Innovationsboost

Gemensam nätverksträff 2025-12-10

Möjliggörs med hjälp av finansiering från:

Medfinansieras av Europeiska unionen

VÄSTRA GÖTALANDSREGIONEN

skaraborgs kommunalförbund

INDUSTRIAL INNOVATION ARENA

HÖGSKOLAN I SKÖVDE

SCIENCE PARK SKÖVDE

industrial development center

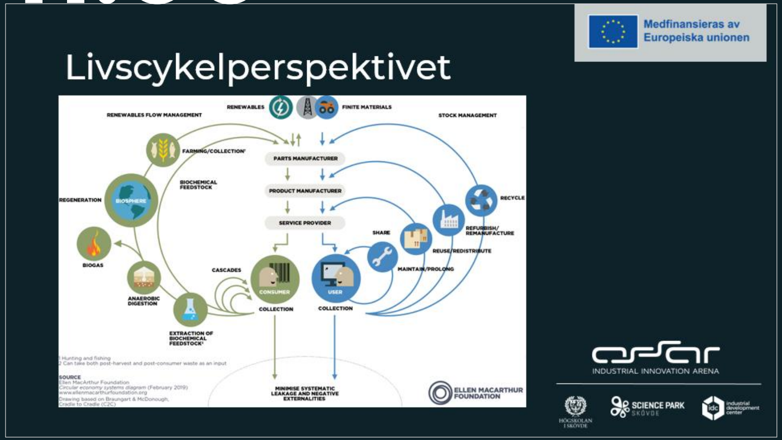
AGENDA

10:00

10:15

10:30

11:00



11:05

11:10

Medfinansieras av
Europeiska unionen

Välkomna!
Mingel & Fika

VI DRAR IGÅNG 10:15

INDUSTRIAL INNOVATION ARENA

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SCIENCE PARK SKÖVDE

industrial development center

INTRO:
Vilka är här och varför?

Medfinansieras av
Europeiska unionen

INDUSTRIAL INNOVATION ARENA

HÖGSKOLAN
I SKÖVDE

SCIENCE PARK
SKÖVDE

industrial
development
center

Vår historia präglas av material

Stenåldern **Bronsåldern** **Järnåldern**

Human-made materials now outweigh Earth's entire biomass - study

Production of concrete, metal, plastic, bricks and asphalt greater than mass of living matter on planet, paper says

London skyline: The dominant categories in the analysis were human-made mass in the form of buildings and infrastructure, composed of concrete, aggregates, bricks and asphalt. Photograph: Daniel Leal-Olivas/AFP/Getty Images

The giant human footprint stamped across the world in 2020 is greater than the impact on the planet of all other living things, research suggests.

The amount of plastic alone is greater in mass than all land animals and marine creatures combined, the study estimates.

Antropocen

https://www.theguardian.com/environment/2020/dec/09/human-made-materials-now-outweigh-earths-entire-biomass-study

17.8

$kgCO_2$-eq

MENTI:
Hur tänker ni (o)lika?

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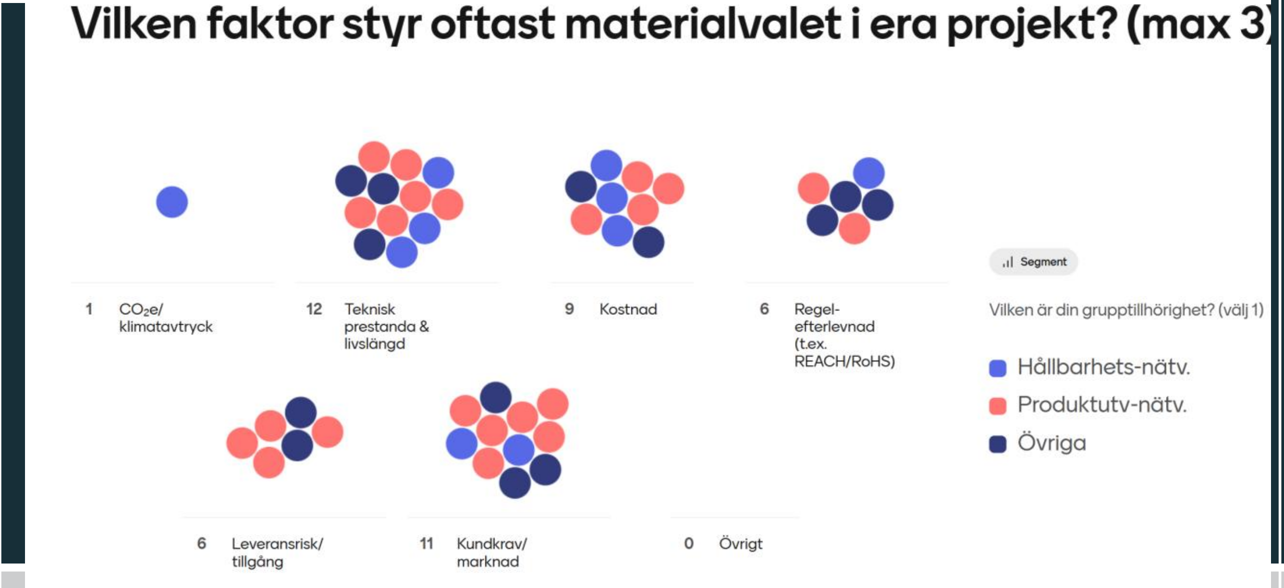
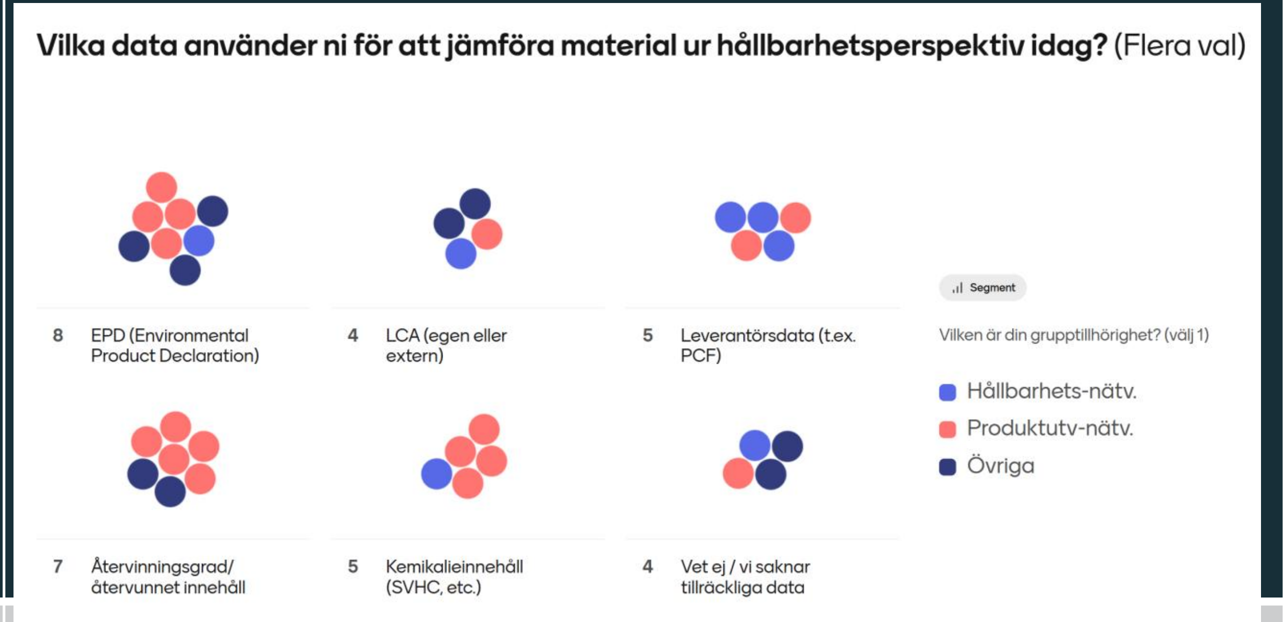
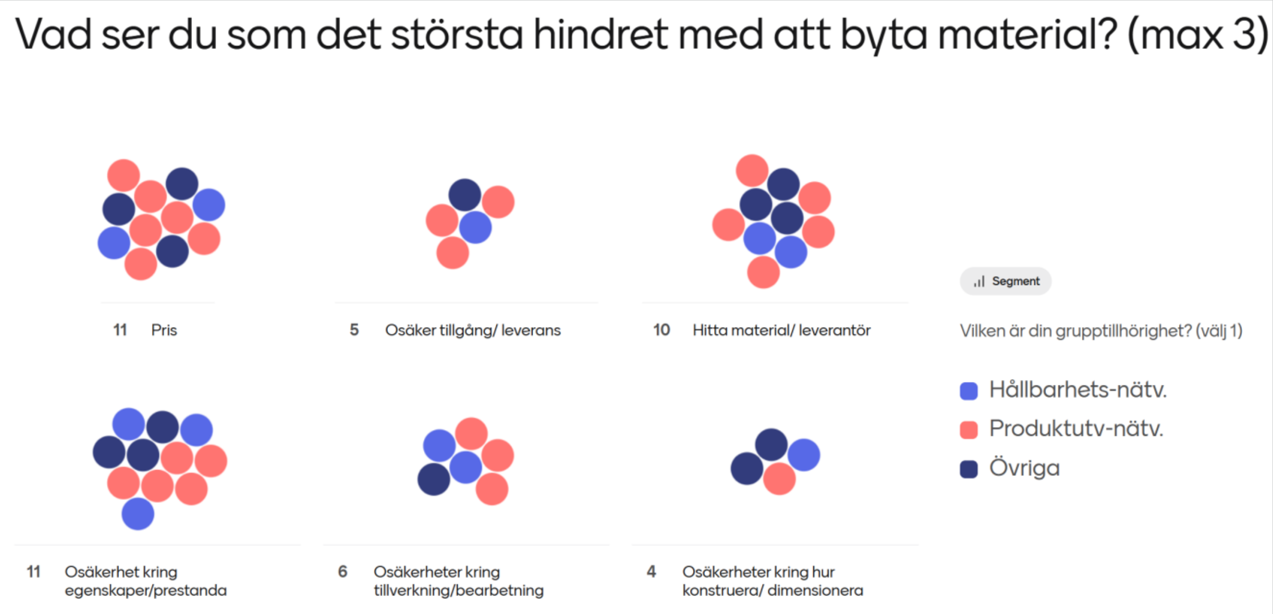
industrial development center


Vilken är din grupptillhörighet? (välj 1)
4 Hållbarhets-nätv.
8 Produktutv-nätv.
5 Övriga


Vilken faktor styr oftast materialvalet i era projekt? (max 3)
1 CO_2e/ klimatavtryck
12 Teknisk prestanda & livslängd
9 Kostnad
6 Regel-efterlevnad (t.ex. REACH/RoHS)
6 Leveransrisk/ tillgång
11 Kundkrav/ marknad
0 Övrigt
Segment
Vilken är din grupptillhörighet? (välj 1)
Hållbarhets-nätv.
Produktutv-nätv.
Övriga


Vilka data använder ni för att jämföra material ur hållbarhetsperspektiv idag? (Flera val)
8 EPD (Environmental Product Declaration)
4 LCA (egen eller extern)
5 Leverantörsdata (t.ex. PCF)
7 Återvinningsgrad/ återvunnet innehåll
5 Kemikalieinnehåll (SVHC, etc.)
4 Vet ej / vi saknar tillräckliga data
Segment
Vilken är din grupptillhörighet? (välj 1)
Hållbarhets-nätv.
Produktutv-nätv.
Övriga


Vilken lösning väljer ni oftast när ni vill öka cirkularitet? (max 3)
7 Design för demontering (skruv/snäpp)
9 Modulär design (bytbara moduler)
6 Design för reparation (serviceåtkomst)
3 Monomaterial (enklare återvinning)
12 Återvinningsbara material
3 Återbrukade komponenter
1 Annat
Segment
Vilken är din grupptillhörighet? (välj 1)
Hållbarhets-nätv.
Produktutv-nätv.
Övriga


Vad ser du som det största hindret med att byta material? (max 3)
11 Pris
5 Osäker tillgång/ leverans
10 Hitta material/ leverantör
11 Osäkerhet kring egenskaper/prestanda
6 Osäkerheter kring tillverkning/bearbetning
4 Osäkerheter kring hur konstruera/ dimensionera
Segment
Vilken är din grupptillhörighet? (välj 1)
Hållbarhets-nätv.
Produktutv-nätv.
Övriga

Miljöhantering

Hållbar återvinning

Miljöhantering

EN KOMPLETT PARTNER

AVFALLSLOGISTIK

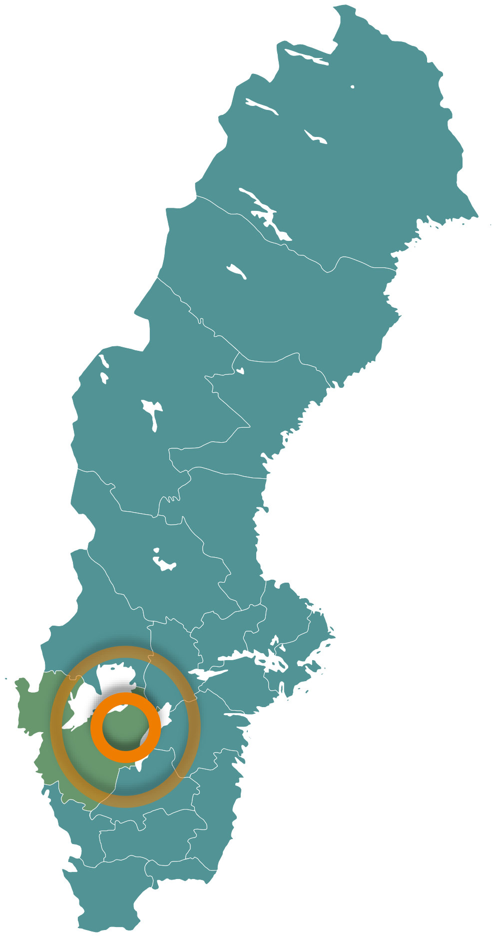
AVFALLSHANTERING & ÅTERVINNING

AVLOPPSUNDERHÅLL

MILJÖTJÄNSTER

Miljöhantering

NÄRA DIG



Sverige

Skaraborg

Miljöhantering

VÅRT ENGAGEMANG

ISO 9001:2015
ISO 14001:2015
QUALITY &
ENVIRONMENTALLY
CERTIFIED
BMG TRADA CERTIFIERING

SWEDAC

FAIR TRANSPORT

Medlem i
ÅTERVINNINGS INDUSTRIERNA

SSTT

GLOBALA MÅLEN
för hållbar utveckling

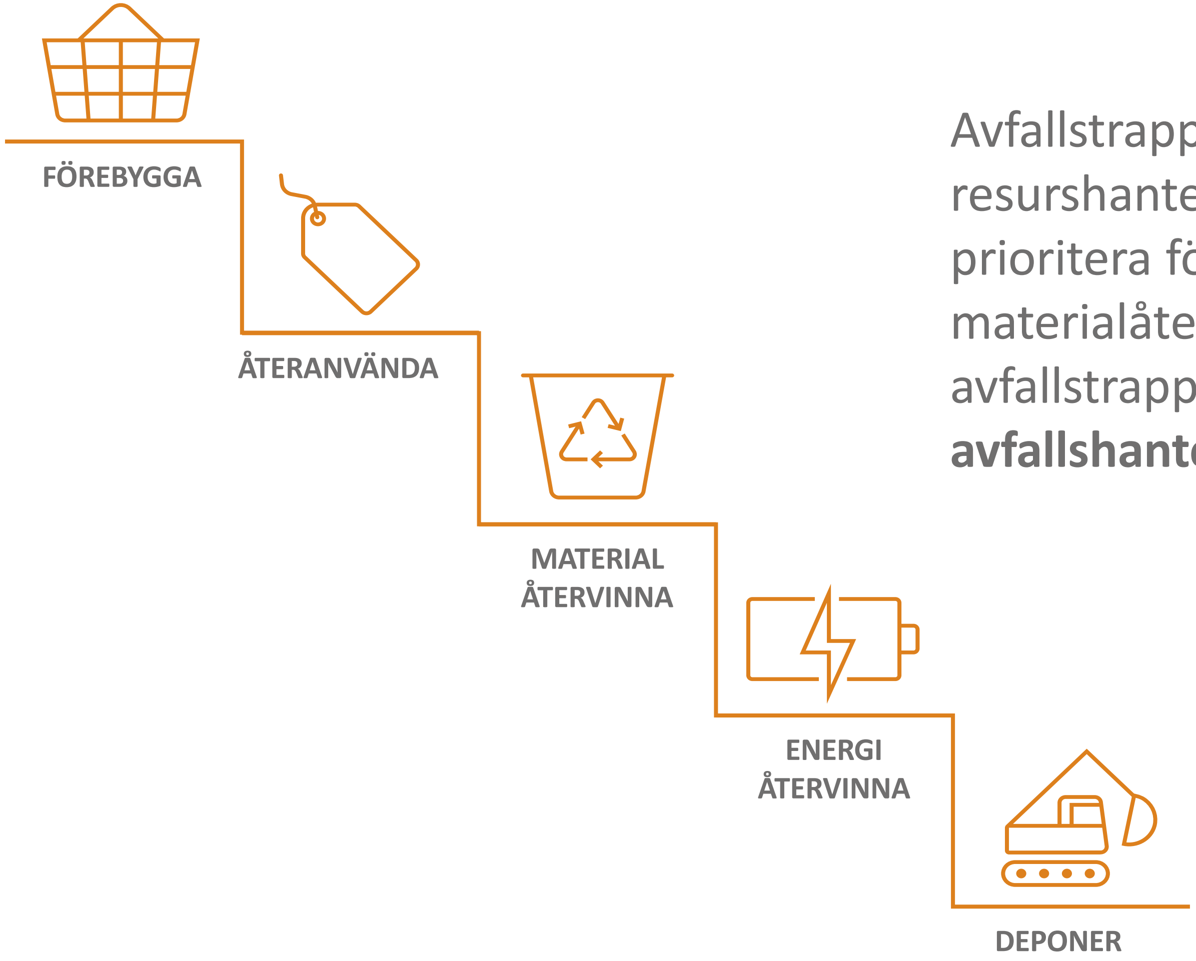
Vi är en del av
KLIMAT 2030
VÄSTRA GÖTALAND STÄLLER OM

Fossilfritt Sverige

BRONZE | Top 35%
ecovadis
Sustainability Rating
FEB 2025

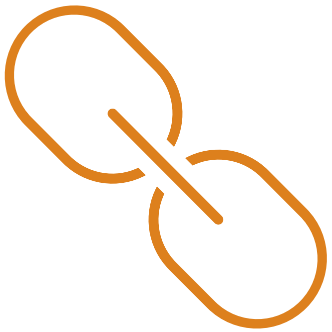
Miljöhantering

VÅR BRANCHS SYN PÅ CIRKULARITET



Avfallstrappan är en beprövad strategi för att optimera resurshantering och minimera miljöpåverkan. Genom att prioritera förebyggande, återanvändning och materialåtervinning över förbränning och deponering, guidar avfallstrappan organisationer **mot en mer cirkulär och hållbar avfallshantering.**

VÄRDEKEDJAN

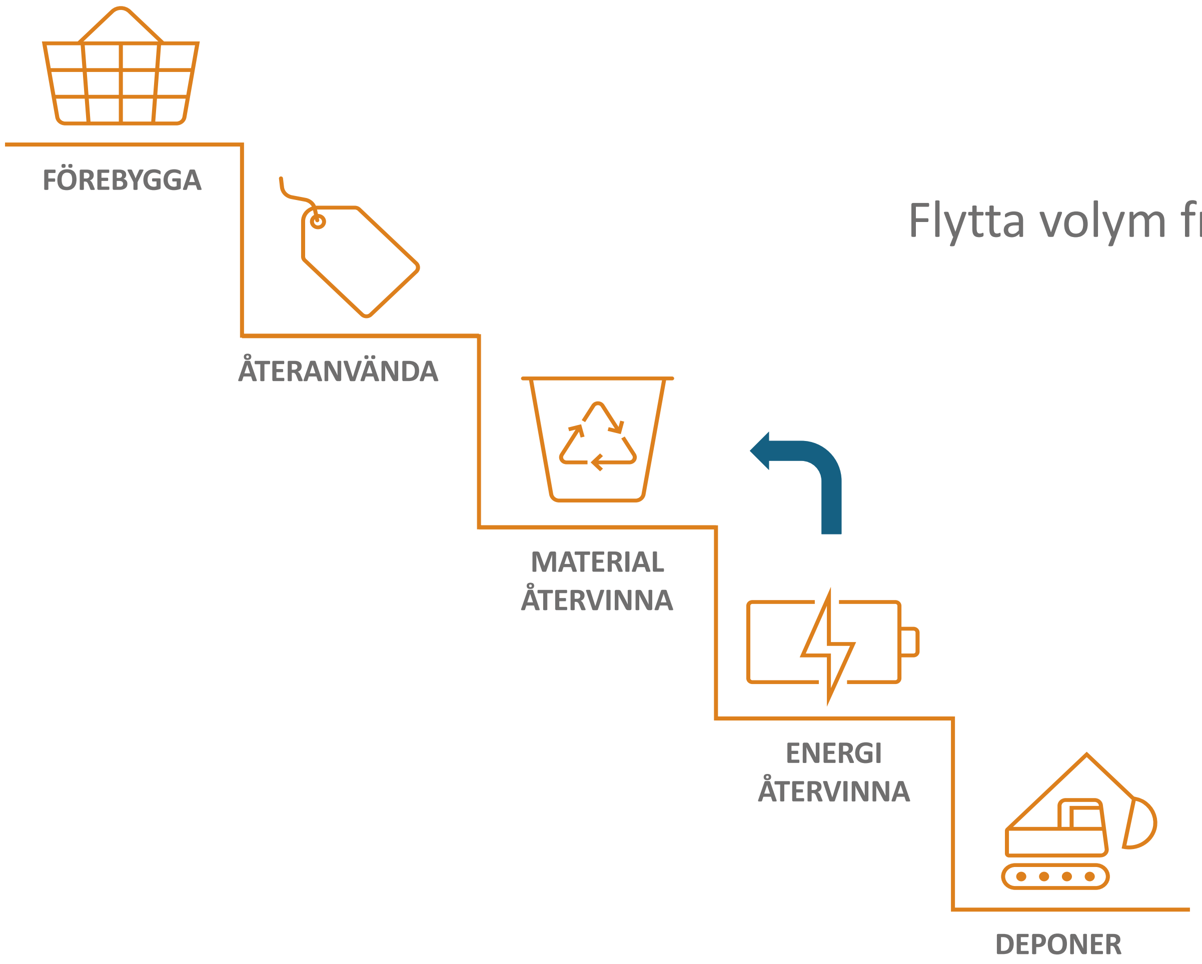


Varje enskild kund har inte resurser (plats, tillstånd, utrustning, kunskap) att hantera sitt avfall från källan till sluthantering

Vår roll är att vara länken mellan kund och sluthantering genom att **samla in, sortera, bearbeta och lagra material**, utan att försämra kvalitén, och avsätta den med - fokus på hållbarhet.

Vatten förorenat med olja är det avfall vi bearbetar mest.

VÅRT HÅLLBARHETSARBETE



Flytta volym från energiåtervinning till materialåtervinning

Miljöhantering

UTMANINGAR MED

MATERIALÅTERVINNING

SEPARERA MATERIAL

-Sammansatta material

- Hantering vid uppkomst (skapar sammansatta avfall)

FÖRORENINGAR

- Ej tömda / helt förbrukade

- Hantering vid uppkomst (kontaminering)

ENERGIÅTGÅNG

- Insamling /Transport

- Sortering/ bearbetning inför återvinning

FÖRSÄMRAD KVALITÈ

- Varje gång ett material hanteras riskerar kvalitén försämras

Miljöhantering

UTMANING SEPARERA MATERIAL

Miljöhantering

UTMANING FÖRORENINGAR

UTMANING FÖRSÄMRAD KVALITÉ

UTMANING ENERGIÅTGÅNG

Miljöhantering

UTMANINGAR MED

MATERIALÅTERVINNING

SEPARERA MATERIAL

-Sammansatta material

- Hantering vid uppkomst (skapar sammansatta avfall)

FÖRORENINGAR

- Ej tömda / helt förbrukade

- Hantering vid uppkomst (kontaminering)

ENERGIÅTGÅNG

- Insamling/Transport

- Sortering/ bearbetning inför återvinning

FÖRSÄMRAD KVALITÈ "downcycling"

- Varje gång ett material hanteras riskerar kvalitén försämras

Trots utmaningarna är det fördelaktigt med materialåtervinning men….

…konkurrens med jungfrulig råvara gällande pris och tillgång på rätt kvalité och volym

Miljöhantering

MÖJLIGHETER MED

MATERIALÅTERVINNING

MILJÖ OCH KLIMAT

MILJÖ & RESURSHUSHÅLLNING

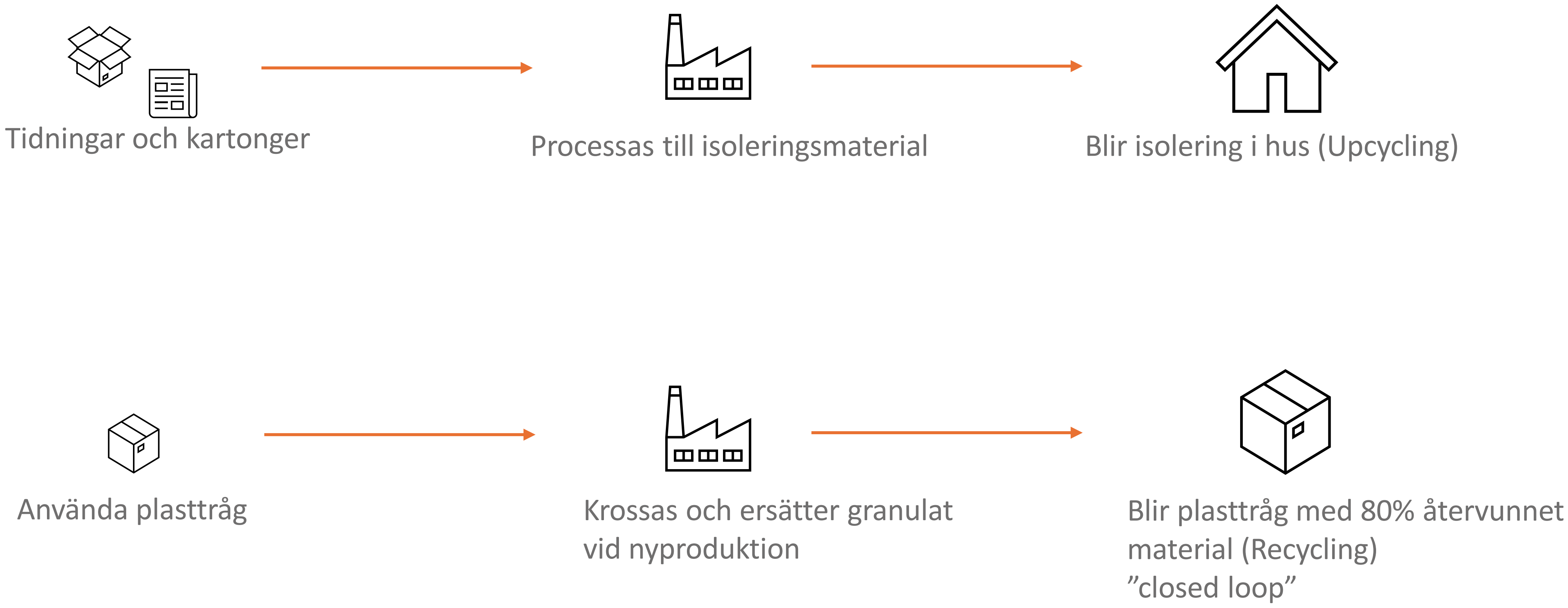
MATERIALÅTERVINNING	2024	2023	2022	2021
Andel materialåtervinning mot energiåtervinning	40%	35%	31%	29%
Antal artiklar för materialåtervinning, av plast och papper	21	19	16	7

Vi återvinner även fler materialtyper.

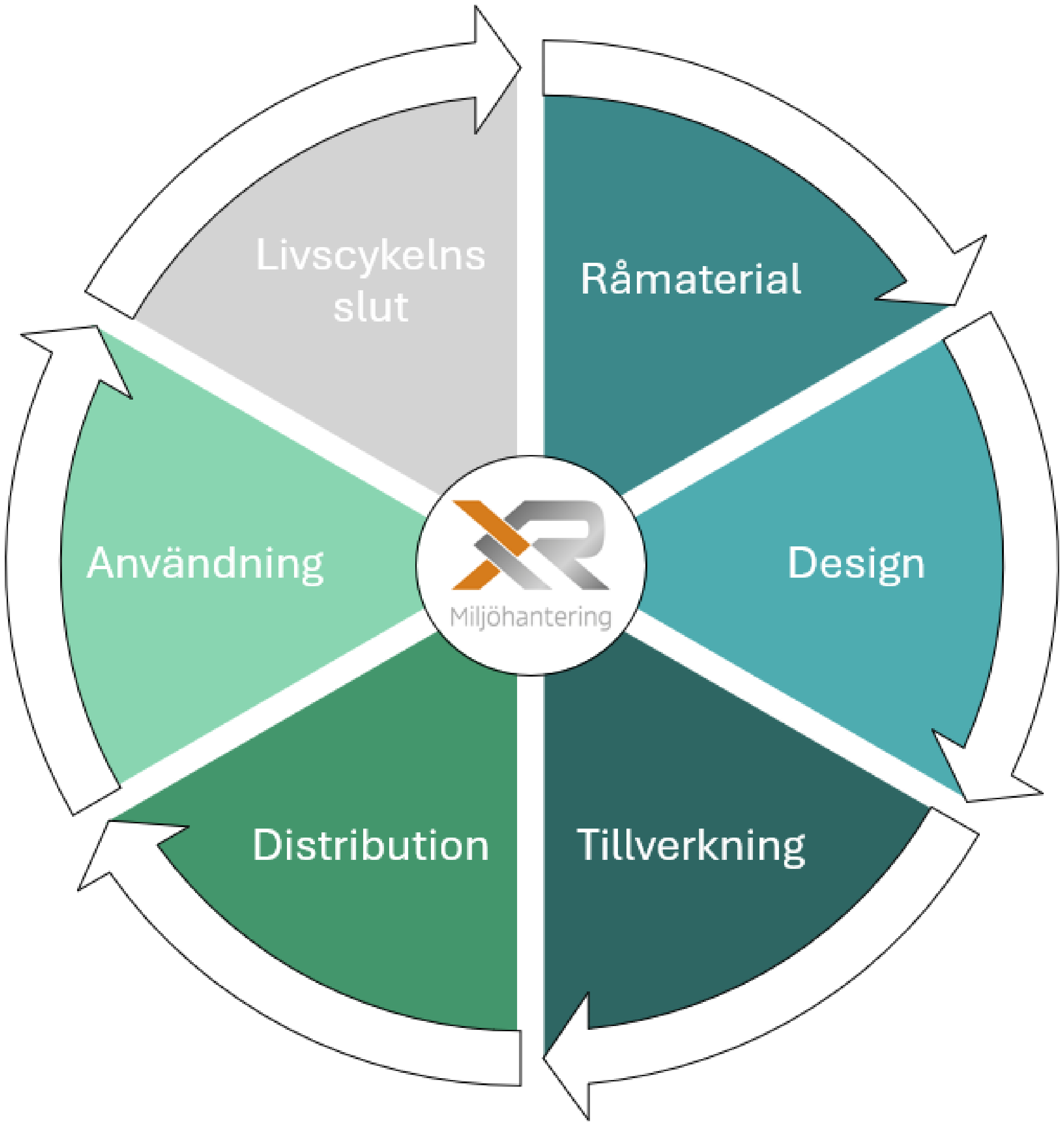
Miljöhantering

MÖJLIGHETER MED

MATERIALÅTERVINNING



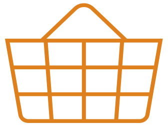
Kartlägg avfallet



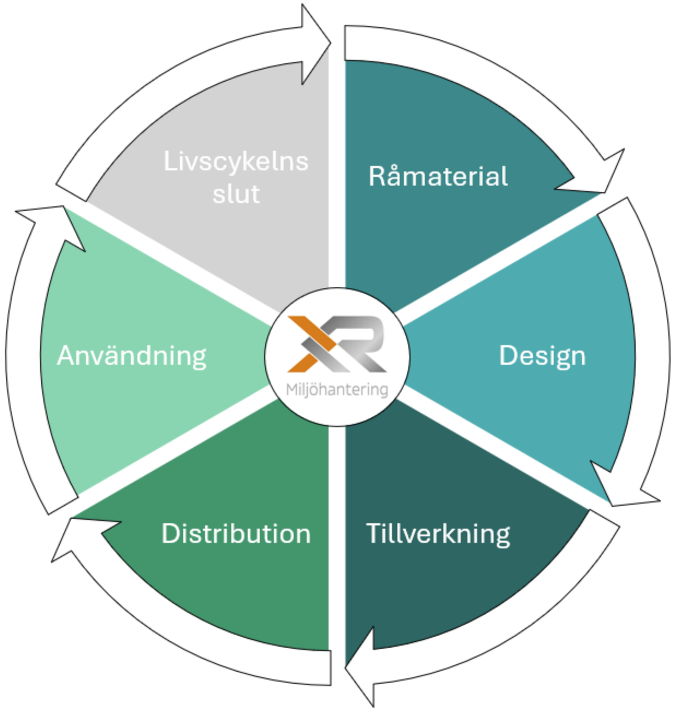
Miljöhantering

Hitta sätt att mäta cirkularitet!

HUR KAN NI BIDRA?



FÖREBYGGA



Skapa hållbara produkter

Designa för minimalt process spill

Ifrågasätt emballage in och ut

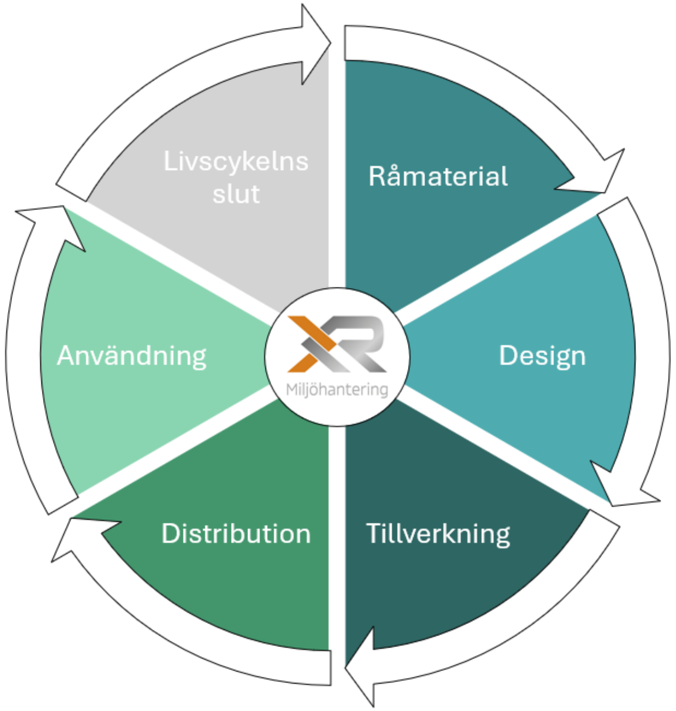
Jobba med att minska defekter, överproduktion, etc (LEAN slöserier)

Designa för demontering

Miljöhantering

HUR KAN NI BIDRA?

ÅTERANVÄNDA



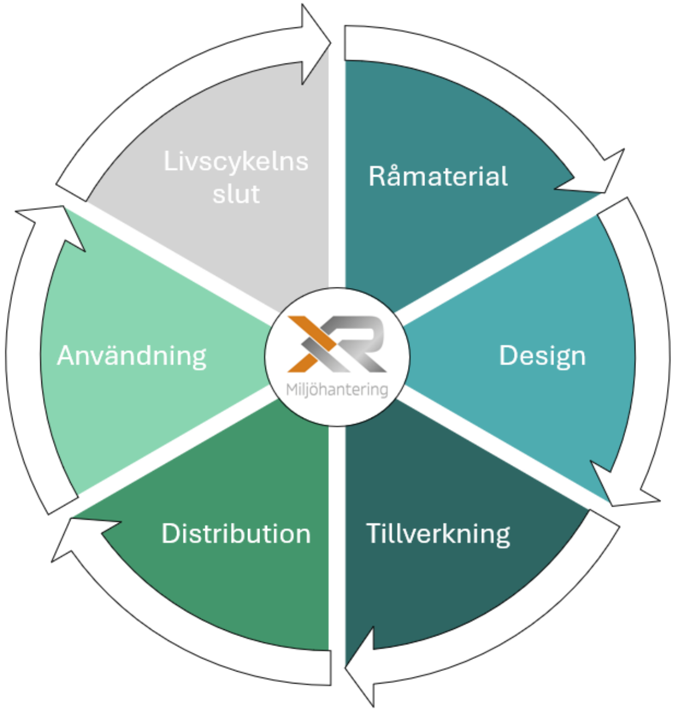
Återanvända (alternativanvända) defekter, överproduktion, etc

Återanvända / cirkulera emballage

Kan process spill ses som biprodukt, som någon behöver, istället för avfall? (flera intressanta projekt kring industriell symbios)

HUR KAN NI BIDRA?

MATERIAL ÅTERVINNA

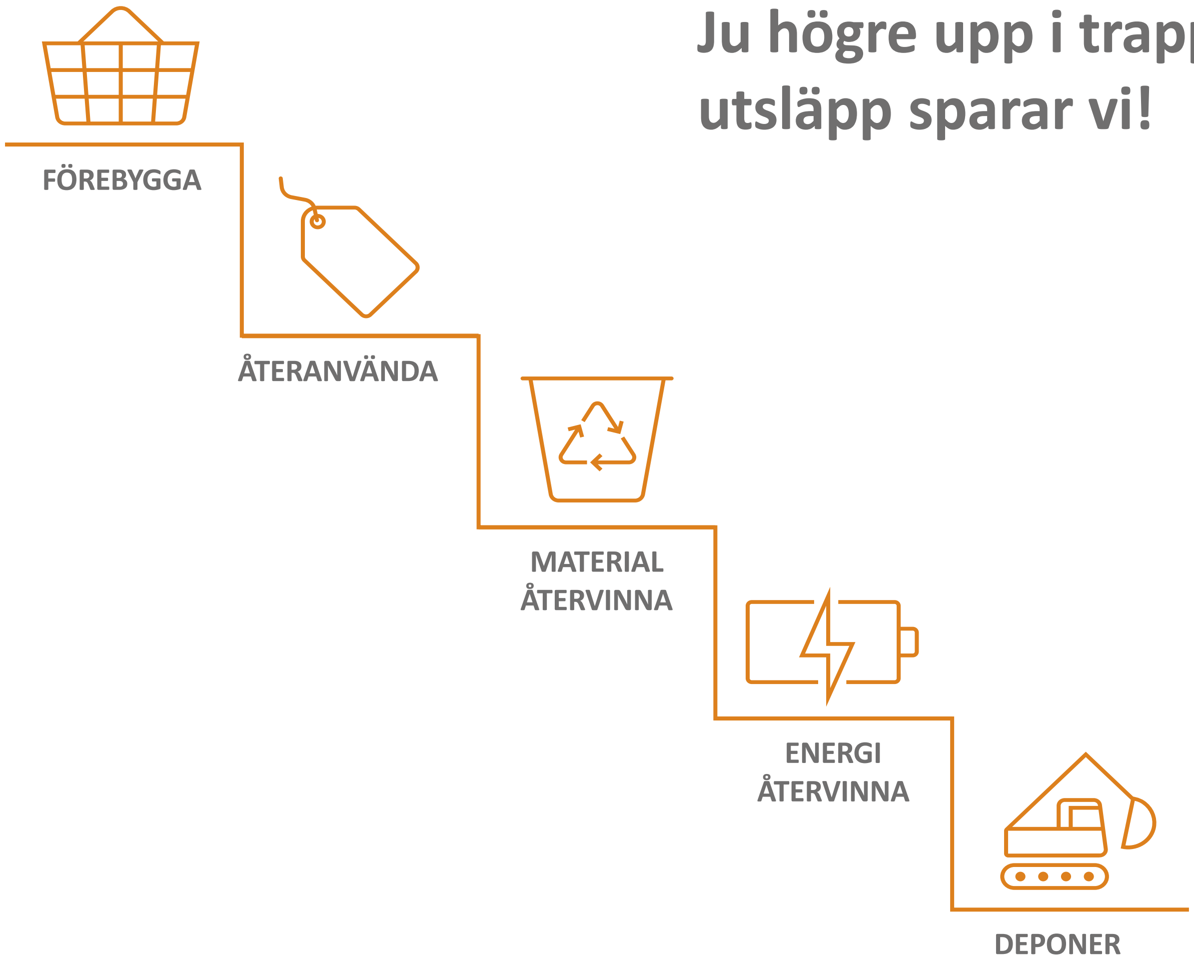


Designa i återvunna material för att skapa efterfrågan

Om inte vi har återvunnet material i våra produkter vem ska då efterfråga vårt avfall?

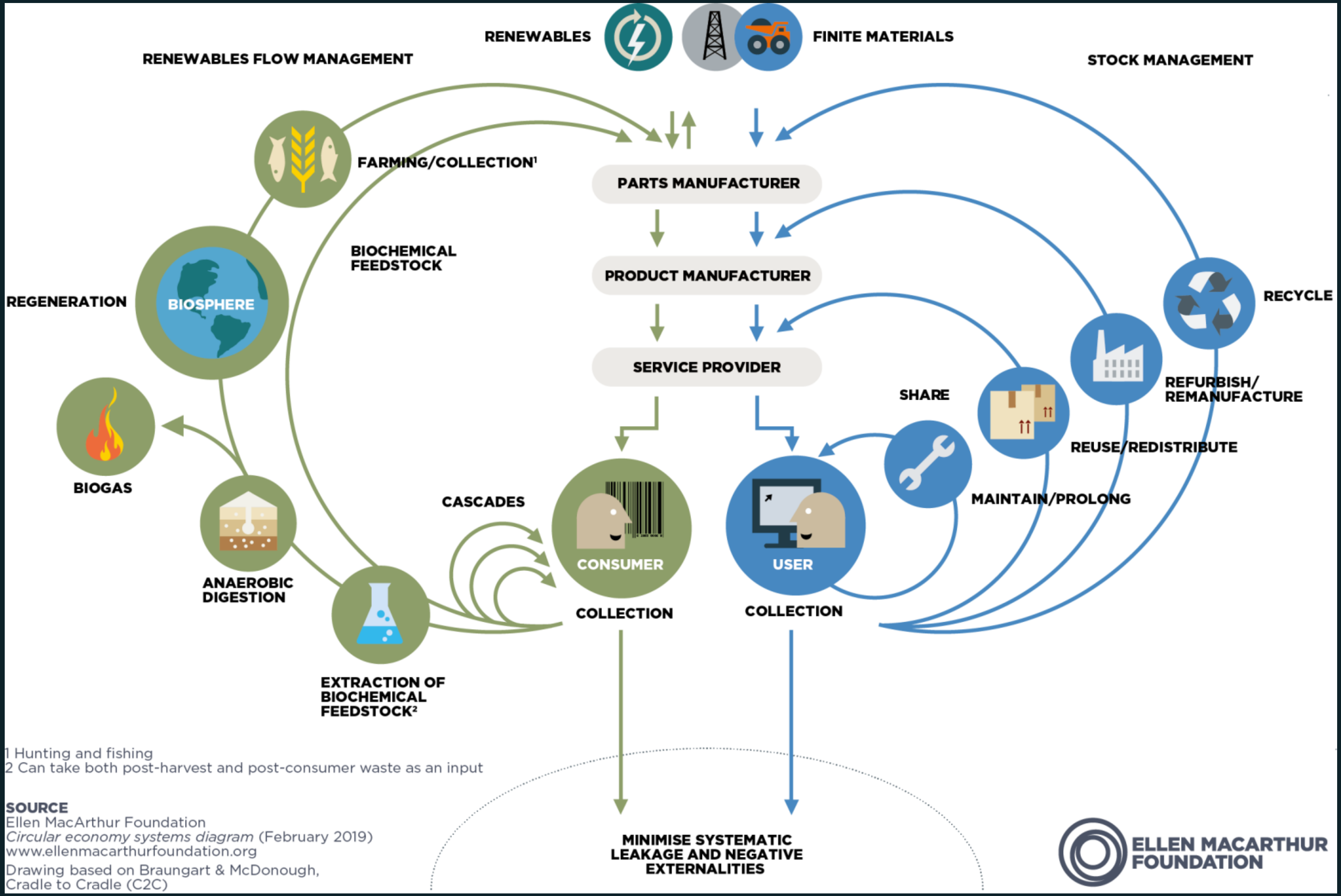
Bygg in återvinning i produktionsprocessen för att minimera sammansättning/kontaminering

Ju högre upp i trappan vi angriper ett avfall ju mer utsläpp sparar vi!



Miljöhantering

Livscykelperspektivet



Medfinansieras av Europeiska unionen

Medfinansieras av
Europeiska unionen

Cirkulära materialval & MCX-databasen

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SCIENCE PARK SKÖVDE
industrial development center

Cheat Sheet Get 1% better at Circular Design every week*

How to select circular materials part 2

Material Circularity Score Lite

criterion	description	metric	score
recycled content	Measures the percentage of recycled material in the product	% recycled content by mass	1 (0%-5%) 2 (6%-10%) 3 (11%-20%) 4 (21%-30%) 5 (31%-40%) 6 (41%-50%) 7 (51%-60%) 8 (61%-70%) 9 (71%-90%) 10 (91%-100%)
material recovery rate	Assesses the ability to recover the material at the end of its life	% of material recoverable through recycling or reuse	1 (0%-10%) 2 (11%-20%) 3 (21%-30%) 4 (31%-40%) 5 (41%-50%) 6 (51%-60%) 7 (61%-70%) 8 (71%-80%) 9 (81%-90%) 10 (91%-100%)
toxicity	Evaluates the presence of hazardous substances that hinder recycling or reuse	Presence of restricted substances	1 (presence) 5 (minimal) 10 (none)
durability	Reflects the material's resistance to wear, degradation or failure during use	Estimated product lifespan (years)	1 (<6 months) 2 (6 months - 1 year) 3 (1-2) 4 (2-5) 5 (5-10) 6 (10-15) 7 (15-20) 8 (20-30) 9 (30-50) 10 (50+)
resource renewability	Assesses whether the material is derived from renewable sources	% of material derived from renewable resources	1 (0%-5%) 2 (6%-10%) 3 (11%-20%) 4 (21%-30%) 5 (31%-40%) 6 (41%-50%) 7 (51%-60%) 8 (61%-70%) 9 (71%-90%) 10 (91%-100%)
recycling efficiency	Evaluates the energy and resource efficiency of the recycling process	Energy consumed per ton of recycled material	1 (>10 MJ/kg) 3 (7-10 MJ/kg) 5 (4-7 MJ/kg) 7 (2-4 MJ/kg) 10 (<2 MJ/kg)
design modularity	Reflects ease of disassembly for reuse or recycling	% of components that can be separated without damaging the material	1 (0%-10%) 2 (11%-20%) 3 (21%-30%) 4 (31%-40%) 5 (41%-50%) 6 (51%-60%) 7 (61%-70%) 8 (71%-80%) 9 (81%-90%) 10 (91%-100%)
material complexity	Evaluates the number of material types or additives in a product that can complicate recycling	Total number of unique material types or additives	1 (>10 types) 3 (7-10 types) 5 (5-7 types) 7 (2-5 types) 10 (1 type)
contamination	Evaluates the purity of the material, focusing on the lack of contaminants that hinder recycling	% of the material free from contaminants that would impair recycling processes	1 (>50%) 3 (41%-50%) 5 (31%-40%) 7 (21%-30%) 10 (0%-20%)
embodied energy	Measures the total energy required to produce the material from cradle to gate, encouraging low-energy-intensity materials	MJ/kg material	1 (>20 MJ/kg) 3 (15-20 MJ/kg) 5 (10-15 MJ/kg) 7 (5-10 MJ/kg) 10 (<5 MJ/kg)

How to use it

1. **Collect data**: gather information for each criterion from material datasheets or LCA studies
2. **Add/remove relevant metrics**: you can adjust the table by adding or removing metrics that are specific to your material or project needs
3. **Evaluate metrics**: measure each criterion
4. **Score criteria**: assign a score from 0 to 10 for each criterion, with 10 being the best.
5. **Total the scores**: add up the scores for all 10 criteria. The total score should be out of 100.
6. **Analyze**: identify strengths and weaknesses in the material's circularity to guide decisions.

Tips for Life Cycle Assessments

Impact categories to monitor

Abiotic Depletion Potential kg Sb-eq
Tracks the depletion of natural resources, including metals, minerals, and renewable materials, highlighting the benefits of recycled or regenerative inputs

Human Toxicity Potential CTU
Evaluates the potential health risks associated with material handling and processing, especially during recycling or disposal stages

Ecotoxicity CTU **or Eutrophication** kg PO4-eq
Reflects the environmental damage caused by substances leaching during disposal or material degradation, which can hinder circularity goals

Scenario Analysis

Model multiple end-of-life scenarios to capture variability in circularity performance

Landfill
Quantify methane released from organic material degradation (e.g. kg CH_4/kg waste)

Energy recovery
Include incineration emissions like CO_2, NO_x and PM in categories such as global warming potential and human toxicity potential

Material recovery
Model energy needed for refurbishing the material (e.g. MJ energy/kg material)

Standards to keep an eye on

ISO 59020
It provides a framework for evaluating circularity performance across various levels, from product to regional systems. It includes metrics for resource inflows and outflows, enabling organizations to assess sustainability impacts and track progress over time.

ISO 14051
It provides a methodology to analyze material and energy flows within production systems. This helps organizations identify inefficiencies, reduce waste, and optimize resource use, directly supporting circular material strategies.

ISO 15270
It offers guidance for the recovery and recycling of plastics, emphasizing compatibility with recycling technologies and systems. This is particularly relevant for assessing the circular potential of polymer materials.

ISO 20400
It encourages integrating sustainability into procurement practices, including selecting materials with recycled content, low carbon footprints, and compliance with circular economy principles.

+/- Key Formulas

Resource Circularity Optimization RCO

This formula evaluates the efficiency of material flows, balancing benefits from reused/recycled inputs against penalties from waste and virgin material use.

$$RCO = \frac{R_r + R_u - \lambda \cdot W_{nr}}{V + E_t}$$

Where:

R_r: mass of recycled material used
R_u: mass of reused material incorporated
W_{nr}: mass of non-recoverable waste generated
V: mass of virgin materials required
E_t: total energy embodied in the system
λ: waste penalty factor (emphasizes the impact of unrecoverable waste)

A higher RCO value indicates a more circular material system, with reduced dependency on virgin materials, lower waste generation, and efficient energy use.

Systemic Circularity Efficiency SCE

This formula provides a holistic measure of circularity by integrating material recovery, carbon emissions reduction, and energy efficiency in a single framework.

$$SCE = \frac{R_{circ} \cdot (1 - C_{rel})}{E_{tot} + W_{loss}}$$

Where:

R_{circ}: circular recovery rate (ratio of recycled/reused material to total input)
C_{rel}: relative carbon emissions reduction compared to baseline material
E_{tot}: total energy consumption across the lifecycle (production, usage, recovery)
W_{loss}: waste loss as a fraction of total material processed

A higher SCE value indicates a material or system that maximizes recovery, reduces emissions, and minimizes energy and waste inefficiencies.

Waste-to-Output Ratio WOR

This formula quantifies the amount of non-recoverable waste generated relative to the usable product mass

$$WOR = \frac{W_{nr}}{M_u}$$

Where:

W_{nr}: mass of non-recoverable waste generated
M_u: mass of the final product output

If a high proportion of raw material inputs is lost as waste, it signals an opportunity to optimize processes or switch to more circular materials that generate less waste.

Want to know more? Write me at gianlucamanago@gmail.com


I am Gianluca and I unlock the potential of sustainability for businesses

linkedin.com > gianlucamanago_ how-to-select-circular-materials-activity

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THE CIRCULAR DESIGN GUIDE

Where do each of your materials go after the current use cycle?

= Material is **not** fit for the circular economy

= Material is fit for the circular economy

1. Material is toxic / non-marketable waste.
   - **yes** → Can this be avoided by choosing a different material?
   - **no** ↓

2. Material going to waste.
   - **yes** → What's stopping this material from being useful? (toxicity, legislation / policy?)
     - ↓ Can this be avoided by choosing different materials?
     - ↓ And who will pay for the processing of this material?
   - **no** ↓

3. Material adds value to the biosphere as biological nutrient.
   - **yes** → How can you make sure that the material is returned to biosphere safely?
   - **no** ↓

4. Material is brought back to my business and cycled.
   - **yes** → What is the business model / collection system?
     - ↓ Will the material be upcycled or downcycled?
   - **no** ↓

5. Material could be used by another organisation to create value.
   - **yes** → Who uses the material and how do they benefit?
     - ↓ Will the material be upcycled or downcycled?

www.circulardesignguide.com

IDEO

ELLEN MACARTHUR FOUNDATION

ellenmacarthurfoundation.org/
smart-material-choices

THE
CIRCULAR
DESIGN
GUIDE

= Material is **not** fit for the circular economy

= Material is fit for the circular economy

Where do each of your materials go after the current use cycle?

1 Material is toxic / non-marketable waste.

yes → Can this be avoided by choosing a different material?

no ↓

2 Material going to waste.

yes → What's stopping this material from being useful? (toxicity, legislation / policy?)

↓

Can this be avoided by choosing different materials?

2 Material going to waste.

yes

What's stopping this material from being useful? (toxicity, legislation / policy?)

Can this be avoided by choosing different materials?

And who will pay for the processing of this material?

no

3 Material adds value to the biosphere as biological nutrient.

yes

How can you make sure that the material is returned to biosphere safely?

no

Material is brought back

4 Material is brought back to my business and cycled.

yes → What is the business model / collection system?

Will the material be upcycled or downcycled?

no

5 Material could be used by another organisation to create value.

yes → Who uses the material and how do they benefit?

Will the material be upcycled or downcycled?

IDEO

ELLEN MACARTHUR FOUNDATION

Var hittar jag material?

skovde.materialconnexion.com

MCX

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IDC West Sweden AB (Mate...
Hi, Demonstrator

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Products

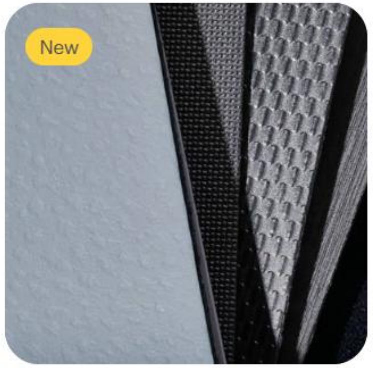
Filters | All 10000+ | Polymers 4602 | Naturals 3085 | Process 909 | Metals 592 | Glass 484 | Ceramics 322 | Cement-Based

Seal of Excellence

- Country
- Availability
- Processing
- Sustainability
- Impact Resistance
- Applications
- Customization
- Feel
- Stiffness
- Structure
- Surface/Texture
- Transparency

New


Pili AdheSeal Inc.
Pili Seal®

New


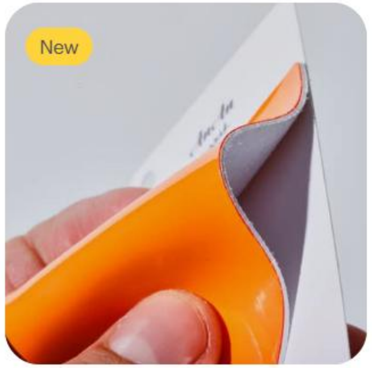
ANAN (CHINA) CO. LTD.
MEGALITH

New


ANAN (CHINA) CO. LTD.
MAXOXY

New


Clayworks
Exterior Clay Plasters

New


ANAN (CHINA) CO. LTD.
MIROKO

New


Fiscatech S.p.A.
riceSKIN

New

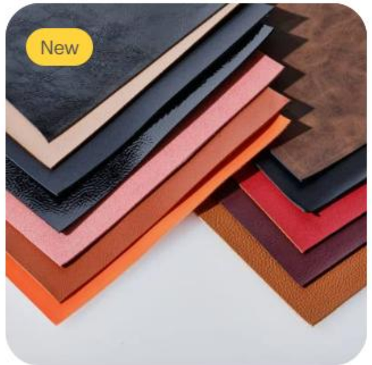

BMT Research Group Faculty ...
HyperClean Pad: Oven and Stove ...

New


Clayworks
Tadelakt Plaster

New


ANAN (CHINA) CO. LTD.
MYCOSKIN

New


Type Hope New Material Ltd
FUL-TEK PU


Products

Filters | All 20 | Naturals 12 | Polymers 10 | Process 1

Seal of Excellence

Country

Availability

Processing

Sustainability

Impact Resistance

Applications

Customization

- Color 12
- Composition 2
- Finish 4
- Pattern 7
- Performance Prop... 4
- Size 11

PersiSKIN SL
PersiSKIN Vegan Leather

LignoPure GbR
Lignin Rubber and Vegan Leather

General Silicones Co. Ltd.
Compo-SiL® Vegan Silicone Leather

Chengdu Silike Technology C...
Si-TPV(dynamic vulcanizate ther...

PEEL Lab
Pineapple Leather

Microlite Industrial Co. LTD.
Reflective Faux Leather

ANAN (CHINA) CO. LTD.
MYCOSKIN

Frumat S.r.l.
Apple Leather

Sommers Plastic Products Co....
Lambskin (and Pleasure)

Sommers Plastic Products Co....
Busker (Musket)

Products

Filters | All 10 | Naturals 7 | Polymers 6

Texture ×

Seal of Excellence

Country

Availability

Processing

Sustainability

Impact Resistance

Applications

Customization 1

- Color 9
- [x] Texture 10
- Thickness 6
- Weight 1

PersiSKIN SL
PersiSKIN Vegan Leather

LignoPure GbR
Lignin Rubber and Vegan Leather

General Silicones Co. Ltd.
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Pineapple Leather

Help

MCX

vegan leather

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Products

Filters | All 1 | Naturals 1

Texture ✕

Compostable ✕ | Clear All

Seal of Excellence

Country

Availability

Processing

Sustainability 1

- [ ] Biodegradable 1
- [x] Compostable 1
- [ ] Lightweight 1
- [ ] Renewable Content 1
- [ ] Waste Material Con... 1

Impact Resistance

Malai Design & Materials

Malai biocomposite

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MALAI DESIGN & MATERIALS

Malai Biocomposite

MC	Categories
MC 877401	Naturals

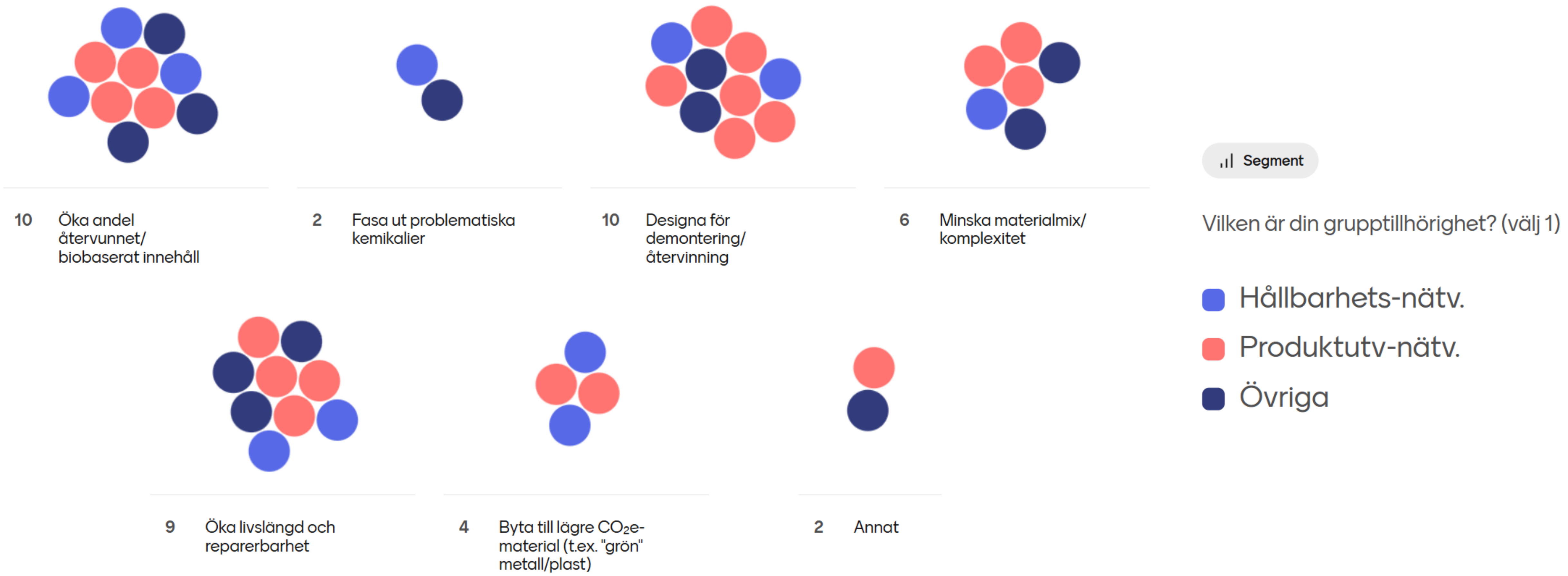
Description

A flexible, leather-like biocomposite sheet based on bacterial cellulose as an alternative to animal hides and their imitations. The company works alongside coconut farmers in Southern India and processing units that find themselves with too much coconut waste water after they have removed the white flesh from inside mature coconuts. Normally, this waste water would be released into drainage systems, but this can cause water pollution and the soil to become acidified in surrounding areas. Instead, the company uses this waste water and places it into vats for sterilization, resulting in an entirely natural, energy-rich nutrient upon which bacterial culture can feed when combined. The fermentation period takes between twelve to fourteen days. At the end of this process, a sheet of cellulose 'jelly' is produced. This jelly undergoes another process of refinement by enriching it with natural fibers, gums, and resins to create a more durable and flexible material. The end product is sustainable, biodegradable, water resistant, and vegan. The material is available in 1.09 yd x 1.09 yd (1 m x 1 m) sheets with a 0.04 in to 0.08 in (1 mm to 2 mm) thickness. It is available in 16 osy to 18 osy (550 gsm to 600 gsm) weight depending on what is most suitable for the material's flexibility and durability; however, weight can be customized upon request. A wide range of colors are made with natural dyes such as indigo, cutch, myrobalan, brazilwood, madder, and turmeric. The material can also be sewn, laser cut, 3D molded, and embossed or printed onto. Applications include fashion, accessories, bags, packaging, stationery, interior surfaces, and furnishings. For future use, this material prior to the refinement

📝 Avsluta mentin!

Medfinansieras av Europeiska unionen

Vilken "materialstrategi" vill ni prioritera mest kommande 12 månader? (Välj 3)



Medfinansieras av Europeiska unionen

Nätverk, uppdelen eder!

Tid att nörda ner sig i riktade diskussioner

INDUSTRIAL INNOVATION ARENA

HÖGSKOLAN I SKÖVDE

SCIENCE PARK SKÖVDE

industrial development center