

Sustainable design S9

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26-05-2023

Agenda

9.15 to 10.00

- Chapters 23-25: Business, policy, consumers
- Sustainable development goals

10 to 10.30

- Exercise: Think of drivers, opportunities, barriers for your material

10.30 to 10.45

- Break

10.45 to 12

- Discussion of exercise
- Discussion of groupwork

Learning objectives

1. Explain how a businesses, governments and consumer influence the choices
 - ❑ *Businesses (Barriers to material use efficiency)*
 - ❑ *Policy (Promoting material efficiency)*
 - ❑ *Consumers (Demanding change)*
2. An understanding of how sustainability overall is being perceived to solve global issues
3. Revisit the terms circular economy, industrial symbiosis, role of design
4. Identify barriers to material reuse (such as design conventions, and policy shortcomings), and find solutions to these problems.

Readings for the session

Readings for the session

Allwood, J., & Cullen, J. (2010). Sustainable Materials – with Both Eyes Open

Chapter 23: Business activity evaluation

Also discussed:

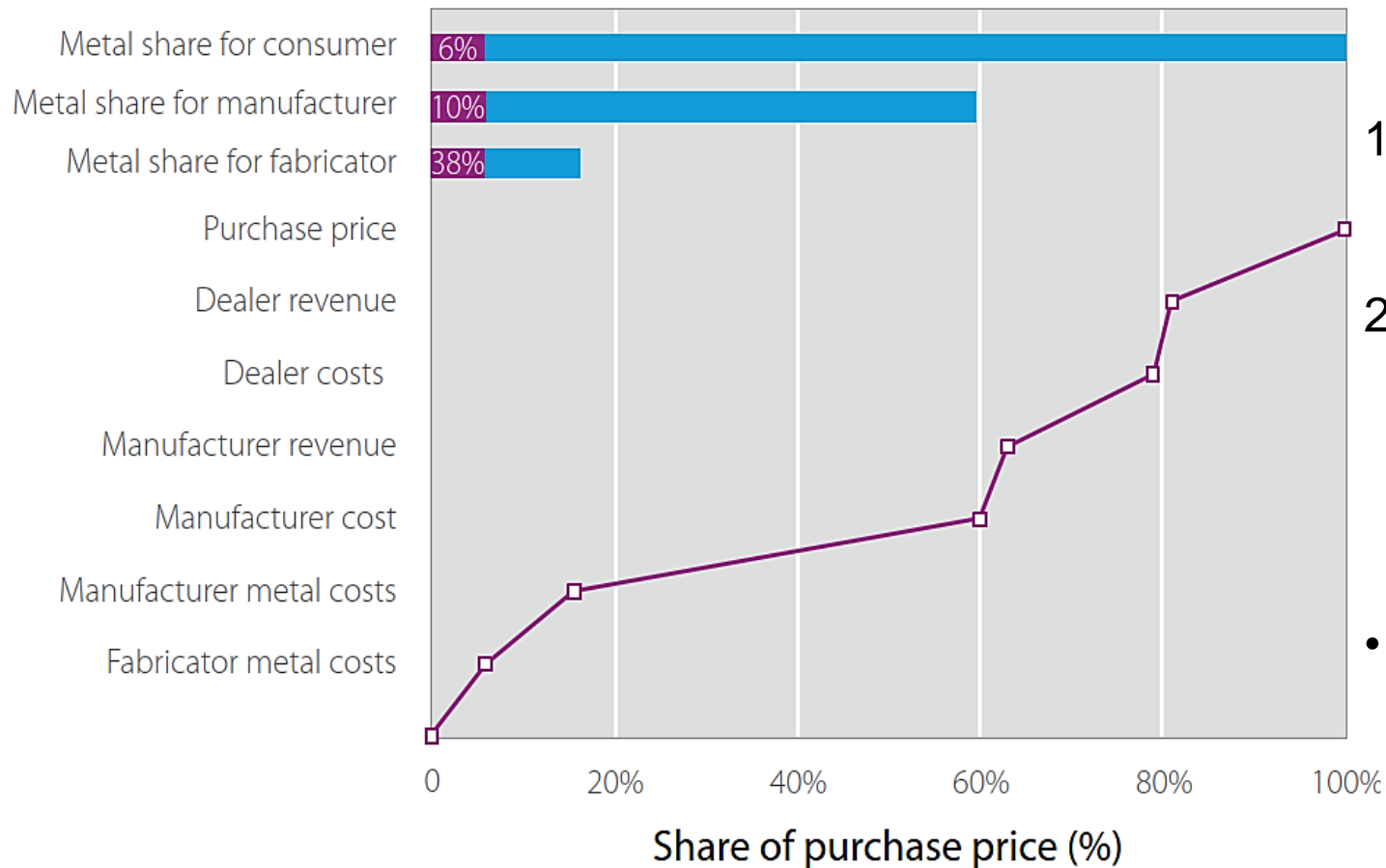
Chapter 24: The influence of policy

Chapter 25: The actions of individuals

Business activity evaluation: Barriers to change

1. Potential cost savings are literally small
2. Standardization and optimization at loggerheads
3. Evolution of the industry is path dependent
4. Risk aversion and imperfect information hinder material efficiency
5. Focus on product sales and not service revenue

Barrier 1: The potential cost savings are small



Problem:

1. Material cost is only a fraction of the purchase price
2. For fabricator & manufacturer, labor costs outweigh material efficiency benefits

Solution:

- Regulatory pressure to improve efficiency through emission saving benefits

Barrier 2: Standardization and optimization at loggerheads

- Standardization = Economies of scale
 - *High-volume products, ease of production, handling storage and transport.*
 - *Downstream production is easy*
- Optimization = Make and use only what you need
- Problem: “Does using less metal now to make an optimized component, compromise our ability to adapt or use the component in future for a changed or different use?”
- Solution: Designers should make flexible systems that cater to more geometries and increase industrial collaboration to optimize for material use

Barrier 3: Evolution of the industry is path dependent

Problem: No one likes 'Disruptive technology'

- Disruption may also create issues of jobs, intellectual property
- Look at standardization vs optimization
- Small-scale change vs large scale disruption
- Ex: Reluctance of primary steel producers to secondary steel production despite available technology (Electric arc furnaces)

Solution: Regulatory interventions to enforce new practices such as steel reuse (already exists in Finland to some extent)

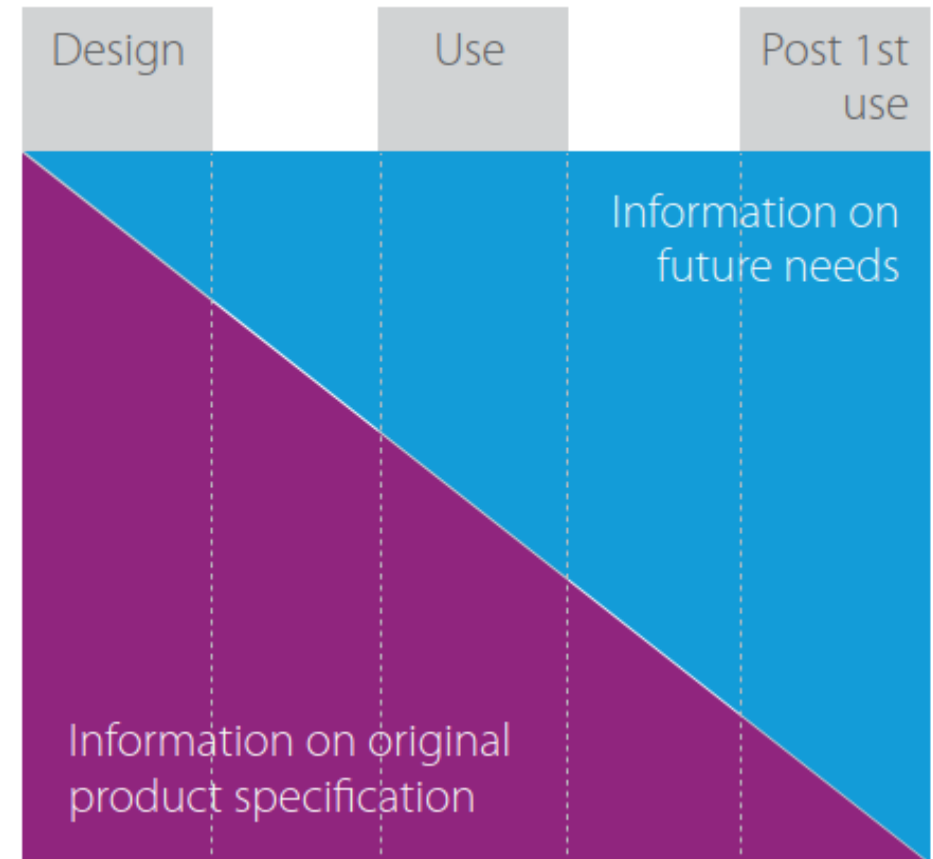
Barrier 4: Risk aversion and imperfect information hinder material efficiency

Problem:

1. Overdesign due to safety concerns and fear of penalties
2. Exaggerated claims of safety means consumers are scared to buy optimized product

Solution:

Better communication between makers and commissioners and insurers



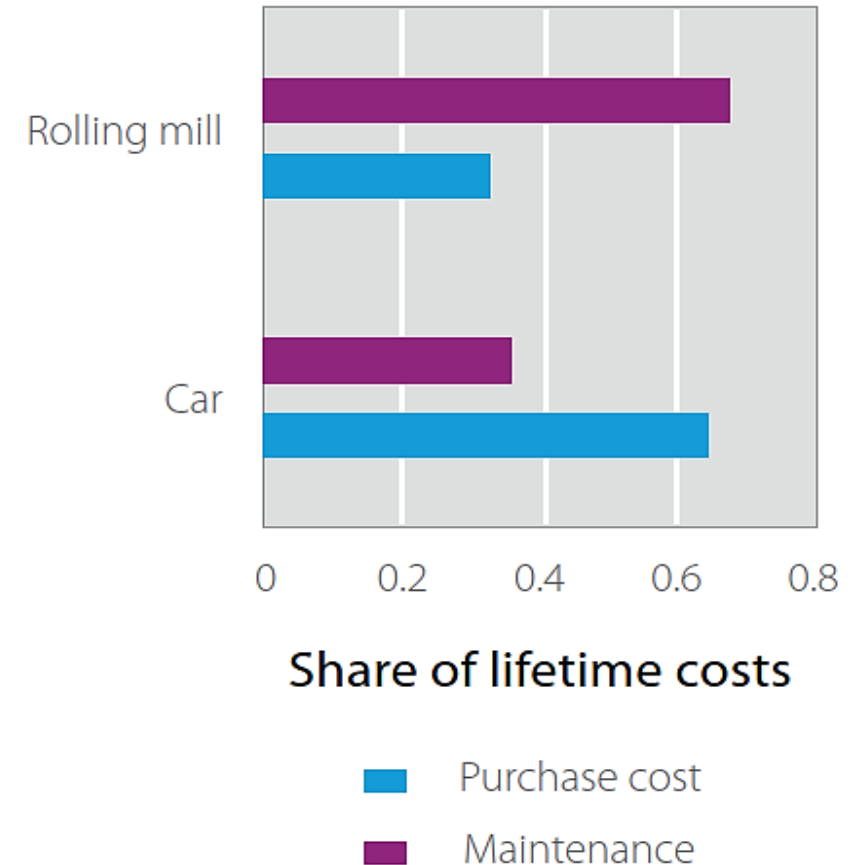
Barrier 5: Focus on product sales and not service revenue

Problem:

- Business models are focused on sales not service so increased material use rather than longer product life

Solution:

- Explore better service providing models and build customer relationship



Do you know...

how many EU legislations on sustainability will impact the textile and clothing companies?

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Ecodesign and Digital Product Passport



National Tax on Waste (EPR)



Waste Shipment



Green Claims and Textile Labelling



Green Public Procurement (GPP)



Waste Legislation



Corporate Sustainability Due Diligence



Corporate Sustainability Reporting Directive



Industrial Emissions



Sustainable Finance (Taxonomy)



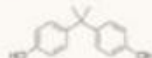
Microplastic



PFAS Restriction



Skin Sensitisers



Bisphenol



REACH Revision



PFHxA Restriction

Digital product passport

- **Make all information available to user**
- The EU Strategy for Sustainable and Circular Textiles (March 2022)
- Eco-design for Sustainable Products Regulation to define requirements by 2024.
- DPPs become mandatory by 2030.

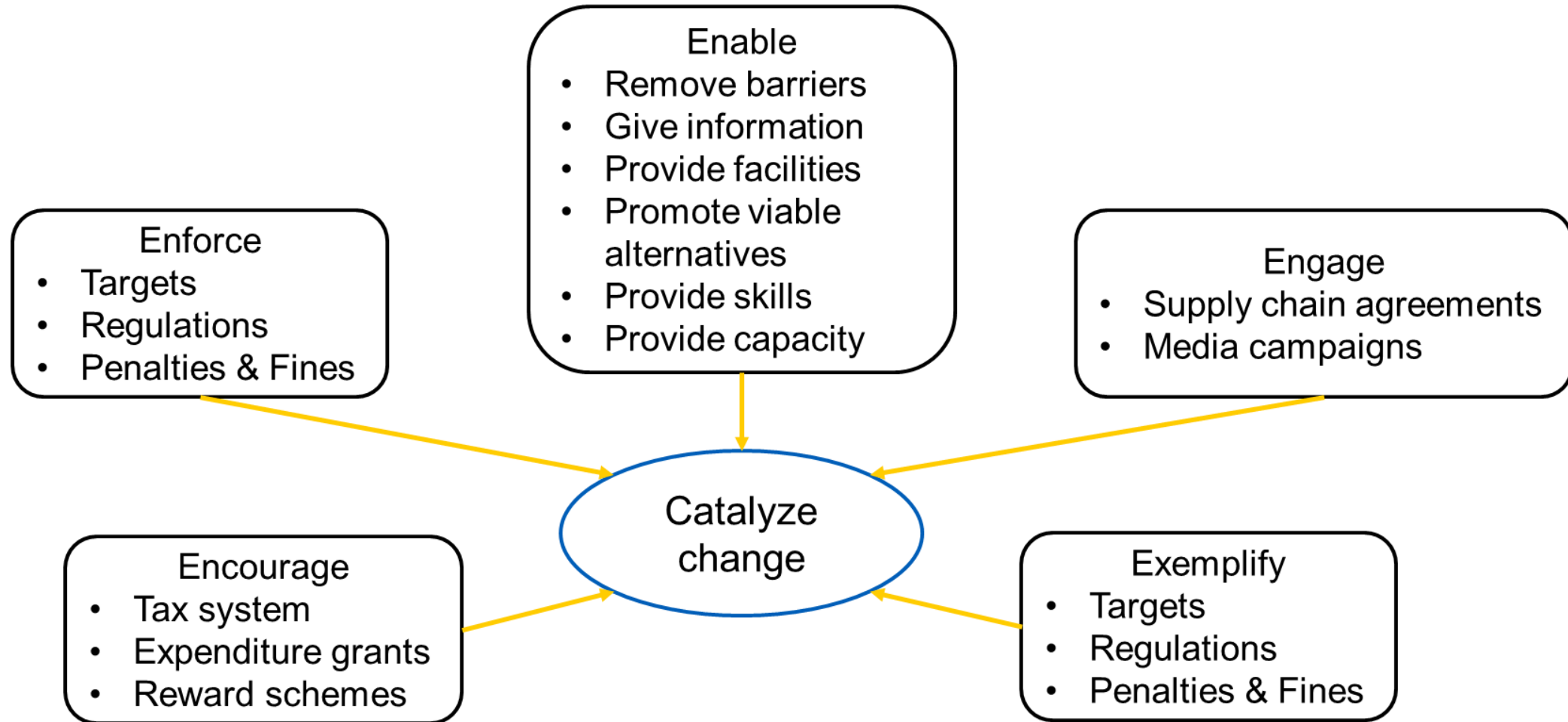


Extended producer responsibility

Extended Producer Responsibility (EPR) puts responsibility on producers to bear the cost of waste management. Ex: Batteries, e-waste, packaging, tires

• Benefits	Challenges
<ul style="list-style-type: none">• Economic instrument to stimulate better design to reduce costs• Obliges producers to take responsibility for the end-of-life phase	<ul style="list-style-type: none">• Only applicable with specific country. Cross-border secondhand market is not included• Focusses only on loss of value rather than value retention• No consultation with economic actors who resell, repair, refurbish, or recycle products• Does not address 'bad design'

Making policies work for our goals



Making policies work for our goals

- **Enforce**

- Emission reduction targets should consider embodied emissions. Ex: 'Zero carbon' houses
- Waste policy should be directed towards minimizing embodied energy losses. Ex: recycle vs reuse
- Health and safety legislation should not prevent material efficiency. Ex: Overall risk analysis
- Product durability standards should be considered. Ex: Eco-design

- **Encourage**

- The tax system should encourage material efficiency. Ex: Tax on disposable products
- Material efficiency should be rewarded in voluntary eco-standards. Ex: Steel quality certificate

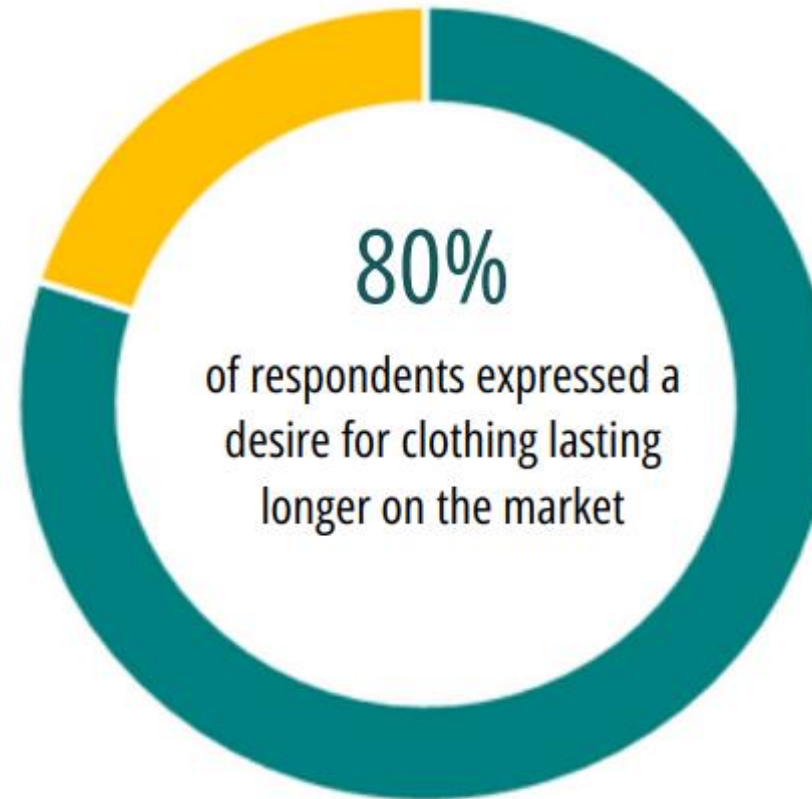
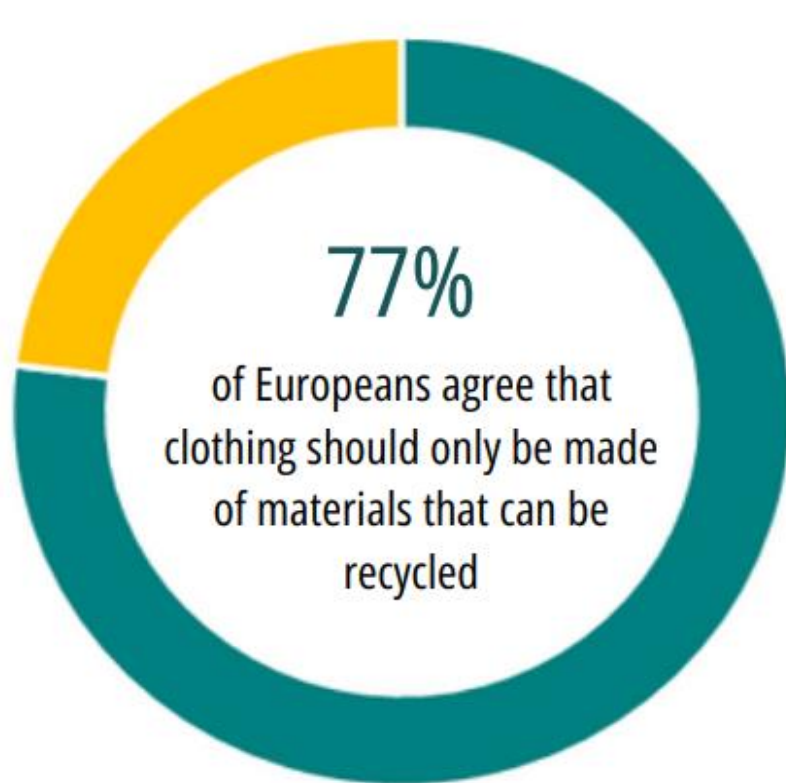
- **Enable**

- Government should promote meaningful data collection on material efficiency. Ex: LCA
- Government should provide greater clarity on requirements or reuse. Ex: Digital product passport

Making policies work for our goals

- **Exemplify**
 - Government procurement can be used to promote material efficiency through their purchasing choice to demonstrate good practices.
- **Engage**
 - Raise consumer awareness of embodied energy. Ex: Digital product passport

Consumers as drivers of sustainability



Survey of 27,000 people in the EU Member States in 2022 [\[↗\]](#)

Finnish consumer attitudes towards circularity

In your opinion, whose responsibility is it to organize reuse of the following products and services?

	Retailers	Specialized companies	Third sector	Public sector	Mine	Total %
Food	22	10	12	12	44	100
Housing	21	14	1	11	53	100
Transportation	11	40	1	34	14	100
Consumer electronics	53	29	1	4	12	100
Average	26.75	23.25	3.75	15.25	30.75	

Extended producer responsibility

What would be your preferred way to extend the lifespan of the following products and services?


















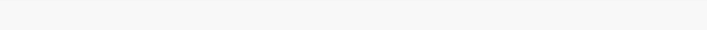

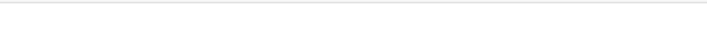
	Service	Third sector	Public sector	Do it myself	Total %
Food	4	15	10	71	100
Housing	53	2	3	42	100
Transportation	57	1	25	17	100
Consumer electronics	75	5	4	16	100
Average	47.25	5.75	10.5	36.5	

What is your preferred way to obtain the following products and services?

	Service	Buy as used	Joint purchase	Buy as new	Public service	Total %
Food	3	17	4	71	6	100
Housing	33	29	2	34	3	100
Transportation	7	35	5	23	31	100
Consumer electronics	2	10	2	84	2	100
Average	11.25	22.75	3.25	53.0	10.5	

Cells with bolded figures were removed from the analyses.

Sustainability rankings

Rank	Country	Score	Performance by SDG
1	 Finland	86.51	
2	 Denmark	85.63	
3	 Sweden	85.19	
4	 Norway	82.35	
5	 Austria	82.32	
6	 Germany	82.18	
7	 France	81.24	
8	 Switzerland	80.79	
9	 Ireland	80.66	
10	 Estonia	80.62	

What can individuals do?

As a consumer
thinking about
buying...



- Building & infrastructure: Use an existing building, reduce use-phase energy, re-use construction materials, design for disassembly, keep it modular, prevent excess material use, choose long lasting parts for insides, repair damages in time.
- Industrial equipment: Include maintenance, operating and future replacement costs in mind, choose a modular design (onion skin model)
- Consumer goods: Cars should have lowest fuel use and embodied energy with easy maintenance. Appliances should be bought with long term requirements in mind with guarantees. Packaging should be reusable or easy to recycle
- Before buying/ discarding consider repair, reuse (resell), disassemble and reuse, recycle

What can individuals do?

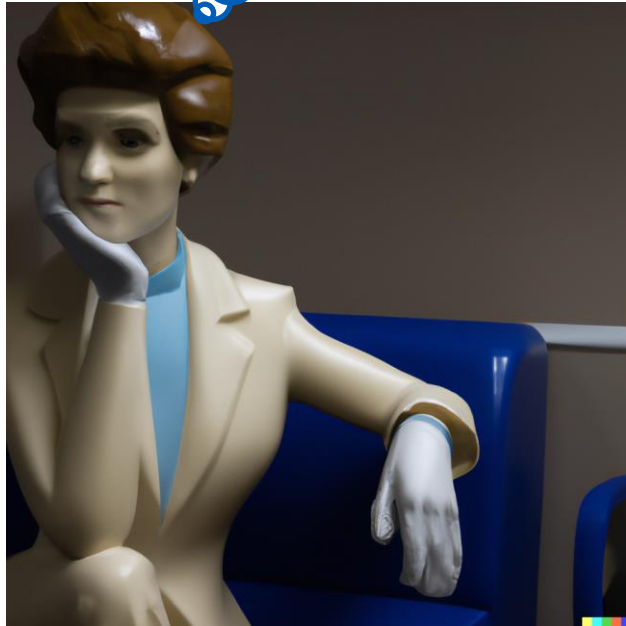
While working in
manufacturing /
product design...



- Try to reduce the material costs, embodied emissions, yield losses.
- Optimize quality for suitable lifespan.
- Shorter-lived components should be separable from long-lived structural components.
- Ensure disassembly at the end of life to reuse or recycle components.
- Segregate metal waste for reuse and recycling.
- Document the product's specification and guidelines for maintenance.
- Explore buy-back contracts.

What can individuals do?

As an employee in the...



- Industry: Promote efficient processes, and heat recovery options. Recover and reuse metals, concrete, paper, plastics. Explore novel process development. Offer reuse certification where possible.
- Insurance sector: Offer risk assessments for investing in new processes, reusing products/ appliances
- Marketing & advertising: Build customer trust by transparent reporting
- Retail: Work with suppliers to put durability labels on products. Collection mechanisms for packaging, promoting durable & reusable products.
- Education: Teach about sustainability, evaluate claims, develop new technologies

How to create a Sustainable Material Future?



A walk-through time: First Industrial Revolution

Create & put toxic waste in air, water, soil

Ruin multiple species and cultural practices



Give financial support to increase this way of production

Dig up natural resources and then burn them

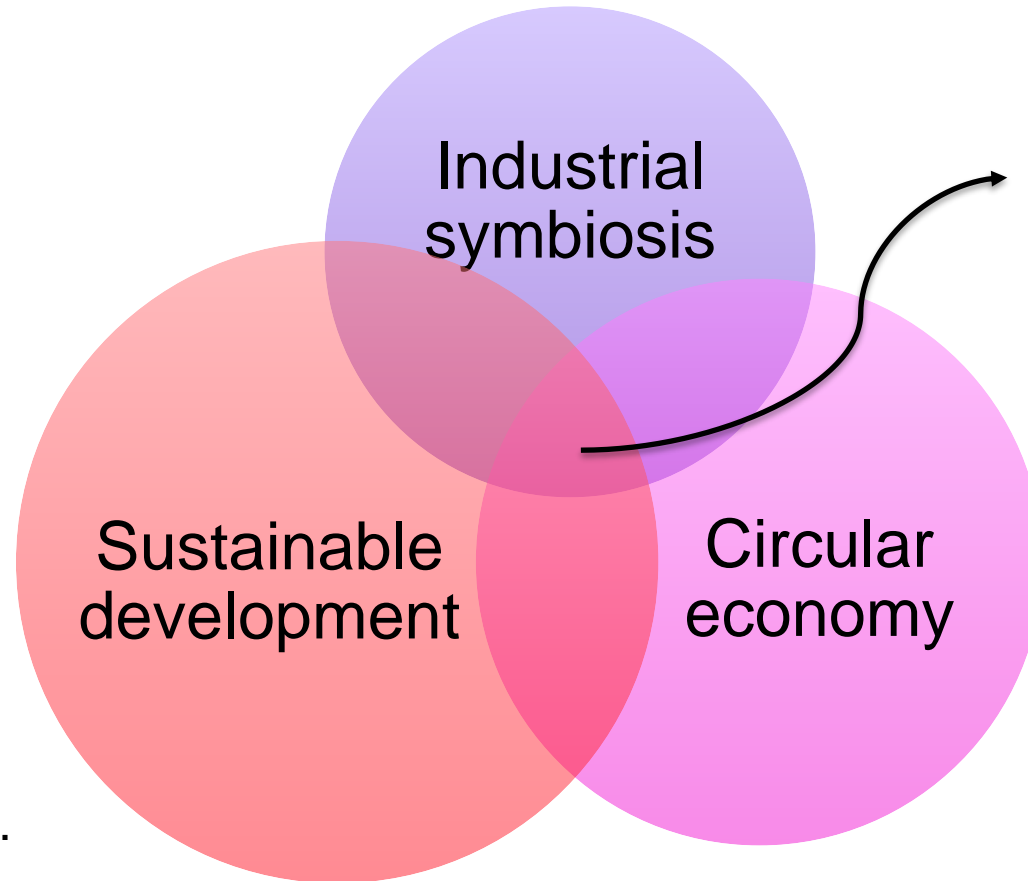


Source: McDonough, W., & Braungart, M. (2010). Cradle to cradle: Remaking the way we make things. North point press.

The Sustainability Umbrella

Differences

- SD promotes balance for long-term well-being.
- CE & IS focus more on resource use and waste reduction.
- CE focuses on designing
- IS focuses on optimizing waste through collaboration.



Commonalities

- Promote better use of resources and reduce environmental impact.
- Improve the economic, social, and environmental systems.
- Promote collaboration and systems thinking

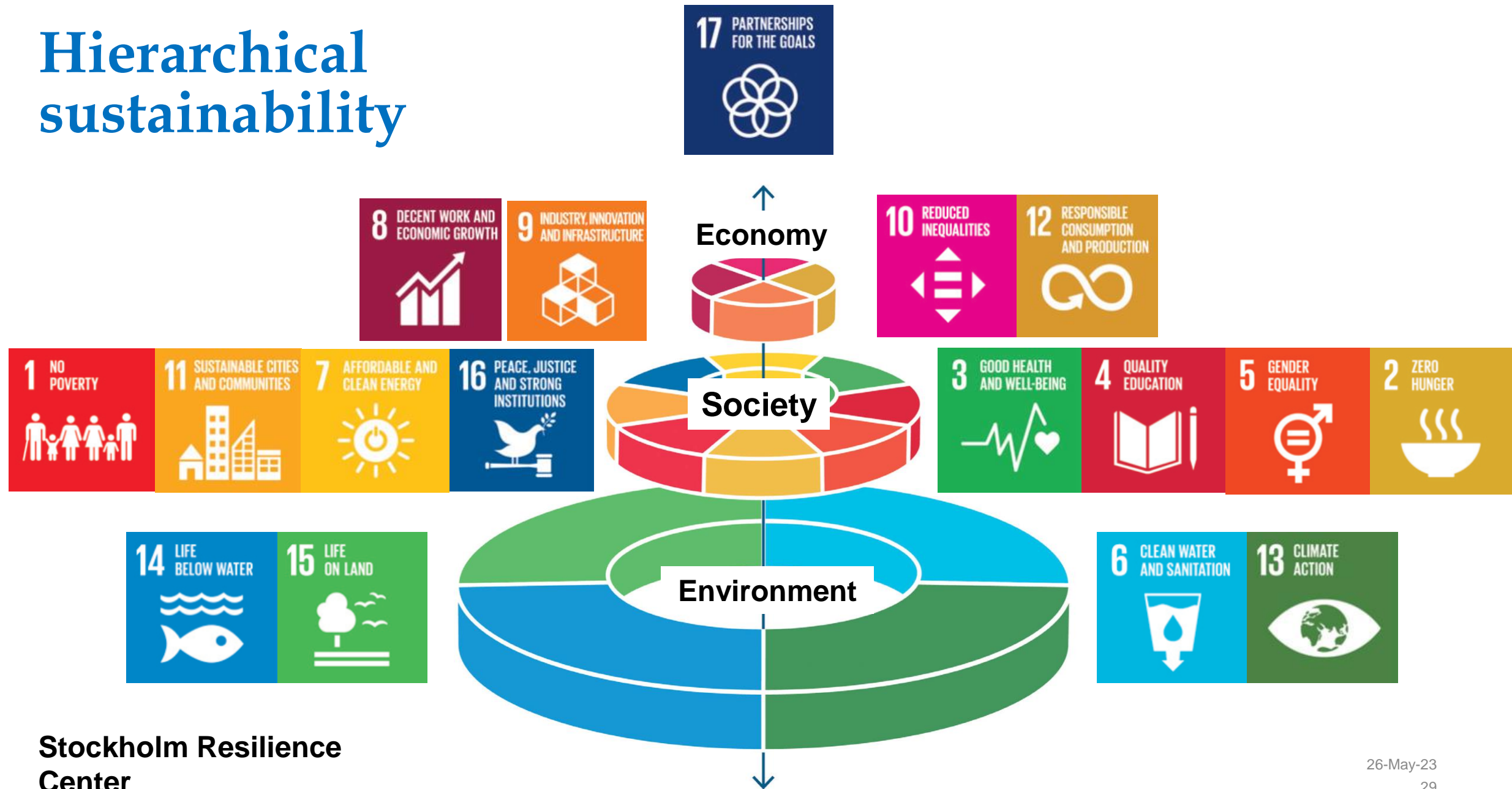
Sustainable development



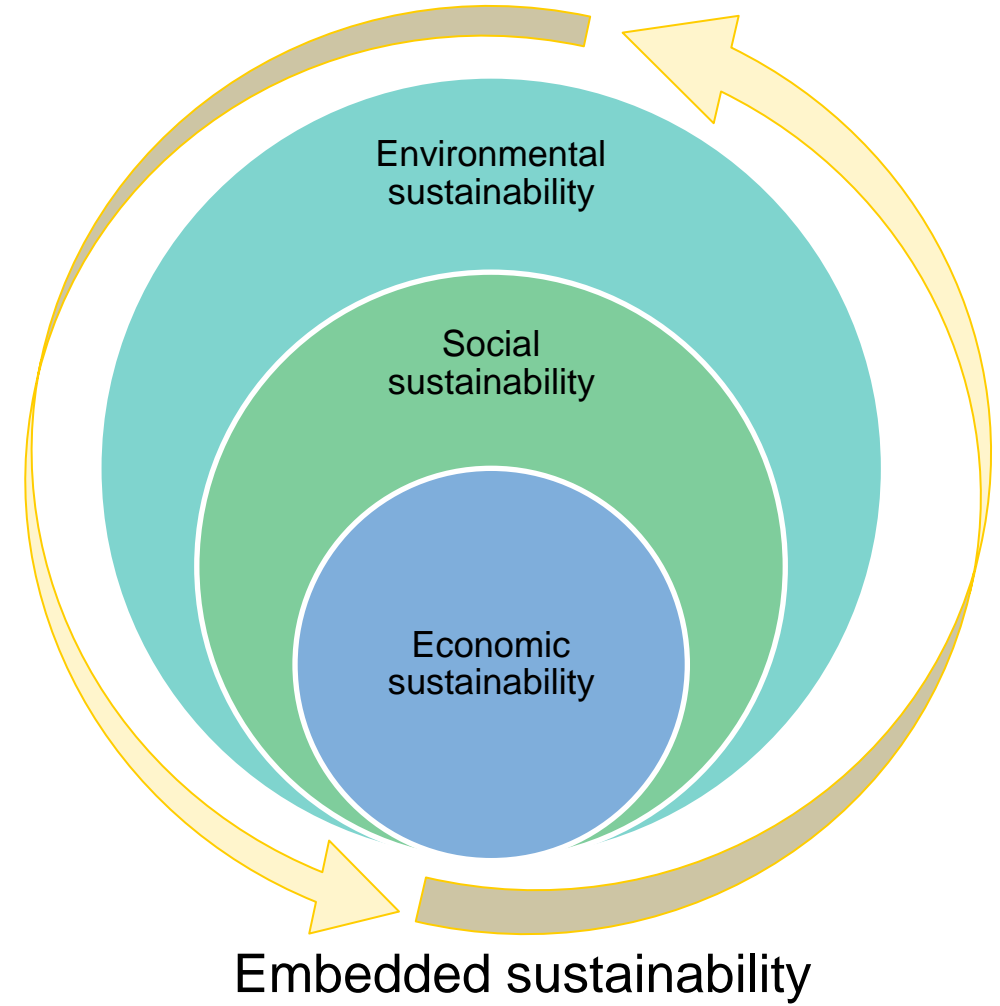
Sustainable development



Hierarchical sustainability



Embedded sustainability in circular economy



Challenges of industrial symbiosis, circular economy, sustainable development

- Waste dependence implies no End of Waste
- Open loop vs Closed-loop recycling issues
 - *Open loop: PET bottles used to make jeans*
 - *Closed loop: PET from bottles used to make bottles*
- Limits of material loops and recycling processes:
 - *No such thing as 100% circular*
 - *Always need virgin material for quality*

Design for sustainability and SDGs



Designing for sustainable agriculture



Designing for health & well-being



Designing for water conservation



Designing for clean energy



Designing for inclusivity



Designing for sustainable transport



Designing for resource efficiency



Designing for climate resilience

Takeaways

- Business are facing many problems in promoting more sustainability but there are also many opportunities
- Governments across the world are taking measures though not fast enough and maybe not even strict enough to bring a change. EPR and Digital passports.
- Consumers can do a lot to bring policymakers (by votes) and businesses (by wallets) together to continue down the path of change
- The mistakes of the first industrial revolution need not be repeated
- An embedded approach to sustainability gives a clear picture of what should be a priority
- But it all starts with better design: Design for redesign, disassembly, multiple users, etc.

Exercise

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26-05-2023

Write the drivers and opportunities for your material...

- **Open the link provided:**
https://miro.com/app/board/uXjVMFh2kDk=
- **Discuss with your group for 30 minutes**

Next sessions...

- **29th May (Monday): Zoom sessions for each material**
- **Time and links will be on MyCourses**
- **2nd June (Friday): NO class**
- **5th June (Monday): Final presentations for groupwork**