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Assesment of Enviromental Impacts in Circular Economy

10.8.2022

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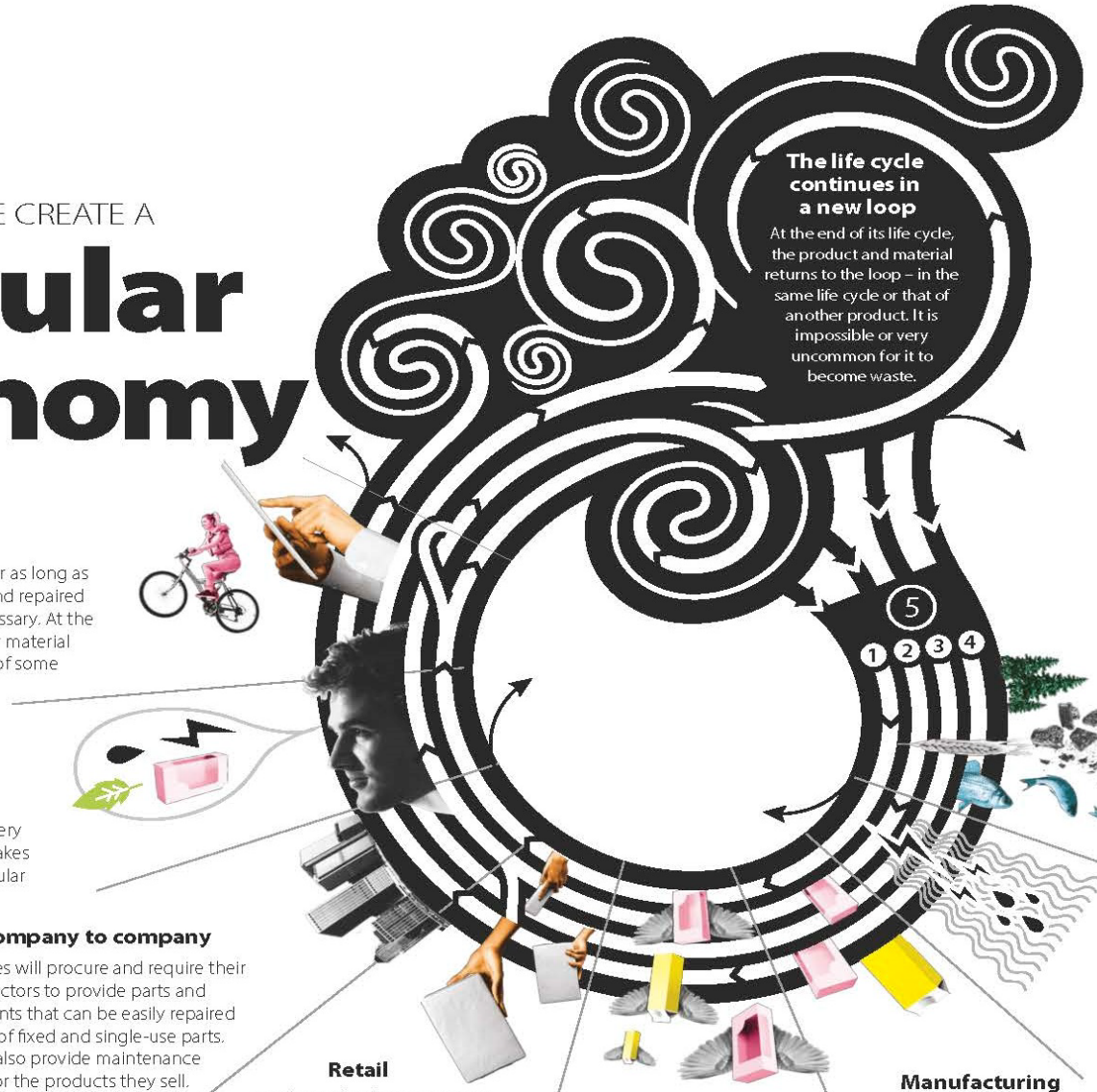
Content

- Circular Economy
- Environmetal impacts
- Measurement methods

THIS IS HOW WE CREATE A

Circular economy

IN FINLAND



Use

The product should be used for as long as possible, it must be serviced and repaired and parts changed when necessary. At the end of its life cycle, the parts or material can be reused in the life cycle of some other product.

Consumer

Demand creates a supply of sustainable products and commodities. Every consumption decision either takes us towards or away from a circular economy.

From company to company

Companies will procure and require their subcontractors to provide parts and components that can be easily repaired – instead of fixed and single-use parts. They will also provide maintenance services for the products they sell.

Retail

Retailers will sell more services instead of goods and inform customers about maintenance and repair services, environmental impacts, materials and further use in the final phase of the life cycle.

Distribution

Transport co-ordinated between different sectors, renewable fuels and jointly owned transport equipment will provide a more sustainable basis for the transfer of products and materials.

Manufacturing industry

Industry will receive accurate information about the materials it uses, so that they can be identified and separated at the end of the product's life cycle. Long-term products that can be repaired and maintained will be brought onto the market.

Material processing

Process planning will decrease the energy need for processing huge amounts of raw materials and the amount of surplus material. The use of side streams will be taken into consideration in, for example, environmental impact assessments and environmental permit processes.

Primary sector

The raw materials are capital for the primary sector. Sustainable solutions are dependent on the protection of raw materials. The aim of a circular economy is to keep Finland vibrant for people and nature.

Initially, Finland's circular economy will grow from the following five areas.

1. **Sustainable food system**
   Consumers choose food that has been produced through the wiser use of raw materials that starts in primary agricultural production. Emissions and resource consumption will be lower.
2. **Forest-based loops**
   Finland is a circular bioeconomy leader because of its forestry and forest industry. Global competitiveness will increase with new commercial products, services, co-operation models and digital technology.
3. **Technical loops**
   Minimising the use of virgin raw materials creates a competitive edge. At the same time, we will maximise the length of material and product life cycles and opportunities for reuse.
4. **Transport and logistics**
   Transport will develop into a seamless, smart system that uses fossil-free fuels. Mobility as a Service (MaaS), the sharing economy and optimised and clean transport will take mobility to a new level.
5. **Common action**
   Legislators, companies, universities and research institutes, consumers and citizens, and vibrant regions are all needed to achieve systemic change. Communication and diverse interaction are particularly important when implementing joint action.

(Sitra 2016)

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From Linear to Circular Economy: What changes?

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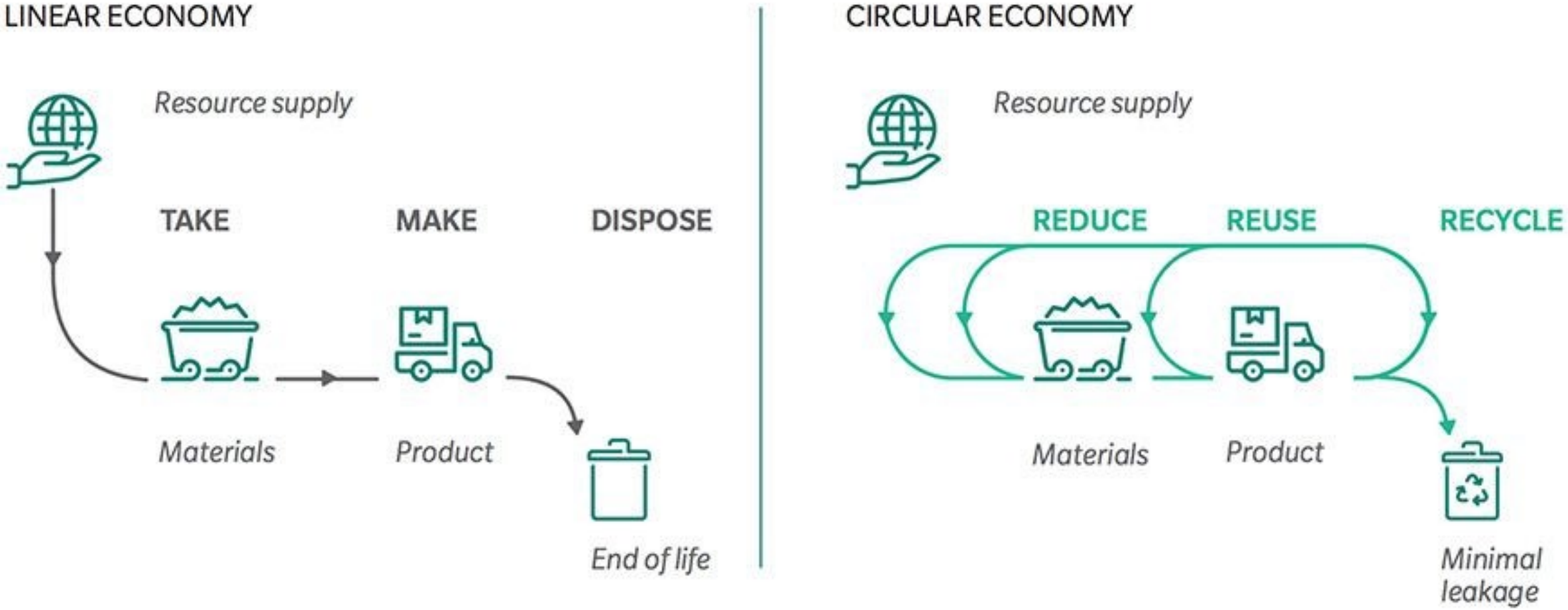
From a linear economy to a circular economy



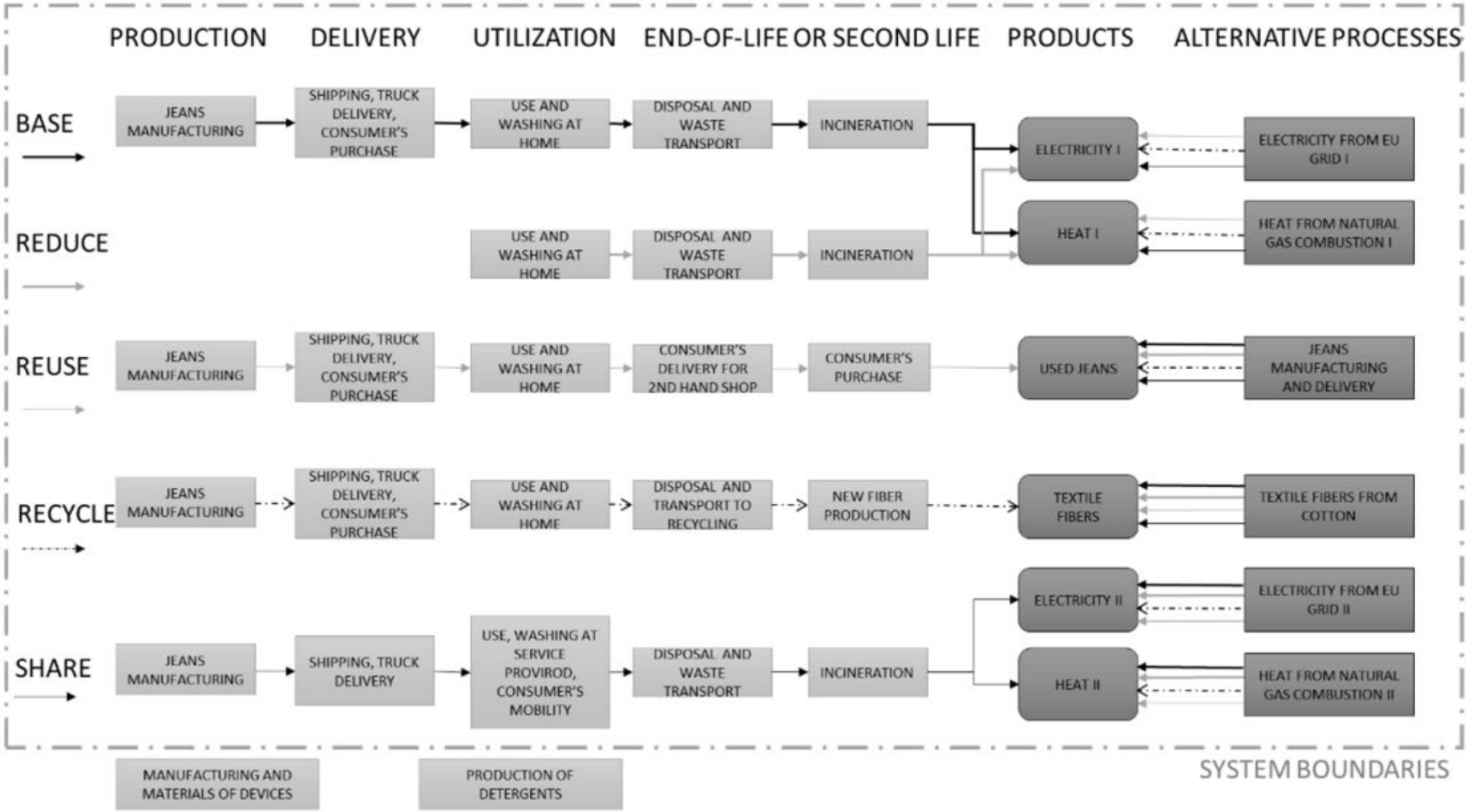


Figure 1. System expansion comparison of BASE, REDUCE, REUSE, RECYCLE and SHARE scenarios as well as system boundaries for different ownership and end-of-life scenarios for jeans.

(Levänen et al. 2021)

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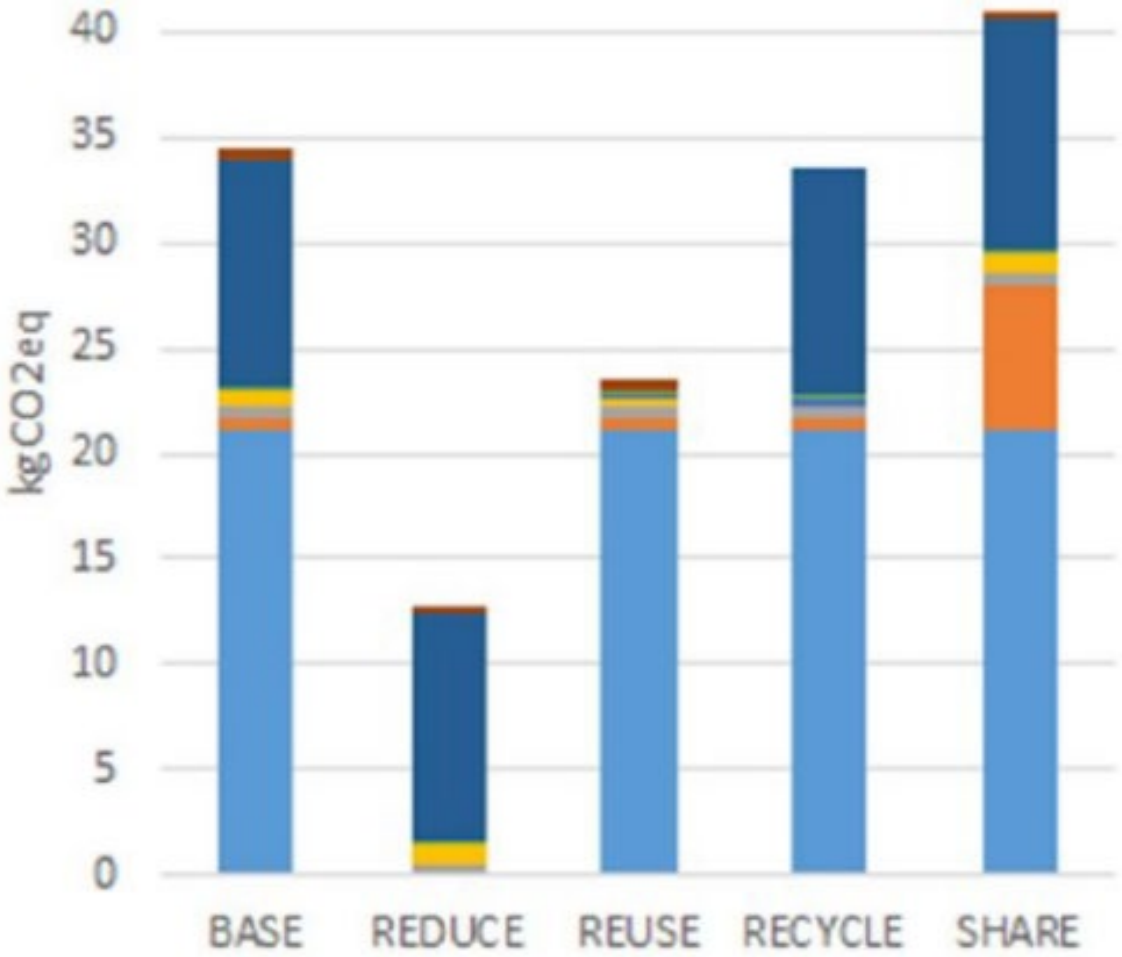

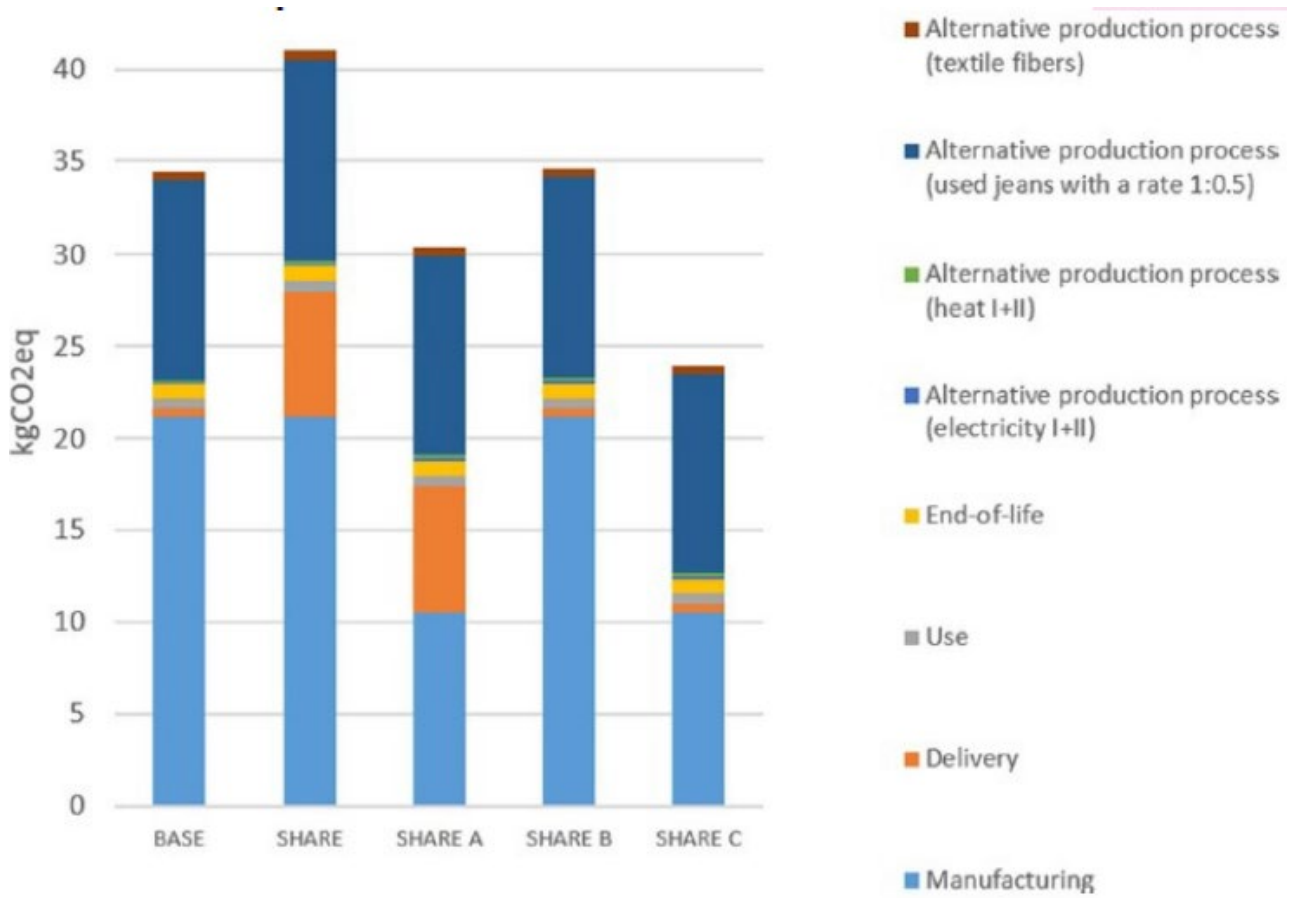

Figure 3. Sensitivity analysis for the SHARE scenario.

(Levänen et al. 2021)

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Environmental impacts: More than just global warming

Impact categories

Name	Reference unit
agricultural land occupation - ALOP	m2a
climate change - GWP100	kg CO2-Eq
fossil depletion - FDP	kg oil-Eq
freshwater ecotoxicity - FETPinf	kg 1,4-DCB-Eq
freshwater eutrophication - FEP	kg P-Eq
human toxicity - HTPinf	kg 1,4-DCB-Eq
ionising radiation - IRP_HE	kg U235-Eq
marine ecotoxicity - METPinf	kg 1,4-DCB-Eq
marine eutrophication - MEP	kg N-Eq
metal depletion - MDP	kg Fe-Eq
natural land transformation - NLTP	m2
ozone depletion - ODPinf	kg CFC-11-Eq
particulate matter formation - PMFP	kg PM10-Eq
photochemical oxidant formation - POFP	kg NMVOC
terrestrial acidification - TAP100	kg SO2-Eq
terrestrial ecotoxicity - TETPinf	kg 1,4-DCB-Eq
urban land occupation - ULOP	m2a
water depletion - WDP	m3

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Environmental impact of EU consumption

through the assessement of 16 different impacts using LCA as reference methodology

Analysis of **consumption trends, patterns and scenarios** for **food**, **housing**, **mobility**, **household goods**, **appliances**.
Including consumers' behaviour

Environmental impacts

3 GOOD HEALTH AND WELL-BEING

- Human toxicity cancer
- Human toxicity non cancer
- Particulate matter
- Photochemical ozone formation
- Ionising radiation

6 CLEAN WATER AND SANITATION

- Impact due to water use
- Ecotoxicity

13 CLIMATE ACTION

- Climate change
- Impact due to resource use

14 LIFE BELOW WATER

- Euthrophication marine and freshwater
- Ecotoxicity

15 LIFE ON LAND

- Impact due to land use
- Euthrophication terrestrial
- Acidification
- Impact due to resource use (metals, minerals and fossils)
- Ozone depletion

(European Commission 2022)

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How we can measure **the environmental burden?**

Different methods

Different impact categories are measured in different ways.

- Water use - water footprint
- Eutrophication - effect of chemical use
- Global warming - emissions into the air
- Noise pollution– decibels
  the list goes on..

Life Cycle Assesment (LCA)

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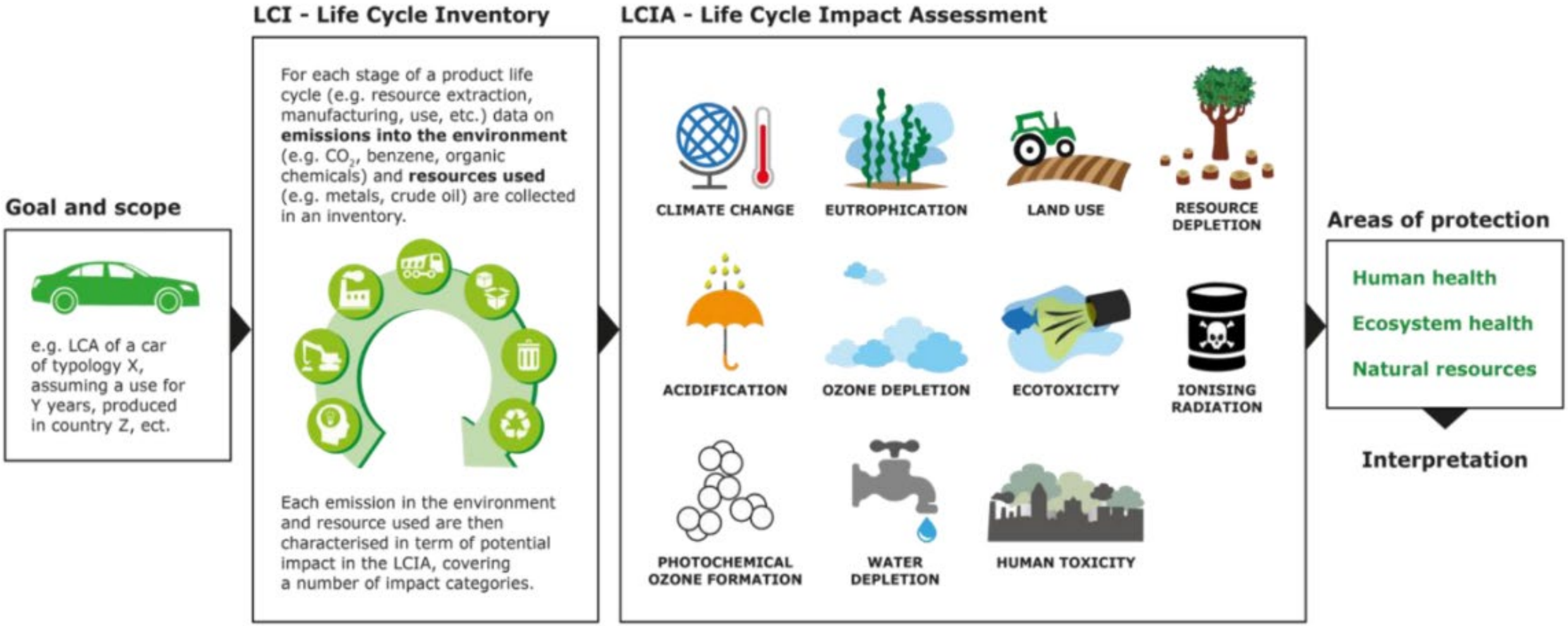


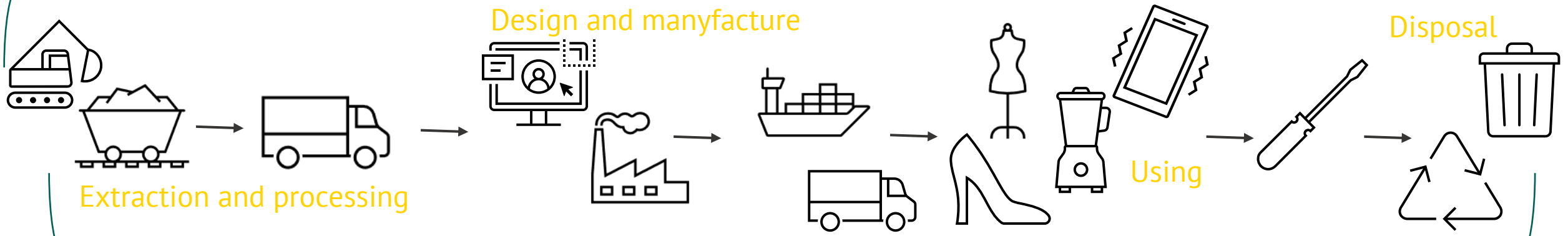
(European Commission 2022)

Life Cycle Assesment

What's the impact

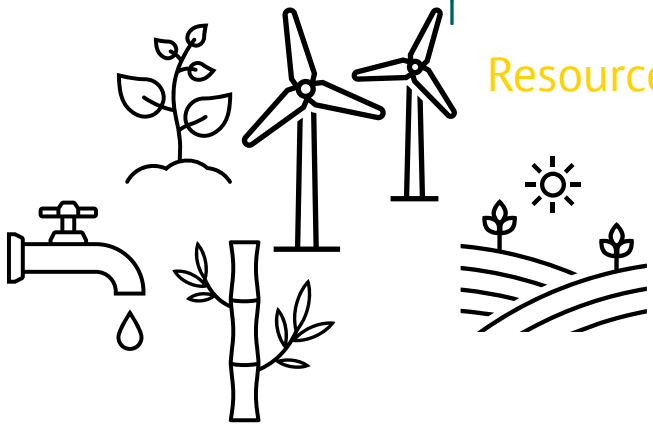
Design and manyfacture

Disposal



Extraction and processing

Using



Resources it needs

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What is a water footprint and what does it include?

Let’s test your water footprint
https://www.watercalculator.org/wfc2

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Conclusion

- All activities produce emissions. Consumption of natural resources, energy, water etc is mandatory in human life, but with circular economy the consumtion can be more sustainable.
- In order to reduce the environmental impacts, you need to know where the impacts comes from.
- In a circular economy, emissions calculation is a tool that can be used to find sustainable ways of working.
- Emissions calculation can be used to compare different modes of operation, taking into account different emission categories.
- LCA can be used to find the emission sources most relevant to a certain process and minimize them.

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Rethink. Resolve. Redo.


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