INPUT ECO-DESIGN

Ursula Tischner

econcept – Agentur für nachhaltiges Design, Köln

www.econcept.org

INHALT

Warum

Gründe für
Ecodesign

Was

Ecodesign
Strategien

Wie

Methoden
und Tools

SUSTAINABILITY ISSUES

- Klimawandel
- Ressourcenverknappung: Rohstoffe, Frischwasser, Land
- Ungerechtigkeit: Arm-Reich, Nord-Süd, Geschlechter, Generationen
- Biodiversitätsverlust
- Energiewende, Verkehrswende
- Ungesunde Lebensstile: Fettleibigkeit, Diabetes, Burnout
- ...

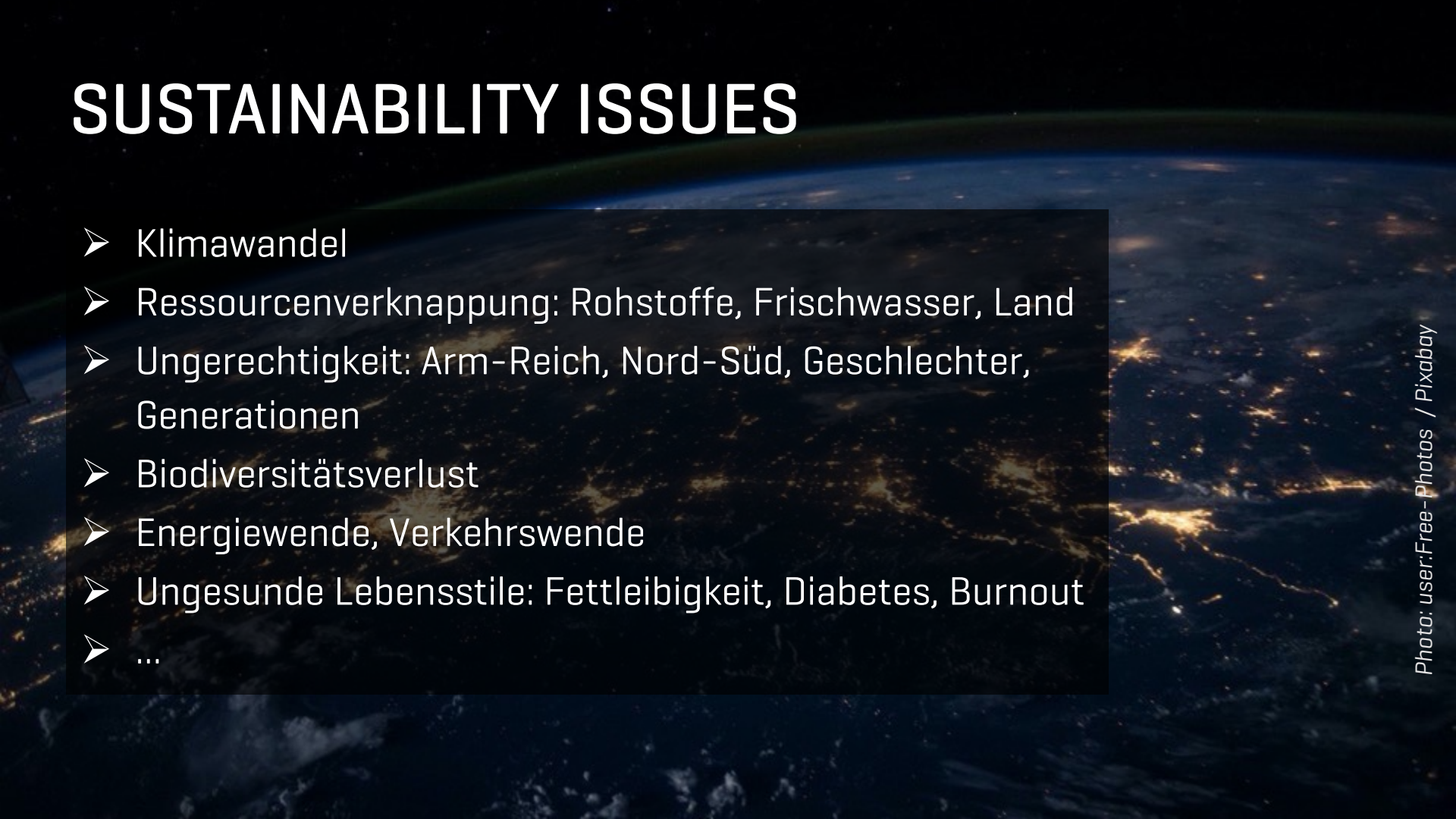


Photo: user:Free-Photos / Pixabay

TO SUMMARIZE ...

We are trashing the planet,

we are trashing the people

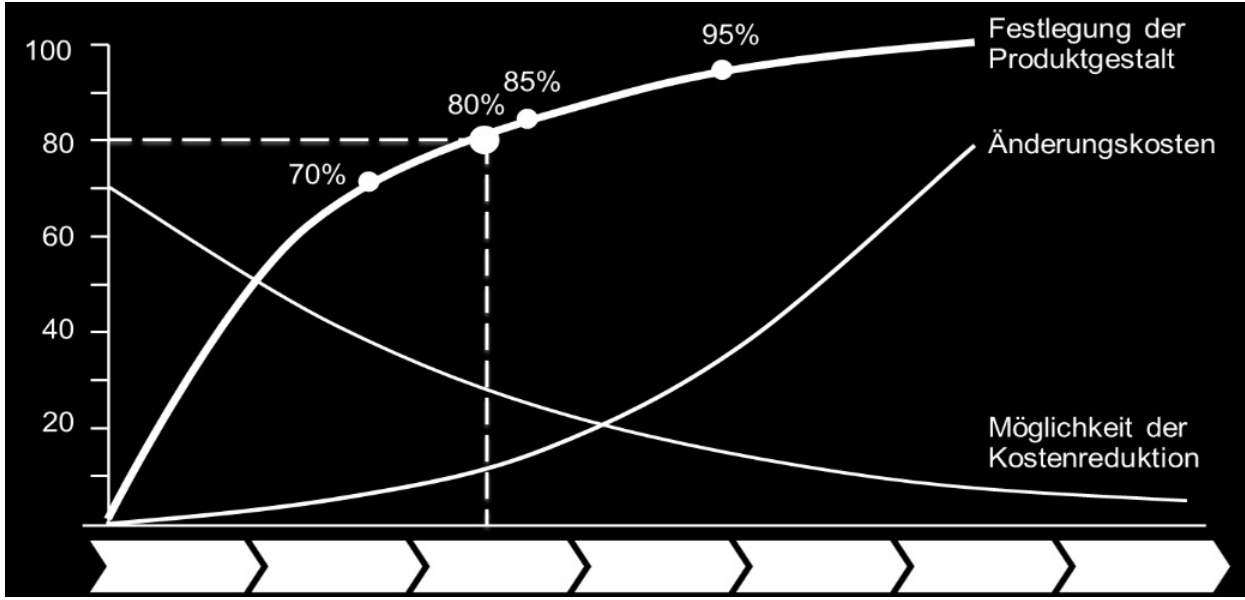
and we are not even having fun ...

as Annie Leonard says in "the story of stuff",
www.storyofstuff.com

WHY FOCUS ON PRODUCT DESIGN ?

About 80% of product impacts are pre-determined in product design and development phase.

Use and end-of life phase are more difficult to influence. Trade-offs occur. That's why also PSS design is needed.



DESIGN ...

From creator of over-consumption

To enabler of sustainable life styles!

Fully biodegradable Coffee-to-Go Cup made from used coffee grounds. Design: Agatha Sowinski, David Minatti-Krauhs, FH JOANNEUM

WARUM ECODESIGN?

Breakout session

PUSH

- ✓ Gesetzgebung
- ✓ Lieferkettengesetz
- ✓ Single Use Plastics Directive
- ✓ WEEE / RoHS / REACH
- ✓ Ecodesign Directive
- ✓ Packaging/ Battery Directive etc.
- ✓ Zertfizierungen und Standards

PULL

- ✓ Kundennachfrage
- ✓ Medien und Öffentlichkeit
- ✓ NGOs und Watchdog Organisationen
- ✓ Skandale und Protest
- ✓ Imageverbesserung
- ✓ Kundenbindung stärken
- ✓ B2B Nachfrage
- ✓ Öffentliche Beschaffung
- ✓ Finanzinvestoren

BENEFITS

- ✓ Gutes Gewissen
- ✓ Zufriedenere Mitarbeiter:innen
- ✓ Innovationsführer-schaft
- ✓ Kosten senken
- ✓ Risiken minimieren
- ✓ Kostenlose gute Presse
- ✓ Positive Impact/ Social Value

Photo: user:5688709 / pixabay

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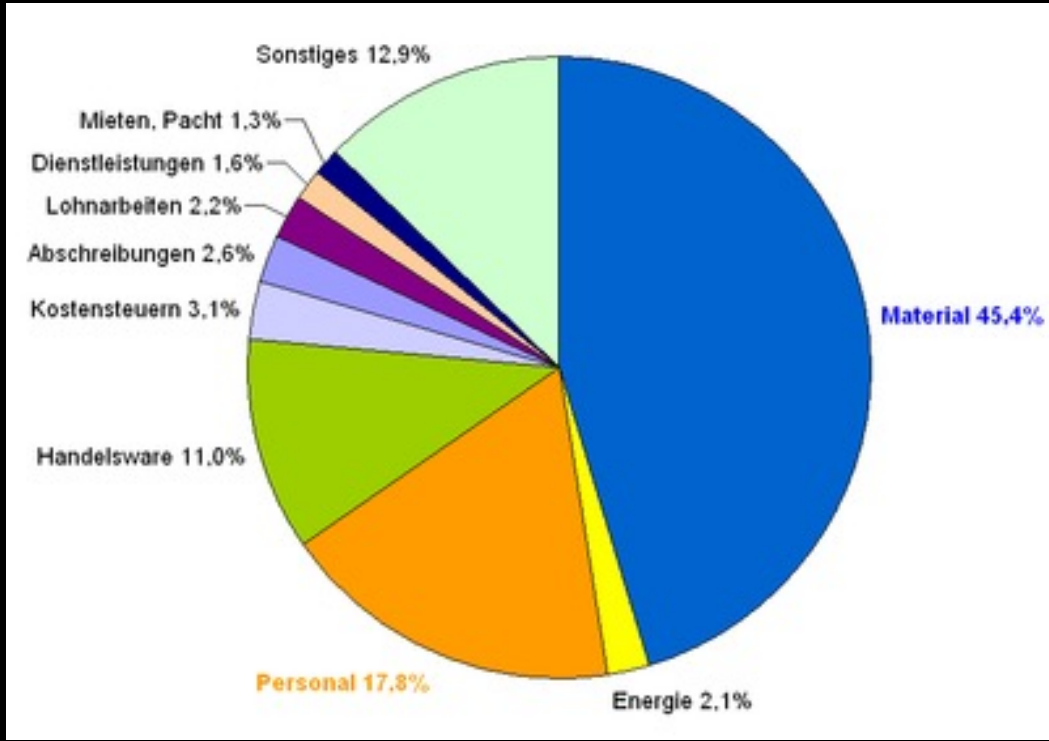
BUSINESS CASE z.B. Materialkosten

Der Anteil der Materialkosten am Bruttoproduktionswert im verarbeitenden Gewerbe liegt bei ca. 45 %.

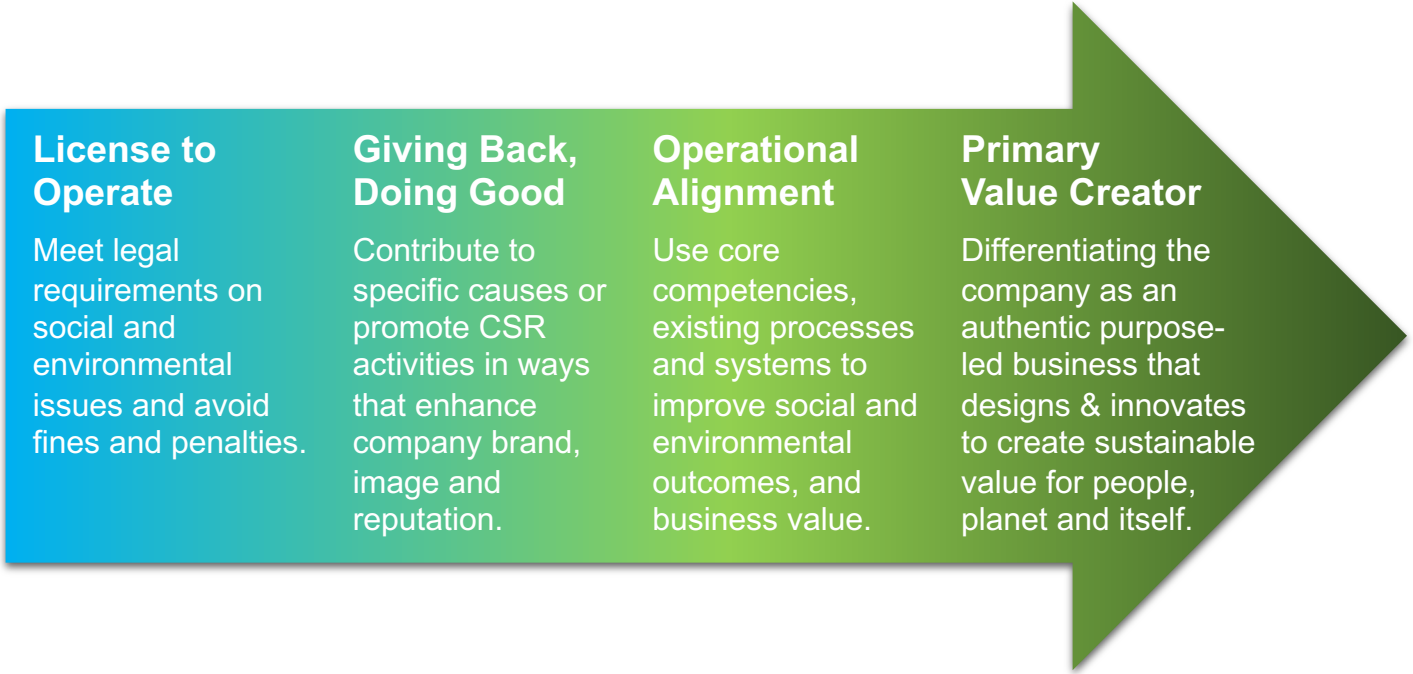
In den Materialkosten sind auch die Kosten der Vorleistungen enthalten, sie umfassen also nicht nur Rohstoffkosten.

Statistisches Bundesamt und Umweltwirtschaftsbericht 2011



THE SUSTAINABILITY BUSINESS ROADMAP

From CSR to Innovation and Design for Sustainability and Sustainable Value Creation.



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WAS WIR NICHT GESTALTEN SOLLTEN

Don‘t design what no one needs /

Nichts gestalten, was kein Mensch (und kein Tier) braucht

WAS WIR NICHT GESTALTEN SOLLTEN

No greening of stupid products /

Keine pseudo-öko Produkte „Öko-Hummer“

WAS WIR NICHT GESTALTEN SOLLTEN

No built in and percieved obsolescence /

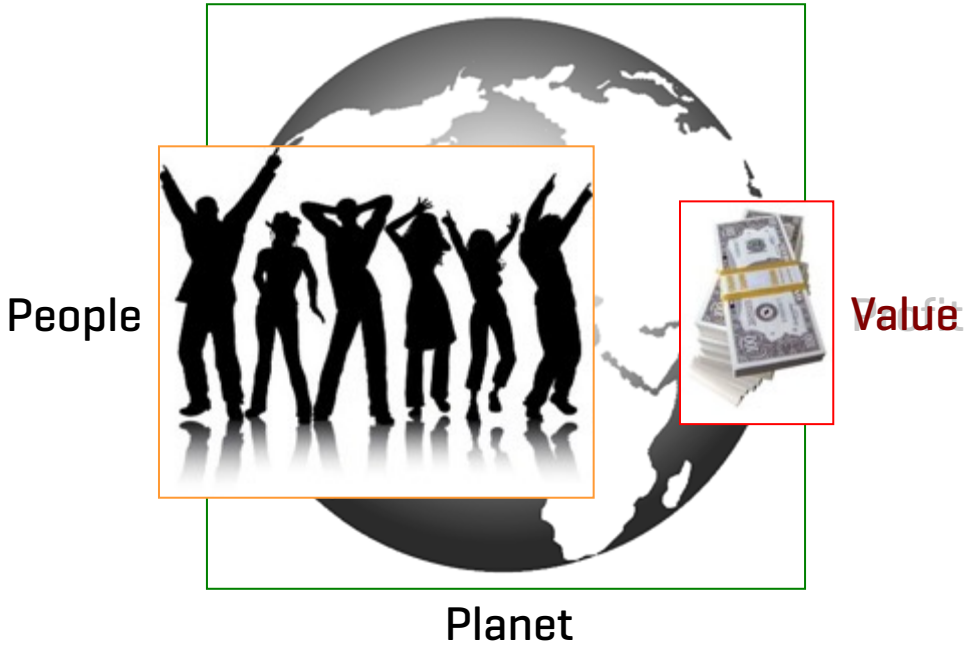
Kein eingebautes und gefühltes Verfallsdatum

DESIGN FOR SUSTAINABILITY

Design, that is good for people and planet, and creates value and wealth for as many people as possible – not only short term profit for a few.

PARADIGM SUSTAINABILITY 2.0

Without a planet there is neither society nor economy possible.



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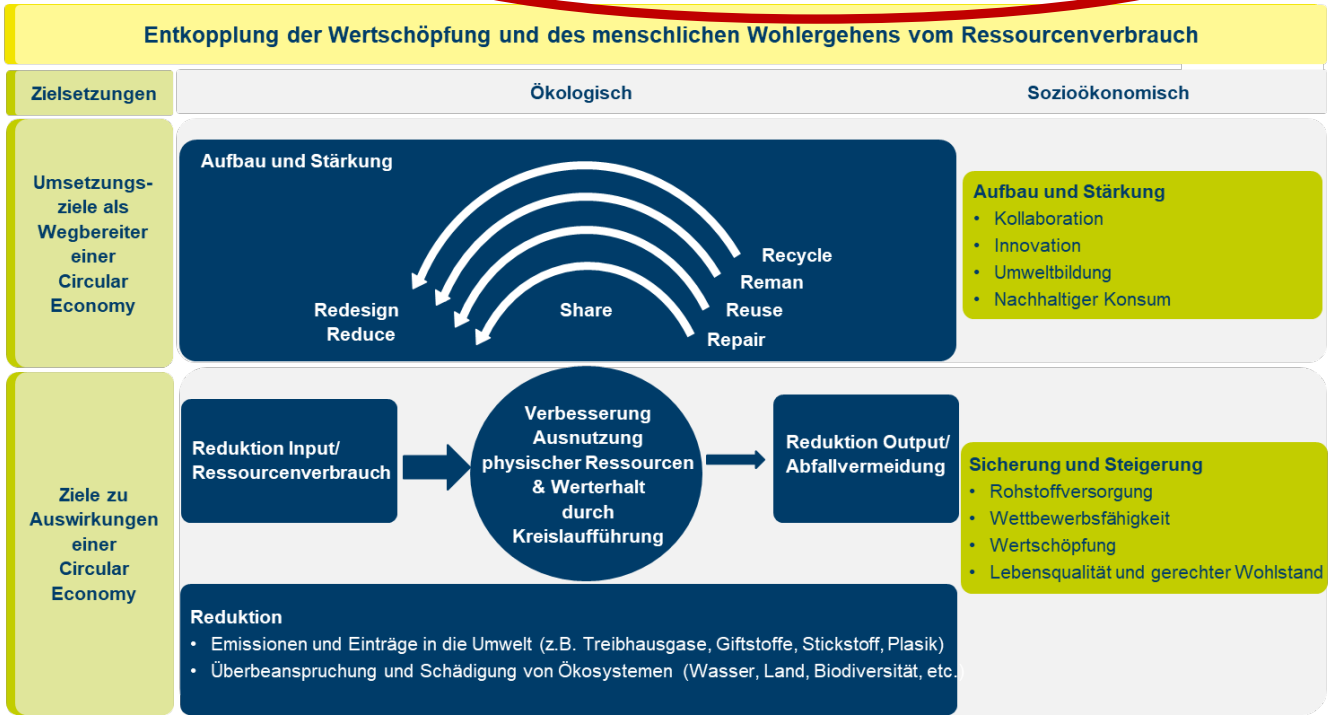
ZIEL: KREISLAUFWIRTSCHAFT

Übernächster Round Table

Design Strategien:

- Re.think
- Re.design
- Re.duce
- Re.use
- Re.pair
- Re.manufacture
- Re.cycle

Aber auch Services (PSS) und Geschäftsmodellinnovationen



Quelle: CEID

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ECO-DESIGN STRATEGIEN MATRIX

econcept 2019

Design principle	Life Cycle Stage: Material selection & sourcing	Production of components & products	Distribution	Use	End of life
Prevention of hazardous substances (includes toxicity)	Select materials that have lowest use and emissions of hazardous substances (e.g. avoid BFRs, PVC).	Avoid input or emission of hazardous substances in production of components and product (e.g. those restricted by RoHS).	Use packaging that does not involve hazardous substances or emissions.	Avoid use or emissions of hazardous substances during use (e.g. substances of very high concern according to REACH in nicotine liquids).	Enable end of life treatment w/o release of hazardous substances or emissions (e.g. meet WEEE requirements for selective treatment).
Effective use of sustainable materials	Minimize material use including indirect materials used. Avoid use of critical raw materials (e.g. Neodym magnet) Prefer renewable materials produced by sustainable methods..	Select production methods and producers with most material-efficient production methods. Minimize waste in production.	Minimize primary and secondary packaging along the whole supply chain. Design packaging to avoid transport damage.	Minimize use of consumables Avoid littering	Design for high quality recycling, avoid down-cycling by e.g.: separability of different materials, low diversity of materials, recyclability of materials.
Renewable & efficient energy use	Select materials with lowest energy consumption including grey energy (e.g. avoid Aluminum). Prefer materials that are produced using energy from renewable sources.	Select production methods and producers with highest energy efficiency. Prefer energy from renewable sources.	Minimize weight and volume of product. Minimize weight and volume of packaging. Select green transportation	Minimize energy consumption during use (e.g. by optimum power management and elimination of stand by energy consumption). Prefer renewable energy sources.	Enable energy efficient re-use & recycling (e.g. reduce effort for disassembly).
Product lifetime optimization	Select materials with adequate durability for the planned lifetime of the product.			Design for longevity (e.g. allow exchange of battery). Provide maintenance, repair and upgrade options.	Plan for 2nd and 3rd life options for product, components and materials. Design for re-use.
Recovery & recycling	Select materials that can either be safely returned to nature or to technical cycles (e.g. avoid laminated paper and metal-plastics composites). Prefer recycled materials (e.g. recycled fibers in packaging).	Allow for input of used components in production. Avoid limiting recyclability through production method, (e.g. plastic on metal overmolding). Recycle production waste.	Design packaging that can be safely returned to nature or to technical cycles (e.g. avoid gluing and mixing metal with paper).	Select consumables that can either be safely returned to nature or to technical cycles. Inform user about the best end of life options for product and components.	Design for high quality recycling: e.g. low diversity of materials, easy collection, disassembly, separation (respect WEEE targets:). Offer/communicate take back scheme and correct disposal.
Responsibility in production, use & end-of-life (social aspects)	Select conflict free materials (e.g. minerals). Select materials from certified/ audited (e.g. SA8000) suppliers.	Guarantee fair & safe working conditions.		Minimize negative, increase positive health impacts. Detail health information on the packaging clearly.	Plan end of life options so that they are not harmful to people, e.g. in developing countries.

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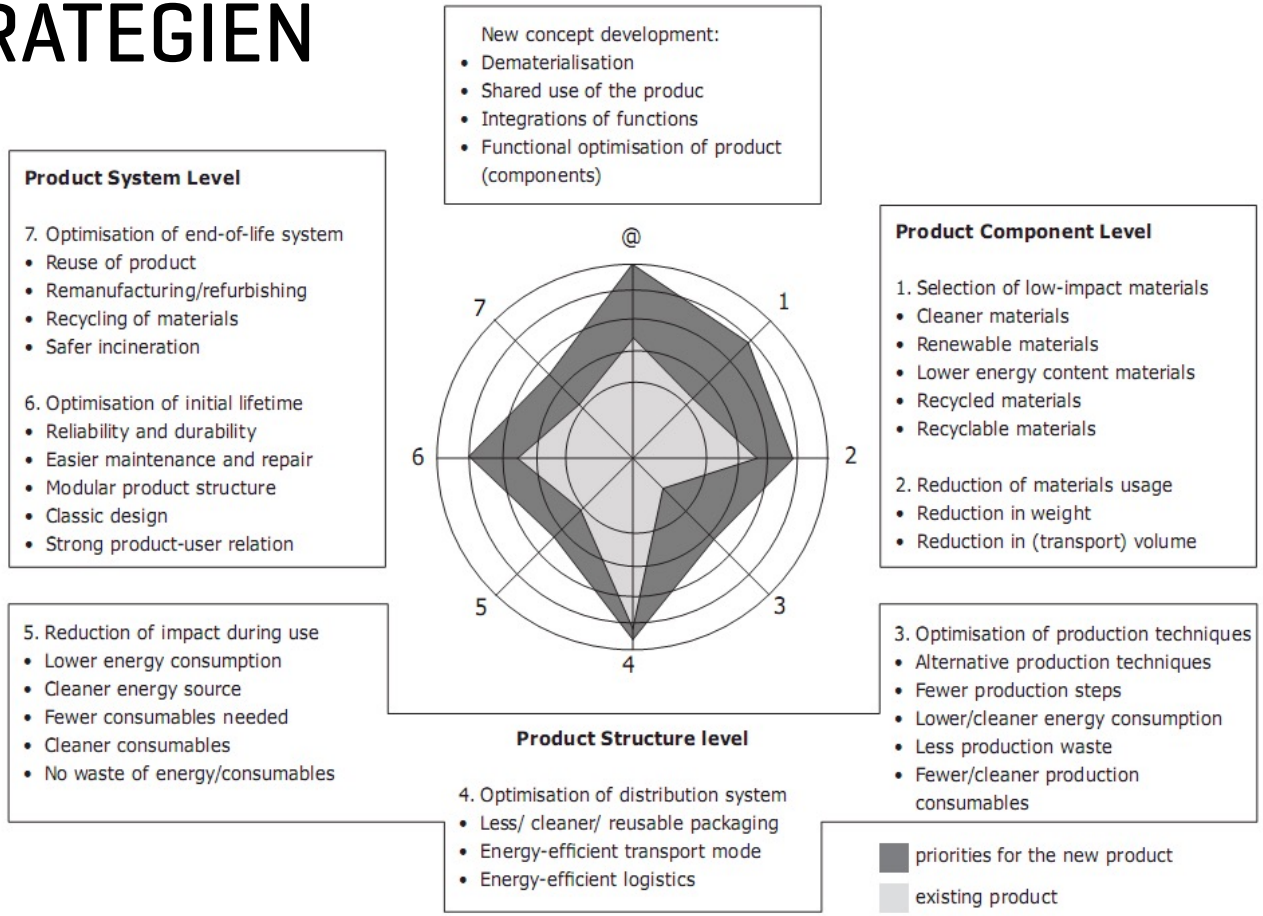
ECO-DESIGN STRATEGIEN

z.B. LIDS WHEEL

Eco-Design Strategien
im Produkt Lebenszyklus

Brezet and van Hemel 1995

Breakout session



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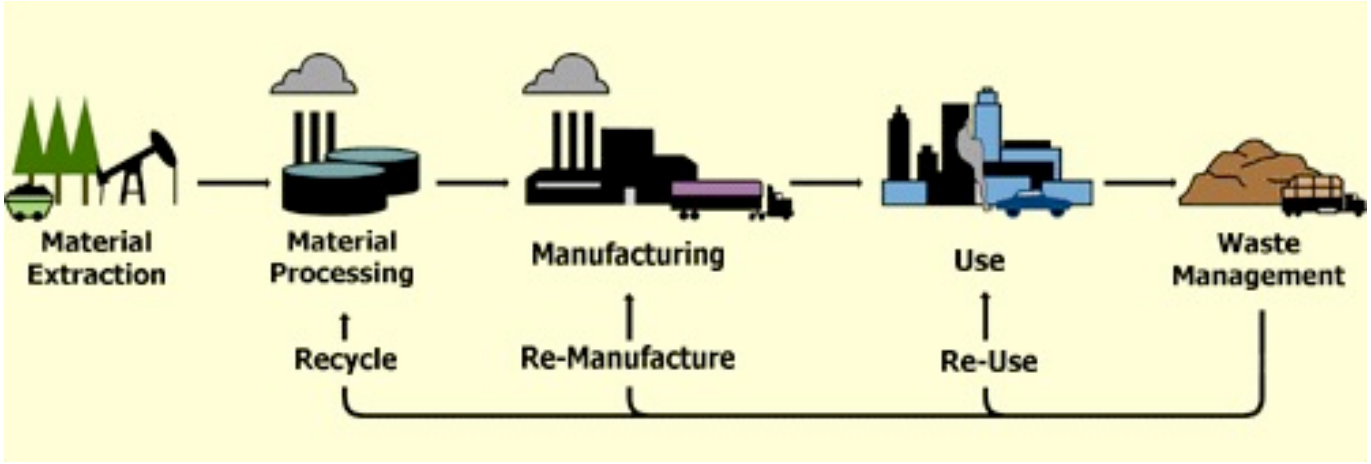
LIFE CYCLE DESIGN

Close the loops as much as possible in technical and / or natural systems.



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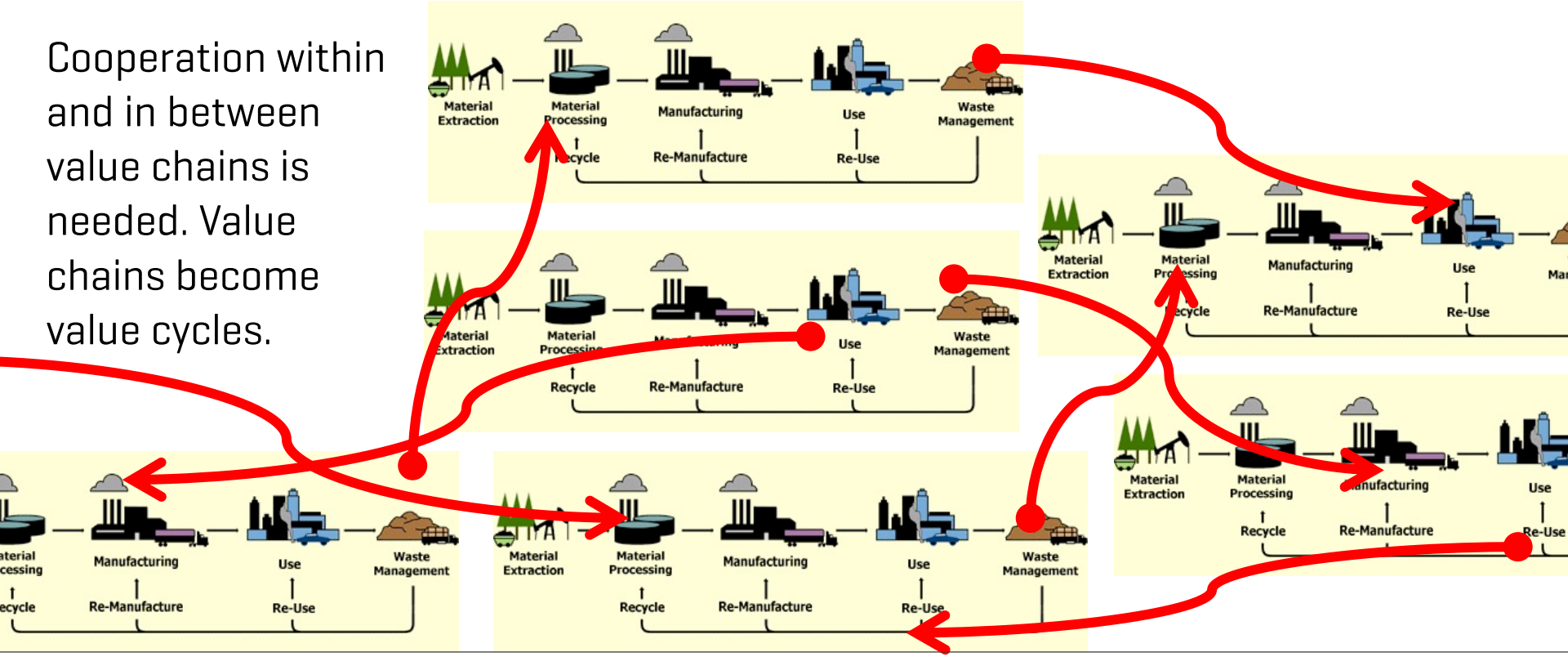
LIFE CYCLE DESIGN

Cooperation within and in between value chains is needed. Value chains become value cycles.



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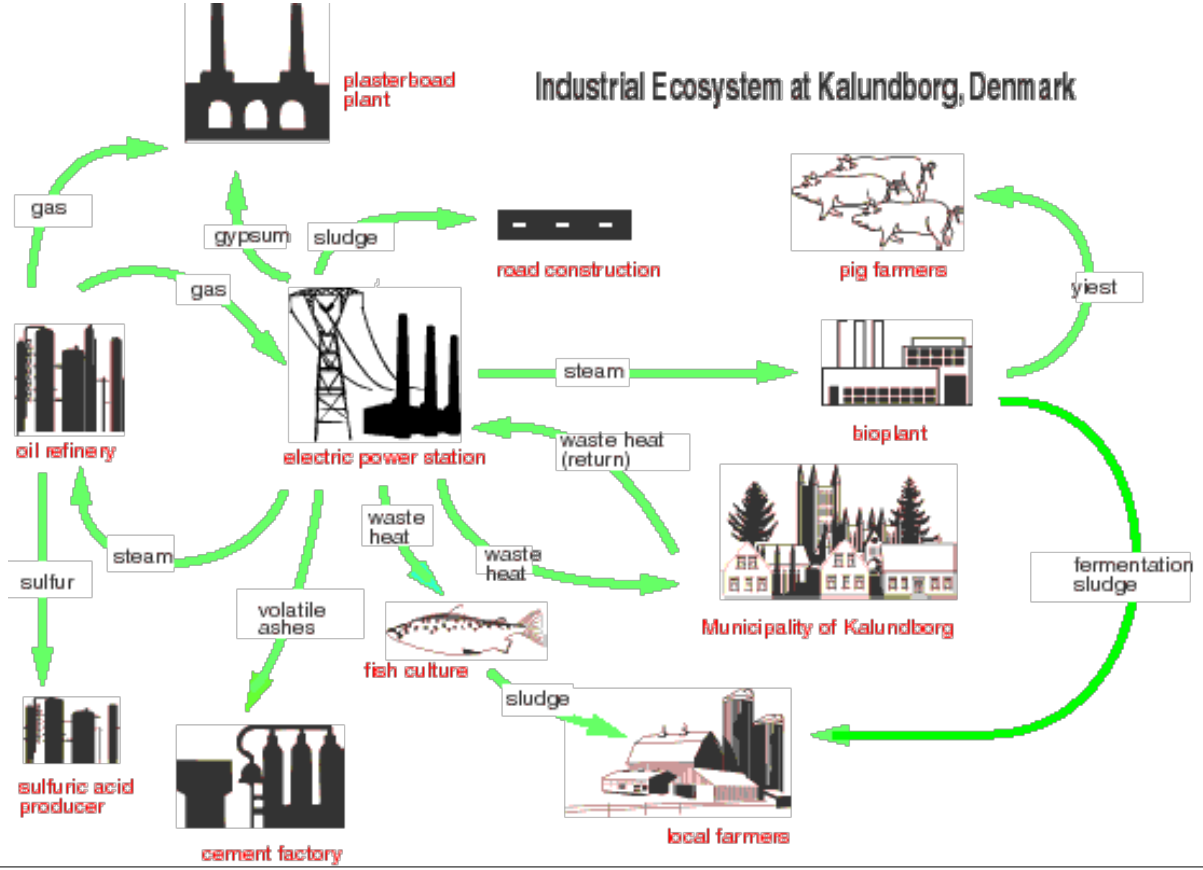
INDUSTRIAL ECOLOGY SYSTEMS

Erleichtert durch Digitalisierung / IoT / Industry 4.0:

Marktteilnehmer wissen, wo Produkte, Komponenten und Materialien sind, in welchem Zustand sie sich befinden und wann sie für eine nächste Anwendung zur Verfügung stehen.

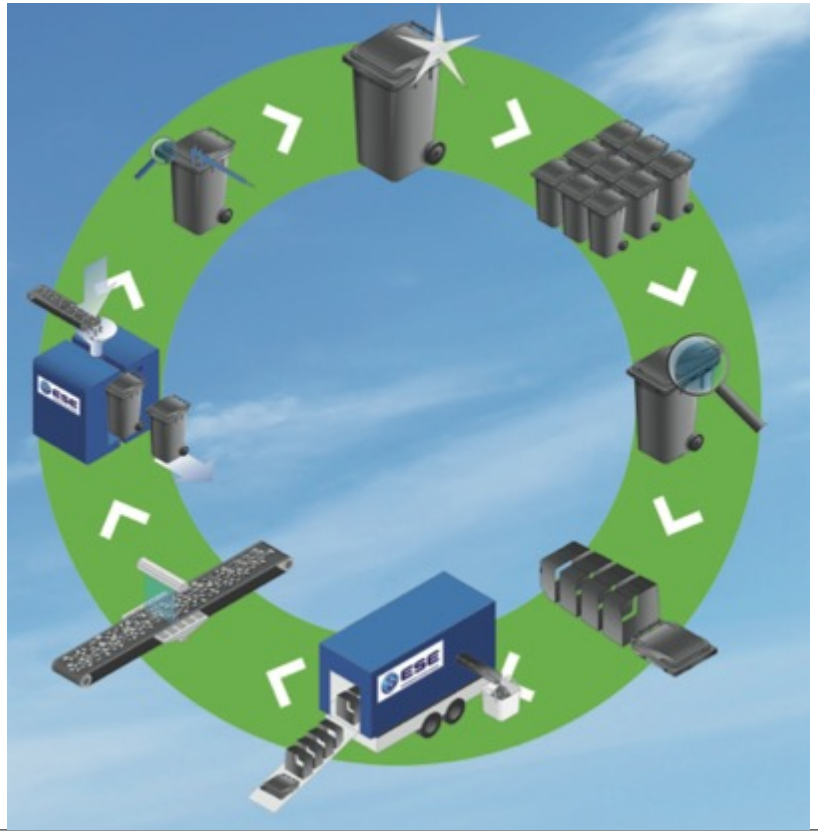


CIRCULAR DESIGN PROJECTS

Fast Food Packaging made from potato flour
that you can eat, feed to animals or compost.

Adital Ela,
Design Academy Eindhoven

CIRCULAR WASTE BINS BY ESE GROUP

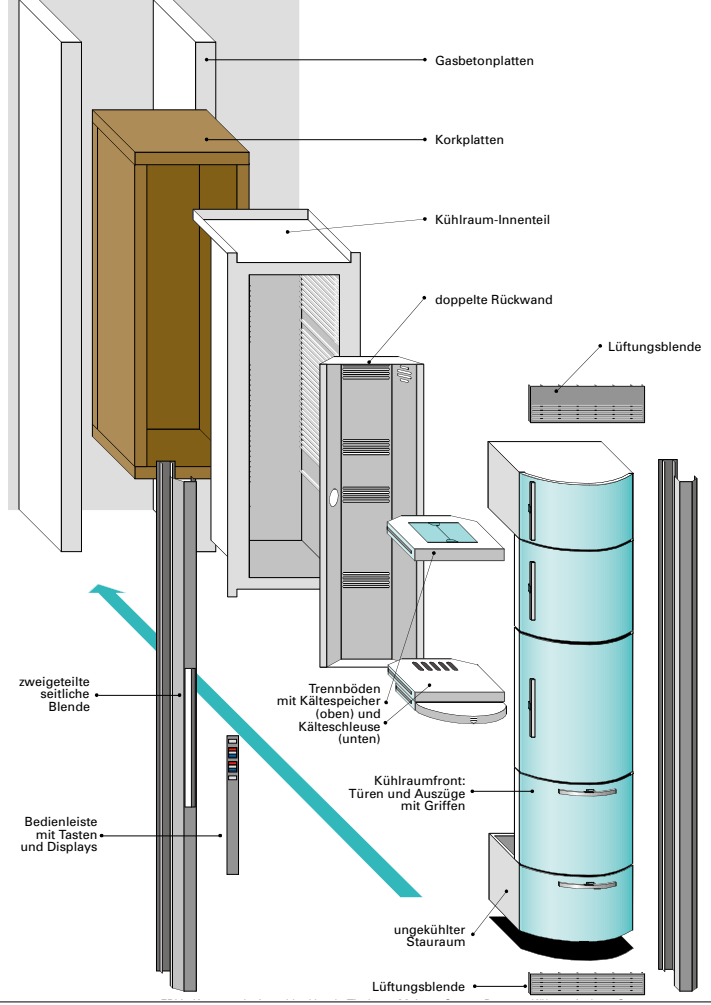


- Unternehmen schließt Materialkreisläufe intern
- Mobiler Shredder holt gebrauchte Tonnen ab und zerkleinert das Material beim Transport
- Minimiert Abfallaufkommen und Rohstoffeinsatz
- Produkt im Servicekonzept, vermietet – nicht verkauft
- Win-win-win Lösung

ECODESIGN PROJEKT FRIA

Umweltschonendes Kühlkonzept für den Haushalt:
In die Küche fest installierte Kühlkammer, die um einen Faktor 4 effizienter ist als herkömmliche Kühlschränke.

Design: Ursula Tischner



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URBAN MINING / UPCYCLING

Upcycling-Design: ‘Der Schweizer Offizier’ / The Swiss Officer

Reststoffe systematisch als Rohstoffe nutzen

Students from Zürich University of the Arts

NEW CIRCULAR MATERIALS

nächster Round Table

e.g. 'Liquid Wood' / Arboform, made from saw dust, acts like thermoplastics

https://www.tecnaro.de

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NEW CIRCULAR MATERIALS AND PROCESSES

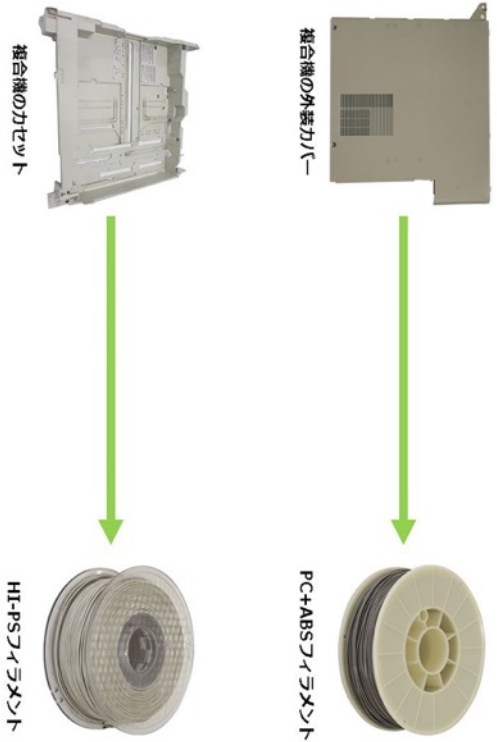
e.g. 3D-printing of spare parts with recycled plastics, individualization, mass customization

Porsche: 3D-printing spare parts for classic cars.

Canon Ecology Industry: produces 3D-printing filaments from used devices.

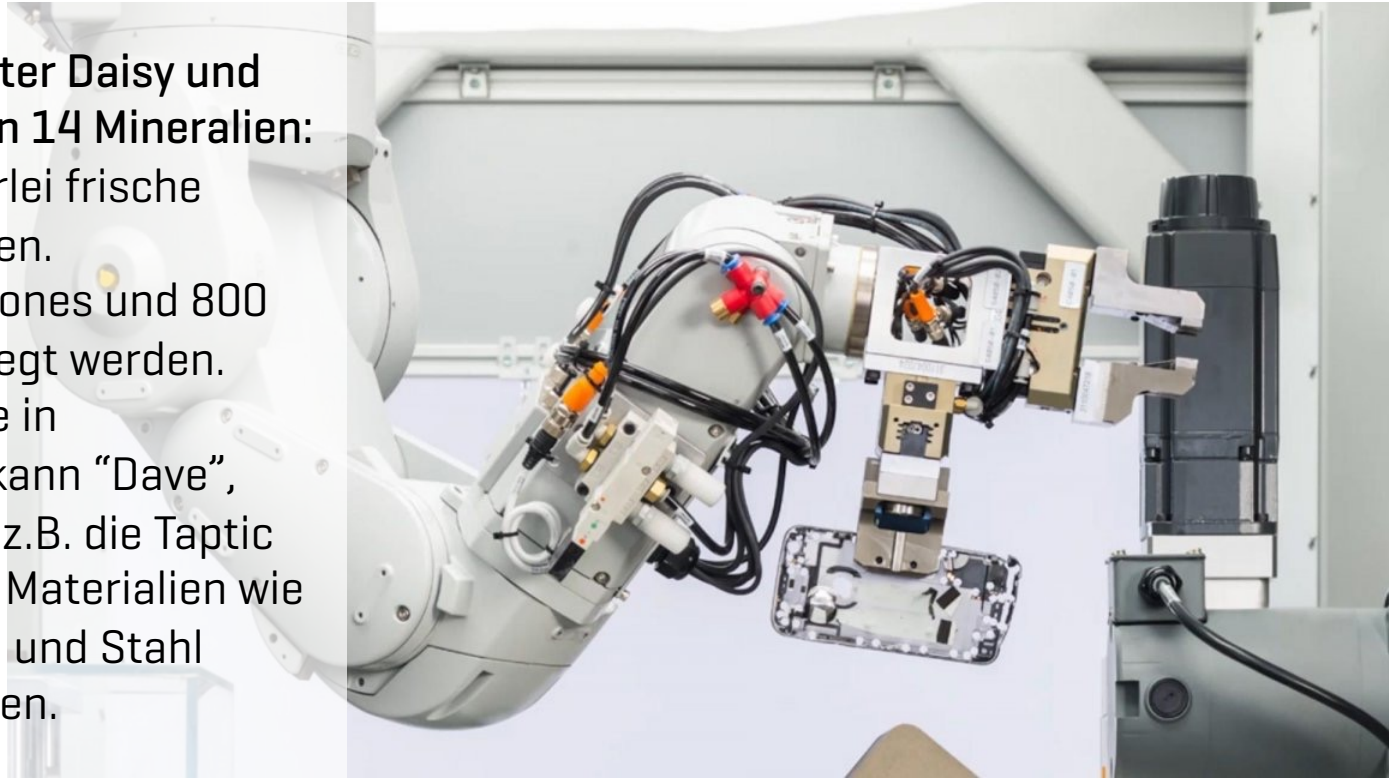
https://www.porsche.com/uk/accessoriesandservice/classic/genuineparts/originalpartscatalogue/
https://global.canon/en/environment/circulation.html

Porsche 3D prints multiple spare parts for its classic cars [Image credit: Porsche]



NEW DISASSEMBLY / RECYCLING TECHNOLOGIES

Apples Recycling-Roboter Daisy und Dave trennen iPhones in 14 Mineralien:
Künftig will Apple keinerlei frische Rohstoffe mehr ankaufen.
Derzeit können 200 iPhones und 800 Module pro Stunde zerlegt werden.
Während “Daisy” Geräte in Komponenten zerlegt, kann “Dave”, einzelne Komponenten z.B. die Taptic Engine verarbeiten, um Materialien wie Seltene Erden, Wolfram und Stahl besser wiederzugewinnen.



https://www.apple.com/environment/pdf/Apple_Environmental_Progress_Report_2020.pdf

DIGITALLY ASSISTED REPAIR, DISASSEMBLY, REMANUFACTURING, RECYCLING TECHNOLOGY

Virtual Reality,
Augmented Reality und
Artificial Intelligence
in Repair, Remanufacturing and Recycling Technologies / Digital Twins etc.

https://www.turbomachinerymag.com/virtual-and-augmented-reality/

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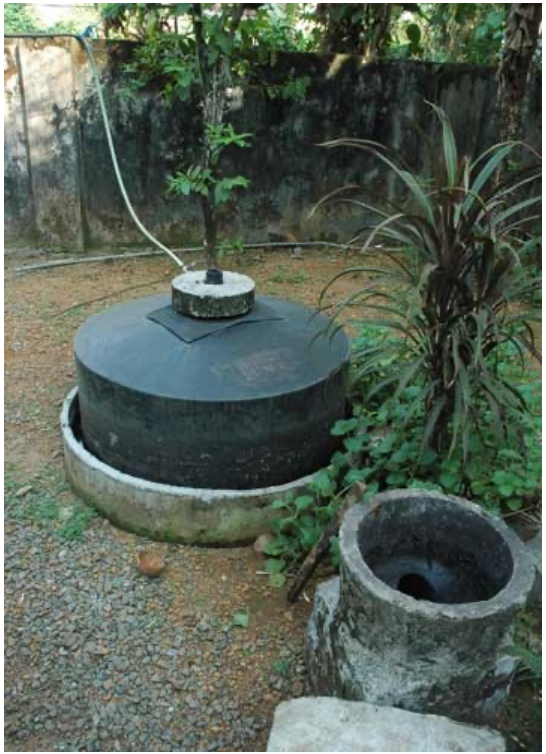
HAS TO BE BASED ON RENEWABLE ENERGY

e.g. Biogas Systems



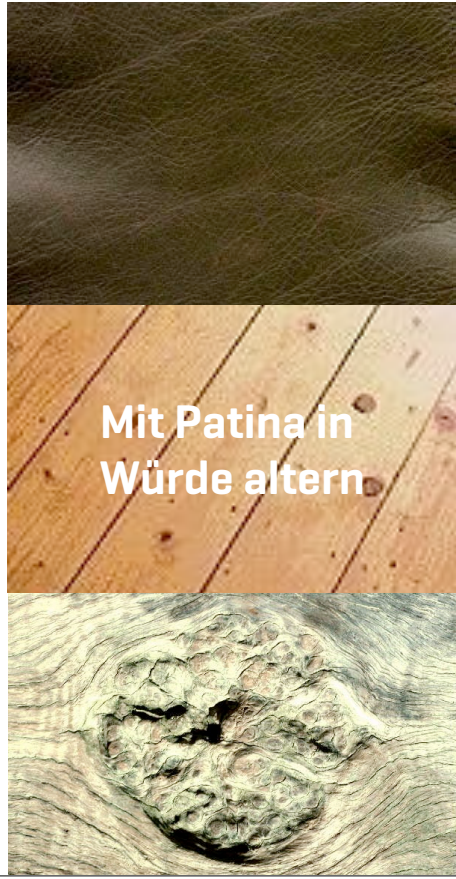
LANGLEBIGKEIT HAT HOHE PRIORITÄT

Stuhl von meiner Oma geerbt
Lebensdauer derzeit 84 Jahre
Ressourceneffizienzfaktor 10,5 (10,5 * 8 = 84)

Stuhl von meiner Mutter geerbt
Lebensdauer derzeit 64 Jahre
Ressourceneffizienzfaktor 8 (8 * 8 = 64)

Stuhl aktuell
Gesamte Lebensdauer geschätzt 8 Jahre
Ressourceneffizienzfaktor 1 (8 * 1 = 8)

*Annahme ungefähr gleicher Ressourceneinsatz



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GEBRAUCHSPHASE WICHTIG

Für die meisten Produkte mit Verbräuchen an Strom, Wasser, Reinigungsmitteln etc. erzeugt die Gebrauchsphase größte Umweltbelastungen: Kann man nachhaltigen Gebrauch designen?

VERHALTEN DURCH DESIGN ÄNDERN

z.B. intelligente Stromzähler und Wasserspülungen,
Partizipatives / Co-Design

DESIGN INTERVENTIONEN

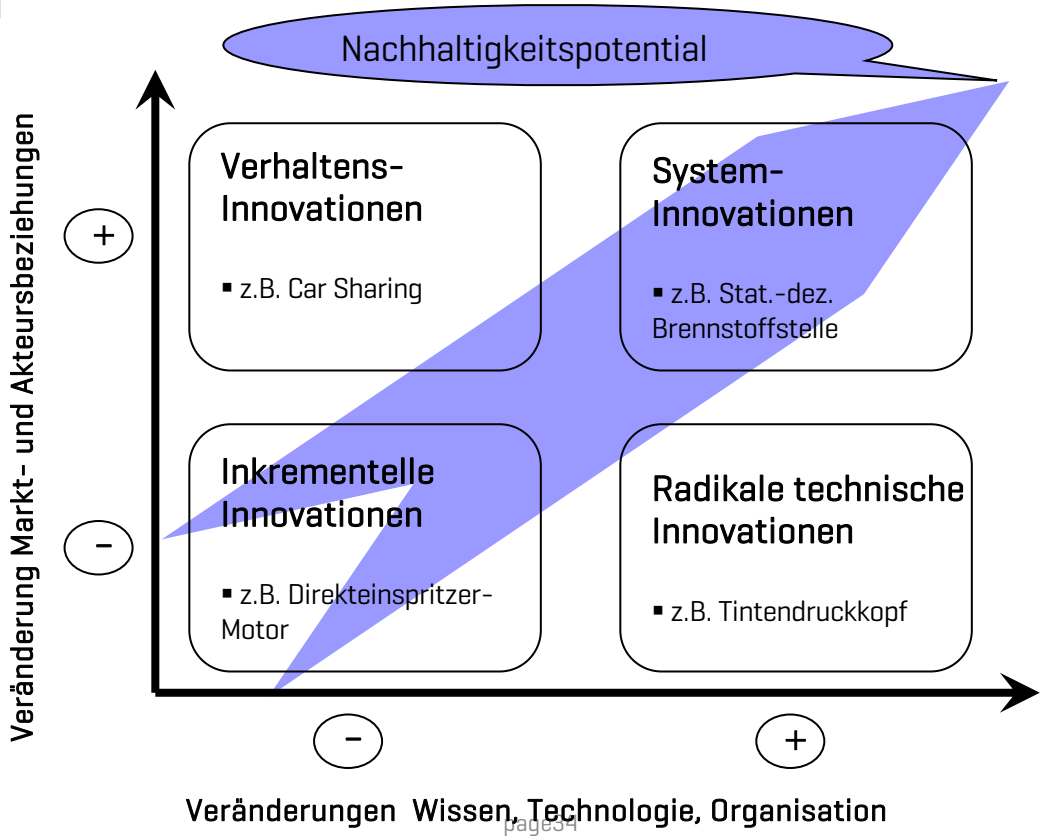
Nudging: Urinal

http://www.urinalfly.com/

NACHHALTIGKEITSPOTENZIALE VON INNOVATIONSTYPEN

Verschiedene Innovationstypen haben i. d. R. unterschiedliche Nachhaltigkeitspotenziale.

Die größten Potenziale liegen in den Systeminnovationen, die sowohl mit technologischen und organisatorischen wie auch mit Markt-, Akteurs- und Verhaltensänderungen einher gehen. Gleiches gilt für PSS.



Tischner, U./Scholl, G. (2004): Nachhaltige Produkt-Dienstleistungssysteme, in: Umwelt-Wirtschafts-Forum, Ausgabe 1/2004

SYSTEM INNOVATION: ENERGY

Winfried Werthmann,
Chris Goetze,
FH JOANNEUM

Altes Firmenlogo

Gründer mit Veranschaulichungsmodell

Start Up from Technical University Graz

Cooperation with 2 Master Students from Master Eco-innovative Design, FH JOANNEUM Graz

Master students designed Product, Branding, Communication and App.

SYSTEM INNOVATION: ENERGY

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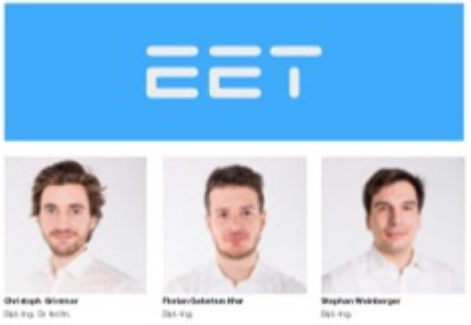

https://www.kickstarter.com/projects/775226155/solmate-dein-grunes-kraftwerk-fur-zuhause

SYSTEM INNOVATION: ENERGY

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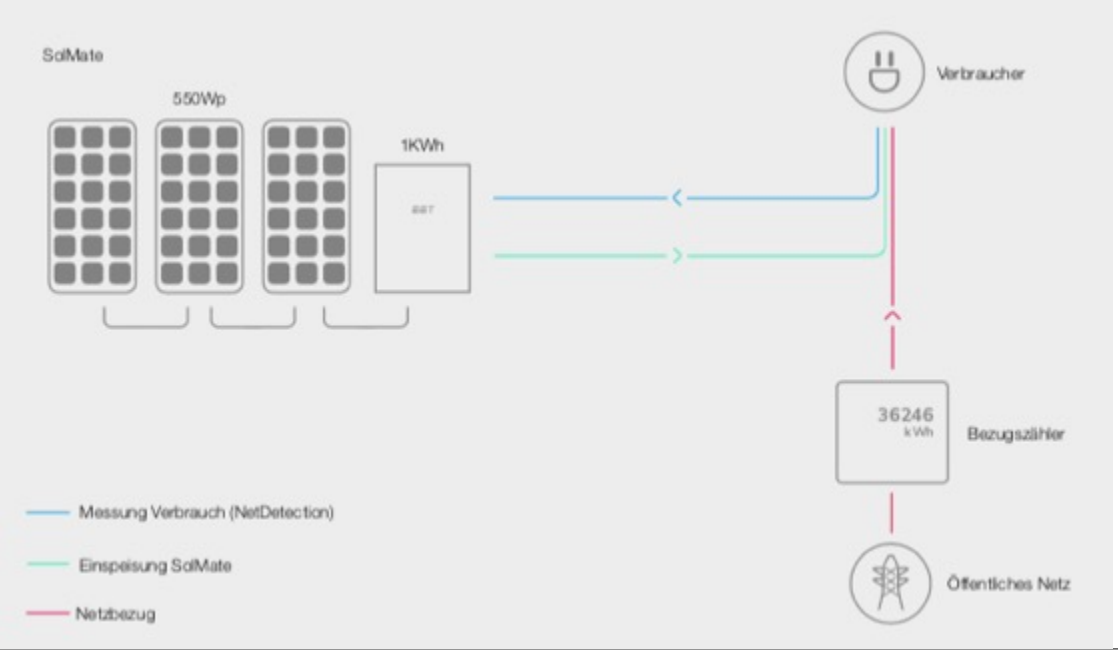

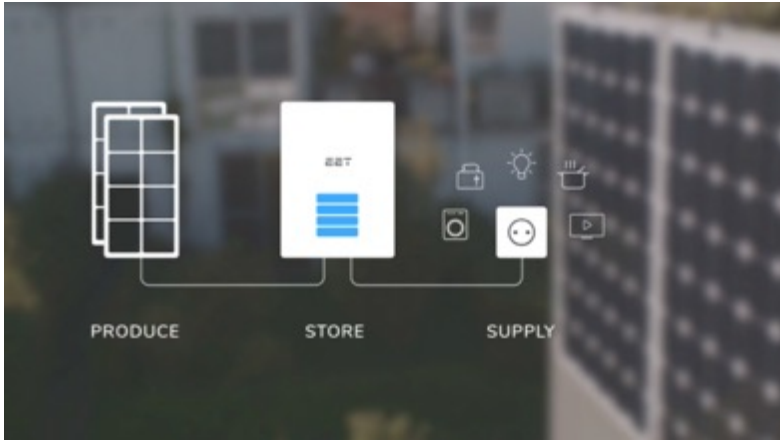

Production, storage and consumption of solar energy in rental apartments possible.

Plug and Play. No contract with energy companies necessary.

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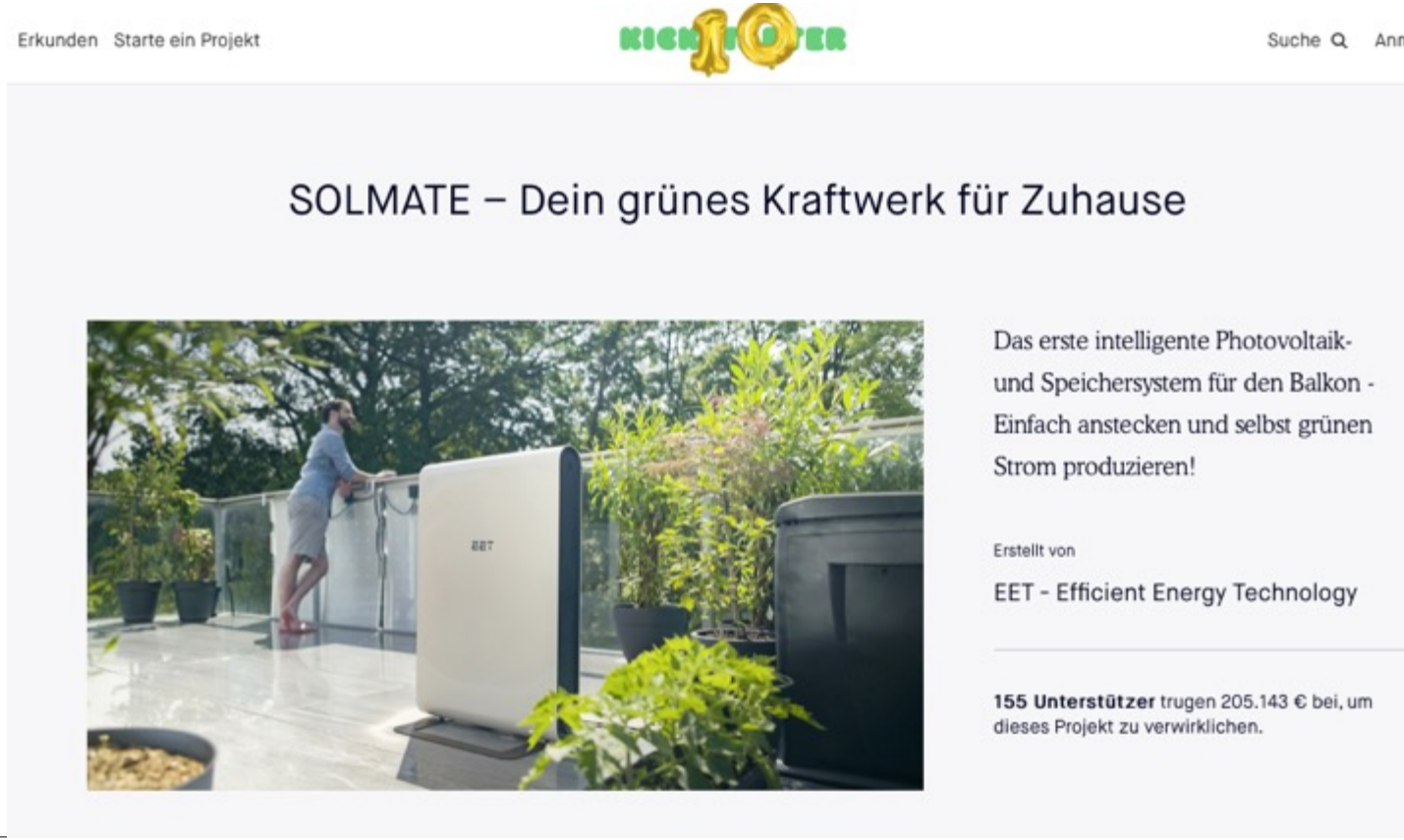
SYSTEM INNOVATION: ENERGY

Winfried Werthmann,
Chris Goetze,
FH JOANNEUM

Kickstarter Campaign reached 205.143 € from 155 backers.

Originally the start up asked for 60.000 €.



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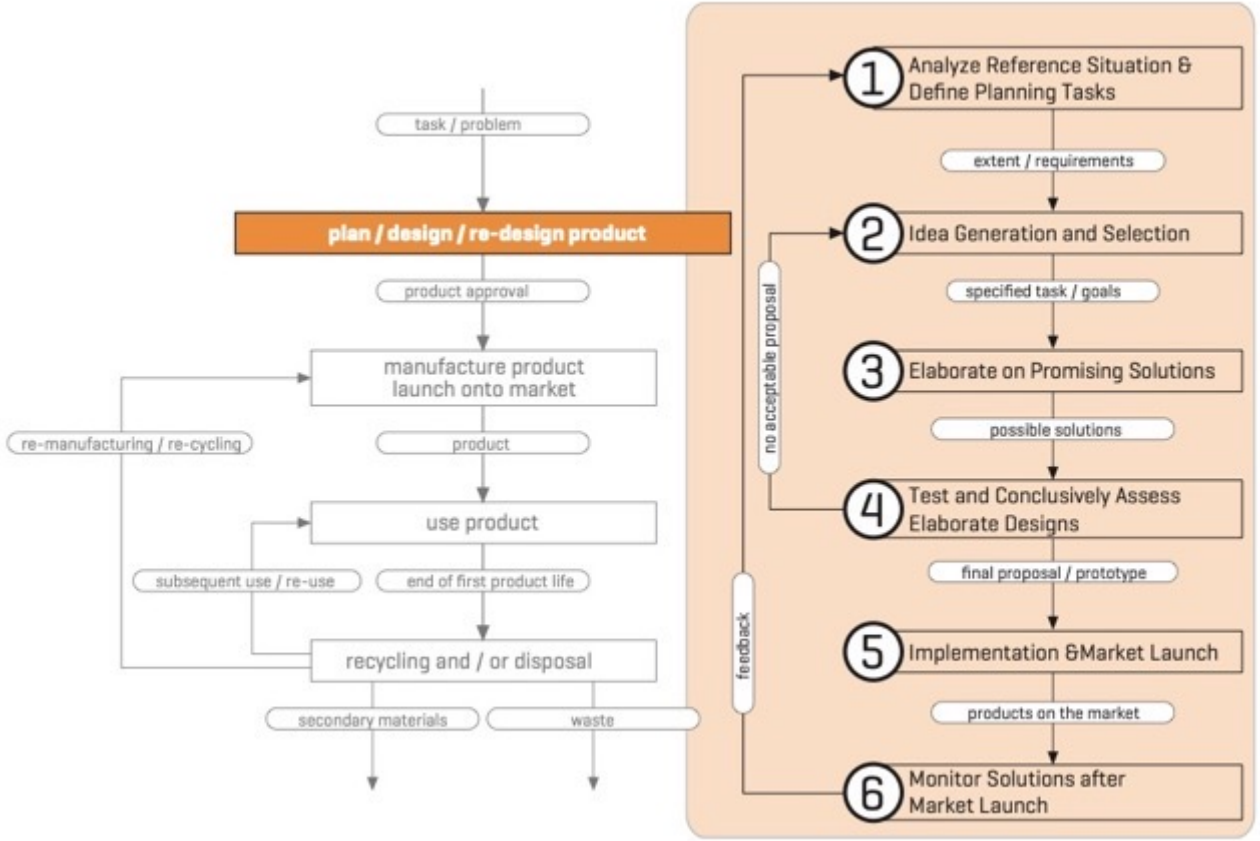
Generic Eco-Design Process, needs to be adapted to the specific company.



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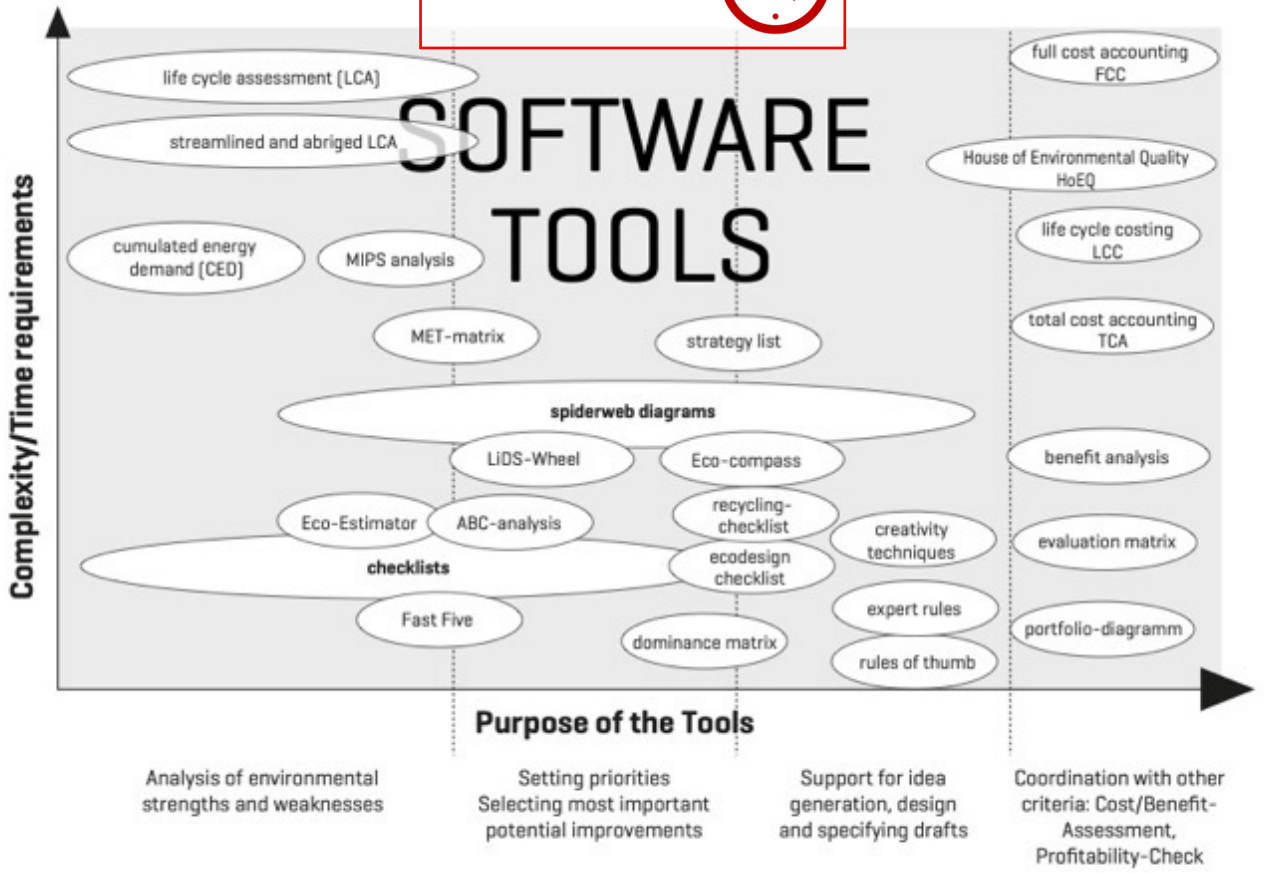
HOW TO DO IT

Many methods and tools available: from complex LCA to simple rules of thumb, from environmental to social and economic aspects.

Pragmatic choice of tools recommended: Normally: (1) analysis, (2) guidance, (3) final evaluation.

Quick Recap LCA



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TOOLS FOR LIFE CYCLE ASSESSMENT (LCA)

e.g. Ecolizer by OVAM

Analog and digital tool to calculate environmental impacts of products.

www.ecodesignlink.be/en/ecolizer-1

Ferrous metals	
Iron	01.01
Stainless steel	01.02
Steel	01.03
Ferrochrome	01.04
Ferronickel	01.05

Non-ferrous metals	
Aluminium	02.01
Bronze	02.02
Copper	02.03
Brass	02.04
Tin	02.05
Other	02.06

Plastics	
ABS	03.01
EVA	03.02
PA	03.03
PC	03.04
PE	03.05
PET	03.06
PMMA	03.07
PP	03.08
PS	03.09
PUR	03.10
PVC	03.11
SAN	03.12
Recycled plastics	03.13
Bioplastics	03.14
Composites	03.15
Rubber	03.16
Teflon	03.17

Wood	
Wood, untreated	04.01
Wood, layered	04.02
Wood, chipped	04.03

Paper and packaging	
Paper	05.01
Newsprint paper	05.02
Cardboard	05.03
Packaging glass	05.04
Paperboard packaging	05.05

Energy	
Electricity (voltage)	06.01
Electricity (according to extraction)	06.02
Heat	06.03

Transport	
Transport	07.01

Lighting and electronic components	
Lighting	08.01
Electronic components	08.02

Construction materials	
Concrete and cement	09.01
Plaster and chalk products	09.02
Brick and ceramics	09.03
Minerals	09.04
Insulation	09.05
Glass	09.06
Blockboard	09.07
Textile	09.08

Chemicals	
Paint and inks	10.01
Inorganic	10.02
Organic	10.03
Glues	10.04

Product or component: chair	Project: example 2
Date: 2009	Author

A chair with a polypropylene (PP) seating and a plied stainless steel frame. The frame is connected to the seating by four stainless steel screws. The chair's life cycle is estimated at 15 years, but since it doesn't cause any impact during use, this is hardly relevant. There is no energy consumption involved and maintenance products are not required. Delivery per van to the customer averages out at 150 km. Recycling is always the preferred waste phase. We detailed both recycling and conventional waste treatment to show you the difference in environmental impact.

Data

Polypropylene seating 2 kg - injection moulding
Frame made from secondary stainless steel 3 kg - rolling - 20 cm bending
4 screws stainless steel 0.01 kg - milling
transport per van <3.5 tonnes

Production

Material or process	Quantity kg	Indicator	Result
PP seating	2	276	552
Injection moulding PP	2	126	252
Stainless steel primary	3,04	551	1675
Stainless steel plate rolling	3	59	177
Stainless steel bending	20 cm	2	40
Stainless steel milling	0,04	704	28
		Subtotal	2724

Transport

Process	Quantity kg	Indicator	Result
Total weight	5 Kg = 0,005 tonnes		
Van		186	
Transport distance	150 Km -> 0,75 tkm		
		subtotal	140

Disposal

Material and type disposal	Quantity kg	Indicator	Result
Recycling option			
Recycling polypropylene	2	-251	-502
Recycling stainless steel	3	-475	-1425
		Total for option 1: recycling	937
Waste treatment option			
PP scenario waste treatment in EU	2	36	72
Stainless steel scenario waste treatment in EU	3	26	78
		Total for option 2: waste treatment in EU	3014

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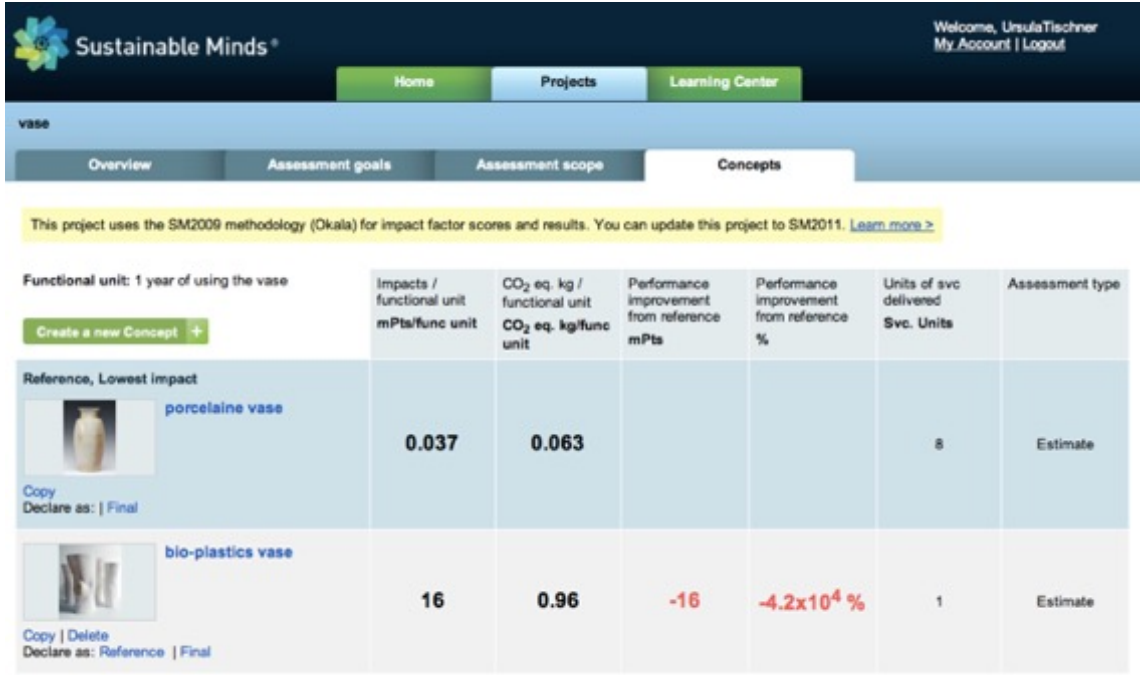
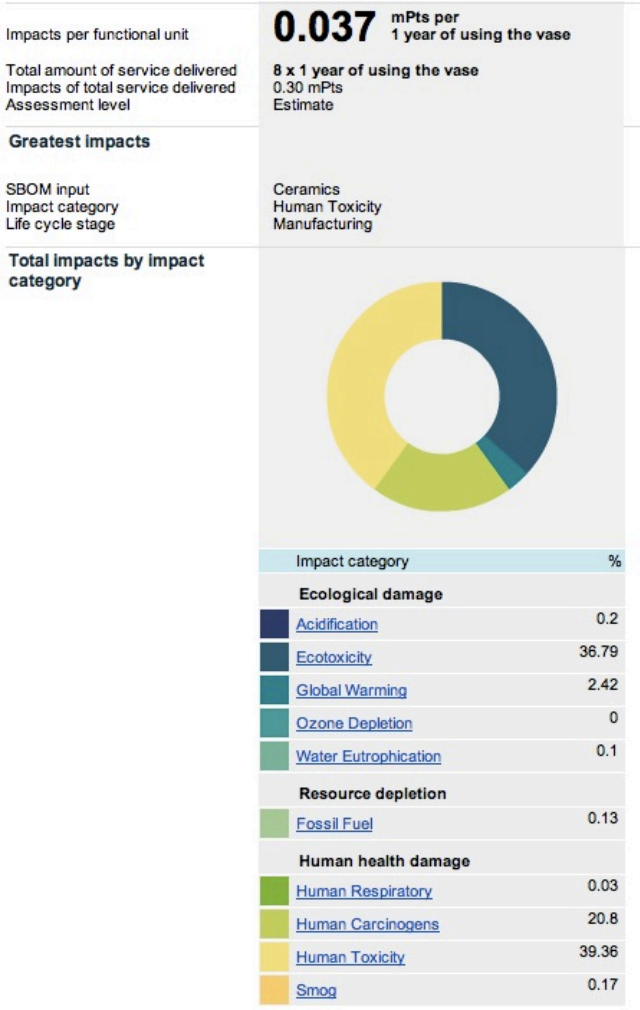
TOOLS FOR LCA

Sustainable Minds: Online Tool for averaged Life Cycle Assessments. www.sustainableminds.com





WAS NUTZT DIE LCA?

Aufgabe: Einen besseren Becher für ein großes Fast Food Unternehmen gestalten.

Expanded Polystyrene (EPS) cup,
Polypropylene (PP) cup,
double wall paper cup lined with PLA (DWPC PLA),
double wall paper cup lined with PLA with PCW paper sleeve (DWPC PLA S),
Polylactic acid cup(PLA).

Schritt 1:
Benchmarking
mit Wettbewerb

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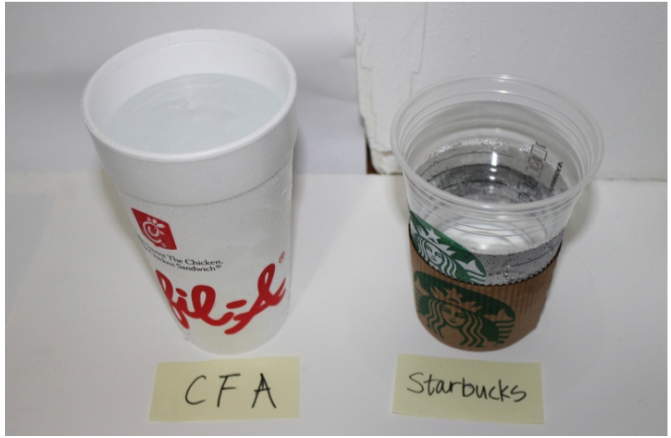
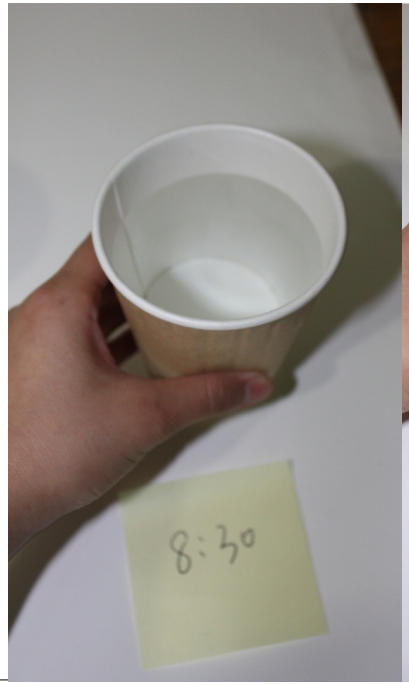
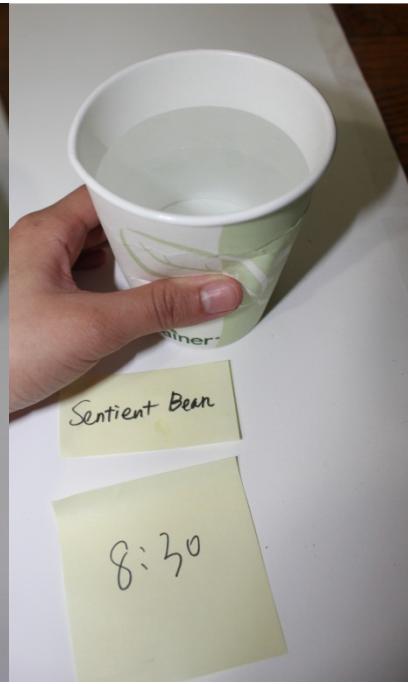
WAS NUTZT DIE LCA?

Aufgabe: Einen besseren Becher für ein großes Fast Food Unternehmen gestalten.

Schritt 2:
Bewertung aller Becher durch Nutzungstests und LCA







WAS NUTZT DIE LCA?

Referenz: PS Becher/Müllverbrennung

Reference

Polystyrene Cup - Incineration

0.24 *mPts per 1 time of use*

1 x 1 time of use
.24 mPts
Calculation

Polystyrene, expandable (EPS)
Human Toxicity
Manufacturing

Impact category
Ecological damage
Acidifcation
Ecotoxicity
Global Warming
Ozone Depletion
Water Eutrophication
Resource depletion
Fossil Fuel
Human health damage
Human Respiratory
Human Carinogens
Human Toxicity
Smog

PS Becher / Recycling = 68% besser

Polystyrene Cup - Recycle

68% performance improvement

0.077 **mPts per 1 time of use**

1 x 1 time of use
.077 mPts
Calculation

Polystyrene, expandable (EPS)
Ecotoxicity
Manufacturing

Impact category
Ecological damage
Acidifcation
Ecotoxicity
Global Warming
Ozone Depletion
Water Eutrophication
Resource depletion
Fossil Fuel
Human health damage
Human Respiratory
Human Carinogens
Human Toxicity
Smog

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WAS NUTZT DIE LCA?

Referenz: PS Becher/Müllverbrennung

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Polystyrene Cup - Incineration

0.24 *mPts per 1 time of use*

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Calculation

Polystyrene, expandable (EPS)
Human Toxicity
Manufacturing

Impact category
Ecological damage
Acidifcation
Ecotoxicity
Global Warming
Ozone Depletion
Water Eutrophication
Resource depletion
Fossil Fuel
Human health damage
Human Respiratory
Human Carinogens
Human Toxicity
Smog

Papier Becher/ Landfill = 11% schlechter

Single-wall Paper Cup with PLA Landfill

11% performance reduction

0.27 **mPts per 1 time of use**

1 x 1 time of use
.27 mPts
Calculation

Disposal, paper, 11.2% water, to sanitary landfill/CH S
Human Toxicity
End of life

Impact category
Ecological damage
Acidifcation
Ecotoxicity
Global Warming
Ozone Depletion
Water Eutrophication
Resource depletion
Fossil Fuel
Human health damage
Human Respiratory
Human Carinogens
Human Toxicity
Smog

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WAS NUTZT DIE LCA?

Referenz: PS Becher/Müllverbrennung

Reference

Polystyrene Cup - Incineration

0.24 *mPts per 1 time of use*

1 x 1 time of use
.24 mPts
Calculation

Polystyrene, expandable (EPS)
Human Toxicity
Manufacturing

Impact category
Ecological damage
Acidifcation
Ecotoxicity
Global Warming
Ozone Depletion
Water Eutrophication
Resource depletion
Fossil Fuel
Human health damage
Human Respiratory
Human Carinogens
Human Toxicity
Smog

Bagasse Becher/ Kompost = 75% besser

Bagasse Cup - Compost

75% performance improvement

0.060 **mPts per 1 time of use**

1 x 1 time of use
.060 mPts
Calculation

Truck 3.5-7.5t
Ecotoxicity
Transportation

Impact category
Ecological damage
Acidifcation
Ecotoxicity
Global Warming
Ozone Depletion
Water Eutrophication
Resource depletion
Fossil Fuel
Human health damage
Human Respiratory
Human Carinogens
Human Toxicity
Smog

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WAS NUTZT DIE LCA?

Referenz: PS Becher/Müllverbrennung

Reference

Polystyrene Cup - Incineration

0.24 *mPts per 1 time of use*

1 x 1 time of use
.24 mPts
Calculation

Polystyrene, expandable (EPS)
Human Toxicity
Manufacturing

Impact category
Ecological damage
Acidifcation
Ecotoxicity
Global Warming
Ozone Depletion
Water Eutrophication
Resource depletion
Fossil Fuel
Human health damage
Human Respiratory
Human Carinogens
Human Toxicity
Smog

PP Becher/
Recycling =
79% besser

Polypropylene Cup - Recycle

79% performance improvement

0.051 **mPts per 1 time of use**

1 x 1 time of use
.051 mPts
Calculation

Injection Molding
Ecotoxicity
Manufacturing

Impact category
Ecological damage
Acidifcation
Ecotoxicity
Global Warming
Ozone Depletion
Water Eutrophication
Resource depletion
Fossil Fuel
Human health damage
Human Respiratory
Human Carinogens
Human Toxicity
Smog

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WAS NUTZT DIE LCA?

Lösung: Neuer Mehrweg Becher aus PP mit Rücknahme und Recycling System.
Sleeve besteht aus PP Rezyklat.

Design: Laura Schoenthaler

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SHORTCUTS POSSIBLE BY DISTINGUISHING PRODUCT GROUPS

Energy using products

Moving products/ vehicles

Long lasting products

Consumption products

Carry out Sustainability Analysis for most important products. Formulate criteria and rules of thumb for design. Monitor progress, learn. Repeat analysis from time to time. Do benchmarking. Search for radical innovation in parallel.

SUSTAINABILITY SYSTEM ANALYSIS

e.g. with the Sustainability Strength – Weaknesses - Opportunities - Threats Analysis (S-SWOT).

Identify Windows of Opportunities.

SWOT	Current Situation		Future Situation	
	Strengths	Weaknesses	Opportunities	Threats
Environment				
Society/ social-ethical				
Economy - for the company - for the customer				
Technology				
Legislation				

BIOMIMICRY/BIONIK

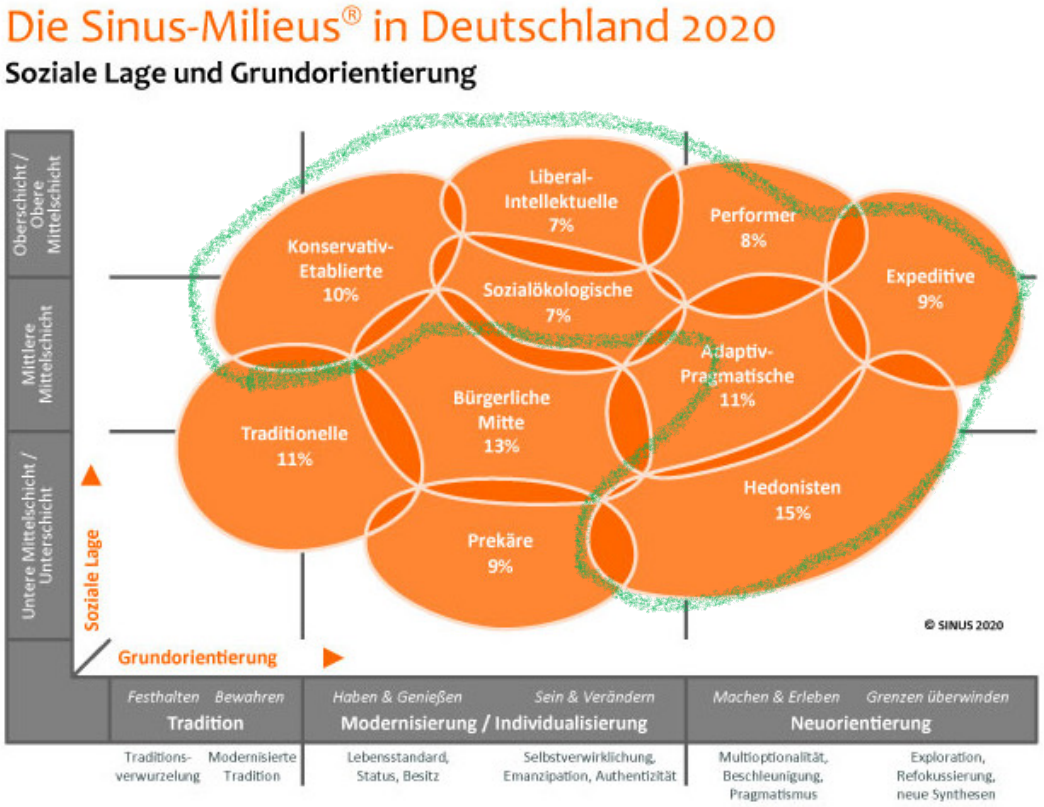
Von der Natur lernen für technische und organisatorische Effizienz-Innovationen, z.B. Leichtbau, Lotus Effekt, aerodynamische Prinzipien und Formen (Kofferfisch)

z.B. https://asknature.org

ANALYSING TARGET GROUPS

e.g. Sinus Lifestyle Groups. Which are potential target groups and what are their sustainability values and expectations?

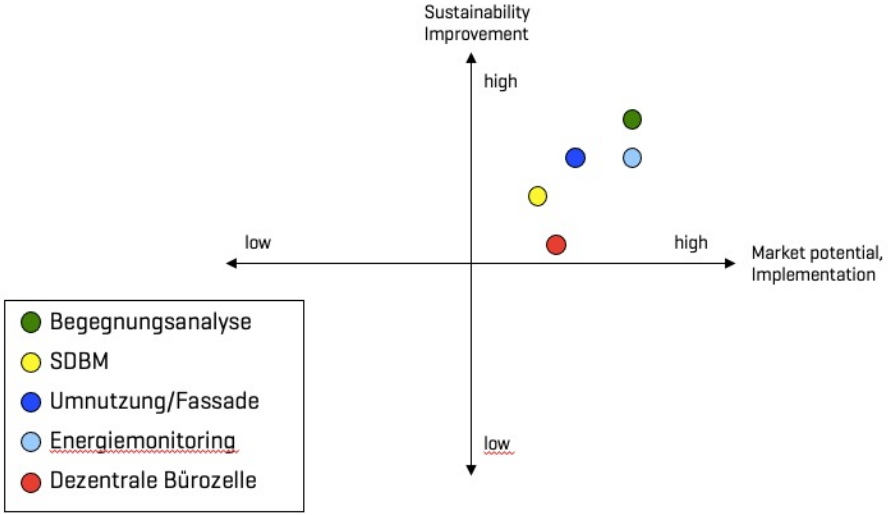
Focus e.g. on LOHAS and first movers.

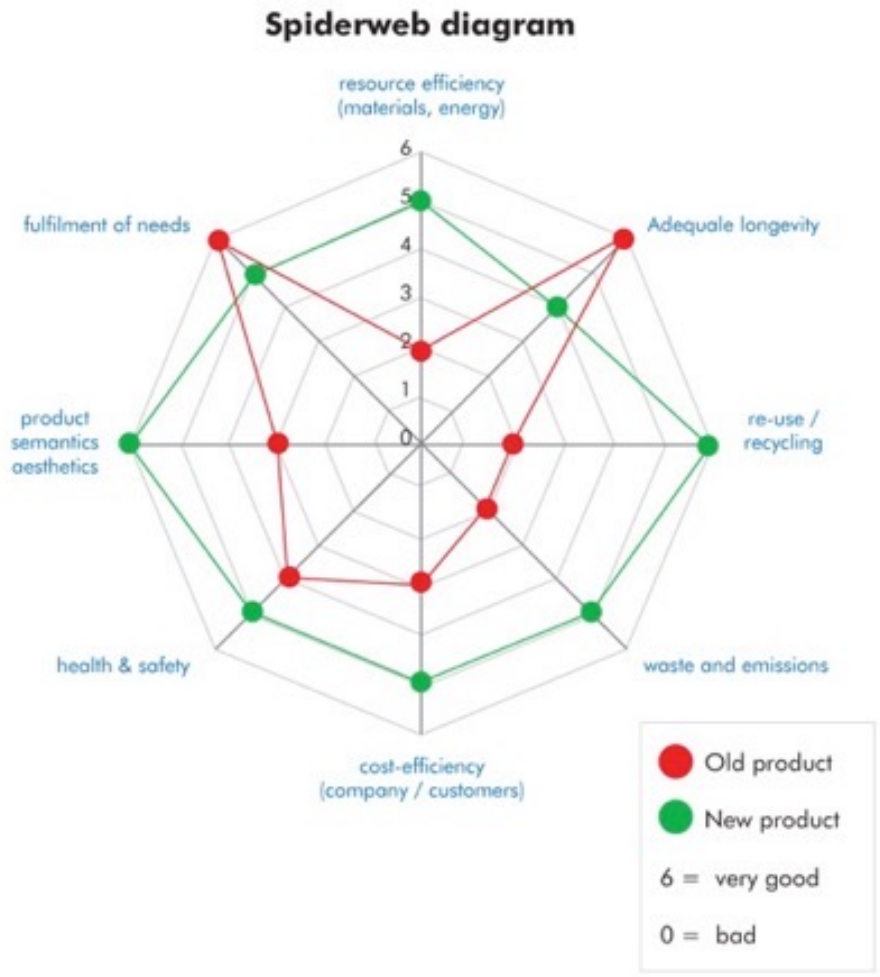


Qelle: https://www.sinus-institut.de/sinus-loesungen/sinus-milieus-deutschland/

EVALUATE AND COMPARE SOLUTIONS

e.g. with Spider Web Diagram, Sustainability-Portfolio or Balanced Score Card.





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SIMPLE GUIDANCE AND CHECKLISTS

e.g. econcept's life cycle wide Eco-Design Checklist

To support designers in the design process when there is little time.

Qualitative evaluation with lower complexity compared to LCA.

Can also be used as guidance in the design process.

Please mark the appropriate values: + = good solution, +/- = indifferent, - = bad solution, o = not relevant

Reuse/Recycling (closing technical material and energy cycles)

	+	+/-	-	o	remarks:
• recycling strategy in place?		●			
• guarantee for take back in place?	●				
• re-use of the complete product (e.g. second-hand, recycling cascade)	●				
• recycling of components (e.g. upgrading, reuse of components)	●				
• recycling of materials		●			
• dismantling of products		●			
• separability of different materials	●				
• low diversity of materials			●		Lots of diverse parts
• low material and energy input for reuse/recycling			●		

Final Disposal

	+	+/-	-	o	remarks:
• compostable, fermentable products (closing biological cycles)			●		
• combustion characteristics		●			
• environmental aspects at deposition			●		

Result:

total value:	*number of marks:*	*name the 8 most important criteria for improvement*		*personal remarks:*
good solution ●	19	*1.* low deversity of materials	*2.* compostable fermentable products	
bad solution ●	7	*3.* enviromental disposal	*4.* minimalising material input	minimalising size and material used
indifferent ●	24	*5.* possibilities of combination	*6.* environmental aspect at deposition	functional use and recycling
not relevant: ●	1	*7.* recycable materials	*8.* minimalising pre-consumer waste	

In case the requirements could not be met, the most important weak points (–) should be eliminated to improve the produc

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NACHHALTIGE MATERIALAUSWAHL

8 KRITERIEN ZUR MATERIALAUSWAHL

1 & 2 Verbrauch von Ressourcen und Energie

3 Gefährliche Substanzen, Emissionen

4 Herkunft und Transporte

5 Aspekte der Lebensdauer

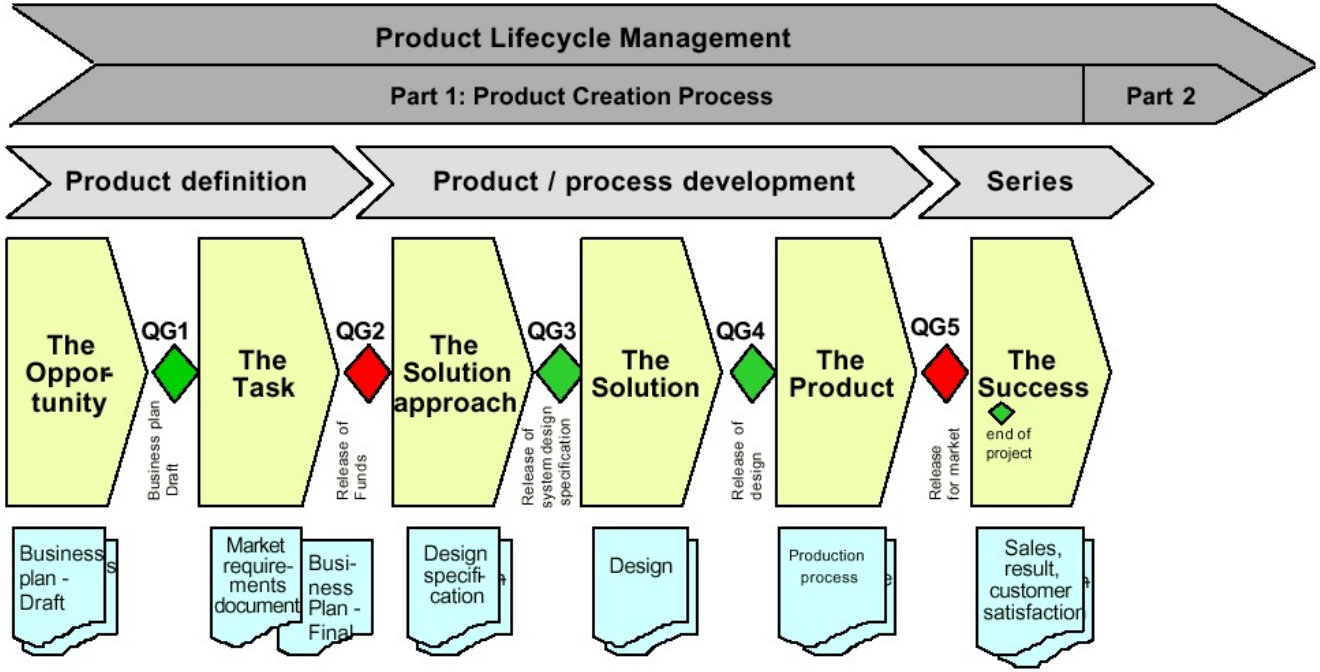
6 Re-use, Recycling und Abfall

7 Biodiversität/Naturschutz

8 Soziale Aspekte

Material	CO_2 equivalent in kg per lb | per kg		Comment/ Source of Data	Hazardousness Classification: red = avoid. yellow = try to substitute. green = low/ no hazardousness			Scarce/S Critical/C
Ceramics							
Clay	0.016	0.035	EcoInvent data			X	
Kaolin	0.099	0.218	Data used are from one single company in Europe. They are used here for an average dataset for RER (Europe).			X	
Concrete. generic	0.268	0.591	Average data of 11 German concrete plants			X	
Glass. flat. uncoated	0.274	0.604	Average data for European flat glas production			X	
Glass-packaging. brown	0.451	0.994	Average data for European situation. based on information from EU-IPPC BAT document about the glass industry Technology: Mix of present used technologies in Europe			X	
Glass-packaging. green	0.439	0.968	Average data for European situation. based on information from EU-IPPC BAT document about the glass industry Technology: Mix of present used technologies in Europe			X	
Glass-packaging. white	0.321	0.708	Average Swiss consumption situation Technology: Present situation in Switzerland			X	

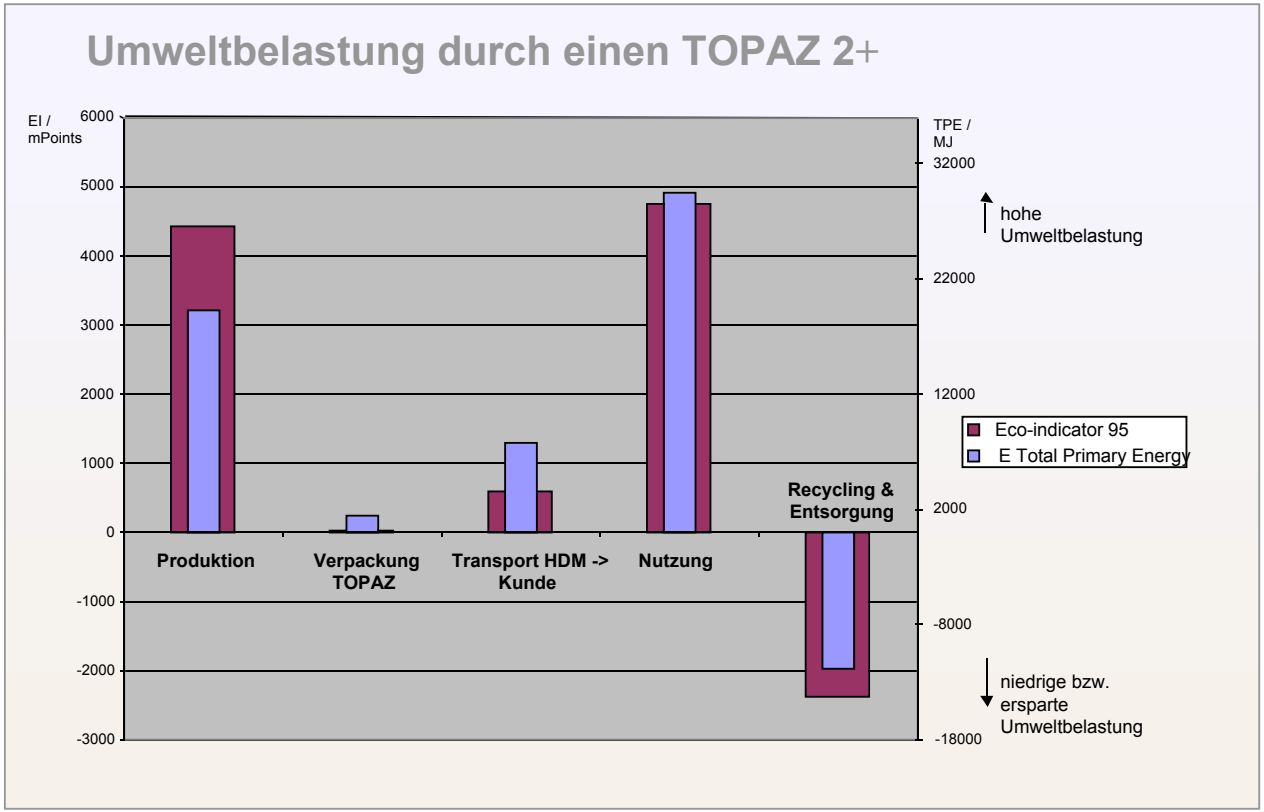
CASE STUDY: HEIDELBERGER DRUCKMASCHINEN

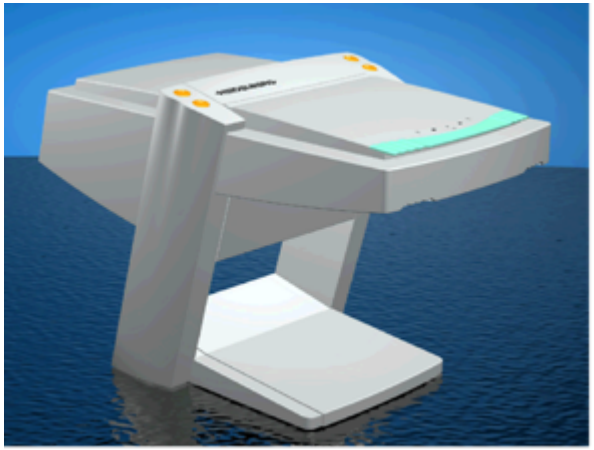


HEIDELBERG

- Ecodesign project over 3 years
- Life cycle assessments
- Revision of the products
- Environmental handbook for developers
- Integration into the company

LCA OF SCANNER TOPAZ





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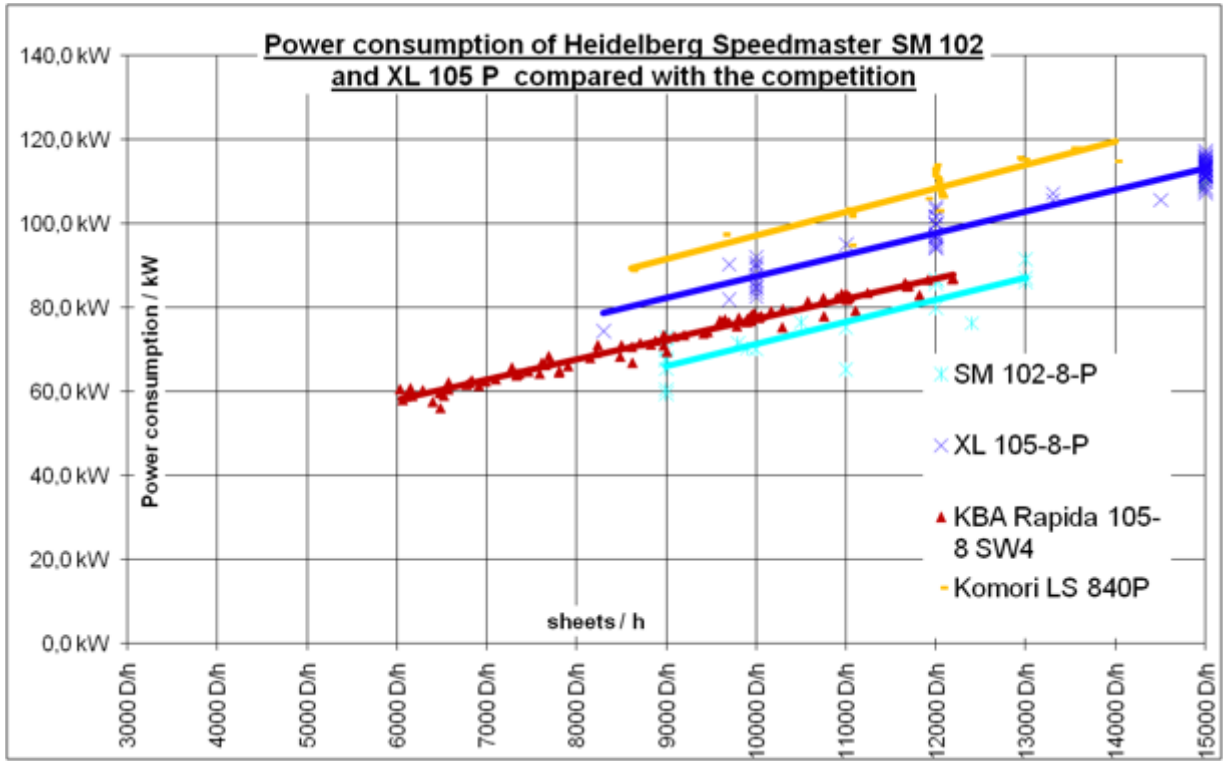
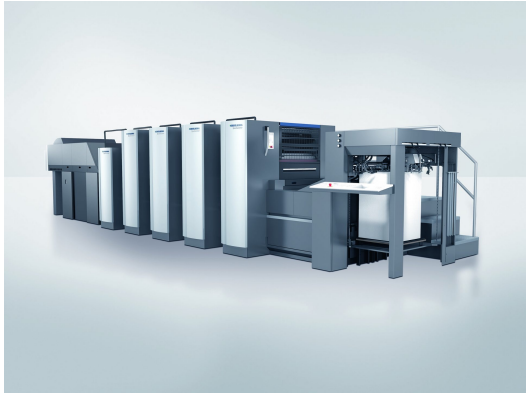
BENCHMARKING WITH COMPETITION



HEIDELBERG



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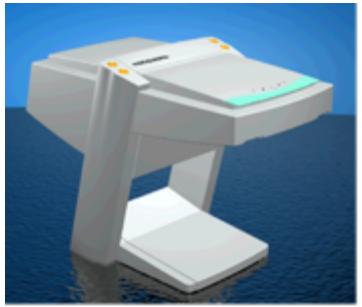
DISASSEMBLY & SUPPLIER STUDIES

HEIDELBERG

PILOT PROJECT FROM TOPAZ TO NEXSCAN



HEIDELBERG

- Energy consumption minus 20%
- No stand by energy consumption
- Material usage reduced from 150 to 90 kg
- Design for Recycling & Recycling Manual

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INTERNAL TOOLS AND MEASURES

8 KRITERIEN ZUR MATERIALAUSWAHL

1	Materialien bevorzugen, die Verbrauch von Ressourcen inklusive Wasser und Fläche minimieren; erneuerbare Materialien bevorzugen, wo sinnvoll.
2	Energieeffizient hergestellte und mit erneuerbaren Energien hergestellte Materialien bevorzugen. Beispiel: Aluminium hat einen sehr hohen Energieverbrauch, aber in Norwegen wird dieser mit Wasserkraft gedeckt.
3	Materialien bevorzugen, die mit geringstmöglichen Schadstoffen und Emissionen verbunden sind.
4	Herkunft prüfen und wenn sinnvoll regional produzierte Materialien wählen; Transporte minimieren und nachhaltige Transportmittel bevorzugen.
5	Materialien wählen, deren Lebensdauer optimal für die erwartete/erwünschte Produktnutzung ist.
6	Kreislaufwirtschaftsfähige Materialien wählen, Re-Use bzw. Recycling maximieren und Abfall minimieren; wo sinnvoll kompostierbare Materialien verwenden.
7	Materialien wählen, die biologische Vielfalt vergrößern und Schutz von Naturgebieten fördern, z.B. solche, die keine Monokulturen benötigen, oder wertvolle Biotope zerstören.
8	Soziale Aspekte berücksichtigen, z.B. Arbeitsbedingungen bei Anbau und Gewinnung der Materialien.

- Checklists/Guidelines for material selection, disassembly-friendly design, batteries, packaging etc.
- ELIS: internal database for environmental and social laws and standards in all relevant markets
- Ecodesign Champion appointed
- Improved communication between environmental and design departments

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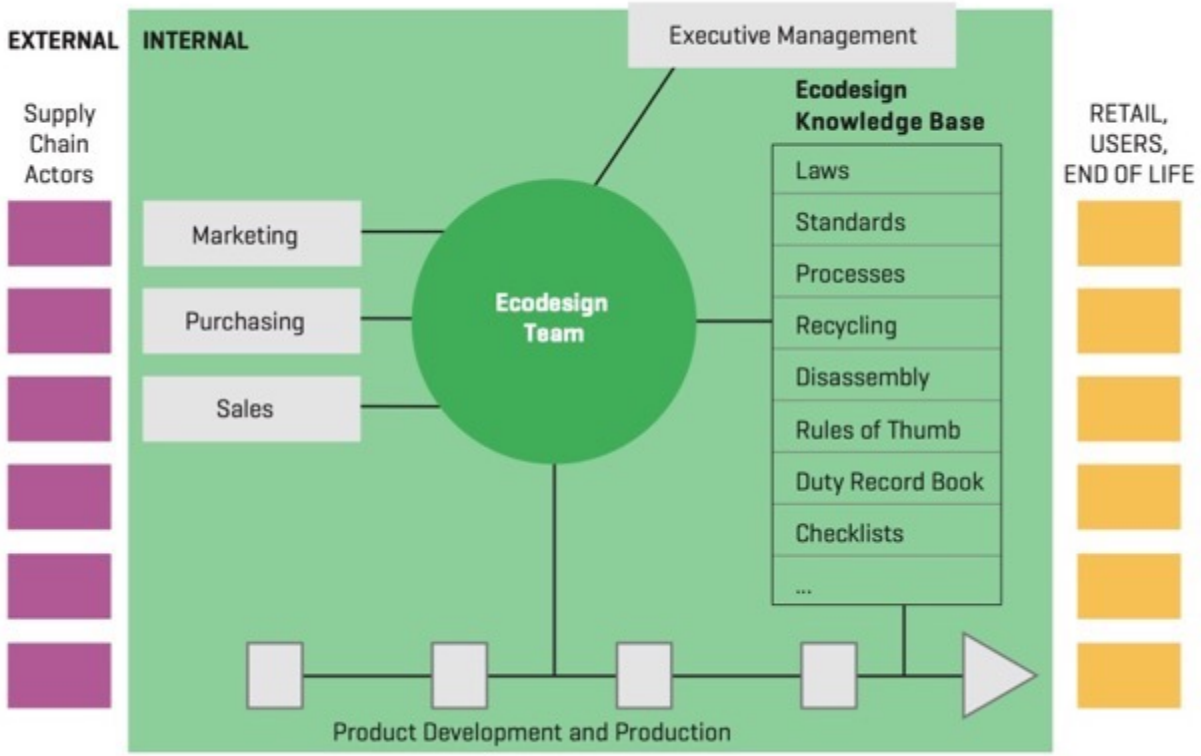
INTERNAL AND EXTERNAL COMMUNICATION

INTERNAL AND EXTERNAL COMMUNICATION

INTEGRATION INTO COMPANY ROUTINES

Breakout session

1. Analysieren, wo man steht (Unternehmen und Produkte)
2. Ziele definieren (KPIs)
3. Ecodesign Team/ Champions benennen, Tools auswählen und spezifizieren
4. Pilotprojekte durchführen
5. Ergebnisse evaluieren
6. Vorgehensweise / Tools systematisch und formell in die Routinen integrieren, Training, interne/externe Kommunikation



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FURTHER READING

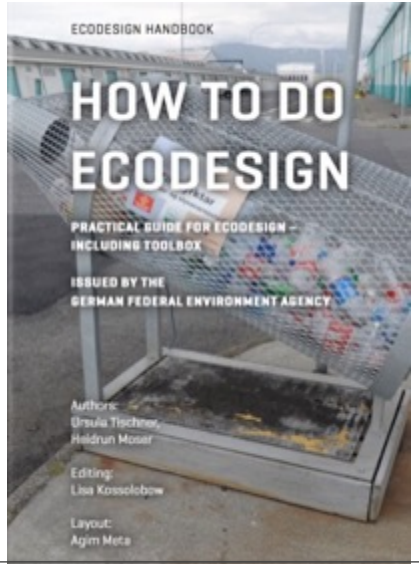
Download for free:

Changing Paradigms, Stebbing/ Tischner for Cumulus Association

https://www.cumulusassociation.org/changing-paradigms-designing-for-a-sustainable-future/

How to do Ecodesign, Tischner et al 2015, 2. Edition, Download for free iBook Store / UBA

https://books.apple.com/de/book/how-to-do-ecodesign/id1135764180



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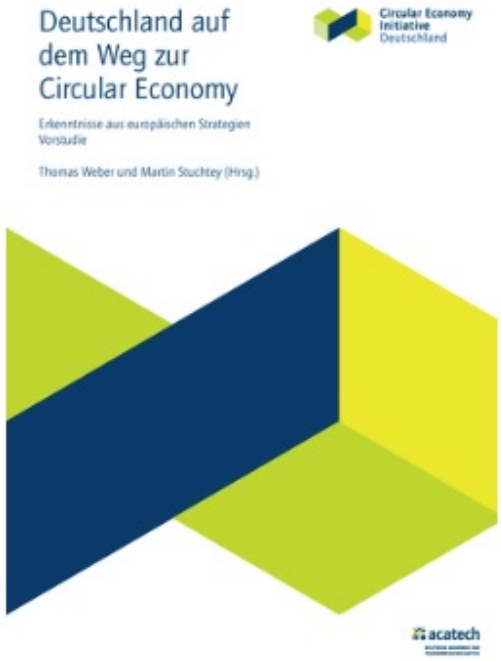
CEID PUBLIKATIONEN

Circular Economy Initiative Deutschland

https://www.circular-economy-initiative.de/publikationen



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It can only be sustainable, if it also makes business sense.

THANK YOU !

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