic pipes/kg	36 (!)
Stretch blow moulding/kg	131 (!)
Blow moulding/kg	123 (!)
Laser welding/m	0,46 (!)
Foaming/kg	60 (!)
Rotation Forming/kg	106 (!)
Injection moulding/kg	126 (!)
Ultrasonic welding (15kHz)/welding*	0,04 (!)
Ultrasonic welding (20kHz)/welding*	0,02 (!)
Ultrasonic welding (40kHz)/welding*	0,01 (!)

RECYCLING	mPt/kg
Plastics (packaging mix)** proces	25 (!)
Primary material saved	-431
Total	-406 (!)

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	45 (!)

* Per welding joint of appr. 2,5 cm² (0,5 seconds welding).
** If sufficiently pure.

PRODUCTION	mPt/kg
EVA/kg	355
EVA, foil/kg	345

PROCESSING	mPt
Revolving, milling, drilling/cm³	0,01 (!)
Extrusion, plastic film/kg	49 (!)
Extrusion, plastic pipes/kg	36 (!)
Stretch blow moulding/kg	131 (!)
Blow moulding/kg	123 (!)
Hot element welding (30sec)	2 (!)
Hot element welding (45min)	155 (!)
Laser welding/m	0,46 (!)
Foaming/kg	60 (!)
Reaction injection moulding (RIM)/kg, large scale/kg	21 (!)
Rotation Forming/kg	106 (!)
Injection moulding/kg	126 (!)
Ultrasonic welding (15kHz)/welding*	0,04 (!)
Ultrasonic welding (20kHz)/welding*	0,02 (!)
Ultrasonic welding (40kHz)/welding*	0,01 (!)

RECYCLING	mPt/kg
Plastics (packaging mix)** proces	25 (!)
Primary material saved	-355
Total	-330 (!)

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	36 (!)

* Per welding joint of appr. 2,5 cm² (0,5 seconds welding).
** If sufficiently pure.

PRODUCTION	mPt/kg
PA 6	756
PA 6.6	715
Glass-filled PA 6	624
Glass-filled PA 66	612

PROCESSING	mPt
Revolving, milling, drilling/cm³	0,01 (!)
Extrusion, plastic film/kg	49 (!)
Extrusion, plastic pipes/kg	36 (!)
Hot element welding (30sec)/welding	2 (!)
Hot element welding (45min)/welding	155 (!)
Laser welding/m	0,46 (!)
Foaming/kg	60 (!)
Reaction injection moulding (RIM), large scale/kg	21 (!)
Rotation Forming/kg	106 (!)
Injection moulding/kg	126 (!)
Ultrasonic welding (15kHz)/welding*	0,04 (!)
Ultrasonic welding (20kHz)/welding*	0,02 (!)
Ultrasonic welding (40kHz)/welding*	0,01 (!)
Vacuum forming/kg	16 (!)

RECYCLING	mPt/kg
Plastics (packaging mix)** proces	25 (!)
Primary material saved	-756
Total	-731 (!)

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	38 (!)

* Per welding joint of appr. 2,5 cm²
  (0,5 seconds welding).
** If sufficiently pure.

Black indicator: trustworthy data
Grey indicator: less trustworthy data/ limited data
(!): generic data for this group of materials
dna: data not available
na: not applicable

PRODUCTION	mPt/kg
PC/kg	672

PROCESSING	mPt
Revolving, milling, drilling/cm³	0,01 (!)
Extrusion, plastic pipes/kg	36 (!)
Hot element welding (30sec)/welding	2 (!)
Hot element welding (45min)/welding	155 (!)
Laser welding/m	0,46 (!)
Foaming/kg	60 (!)
Reaction injection moulding (RIM), large scale/kg	21 (!)
Rotation Forming/kg	106 (!)
Injection moulding/kg	126 (!)
Ultrasonic welding (15kHz)/welding*	0,04 (!)
Ultrasonic welding (20kHz)/welding*	0,02 (!)
Ultrasonic welding (40kHz)/welding*	0,01 (!)
Vacuum forming/kg	dna

RECYCLING	mPt/kg
Plastics (packaging mix)** proces	25 (!)
Primary material saved	-672
Total	-647 (!)

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	33 (!)

* Per welding joint of appr. 2,5 cm²
  (0,5 seconds welding).
** If sufficiently pure.

Black indicator: trustworthy data
Grey indicator: less trustworthy data/ limited data
(!): generic data for this group of materials
dna: data not available
na: not applicable

PRODUCTION	mPt/kg
Low Density Polyethylene, LDPE/kg	**285**
High Density Polyethylene, HDPE/kg (products)	277
Linear Low Density Polyethylene, LLDPE/kg	272
EPE (expanded PE)	dna

PROCESSING	mPt
Revolving, milling, drilling/cm³	0,01 (!)
Extrusion, plastic film/kg	**49**
Extrusion, plastic pipes/kg	36 (!)
Stretch blow moulding/kg	131 (!)
Hot element welding (30sec)/welding	2 (!)
Hot element welding (45min)/welding	155 (!)
Blow moulding/kg	123 (!)
Laser welding/m	0,46 (!)
Foaming/kg	**60** (!)
Reaction injection moulding (RIM)/kg, large scale/kg	21 (!)
Rotation Forming/kg	106 (!)
Mirror-welding	dna
Injection moulding/kg	126 (!)
Ultrasonic welding (15kHz)/welding*	0,04 (!)
Ultrasonic welding (20kHz)/welding*	0,02 (!)
Ultrasonic welding (40kHz)/welding*	0,01 (!)
Vacuum forming/kg	dna

RECYCLING**	mPt/kg
Proces	25 (!)
Primary material saved	-285
Total	-260 (!)

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	39 (!)

* Per welding joint of appr. 2,5 cm²
  (0,5 seconds welding).
** If sufficiently pure.

Black indicator: trustworthy data
Grey indicator: less trustworthy data/ limited data
(!): generic data for this group of materials
dna: data not available
na: not applicable

PRODUCTION	mPt/kg
PET/kg	327
PET (bottle grade)/kg	347

PROCESSING	mPt
Revolving, milling, drilling/cm³	0,01 (!)
Extrusion, plastic film/kg	**49** (!)
Extrusion, plastic pipes/kg	**36** (!)
Hot element welding (30sec)/welding	2 (!)
Hot element welding (45min)/welding	155 (!)
Blow moulding	**123** (!)
Laser welding/m	0,46 (!)
Reaction injection moulding (RIM)/kg, large scale/kg	21 (!)
Rotation Forming/kg	106 (!)
Injection moulding/kg	**126** (!)
Ultrasonic welding (15kHz)/welding*	0,04 (!)
Ultrasonic welding (20kHz)/welding*	0,02 (!)
Ultrasonic welding (40kHz)/welding*	0,01 (!)
Vacuum forming/kg	dna

RECYCLING**	mPt/kg
Proces	25 (!)
Primary material saved	-327
Total	-302 (!)

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	38 (!)

* Per welding joint of appr. 2,5 cm²
  (0,5 seconds welding).
** If sufficiently pure.

Black indicator: trustworthy data
Grey indicator: less trustworthy data/ limited data
(!): generic data for this group of materials
dna: data not available
na: not applicable

PRODUCTION	mPt/kg
PMMA (beads)/kg	676
PMMA (sheet) - casted semi-finished product/kg	768

PROCESSING	mPt
Revolving, milling, drilling/cm³	0,01 (!)
Extrusion, plastic film/kg	49 (!)
Extrusion, plastic pipes/kg	36 (!)
Hot element welding (30sec)/welding	2 (!)
Hot element welding (45min)/welding	155 (!)
Laser welding/m	0,46 (!)
Foaming/kg	60 (!)
Reaction injection moulding (RIM)/kg, large scale/kg	21 (!)
Rotation Forming/kg	106 (!)
Injection moulding/kg	126 (!)
Ultrasonic welding (15kHz)/welding*	0,04 (!)
Ultrasonic welding (20kHz)/welding*	0,02 (!)
Ultrasonic welding (40kHz)/welding*	0,01 (!)
Vacuum forming/kg	dna

RECYCLING	mPt/kg
Plastics (packaging mix)** proces	25 (!)
Primary material saved	-676
Total	-651 (!)

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	36 (!)

* Per welding joint of appr. 2,5 cm²
  (0,5 seconds welding).
** If sufficiently pure.

PRODUCTION	mPt/kg
PP/kg	276
EPP/kg	dna

PROCESSING	mPt
Revolving, milling, drilling/cm³	0,01 (!)
Extrusion, plastic film/kg	49 (!)
Extrusion, plastic pipes/kg	36 (!)
Stretch blow moulding/kg	131 (!)
Hot element welding (30sec)/welding	2 (!)
Hot element welding (45min)/welding	155 (!)
Blow moulding/kg	123 (!)
Laser welding/m	0,46 (!)
Reaction injection moulding (RIM)/kg, large scale/kg	21 (!)
Rotation Forming/kg	106 (!)
Mirror-welding	dna
Injection moulding/kg	126 (!)
Ultrasonic welding (15kHz)/welding*	0,04 (!)
Ultrasonic welding (20kHz)/welding*	0,02 (!)
Ultrasonic welding (40kHz)/welding*	0,01 (!)
Vacuum forming/kg	16 (!)

RECYCLING**	mPt/kg
Proces	25 (!)
Primary material saved	-276
Total	-251 (!)

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	36 (!)

* Per welding joint of appr. 2,5 cm²
  (0,5 seconds welding).
** If sufficiently pure.

PRODUCTION	mPt/kg
Polystyrene, general purpose, GPPS/kg	388
Polystyrene, PS, expandable/kg	384
Polystyrene, high impact, HIPS/kg	**389**

PROCESSING	mPt
Revolving, milling, drilling/cm³	0,01 (!)
Extrusion, plastic pipes/kg	**36** (!)
Hot element welding (30sec)/welding	2 (!)
Hot element welding (45min)/welding	155 (!)
Blow moulding/kg	**123** (!)
Laser welding/m	0,46 (!)
Reaction injection moulding (RIM)/kg, large scale/kg	21 (!)
Rotation Forming/kg	106 (!)
Injection moulding/kg	**126** (!)
Ultrasonic welding (15kHz)/welding*	0,04 (!)
Ultrasonic welding (20kHz)/welding*	0,02 (!)
Ultrasonic welding (40kHz)/welding*	0,01 (!)
Vacuum forming/kg	16 (!)

RECYCLING**	mPt/kg
Proces	**25** (!)
Primary material saved	-388
Total	-363 (!)

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	**40** (!)

* Per welding joint of appr. 2,5 cm²
  (0,5 seconds welding).
** If sufficiently pure.

PRODUCTION	mPt/kg
Polyurethane, rigid foam, PUR/kg**	**459**
Polyurethane, flexible foam, PUR/kg***	484
PUR (no foam)/kg	dna

PROCESSING	mPt
Revolving, milling, drilling/cm³	0,01 (!)
Reaction injection moulding (RIM)/kg	21
Injection moulding/kg	**126** (!)
Ultrasonic welding (15kHz)/welding*	0,04 (!)
Ultrasonic welding (20kHz)/welding*	0,02 (!)
Ultrasonic welding (40kHz)/welding*	0,01 (!)

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	**36** (!)

Thermosetting compounds and rubbers cannot be recycled.

 * Per welding joint of appr. 2,5 cm²
   (0,5 seconds welding).
 ** For white goods, insulation, building material.
*** For furniture, mattresses, clothing.

PRODUCTION	mPt/kg
PVC/kg***	220
PVDC (Polyvinylidenchloride), granulate/kg****	451
Softened PVC	dna

PROCESSING	mPt
High frequency welding	dna
Extrusion blow molding, pipes/kg	36 (!)
Stretch blow moulding/kg	131 (!)
Hot element welding (30sec)/welding	2 (!)
Hot element welding (45min)/welding	155 (!)
Blow moulding/kg	123 (!)
Laser welding/m	0,46 (!)
Reaction injection moulding (RIM)/kg, large scale/kg	21 (!)
Rotation Forming/kg	106 (!)
Injection moulding/kg	126 (!)
Ultrasonic welding (15kHz)/welding*	0,04 (!)
Ultrasonic welding (20kHz)/welding*	0,02 (!)
Ultrasonic welding (40kHz)/welding*	0,01 (!)
Vacuum forming/kg	16 (!)
Calendering, rigid sheets/kg- only for weak PVC	37 (!)

RECYCLING**	mPt/kg
Proces	25 (!)
Primary material saved	-220
Total	-195 (!)

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	34 (!)

 * Per welding joint of appr. 2,5 cm² (0,5 seconds welding).
 ** If sufficiently pure.
 *** Average European use of PVC from bulk, suspension and emulsion.
 **** For thin coatings.

PRODUCTION	mPt/kg
SAN/kg	403

PROCESSING	mPt
Revolving, milling, drilling/cm³	0,01 (!)
Extrusion, pipes/kg	36 (!)
Hot element welding (30sec)/welding	2 (!)
Hot element welding (45min)/welding	155 (!)
Laser welding/m	0,46 (!)
Reaction injection moulding (RIM), large scale/kg	21 (!)
Rotation Forming/kg	106 (!)
Injection moulding/kg	126 (!)
Ultrasonic welding (15kHz)/welding*	0,04 (!)
Ultrasonic welding (20kHz)/welding*	0,02 (!)
Ultrasonic welding (40kHz)/welding*	0,01 (!)
Vacuum forming/kg	16 (!)

RECYCLING	mPt/kg
Plastics (packaging mix)** proces	25 (!)
Primary material saved	-403
Total	-378 (!)

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	40 (!)

 * Per welding joint of appr. 2,5 cm² (0,5 seconds welding).
 ** If sufficiently pure.

PRODUCTION	mPt/kg
Agglomerate from	
Industrial mix of plastics	62
Household mix of plastics	93
Grinding product from	
Industrial mix of plastics	64
Household mix of plastics	95
Regranulate from	
Industrial mix of plastics	70
household mix of plastics	87

The environmental impact of the collection and recycling process itself is hardly linked to material type, but much more dependent on efficiency of logistics and the impact of separation and purification. When empty bottles are transported, for instance, the transported material consists mainly of air, unless the bottles are squeezed at the collection point. Separation of mixed plastics requires additional machinery.

The specifications consider the environmental impact for several secondary products without taking into account the profit that could be made from recycling.

Those calculated processes and products are:

Agglomerate
The granule forms as a result of foil heating and shrinkage. It is generally used for thick-walled products. Size of the granule and their variance are key elements.

Grinding product
A sorted, washed stream of plastics, sometimes made dustfree. The material has been milled to reach a certain particle size.

Regranulate
Regranulate is material cleaned by melt purification. In this process, the secondary raw material is melted by extrusion and forced through a fine sieve pack.

The size of the sieve pack (expressed in mesh) determines the volume of pollution. Additives may be added during production of regranulate. Special equipment is required if this is done in large amounts during the last phase, and the process is then called compounding. There are three types of regranulate.

Besides the environmental impact, you can also calculate the advantages of recycling. This is easiest when a material is used in a closed cycle and is thus kept within the product system. The disposed product is then used for new products. The profit of recycling manifests itself both on the production side and on the waste side, but doesn't count as double profit.

It doesn't occur often in practice; the recycled product will sooner find an application in a next product life cycle. There is a risk of double counting at this stage, since the designer can enter a profit both from the application of secondary materials for production, and from ensuring proper recycling. In those situations we recommend to assume a closed cycle for the quantity of secondary material, at the start and at the end. You subsequently calculate the environmental impact of that cycle only once on the basis of the given recycling processes.

The indicators provided here are those for the recycling process of a certain type of recycled plastics. When using recycled plastics, have a look at the type of recycled plastics that can be considered first. From this indicator, deduct the indicator of the primary plastics that you can avoid using.

These indicators apply only to thermoplastics because (composites of) thermosetting plastics are usually unrecyclable due to their irreversible condition.

An example: You are making a product from HDPE. If you want to make this product from recycled plastics and it allows for less technical properties, you can choose, for instance, indicator 62: 'Agglomerate from industrial mix of plastics'.

The original plastic you are replacing is HDPE, indicator 277. To get the total indicator, you deduct the avoided product 277 from process 25, resulting in indicator -252.

If 50% of the product already consists of secondary materials, you are allowed to deduct only 50% of 277. Use of secondary materials now seems less beneficial, however you need only include half the environmental impact for manufacture of the product; the recycling process supplies the other half if you assume a closed cycle.

PRODUCTION	mPt/kg
Modified starch/kg	275
Polylactide (PLA)/kg	312

PROCESSING	mPt
Revolving, milling, drilling/cm³	0,01 (!)
Extrusion, plastic film/kg	49
Extrusion, plastic pipes/kg	36 (!)
Hot element welding (30sec)/welding	2 (!)
Hot element welding (45min)/welding	155 (!)
Blow moulding/kg	123 (!)
Laser welding/m	0,46 (!)
Foaming/kg	60 (!)
Reaction injection moulding (RIM), large scale/kg	21 (!)
Rotation Forming/kg	106 (!)
Mirror-welding	dna
Injection moulding/kg	126 (!)
Ultrasonic welding (15kHz)/welding*	0,04 (!)
Ultrasonic welding (20kHz)/welding*	0,02 (!)
Ultrasonic welding (40kHz)/welding*	0,01 (!)
Vacuum forming/kg	dna

RECYCLING	mPt/kg
Proces	dna
Primary material saved	dna
Total	dna

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	dna

* Per welding joint of appr. 2,5 cm² (0,5 seconds welding).

PRODUCTION	mPt/kg
Glass fibre reinforced plastic, polyester resin/kg	455
Glass fibre reinforced polypropylene/kg	359
Wood plastic composite (WPC)	dna
Kevlarfibre reinforced epoxy/kg	1249
Carbon fibre reinforced polypropylene/kg	620
Carbon fibre reinforced epoxy/kg	883
Flaxfibres reinforced polypropylene/kg	383
Epoxy resin (liquid)/kg	734
Polyester resin, unsaturated/kg	644
Glass fibre /kg	264
Kevlarfibre	dna
Carbon fibre /kg	833
Polyester fibres/kg	660
Flaxfibres/kg	350

PROCESSING	mPt
Revolving, milling, drilling/cm³	0,01 (!)
Sheet rolling/kg	dna
Hand-layup/kg	69 (!)
Cold press/kg	43 (!)
Laser cutting/m	17 (!)
Preformed matched die/kg	37 (!)
Pultrusion (extrusion together with fibres)/kg	11 (!)
Resin Transfer Moulding (RTM)/kg	46 (!)
Sheet Moulding Compound (SMC)/kg	13 (!)
Injecting/kg	54 (!)
Vacuum forming/kg	16 (!)
Vacuum assited resin infusion (VARI)/(kg)	37 (!)
Winding (of glass or fibres)/kg	9 (!)

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	39 (!)

Thermosetting compounds, composites and rubbers cannot be recycled.

PRODUCTION	mPt/kg
Vulcanised EPDM (ethylene propylene diene Monomer)/kg	**355**
Latex/kg	230
Natural Rubber/kg	599
Polybutadiene rubber/kg	**444**
SBR (Styrene Butadiene rubber)/kg	453
Silicones/kg	274
Thermoplastic elastomer (TPE)	dna
Thermoplastic olefine (TPO)	dna
Thermoplastic PUR	dna
Thermoplastic urethane (TPU)	dna

PROCESSING	mPt
Revolving, milling, drilling/cm³	dna
Sheet rolling/kg	dna
Calender, plate	dna
Injection moulding/kg	dna
Vulcanize	dna

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	**50** (!)

Thermosetting compounds, composites and rubbers cannot be recycled.

PRODUCTION	mPt/kg
Teflon PTFE/kg	16089
Teflon PTFE, on glass/kg	16929

PROCESSING	mPt/m²
Teflon coating (30min)/m²	157
Teflon coating (3min)/m²	16
Sintering	dna

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	**49** (!)

Wood

Opt for renewable materials.

Use wood from sustainably managed forests.

Try to avoid polluting the wood too much by applying harmful coatings.

PRODUCTION (excl. transportation)	mPt/kg
Azobe, Sawn timber (SFM), planed, air dried (u=15%)/kg**	558
Hardwood, Sawn timber, raw, air/ kiln dried (u=10%)/kg***	236
Hardwood, Sawn timber, planed, air/ kiln dried (u=10%)/kg***	271
Hardwood, Sawn timber, raw, air dried (u=20%)/kg***	234
Hardwood, Sawn timber, raw, kiln dried (u=10%)/kg***	239
Sawn timber, hardwood, planed, kiln dried (u=10%)/kg***	275
Cork slab/kg	257
Softwood, Sawn timber, raw, air dried, u=20%/kg*****	149
Softwood, Sawn timber, planed, air dried/kg*****	173
Softwood, Sawn timber, raw, kiln dried, u=10%/kg*****	154
Softwood, sawn timber, raw, kiln dried, u=20%/kg*****	152
Softwood, Sawn timber, planed, kiln dried/kg*****	179

PROCESSING	mPt/m³
Impregnating wood (beam)/m³******	630
Impregnating wood (pole)/m³******	362
Folding	dna
Sawing	dna

RECYCLING	
See machined wood	

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	19 (!)

* For all wood types, the renewable CO2 (uptake during growth) considered neutral.
** Density azobe: 1000 kg/m³.
*** Density hardwood: 700 kg/m³.
**** Density parana pine: 500 kg/m³. Incl. transport naar Europese haven.
***** Density softwood: 450 kg/m³.
****** Only the impregnation process, production of wood must be added. See "Production of paint" for impregnation product.

Black indicator: trustworthy data
Grey indicator: less trustworthy data/ limited data
(!): generic data for this group of materials
dna: data not available
na: not applicable

PRODUCTION	mPt/m³
Laminated board, three layered/m³	175806
GLT (Glued laminated timber) /m³	105085
Plywood (indoor use) /m³	299627
Plywood (outdoor use) /m³	314255

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	19 (!)

* For all wood types, the renewable CO2
  (uptake during growth) is considered neutral.

PRODUCTION	mPt/m³
MDF- board/m³	63809
OSB- board/m³	40633
Particle board/m³	38079
Fibreboard soft/m³	23129

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	20 (!)

* For all wood types, the renewable CO2
  (uptake during growth) is considered neutral.

At this moment there are no data avalable of the
following materials and processes

Materials:
veneered boards - laminated boards - HPL coated
boards - paper foil coated boards - PVC foil coated
boards - water resistant boards - flame retardant
boards - sandwichboards - honeycomb structures -
solid cores

Machine processes:
planing - drilling- sawing - CNC operations - drift
drilling – veneers – milling - wood drying - profiling
Wood carvings: CNC cutting - 3D cutting - other
cutting

Wood bending

Connection:
physical connection - gluing

Surface treatments:
pickling - high gloss spraying - paint spraying - paint
rolling - UV paint rolling and drying, varnishing -
treating with lye

Coating application:
application veneer - application melamine -
application HPL - application paper foil - application
PVC foil - side gluing – softforming – postforming -
profile paneling

Use less burdensome materials and minimise volume and weight of transport packaging.

Opt for reusable (transport) packaging.

Paper + packaging

PRODUCTION	mPt/kg
Recycled, with deinking/kg*	262
Recycled, no deinking/kg*	76
Woodfree, coated/kg	258
Woodfree, uncoated/kg	309
Wood-containing, light weight coated (LWC)/kg	261
Wood-containing, supercalendred (SC) /kg	258

RECYCLING	
Proces	176 (!)
Primary material saved	dna
Total	dna

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	9 (!)

* Including paper waste as input flow.

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(!): generic data for this group of materials
dna: data not available
na: not applicable

PRODUCTION	mPt/kg
New fibre/kg	207
DIP containing/kg	164
European average/kg*	174 (!)

RECYCLING	mPt/kg
Proces	176 (!)
Primary material saved	dna
Total	dna

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	19 (!)

* European average, consists of 77% recycled paper.

PRODUCTION	mPt/kg
Mixed fibre, single wall/kg	147
Recycling fibre, single wall/kg	95
Recycling fibre, double wall/kg	125
Fresh fibre, single wall/kg	261

PROCESSING	mPt/kg
Carton board boxes, gravure printing/kg**	39
Carton board boxes, offset printing/kg**	68
Folding boxboard, Folding Box Board/kg***	260

RECYCLING	mPt/kg
Proces	95 (!)
Primary material saved	dna
Total	dna

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	20 (!)

* Cardboard class C.
** Only process, excluding production of cardboard
*** Including production of cardboard.

Glass (packaging) 05.04

PRODUCTION	mPt/kg
Brown (53,1% recycled) /kg	97
Green (80% recycled) /kg	95
White (58% recycled) /kg	91

RECYCLING	mPt/kg
Proces	58 (!)
Primary material saved	dna
Total	dna

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	na

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Grey indicator: less trustworthy data/ limited data
(!): generic data for this group of materials
dna: data not available
na: not applicable

Liquid packaging board containers 05.05

PRODUCTION	mPt/kg
Production of liquid packaging board containers/kg	347

RECYCLING	mpt/kg
Proces	dna

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	17 (!)

Black indicator: trustworthy data
Grey indicator: less trustworthy data/ limited data
(!): generic data for this group of materials
dna: data not available
na: not applicable

Design products that don't depend on energy or minimise their energy consumption.

Use renewable energy or human power.

Do not use a high-grade energy source for a low-grade application.

Avoid the use of single-use batteries; use recharge-able batteries.

Make sure internal batteries can be easily removed in the disposal phase.

Raise the user's awareness of energy consumption, sleep power consumption and consumption in stand-by.

Energy

PRODUCTION*	mPt/kWh
High voltage (HV) (> 24 kVolt)	
Electricity, high voltage Europe (UCTE)	44
Electricity, high voltage Belgium	28
Medium voltage (1 tot 24 kVolt)	
Electricity, medium voltage Europe (UCTE)	45
Electricity, medium voltage Belgium	29
Low voltage (< 1 kVolt)	
Electricity, low voltage Europe (UCTE)	51
Electricity, low voltage Belgium	31
Electricity, low voltage, CENTREL**	88
Electricity, low voltage Germany	59
Electricity, low voltage France	10
Electricity, low voltage Greece	113
Electricity, low voltage United Kingdom	60
Electricity, low voltage Ireland	78
Electricity, low voltage Italy	63
Electricity, low voltage Luxembourg	53
Electricity, low voltage the Netherlands	64
Electricity, low voltage NORDEL***	18
Electricity, low voltage Austria	31
Electricity, low voltage Portugal	66
Electricity, low voltage Spain	56
Electricity, low voltage Switzerland	3

* Including production of fuels.
** Slovakia, Hungary, Poland, Czech Republic.
*** Norway, Denmark, Sweden, Finland.

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Grey indicator: less trustworthy data/ limited data
(!): generic data for this group of materials
dna: data not available
na: not applicable

PRODUCTION	mPt/kWh
Electricity, from nuclear power*	1,2
Electricity, from hard coal	89
Electricity, from oil	85
From bagasse, sugarcane, at sugar refinery	1,66
From bagasse, sweat sorghum, at distillation	3,77
Electricity, from hydropower	0,35
Electricity, from wind energy	1,2
*From solar-energy***	
Facade, single-Si (laminated, integrated)	9,6
Facade, multi-Si (laminated, integrated)	8,7
Flat roof installation, single-Si	7
Flat roof installation, multi-Si	6,5
Slanted-roof, a-Si (panel, mounted)	6,4
Slanted-roof, a-Si (laminated, integrated)	5,3

 * No consideration of calamities.
** Photovoltaic electricity produced in a small
   installation (3kwp). Different indicators
   depending on the position of the installation in
   the building (outer wall, flat roof, pitched roof).

PRODUCTION* FROM:	mPt/MJ
Anthracite	
At stove (5-15kW)	11
Lignite briquette	
At stove (5-15kW)	16
Diesel	
Boiler (10kW)	7,7
Industrial (1MW)	8
Natural gas	
At boiler atm. low-NOx condensing non-modulating <100kW	6,7
At boiler fan burner low-NOx non-modulating <100kW	7,6
At industrial furnace low-NOx >100kW	7,1
Wood	3,9
Hard coal	
At stove 5-15kW	15
Industrial furnace 1-10MW	11
Heat pump 30kW	3,5
Heavy fuel oil	
At industrial furnace (1MW)	9,2
Solar-energy	
Flat plate collector	
For combined system	0,84
Solar+gas heating	5,2
One-family house, for hot water	1,1
Hot water tank	
Solar+electric, flat plate, multiple dwelling**	2,8
Solar+gas heating, one-family house***	5,2

  * Including production of fuels.
 ** Hot water system with use of electricity for
    control and post-heating.
*** Hot water system with use of natural gas for
    control and post-heating.

Stack the product to maximum compactness, if necessary through different or partial assembly.

Optimise distribution plans and limit transport distances: choose suppliers that are closest to the manufacturing location; assure transportation in large quantities rather than small ones, ...

Opt for the least burdensome means of transport.

Transport

	mPt
Road	
Van <3.5t/tkm	186
Lorry >16t(Eur4)/tkm	15
Lorry >32t(Eur4)/tkm	12
Railroad	
Train (freight)/tkm	3,9
Water	
Barge tanker (inland)/tkm	4,4
Barge (inland)/tkm	4,7
Transoceanic tanker (ocean)/tkm	0,6
Transoceanic freight ship/tkm	1,3
Air	
Aircraft, freight, Europe/tkm	181
Helicopter, LTO cycle (takeoff and landing)/piece	14637
Helicopter (flying time)/hour	8601
Aircraft, freight, intercontinental/tkm	99

* Including production of fuels.
  Indicators per tkm (ton kilometer, transport of one tonne over one kilometer).

Black indicator: trustworthy data
Grey indicator: less trustworthy data/ limited data
(!): generic data for this group of materials
dna: data not available
na: not applicable

Lighting and electronic components

Make your design with universally available components.

Avoid designs using disposable batteries.

Make sure that the consumer does not pay for functions he never uses. Integrate an "off" button to shut off all energy consumption next to the "stand-by" button.

LIGHTING	mPt
Light bulb 60 Watt/piece*	11
Halogen lamp/piece	3
Candle	dna
LED lamp (incl. PCB) (0,35g) /kg	20691
LED lamp (incl. PCB) (0,35g)/piece	7
OLED	dna
Light bulb SL11 (E-saving)/piece**	136
T5 (16 mm) fluorescent lamp/piece	25
T8 (26 mm) fluorescent lamp	dna
T12 (38 mm) fluorescent lamp	dna

As regards lighting you must consider the lamp's application and lifespan. A type A lamp can have a high score for production, yet in the long run achieve better marks than type B due to lower energy consumption. Also take into account the lighting application that requires, for instance, one single type A lamp against five type B lamps for equal functional lighting.

* Life span of 1000 hours.
** Life span of 8000 hours.

Black indicator: trustworthy data
Grey indicator: less trustworthy data/ limited data
(!): generic data for this group of materials
dna: data not available
na: not applicable

ELECTRONIC COMPONENTS	mPt
CRT screen, 17 inches	30487
LCD screen, 17 inches	209610
Desktop computer, without screen	24809
Electrode, negative, LiC6/kg	290
Electrode, negative, Ni/kg	8185
Electrode, positive, LiMn2O4/kg	1728
HDD, desktop computer/piece	1080
HDD, laptop computer/piece	300
Laptop computer	35639
Rechargeable battery, Li-ion, prismatic/kg	7720
Rechargeable battery, NiMH, prismatic/kg	6119
Mouse device, optical, with cable	473
Power supply unit/piece	2723
Printer, laser jet, colour	5642
Printer, laser jet, b/w	5631
Keyboard, standard version	2440
Toner module, laser jet, colour/piece	900
Toner module, laser jet, b/w/piece	889
Fan, for electronics/kg	1190
PCB's	
Printed wiring board, surface mounted, Pb containing/kg	22345
Printed wiring board, surface mounted, Pb free/kg	22360
Naked printed wiring board, surface mount, lead-containing surface/m²	24531
Naked printed wiring board, surface mount, lead-free surface/m²	24430
Printed wiring board, through-hole mounted, Pb containing/kg	5275
Printed wiring board, through-hole mounted, Pb free/kg	5120
Naked printed wiring board, through-hole, lead-containing surface/m²	9586
Printed wiring board, through-hole, lead-free surface/m²	9243

Give preference to an application without batteries and use more environmentally safe energy resources. If use of a battery is unavoidable, opt for rechargeable batteries. Rechargeable batteries (e.g. NiMH, Ll-ion, etc.) can be recharged up to 1,000 times and thus save a considerable amount of raw materials and energy in the production and waste treatment phases.

Note that the European Batteries Directive prohibits the use of rechargeable NiCd batteries (except for a few applications) due to the harmful, poisoning and carcinogenic properties of cadmium.

Make sure to design appliances that allow for easy removal of disposed batteries and accumulators. Provide a manual for appliances with built-in batteries that explains their easy removal and informs the user about the type of built-in batteries or accumulators used.

Used up batteries fall under Small Hazardous Waste and must therefore always be collected and treated separately.

Flanders applies a take-back obligation for electronic appliances.

Black indicator: trustworthy data
Grey indicator: less trustworthy data/ limited data
(!): generic data for this group of materials
dna: data not available
na: not applicable

Construction materials

Opt for local raw materials and energy sources.

Make designs using recycled materials, particularly for invisible parts and use their specific properties.

PRODUCTION	mPt
Concrete (exacting)/m³*	20575
Poor concrete/m³**	8585
Concrete (normal)/m³***	16759
Concrete (sole plate and foundation)/m³***	11110
Autoclaved aerated concrete block/kg	28
Cement/kg (Portland)	49
Blast furnace slag cement/kg	27
Fibre cement roof slate/kg	61
Wall plate from cementfibre/kg	dna

RECYCLING	mPt/kg
Gravel replacement	-0,67 (!)

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	na

Non combustible building materials usually go to landfill or are re-used as road embankment or as coarse fraction in concrete.

* Ready-for-use concrete with density of 2440 kg/m³.
** Ready-for-use concrete with density of 2190 kg/m³.
*** Ready-for-use concrete with density of 2380 kg/m³.

PRODUCTION	mPt/kg
Gypsum (CaSO4*2H2O)/kg	2,7
Gypsum plaster board/kg	35
Gypsum fibre board/kg	28
Lime, hydrated/kg	48
Quicklime, milled, packed/kg	62
Stucco/kg	10

RECYCLING	mPt/kg
Proces	dna

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	na

PRODUCTION	mPt/kg
Brick/kg	18
Ceramic (porcelain)/kg	dna
Ceramic tiles/kg	124
Roof tile/kg	27
Light clay brick/kg*	17

RECYCLING	mpt/kg
Proces	dna

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	na

Non combustible building materials usually go to landfill or are re-used as road embankment or as coarse fraction in concrete.

* Consists of clay and straw.

PRODUCTION	mPt/kg
Basalt/kg	44
Bentonite/kg	13
Refractory/kg	195
Dolomite/kg	dna
Gravel (round) /kg	0,6
Gravel (crushed) /kg	dna
Limestone/kg	3,5
Sand-lime brick/kg	10
Clay/kg	0,3
Perlite/kg	1,6
Silica sand/kg	2,2
Feldspar/kg	3,6
Vermiculite/kg	0,77
Sand/kg	0,6

RECYCLING	mPt/kg
Sand replacement	-0,598 (!)

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	na

Non combustible building materials usually go to landfill or are re-used as road embankment or as coarse fraction in concrete.

PRODUCTION	mPt/kg
Mineral isolation	
Cellulose fibres/kg	50
Glass wool mat/kg	158
Rock wool/kg*	169
Vermiculite/kg	**0,77**
Plastic isolation	
Tube insulation (elastomere) /kg**	530
Polystyrene foam slab/kg***	**460**
Urea formaldehyde foam slab, hard/kg****	337
PUR/kg	459

RECYCLING	mPt/kg
Mineral isolation proces	**dna**
Plastic isolation proces	**na**

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	**36** (!)

The production of insulation materials
is usually small compared to the environmental
benefits.

   * Density: 100 kg/m³.
  ** For different technical applications.
     Density: 75 kg/m³.
 *** Density: 30 kg/m³.
**** Density: 10-30 kg/m³.

Black indicator: trustworthy data
Grey indicator: less trustworthy data/ limited data
(!): generic data for this group of materials
dna: data not available
na: not applicable

PRODUCTION	mPt/kg
Flat glass, coated/kg*	82
Flat glass, uncoated/kg	**70**
Tempering, flat glass (proces)/kg**	**19**
Glass fibre/kg	**264**
Triple glazing (U<0,5W/m² K)m²	6389

RECYCLING	mPt/kg
Proces	**58** (!)
Primary material saved	-82
Total	-24 (!)

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	**na**

 * Tin, silver, nickel coating (77 g/m²).
** Process, only and including loss of glass.
   Excluding the input of glass.

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	mPt/kg
Melamine laminate 20mm/m²*	10177
Solid surface (PMMA) 3mm/m²	2948
Solid surface (PMMA en Al(OH)3) 12 mm (flexible)/m²**	3418
Solid surface (PMMA en Al(OH)3) 6mm (flexible)/m²***	6664
High Pressure Laminate (chipboard core), 20mm/m²	1040
High Pressure Laminate (paper core), 10mm/m²	4406

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	**20** (!)

Furniture panels are not recyclable.

  * Both sides of plate are covered with
    decorative layer.
 ** For horizontal use.
*** For vertical use.

	mPt/kg
Fleece, PET	401
Refining of textile, coton	502
Spinning of fibres, bast fibre	130
Spinning of fibres, coton fibre	884
Weaving of bast fibres (e.g. flax)	35
Weaving of coton	1036

Avoid harmful substances in a product as well as harmful processing substances.

Use production techniques with a low environmental impact.

Chemicals

PRODUCTION	mPt/kg
Acrylic varnish, 87.5% in H2O/kg	205
Alkyd paint, white, 60% in H2O/kg	309
Alkyd paint, white, 60% in solvent/kg	393
Printing colour, offset, 47.5% solvent/kg	498
Printing colour, rotogravure, 55% toluene/kg	381

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	**22** (!)

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PRODUCTION	mPt/kg
Ammonia (NH3), liquid/kg	218
Argon, liquid/kg	dna
Bentonite/kg	69
Chemicals (inorganic) /kg*	170
Chlorine (Cl2), liquid/kg	99
Fluoride	dna
Phosphoric acid (industrial grade, 85% in water) /kg	220
Phosphoric acid (fertiliser grade, 70% in water) /kg	167
Iron sulphate FeSO4/kg	18
Sodium chloride NaCl/kg	19
Caustic soda NaOH/kg	dna
Sodium perborate, monohydrate (NaBO3 · H2O) powder/kg	355
Sodium perborate, tetrahydrate (NaBO3 · 4 H2O) powder/kg	159
Nitric acid, HNO3/kg	197
Silicate (water glass) /kg	102
Hydrochloric acid, mannheim process powder/kg	41
Nitrogen (N2), liquid/kg	37
Decarbonised water/kg	0,001
Water (demineralized)/kg	dna
Tap water/kg	0,03
Hydrogen, liquid/kg	253
Zeolite/kg	425
Hydrochloric acid HCl (Mannheim)/kg	dna
Hydrochloric acid HCl/kg	dna
Oxygen, liquid/kg	35
Sulphuric acid/kg	27

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	22 (!)

* Average value for production of anorganic chemicals.

PRODUCTION	mPt/kg
Chemicals (organic)/kg*	249
Diesel (fuel)/kg*	174
Ethylene oxide/kg	245
Ethylene glycol/kg	203
Petrol, unleaded (fuel) /kg**	190
Heavy fuel oil/kg**	166
Propylene glycol/kg	446
Urea/kg	350
Soap/kg	5306

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	22 (!)

* Average value for production of organic chemicals.
** Only production of fuel, excluding combustion emissions.

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PRODUCTION	mPt/kg
Wood glue/kg	280
PVC glue/kg	159
EVA hot melt glue/kg*	320
Flooring glue/kg	94

USE	mPt/m²
PVC glue (solvent)/m²	26
Hotmelt glue/m²	21

WASTE TREATMENT	mPt/kg
Waste treatment scenario in the EU	**22** (!)

* Glue consumption per m² and energy use
  for 2 minutes.

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This Ecolizer 2.0 was created in collaboration with VITO (Flemish Institute for Technological Research).

The calculations were done on the basis of the ReCiPe method.

The indicators were constructed on the basis of the following available sources and data.

1. "National Life Cycle Inventory Database Ecoinvent 2009"
   www.ecoinvent.ch
2. ESU-ETH database
   "Ökoinentare für Energiesystemen",
   1996 3rd edition, ETH Zürich. [1996]

Please let us know if other or more recent data are available.

Want to know more?
More information and other detailed examples of Ecolizer applications can be found on www.ovam.be/ecolizer
For questions, comments and additional information, please write to ecodesign@ovam.be

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Although OVAM supports the method used in Ecolizer 2.0, results or indicators should not be considered approved OVAM's point of view.

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