European Standardization Organizations

Webinar Circular Product Design

We start at 10:00 CEST

Webinar moderator

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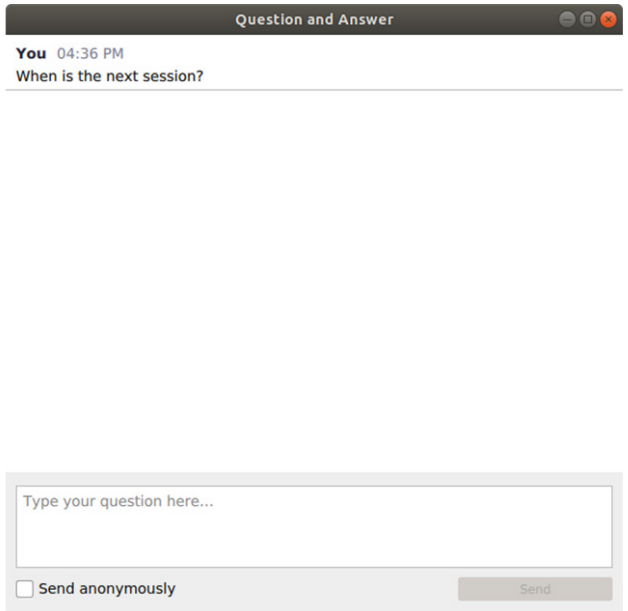
Get the most out of the webinar today

- You are muted
- Use the Q&A panel to submit your questions



- Talk about us on Twitter #training4standards @Standards4EU

Speakers

Solange BLASZKOWSKI

Director Standardization Environment, Philips Q&R

Leader of CEN-CLC SABE group on Circular Economy

Convenor CEN-CLC JTC10/WG8 on Circular Product Design and WG6 on Mat. Eff. communication

Leendert Jan DE OLDE

Director Ecodesign and Sustainability, Philips International B.V.

Chair Working group circular economy APPLiA

Vice-chair DSPG Digital Europe

Christian DWORAK

Corporate Operations Steering, Referent/-in COS-ES COS-ES; BSH Hausgeräte GmbH

Chair of CLC TC 111X on Environment

Convenor IEC TC 111/WG 19 on Global e-waste management

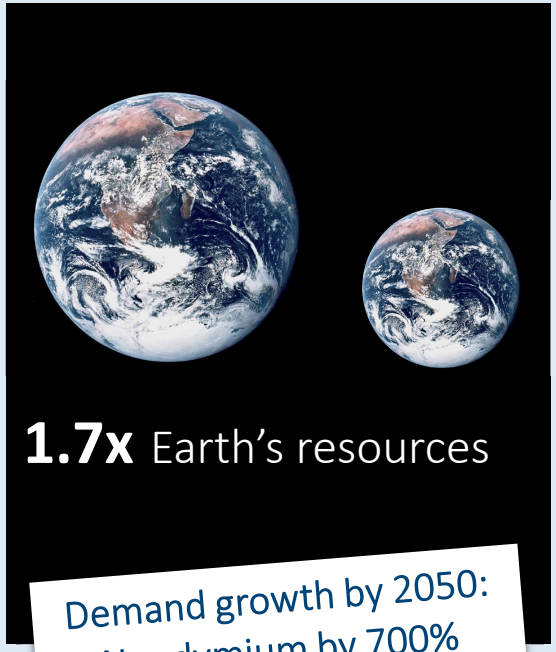
Agenda

1. Background
2. Circular Product Design – what is
3. Understanding flows and value
4. Circular strategies - Use less, Use longer, and Use again
5. Managing trade-offs
6. Standards in support of circular design
7. Practical application examples

Global challenges make circular economy an **urgent necessity**

Growing demand from an expanding population

Overconsumption of resources



Demand growth by 2050:
Neodymium by 700%
Dysprosium by 2600%

Depletion of the earth visible

75% of the surface of the earth shows signs of depletion

Climate change

45% of CO2 emissions relate to production

Wasted resources…

>90% of used materials and other resources go to waste each year

SOURCE: Global Footprint Network (2019)

Humanity generates ca. 2.24 billion tons of municipal solid waste annually, of which only 55 % is managed in controlled facilities.
Every year,

- 931 million tonnes of food is lost or wasted (8-10 % of global GHG emissions)
- ca. 14 million tonnes of plastic waste enters aquatic ecosystems
- over 50 million tonnes electronic waste is produced

(SOURCE: UN, various reports)

Circular product design and the SDGs

Twelve Sustainable Development Goals (SDGs) are associated to management of resources.

European standards contribute to the SDGs (link)

SDG 12 is the most efficient strategy to mitigate trade-offs among SDGs and to create synergies to resolve development and environment challenges

Design out waste and pollution

80% of the environmental impacts of a product is determined at the design stage

Circular product design: What is it?

Circular product design is…

process of creating products that are aligned with the principles of a circular economy.

Principles of a circular economy:

(i) eliminate waste and pollution

(ii) circulate products and materials at their highest value

(iii) regenerate nature

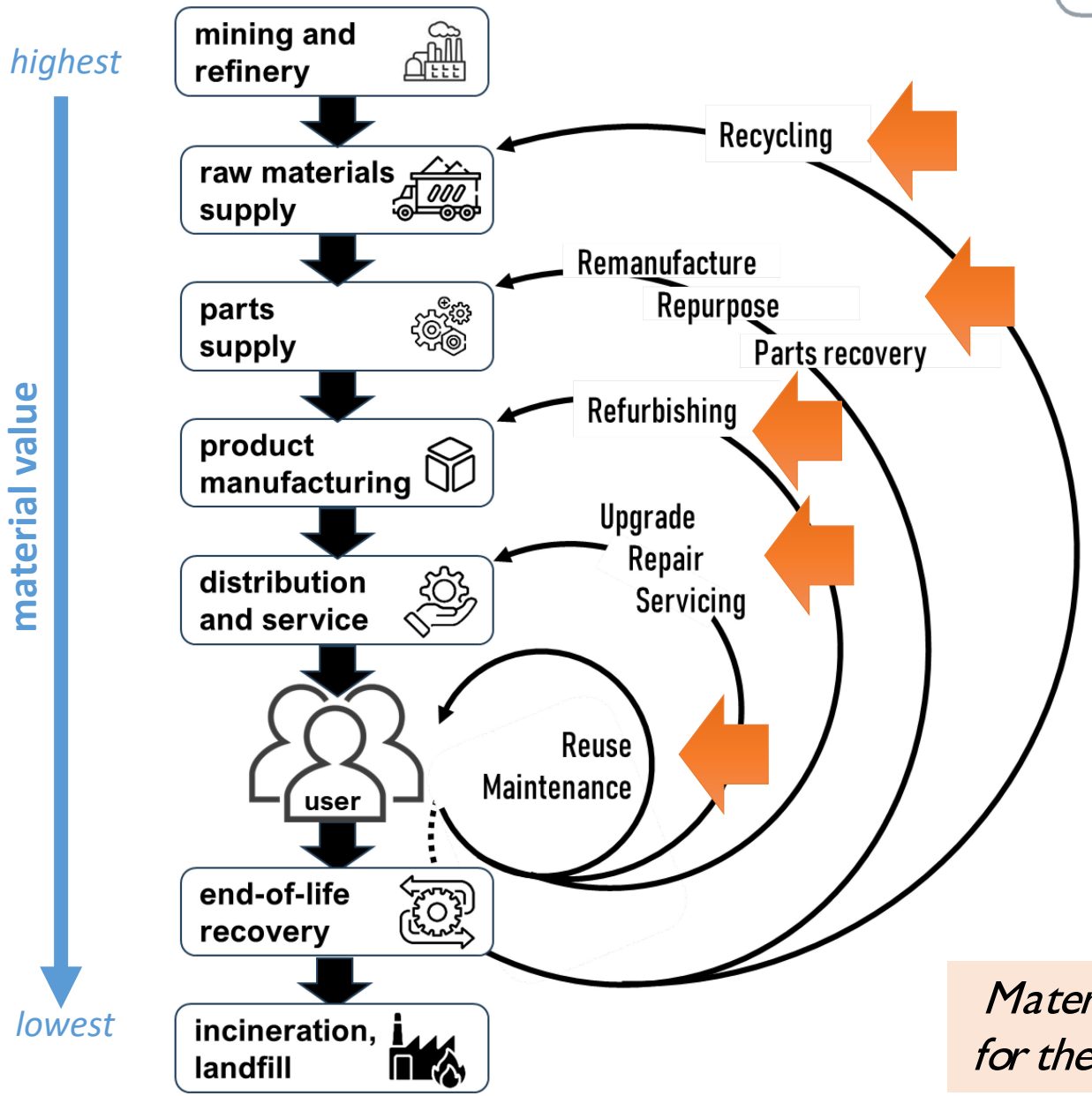
(SOURCE: prEN 45560:2023)

'From linear to circular, the focus shifts from **value creation** to **value preservation** and from **throughput maximization** to **waste minimization**'

SOURCE: Corentin FIVET, Jan BRÜTTING, Nothing is lost, nothing is created, everything is reused: structural design for a circular economy, The Structural Engineer, vol. 98(1), p. 74-81, 2020

Understanding material flows and value

"**circulate products** and materials at their highest value"



Use Again
Close the material flows

Use Longer
Slow the material flows

Use Less
Narrow the material flows

Use less | Narrow the material flows

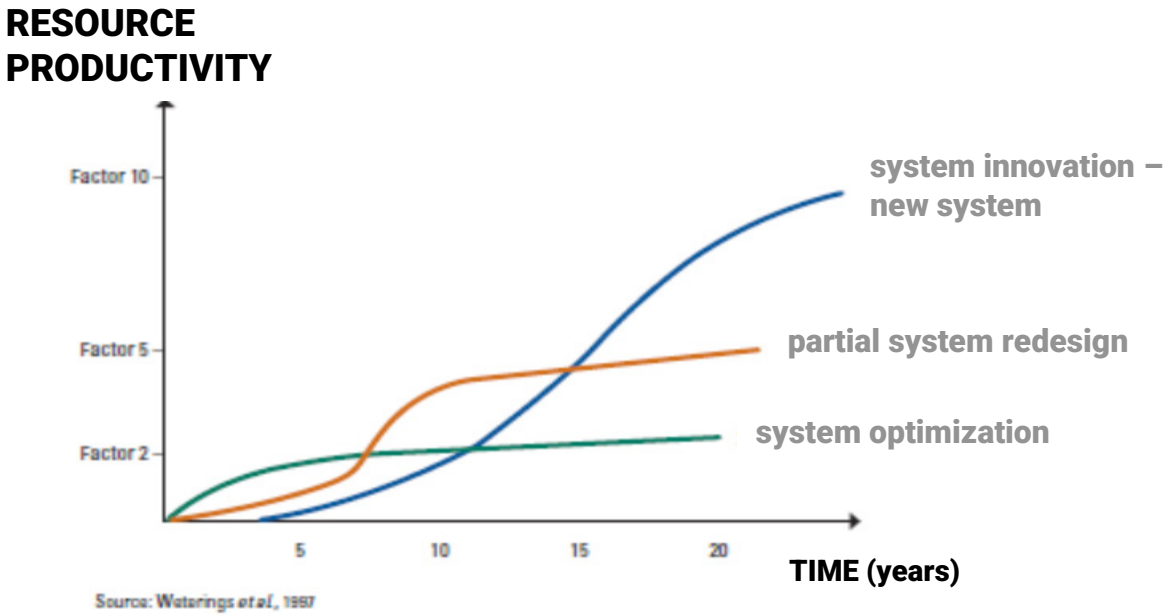
'Circular product designs that require less resources to make and use the product, while delivering the same function to the user; Design out waste'

- Design light-weight products
- Design products combining multiple functions
- From physical to virtual solutions
- Maximize capacity use of products (leasing and sharing)
- Design products with (more) durable or more efficient materials
- Enable and incentivize users to consume less
- Eliminate waste in production
- Localize supply where appropriate

Design out waste | resource productivity

Optimization of existing designs and redesign allow for incremental improvements in resource usage;

Innovative designs allow for big leaps in resource productivity



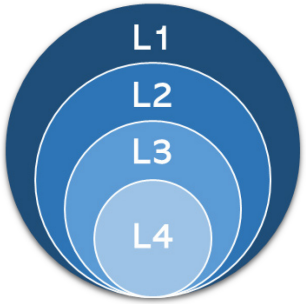
Resource productivity is the efficiency with which we use energy (energy efficiency) and materials (material efficiency) throughout the economy, i.e. the value added per unit of resource input (SOURCE: eur-lex.Europe.eu)
(See also Global material flows and resource productivity , UNEP, 2016)

Big leaps in resource productivity come from breakthrough innovations

	(1880)  INCANDESCENT LIGHT BULBS	(1980)  COMPACT FLUORESCENT	(1995)  LED
BRIGHTNESS (lumens)	800	800	800
ELECTRICITY USED (W/h)	60	13-15	6-8
CO_2 EMIS-SION (kg/yr)	2200	480	200
BULB LIFE-TIME (hr)	1.200	10.000	25.000
HEAT (btu/h) EMITTED	85	30	3.4
HS	--	Hg	(!)

Approximate values for comparison purposes only. SOURCE: medium.com

EN 45560 | Circular design in an organization



Based on ISO/IEC 62430

L1 **Circular GOALS as part of the ESG strategy by an organization**

'By 2025 50% of sales are from circular products whereby a third is from refurbished products' *(CEO)*

L2 **Cascade the circular goal(s) in the organization by defining circular CATEGORIES**

'Reinforce refurbishment activities
Introduce commercial returns, etc.' *(Business Unit)*

Make it measurable by defining KPIs

L3 **For each circular category, determine the applicable circular product ATTRIBUTES (enablers)**

Relevant for refurbishment:

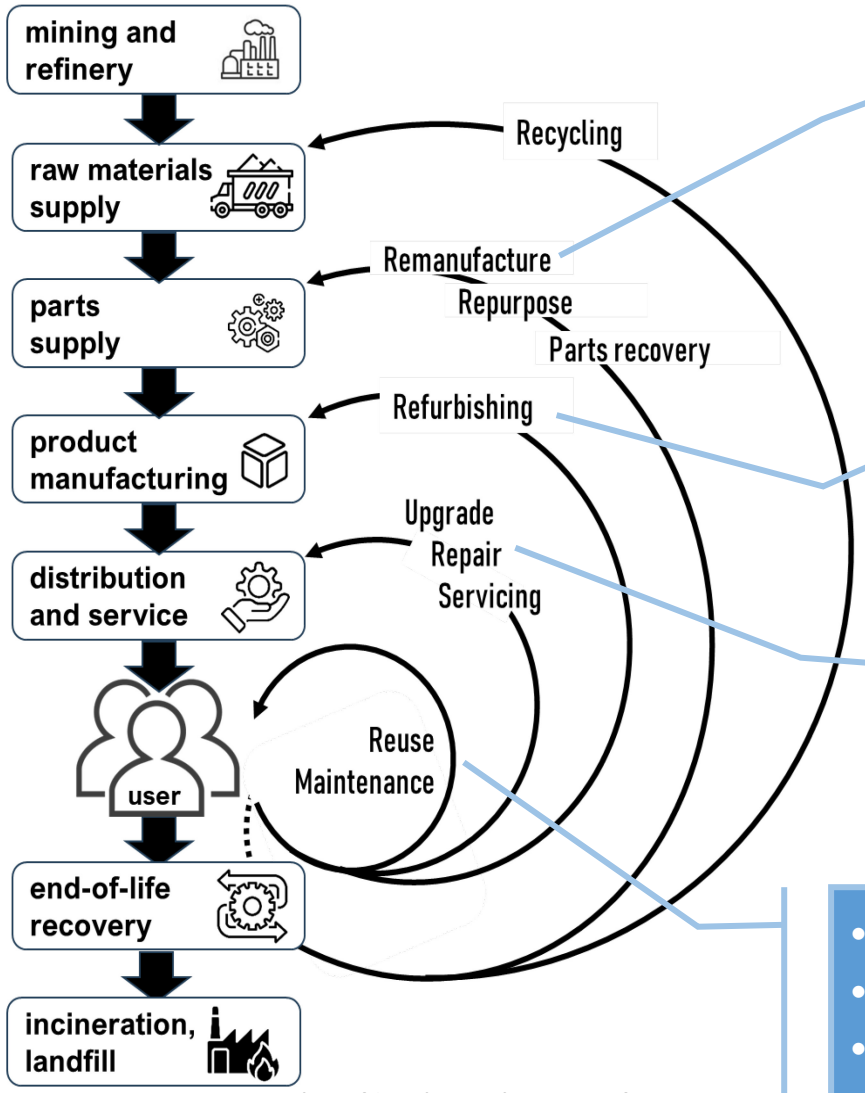
- (Easy) disassembly and reassembly
- (Easy) to clean and restore aesthetics
- (Easy) to repair and upgrade
- Digital security, etc.

L4 **Translate the circular attributes into specific product circular DESIGN REQUIREMENTS**

E.g., for refurbishment, *(product/company specific)*
'The dismantling process shall avoid leakage of infectious liquids'; 'Assess remaining life-time of priority parts' *(Engineers)*

Use longer | Slowing material flows

'Designs aimed at using products, parts and materials longer; Focus is on increased reliability and durability in combination with product-life extension strategies'



- Easy disassembly and reassembly
- Forward/backward compatibility
- Standard parts and modularity
- Clean, restore aesthetics, sterilize
- Digital security
- Parts durability and reliability
- Safe operation at longer lifetimes

- Easy disassembly and reassembly
- Forward/backward compatibility
- Standard parts and modularity
- Clean, restore aesthetics, sterilize
- Digital security

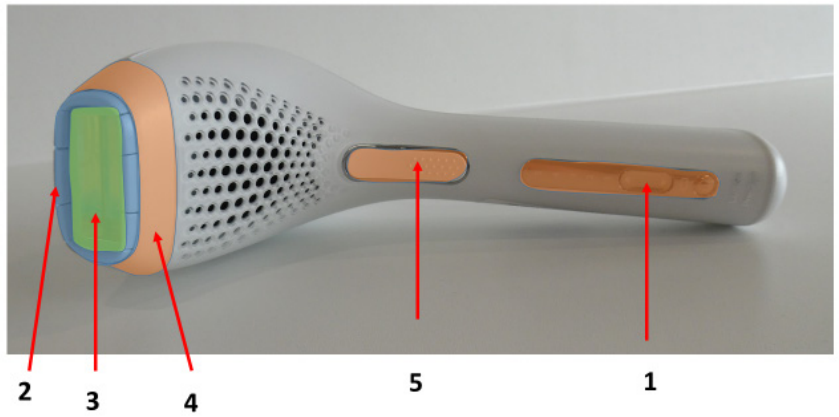
- Easy disassembly and reassembly
- Forward/backward compatibility
- Standard parts and modularity

- Easy maintenance
- Easy SW updates
- Digital security (easy data removal)

Design for easy cleaning, restore aesthetics and sterilize

'Designs aimed at producing **safe and aesthetically appealing** "next-use" products in an easy and effective way; Users are safe and trust the brand with the (e.g. refurbished) product'

Natural contamination analysis



Some design DO's and DON'T's *(Product / company specific)*

- For easy cleaning design the product with simple surfaces and minimal interruptions (split lines, gaps, grills and grips)
- Use rounded corners for those parts that have to be disinfected
- Avoid large scratchable, high gloss/ lacquered surfaces for external parts
- Make cosmetic parts easy to disassemble and reassemble without scratching
- Minimize material diversity to ease testing of disinfection substances
- Cleaning process should not degrade the product quality
- Use scratch resistant textures for all parts exposed to wear and scratching

Design for forward and backward compatibility, standard parts and modularity

'Designs with standard elements, interfaces and connections, enabling

- **upgradability and forward/backward compatibility** between different product generations, and
- **modularity** within a platform,

making repair, upgrade, refurbishment easier

(prEN 45560)
Forward and backward compatibility, standard parts and modularity

1. Is the product part of a platform?
2. Is the product compatible with backward and forward generations?
3. Are spare parts available?
4. Are spare parts (industry) standard?
5. Has the product been optimized by including modules?
6. Are the modules grouped based on similarities, e.g. same lifespan, size, combine hazardous or non-recyclable materials in one module?

https://www.fairphone.com/nl/story/

Design for dis- and reassembly

‘Designing the product in such a way that the product and its parts can be

- disassembled **and reassembled**,
- in a **non-destructive way**,

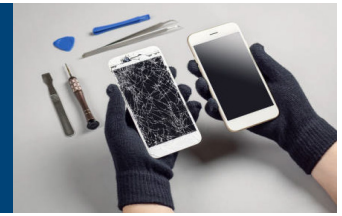
to enable repair, upgrade, refurbishing, remanufacturing, and repurpose activities’

Disassembly and reassembly

Recycling

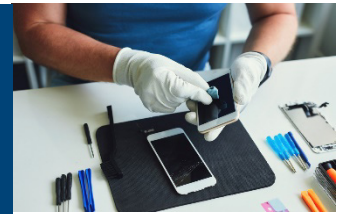
- Destructive
- Automated
- Focus on materials libe-ration & sorting

Repair



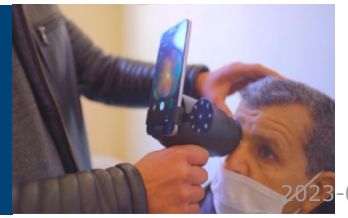
Upgrade

Refurbish



Remanu-facture

Repurpose



Priority parts

Not all parts will be equally relevant for repair, reuse, upgrade or refurbish.

To help prioritize the disassembly process, a list of **priority parts** must be established;

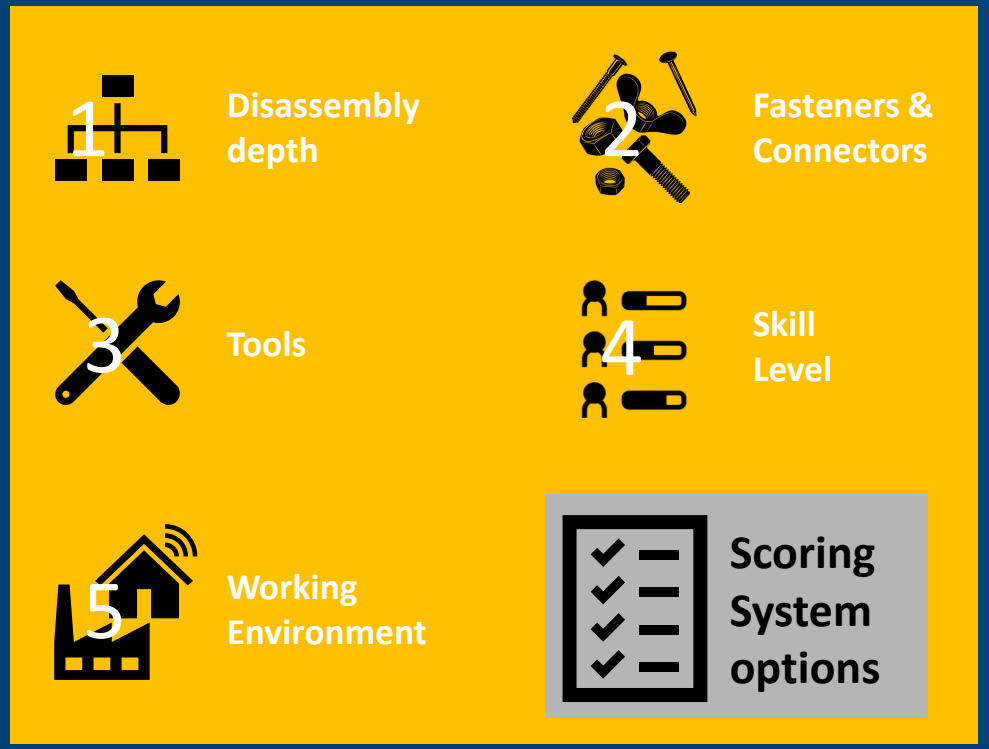
(SOURCE: Adapted from EN 45554)

Circular Category	Definition of priority
Repair	Parts with a high average occurrence of • Malfunctioning • Complete failure • Replacement
Upgrade	• Parts planned to be upgraded • Parts that can extend product life and avoid consumer replacement motivation (e.g. new aesthetics to fight emotional obsolescence) • Parts subject to rapid technological changes
Parts Reuse/ Recovery	Parts with high potential for reuse/recovery: • high request from Service • high BoM cost • part lifetime longer than product lifetime
Refurbish	• Parts that need replacement due to hygiene or aesthetics

Designing products easy to repair, reuse & upgrade

EN 45554 – Ability to repair, reuse, upgrade an ErP

ErP: Energy-related product



Use again | Close the material flows

'Designs aimed to bring post-consumer waste (materials, parts and products) back into the economic cycle.
It also include use of renewable content to close the material loops'

Use Again | Closing the material flows

Design for easy recycling

'Design the product in such a way that its materials can be

- liberated **into pure material streams**,
- in a **destructive way,**

enabling efficient recycling process'

Design for easy recycling

'recycling is a must for all products at the end-of-life. (Earlier or later) every product should be recycled…'

Use sustainable materials

Use materials able to be separated and recycled

DO's and DONT's

- Avoid substances that can limit recycling
- Avoid design with toxic, hazardous substances
- Enable easy access and removal of valuable, critical, hazardous or polluting components.
- Use materials combinations and connections that allow easy liberation
- Avoid surface treatment or additives that hamper recycling (e.g. platings, coating on plastics, additives in polymers, composites, foams, etc.)
- Label plastic parts clearly with the material type to help the sorting

Design from recycling

'Design **for** and **from** recycling are equally important and necessary to promote a circular economy'

Design <u>for</u> recycling:

optimize the design of a product in such a way that it can be effectively recycled

Design <u>from</u> recycling:

use recycled material to produce a new product

Recycled material

Turning weaknesses into strenghts

Speckled surface

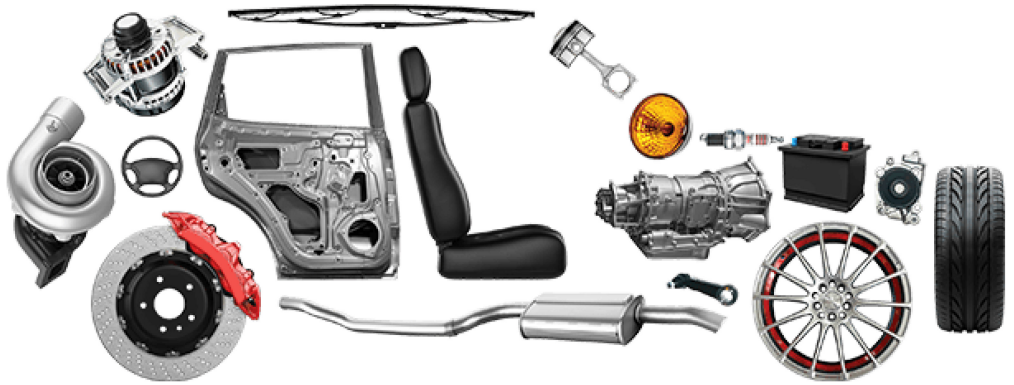
Material imperfections create desirability; no mass production – but unique pieces. Imperfect and random effects look closer to nature, and therefore more emotional

Recovering parts from end-of-life products

- Understand priority parts suitable for reuse / recovery
- Design products so that priority parts can be easily disassembled and reassembled (without damage!)
- Plan recovering parts from end-of-life products

  Make it part of the organization's goals (!)
- Apply used parts in repairs, upgrades, refurbishing, repurpose, etc.
- To assess proportion of reused parts in products: IEC 63333 (new!) and EN 45556 (important to validate claims)

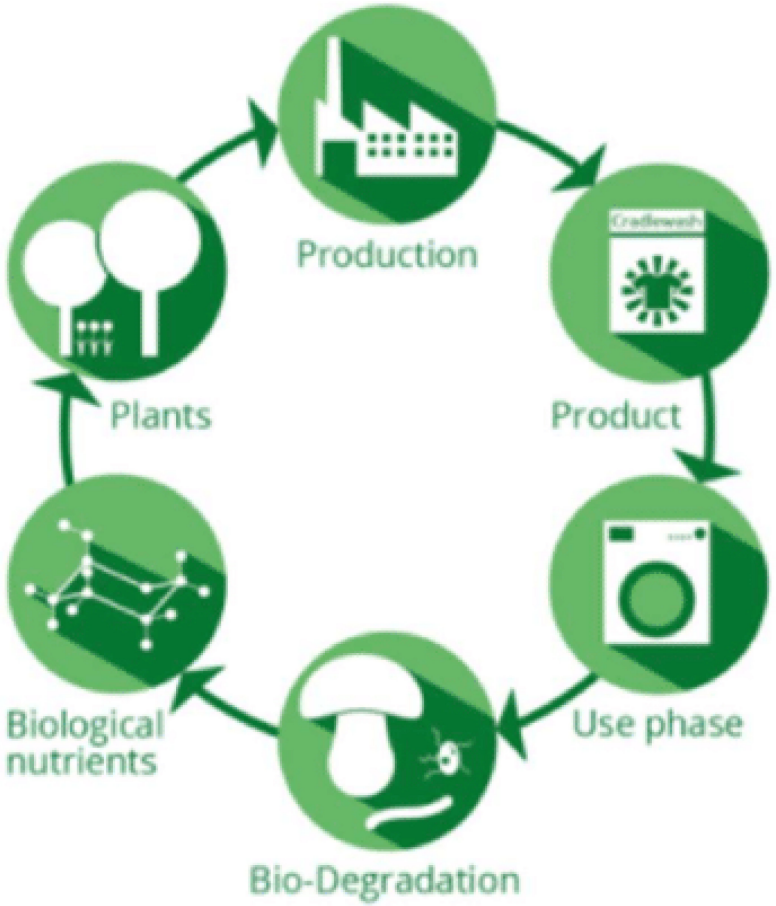
Pedestrian bridge in Myanmar built with cables from donated second-hand cables
SOURCE: Corentin Fivet, Jan Brütting, Nothing is lost, nothing is created, everything is reused: structural design for a circular economy, The Structural Engineer, vol. 98(1), p. 74-81, 2020

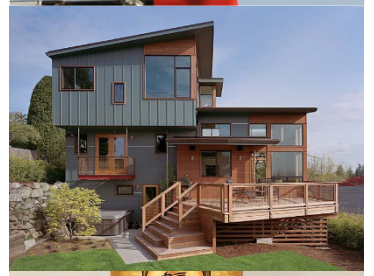


Used Car Parts For Sale (SOURCE: Kenny U-Pull)

Closing the material flows: using renewable materials

- Renewable content to close the material loops
- The return of the material to the biosphere is key(!)
  - Through e.g. biodegradation, anaerobic digestion or composting
- To guarantee safe return, no harmful substances to soil organisms or human health should be used





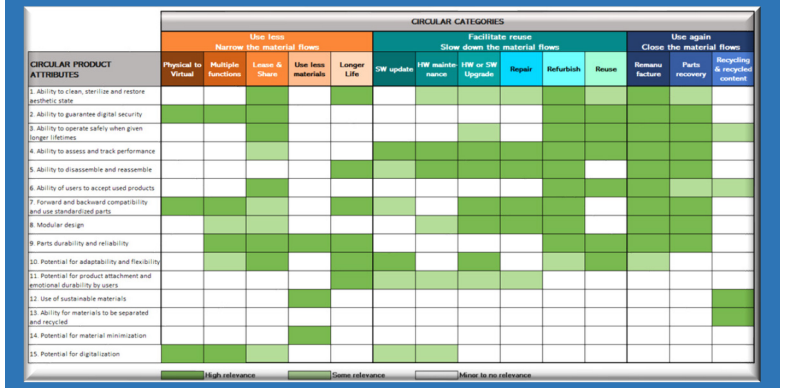
Circular design involves tensions and trade-offs

- **It should be useful**
  - Do not extend the technical life of products that no one wants to use (i.e. end of economic life)
- **It should be effective**
  - Reuse should cost less energy and resources than making new
  - Increasing the overall reliability/durability of the product could be more favorable than repair or refurbishing
- **It should be profitable**
  - To be sustainable a company needs to make profit
- **No trade-offs to safety!**

Circular design standards

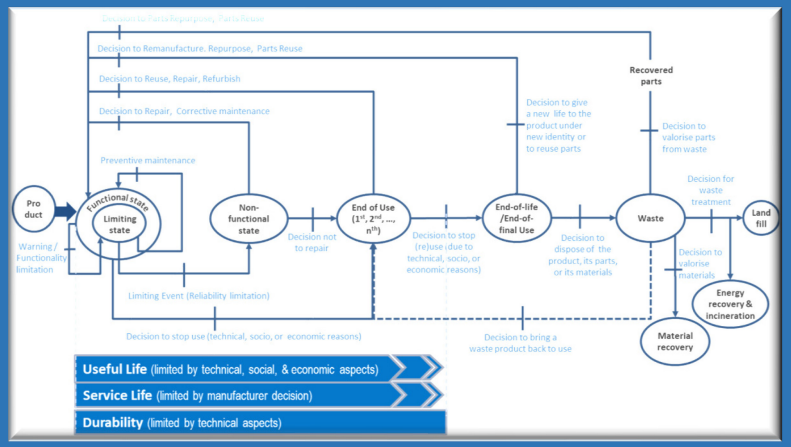
prEN 45560, Circular designs of products

- Scope: products under the EU EcoDesign regulation
- Focus on material efficiency
- Enquiry ongoing (deadl.24Nov)



IEC CD TS 63428, Material circularity considerations in environmentally conscious design

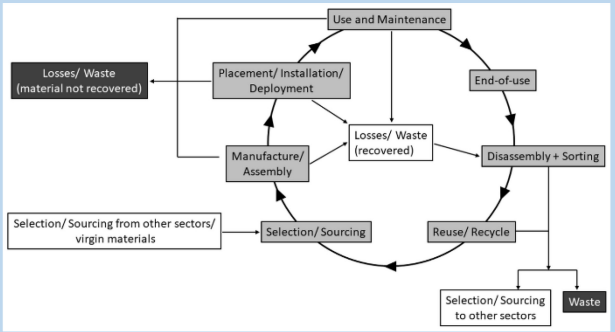
- Scope: electrotechnical products
- Details the steps and strategies within the product use and end-of-life phases



IEC CD 60050-193 - International electrotechnical vocabulary (IEV) – Part 193: Circular economy and material efficiency

prEN 17988-4, Circular design of fishing gear & aquaculture equipment – *Part 4 - environment and circularity requir. & guid.*

- Part of a series of stds under SReq M/574 (Feb 2021 - End 2024)
- Address impacts of the plastic components of fishing gear covering all product life-cycle stages



No material flows without data

ISO-IEC/CDV-DIS 82474-1 and IEC 62474
Material declaration; Incl. circularity data
(e.g. recycled-renewable-reused content)

*** Webinars on new function. in the Std 14 & 27 Sep**

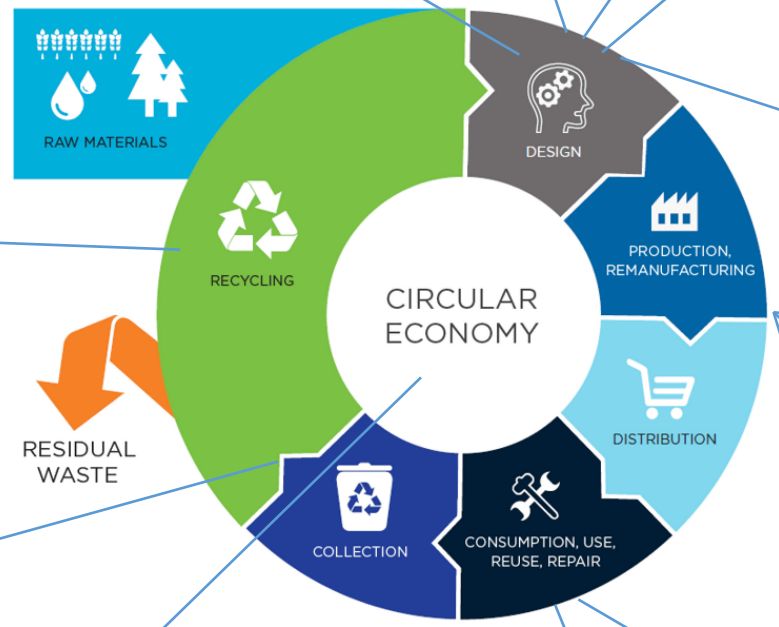
EN 45558 Info Critical
Raw Materials in prod.

ISO/DIS 59014
2ry mat. traceability

ISO/CD 59040 PCDS (qualitative data only)

Digital Product Passport

- IT framework Sreq under prep.; new CEN-CLC JTC proposed
- Content: Prod. Stds via delegated acts



EN 45555 and IEC TR 62635*
Recyclability and
recoverability (rates)
**under review*

EN 45557 Recycled content

EN 45556 and IEC 63333
Reused content

EN 62325 series and
IEC/CD 63395 Waste
management EEE

EN 45553 Ability to remanufacture*
**under review (ability to refurnish)*

ISO/DIS 59020
Circularity assessment

EN 45554 Ability to
repair-reuse-upgrade

EN 45552
Product durability

CE & ME International Standardiz. landscape

● final approval / published
● under development

SDO	Type	TC	Topic	Publication specifies
IEC	Horizontal	111	● IEC TR 62635 EoL & recyclability rate calculation	Assessment
		111	● IEC TR 62824 Material efficiency considerations in ECD	Basic concepts, terms
		111	● IEC CD TS 63428 Material circularity considerations in ECD	Basic concepts
		111	● IEC/CD 63333 Proportion of reused components	Assessment method
		56	● IEC 62309 Dependability of products with reused parts	Requirement
		56	● IEC 62402 Obsolescence management	Requirement, guidance
		1	● IEC CD 60050-193 IEV – Circular economy & material efficiency	Terminolgy
	Product	2	● IEC 60034-23 Rotating electrical machines - Repair, overhaul…	Requirement
		62	● IEC 63077 Refurbishment of medical imaging equipment	Requirement
IEC ISO	Horizontal	111/207	● ISO/IEC IEC 62430 Environmentally conscious design (ECD)	Requirem/Guidance
		111/207	● ISO/IEC CDV/DIS 82474-1 – Material Declaration	Requirem/Cross-sector
ISO	MS / Horizontal	207	● ISO 14009 EMS – Material circulation in design & development	Basic concept, guidance
		207/323	● ISO/DIS 2ry materials - Principles, sustainability & traceability	Basic concept, guidance
		323	● ISO/DIS 59004 CE – Framework and principles for implement.	Terms, guidance
		323	● ISO/DIS 59010 CE – Business models & value chains	Basic concept, guidance
		323	● ISO/DIS 59020 CE – Measuring circularity framework	Assessment, guidance
		323	● ISO/CD TR 59031 CE – Performance-based approach	Case studies
		323	● ISO/CD 59040 CE – Product Circularity Data Sheet	Requirements
ITU	ICT	ITU-T	● L.1023 (09/20) Assessment method for circular scoring	Assessment
			● L.1022 (10/19) CE - Definitions and concepts for ME for ICT	Terminology

CE & ME standard. landscape in Europe

- final approval / published
- under development

SDO	Type	TC	Topic	Publication specifies
CEN CENELEC	Generic/ Horizontal	JTC10	• CLC/TR 45550 Terms and Definitions related to material efficiency	Terminology
			• EN 45552 Method to assess of the durability of ErP	Assessment
			• EN 45553 Method to assess of the ability to remanufacture ErP	Assessment
			• EN 45554 Method to assess the ability to repair, reuse & upgrade ErP	Assessment
			• EN 45555 Method to assess the recyclability and recoverability of ErP	Assessment
			• EN 45556 Method to assess proportion of reused components in ErP	Assessment
			• EN 45557 Method to assess the proportion of recycled content in ErP	Assessment
			• EN 45558 Method to declare the use of critical raw materials in ErP	Use dclaration requirem.
			• EN 45559 Method for providing information on ME aspects of ErP	Communication requir.
			• prEN 45560 Method to Method to achieve circular designs of products	Requirements, guidance
CEN CENELEC ETSI	Product	various	• EN 17988 series, Circular design of fishing gears	Terms, metrics, guidance
			• Servers – group of standards on ME aspects like firmware update, data deletion, repair, upgrade, disassembly, and CRMs (Sreq M/573)	Requirements, guidance Requirements, guidance
			• Displays – group of standards on ME aspects like repair, reuse, dismantling, recycling, halogen-FR free parts, etc.	Requirements, guidance
			• prEN 50731 Voluntary standard on durability washing machines	
			• Circular Plastics – 45 new standards under Sreq M/584 plus 11 revisions	Requirements, guidance
			• ETSI TR 103476 CE in ICT - Definitions, concepts and metrics	Requirements, guidance
bsi.	National	BSI	• BS 8001 - Framework for implementing the principles of the CE in organizations - Guide	Principles, guidance

Conclusions

- Eliminating waste from products should be prioritized during product designs and redesigns
- Core strategies to retain and recover value of materials
  - Use less | Narrow the material flows
  - Use longer | Slow the material flows
  - Use again | Close the material flows
- 'Priority part' is a key concept in circular design
- 'Easy dis- and reassembly' is likely to be used in all strategies to maintain or recover value of products
- Recycling is likely to apply to all products at some point in time of their life
- Renewable content is becoming popular. But it is important that this bio-based materials are brought back to the biosphere in safe manner

Practical applications examples

Leendert Jan de Olde
Christian Dworak

PHILIPS

Embedding sustainable plastics in new product designs

Leendert Jan de Olde

innovation you

Philips is stepwise changing its portfolio by embedding recycled plastics

- In 2010 Philips launched its first product containing recycled plastic materials

- In 2015 Philips pledged to EU Commission to use >7600 tons on recycled materials in her products

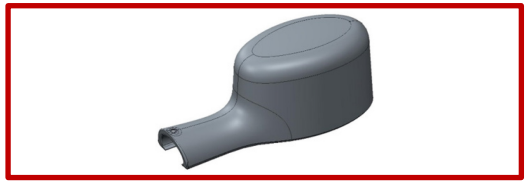
- Products marketed so far with recycled materials include shavers, hairdryers, body groomers, audio & video monitors, air fryers, steam irons, coffee makers, espresso, vacuum cleaners, blenders etc.

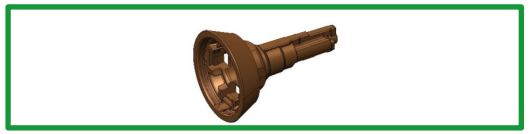
Philips is expanding the effort by applying biobased materials

Bio-based plastic vs `fossil-fuel based plastic’

Bio-based polymers are partially or completely derived from **renewable biomass** sources such as corn stalks, sugar cane stems and cellulose, and oils and fats from renewable sources which do not compete with food production

Implementation of biobased materials in Brush Heads



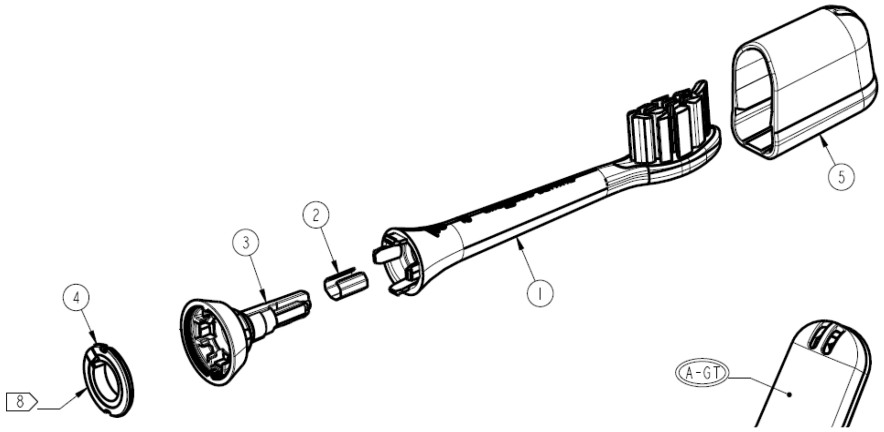


Implementation of sustainable materials

- Materials in scope: neck material, coupling material and Cap material

ISCC certification needed in order to use Logos and claims

- Anticipating the further implementation of EU Policy Framework Biobased
- Certification for all suppliers delivering brush heads



1. Brush Neck
2. Spring
3. Coupling Piece
4. Inertia Ring
5. Cap

ISCC
International Sustainability & Carbon Certification

Same looks & efficacy, less environmental impact

Philips Sonicare Brush Head, now with 75% bio-based plastic

75% Bio-based plastic

*mass balance basis

ISCC
www.iscc-system.org
contributing to responsible sourcing of bio-based materials

Philips Sonicare technology

Philips Sonicare's advanced sonic technology pulses water between teeth, and its brush strokes break up plaque and sweep it away for an exceptional

Now more sustainable

To help us all reduce our eco-footprint, 75% of the plastic in this brush head is bio-based****** and all our brush head packaging is 100%

Replace every 3 months

Brush heads become less effective after 3 months of use, but with BrushSync™ you'll be reminded before this happens. Your smart toothbrush will track


PHILIPS

B/S/H/

BSH Home Appliances Group

Bosch SmartGrow Life: A leap towards Circular Design.

Every part of our product lifecycle is carefully designed to reduce environmental impact - from manufacturing and use to recycling.

2023-09-05

Christian Dworak (COS-ES)

Bosch SmartGrow Life

Modular design for customization, intelligent functionality and easy-repair

“Eye For Detail” Usability

Modular, durable and user-friendly

- Easy-repair
- Customizable (e.g. Light modules, Microgreen Tray)
- Easy-use and maintenance (dishwasher-safe)
- Durable (10 year usage lifetime, UV-stable)

Intelligent lighting and minimalistic design:

- Sensors identify the different plant phases (germination, teenager, adult) to adjust the light spectra for optimal growth
- Light unit double-functions as a “humidity dome”
- Avoids extra parts for germination process

Active Irrigation:

- Patented system actively pumps water and nutrient from bowl to tray
- The plant roots get the right amount of nutrient water at the right time

Contactless magnetic coupling:

- Docking unit provides contactless energy
- User can remove and “serve” on the table, while the system switches off, saving electricity

B/S/H/

Bosch SmartGrow Life

A Sustainable Circular Model from cradle to cradle

Basil grown in SmartGrow has up to ***50% lower CO2 footprint***
than store-bought basil, with low energy consumption, high durability and multiple harvest [1]

3 Social Organization [2]

Separate and clean parts

*" We partner **Social Organizations**[2] that employ people with special needs for our plant capsules and our circular model."*

Plant pods:

- Produced by Social Organization[2]
- Natural or recycled and recyclable materials

2 END-OF-LIFE:

User sends back

1 SmartGrow

Appliance and accessories:

- ***100% recycled and recyclable white plastic***
- 10-year usage lifetime
- Made in Europe
- Modular, easy-repair

"Origami" Packaging:

- > 90% recycled content
- 100% recyclable
- 2nd life concept
- no EPS

*"We sell **Direct-to-Consumer (D2C)** to minimize logistic footprint"*

4 100% Recycled granules

Recycle & re-process incl.
QM checks

*"With **100% recycled** white plastic, an **additional 4.2 tonnes of CO_2 equivalent is saved** for every 1 k SmartGrows.[1]"*

5 New appliances from old ones

*"SmartGrow is produced by a **carbon-neutral factory** in Slovenia"*

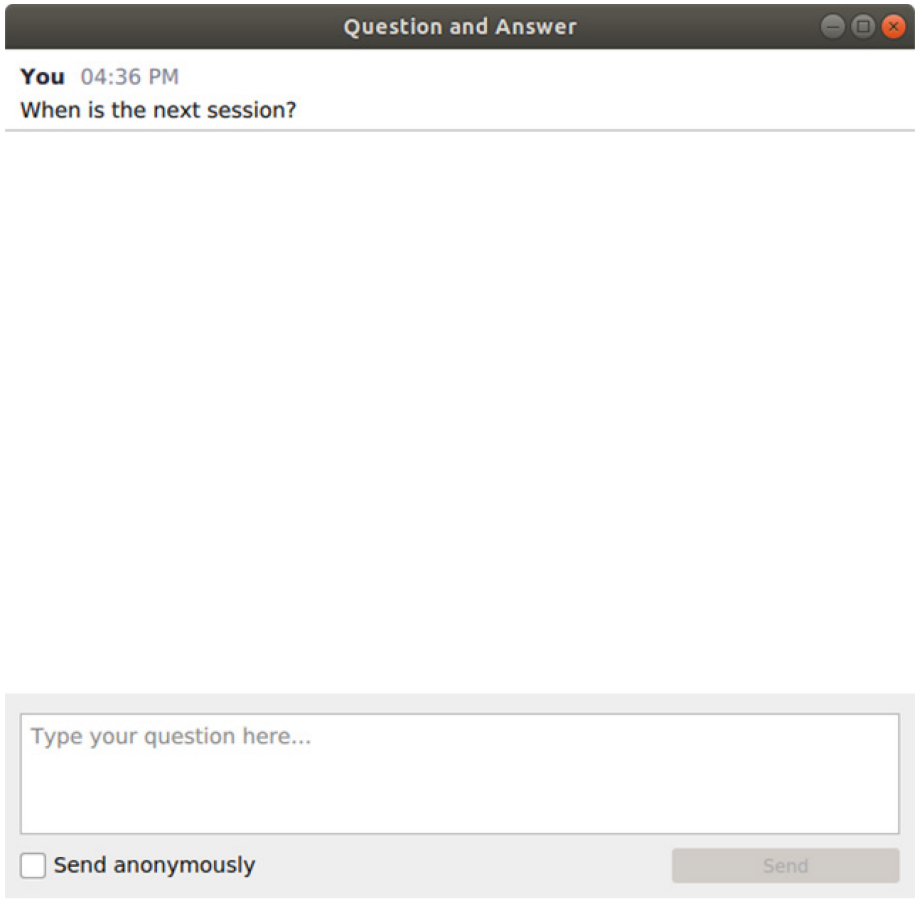
1) Source: A study conducted by an independent consultancy firm LCS Lifecycle Simulation GmbH, on behalf of BSH Hausgeräte GmbH. Methodology: Hot-spot analysis according to ISO standards 14040 and 14044. For lifecycle of appliance based on 10 years of usage per kilogram Basil Genovese
2) Organizations that employ people with special needs in Europe.

B/S/H/

Your feedback

Question time

- Use the Q&A panel to submit your questions



Thank you for your participation!

Upcoming events/webinars

2023-09-15 - Navigating Uncertainties: SESEC V and Stakeholder Exchange

2023-10-03 - Stakeholder Workshop “Timely European standards for a Green & Digital, Single & Global Market”

2023-10-05 - Webinar 'Implementing International Standards in Europe – The Frankfurt Agreement'

2023-10-24 - The Power of Standardization in Building the African and European Single Markets