

# Transitioning to a circular economy: addressing the resource challenge

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# REMOVABLE, REPLACEABLE AND REPAIRABLE BATTERIES

HOW TO IMPROVE THE CIRCULARITY OF RECHARGEABLE BATTERIES IN CONSUMER ELECTRONICS AND LIGHT ELECTRIC VEHICLES



6<sup>th</sup> DECEMBER 2021

CARL DALHAMMAR, JESSIKA LUTH RICHTER

## Planned obsolescence

Built not to last



## Increasing the lifespan of products

Policies and consumer perspectives

ER 2021:25

## The circular economy: towards a new business paradigm with support from public policy



### Abstract

Today, we live in a linear economy and the current situation is a product of past ideas on effective markets, legal concepts and legal culture, business models and ideas on ownership and consumer culture. For us to move to a more circular economy, we need to start questioning how we look at products, markets, ownership and resources.

As a foundation for this process, this report highlights what the circular economy is about and some key issues we need to address to move towards a circular economy. It also highlights the need to connect the business and policy developments related to the circular economy to other sustainability fields, such as climate change and chemicals, and to place it within the broader context of sustainable consumption. A circular economy is not only about taking care of our resources; we must also ensure that all humans have access to the resources they need to live a decent life. Thus, the social dimensions of the circular economy should not be neglected: it must be an economy that benefits all humans.

### Key messages

- Our language is a means for change –we must pay attention to terms we use and

## Moving away from the throwaway society

Five policy instruments for extending the life of consumer durables

Carl Dalhammar  
Cornelia Hartman  
Jörgen Larsson

Johan Jaczin  
Leonidas Milos  
Olziana Mont



## Making governance better for fair and sustainable consumption



### Abstract

The past 50 years have seen the birth of many environmental policies, and yet, despite some progress, the ecological integrity of the planet remains threatened. Resource-intensive lifestyles, and the difficulties in decoupling increased consumption from resource use and greenhouse gas emissions at the scale needed, seem to be the main causes of our crisis.

Furthermore, the current distribution of Earth's resources is very unequal, both between countries, but also within countries. The basic needs of too many people are not met. In order to reach the targets of the Paris Agreement, safeguard ecological limits, and reach sustainable development, we must address the consumption challenge.

### Key messages

- Monitor consumption-based emissions;
- Work towards more fair and inclusive consumption patterns and support strong sustainable consumption governance;
- Develop more comprehensive policy packages for sustainable consumption;
- Support policy experiments that can increase public support for new policies;
- Analyse the potential for introducing sufficiency policies.

### BACKGROUND PAPER

May 2022

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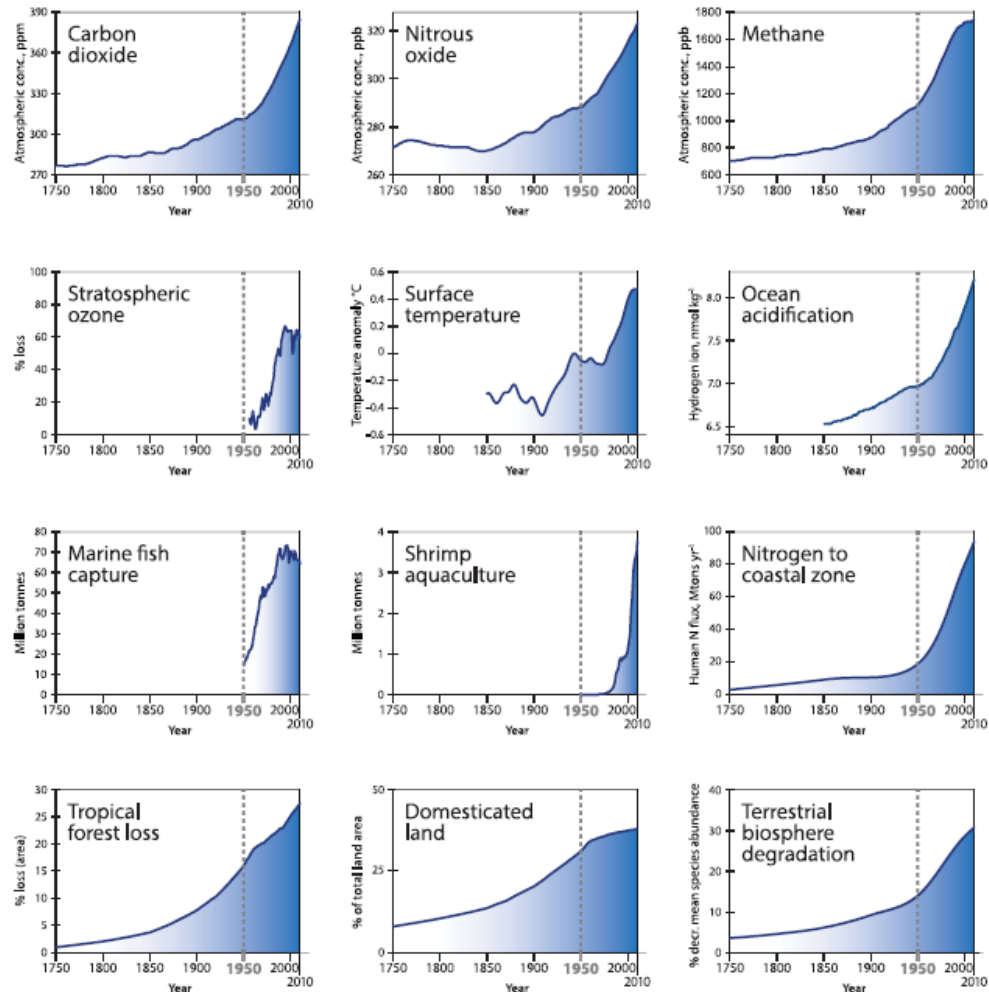
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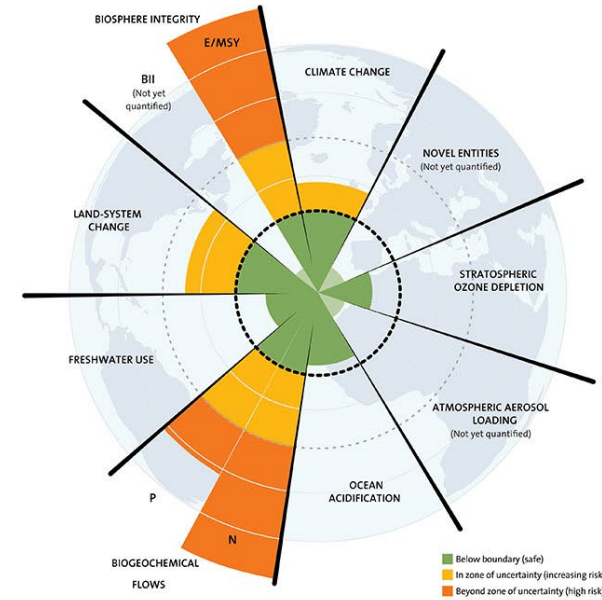
<sup>3</sup> Environmental Sustainability Assessment, Science and Technology, Malmö University, Malmö, Sweden

This Background Paper supports the scientific report, Stockholm+50: Unleashing a Better Future

## Earth system trends



Source: Steffen et al., *The trajectory of the anthropocene...*



Source: SEI

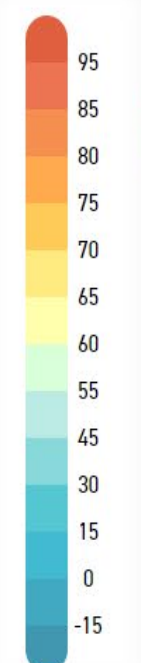
“Using 'business-as-usual' projections, we predict that, by 2100, solid-waste generation rates will exceed 11 million tonnes per day - more than three times today's rate”

Hoornweg et al. 2013, Nature



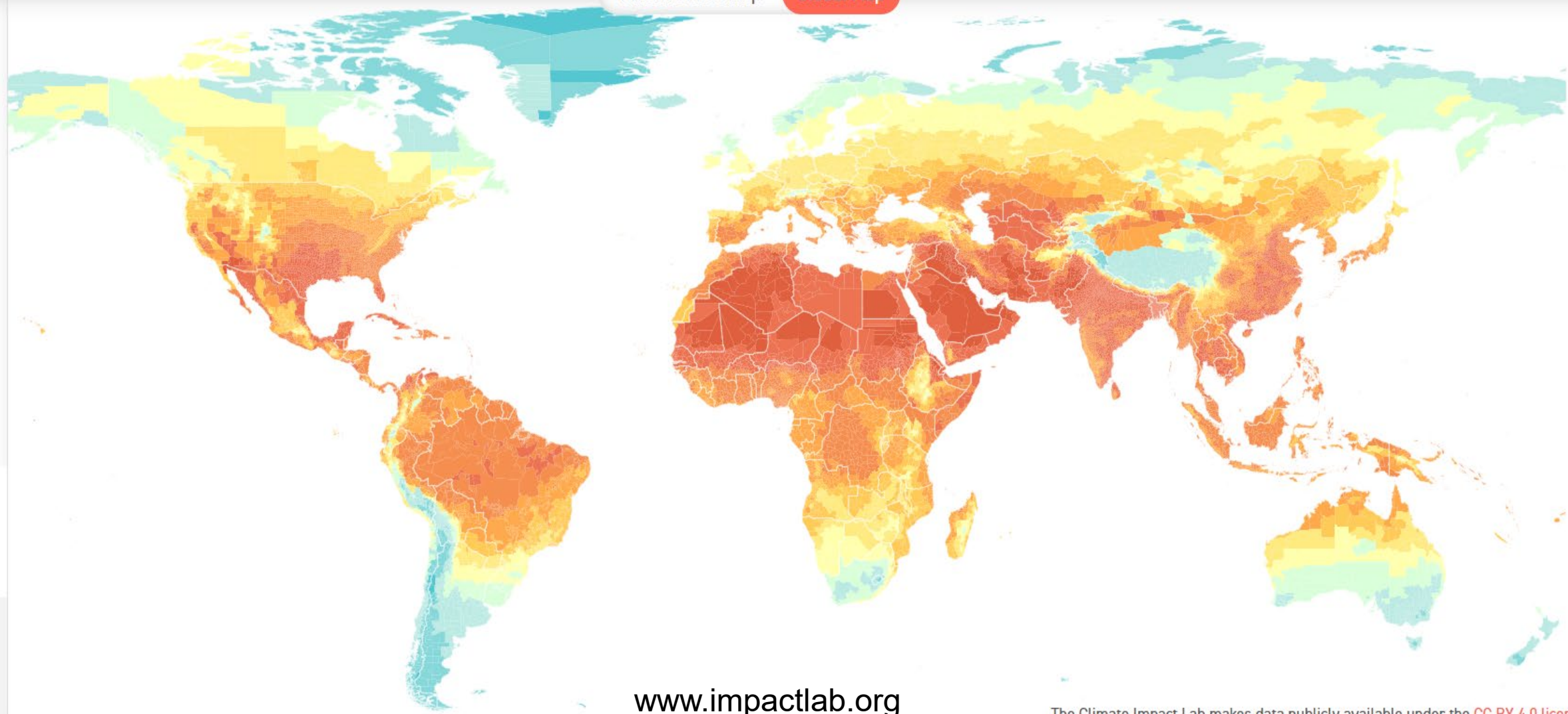
United States Map

Global Map



Temperature

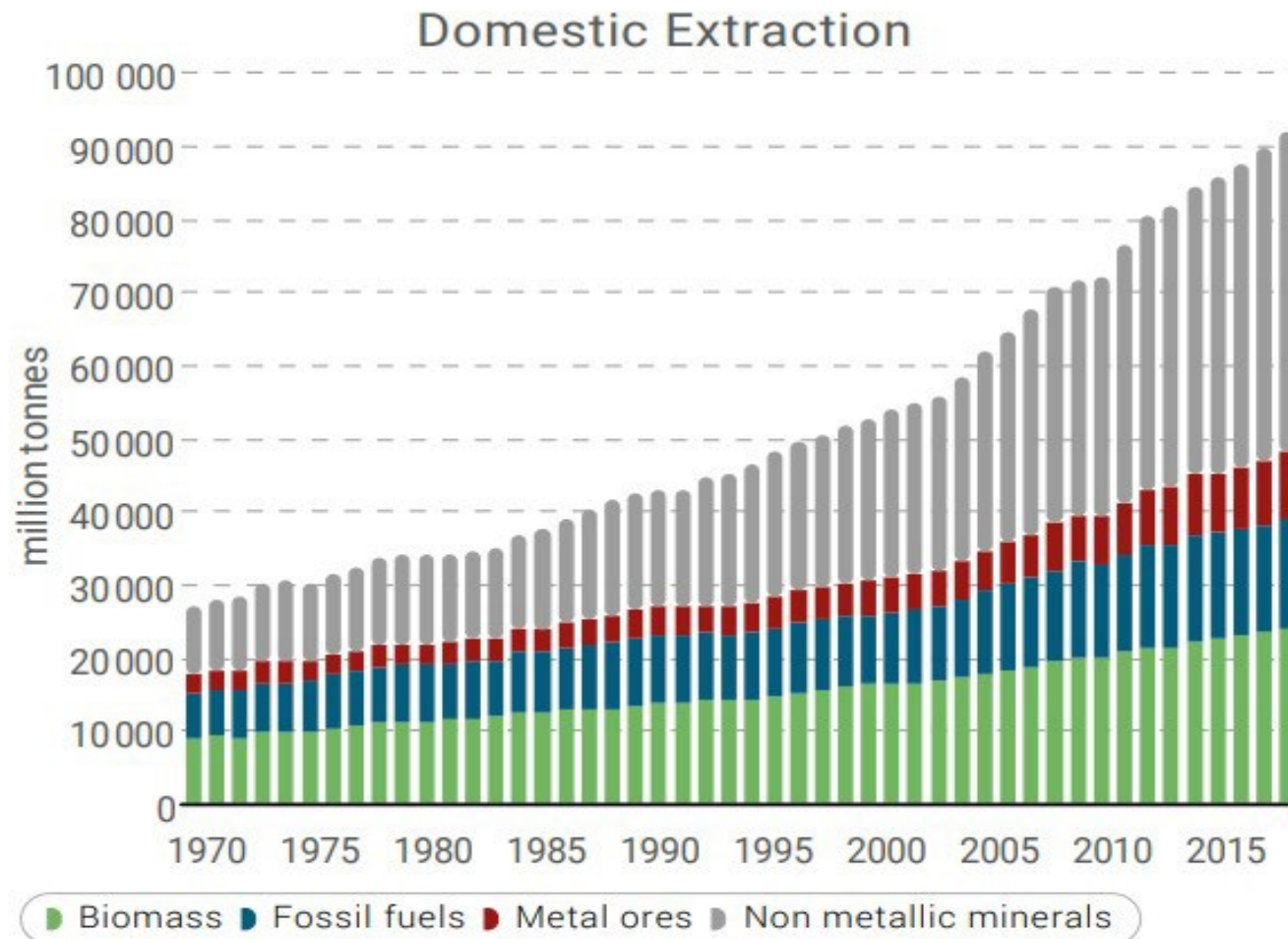
°F  °C



[www.impactlab.org](http://www.impactlab.org)

The Climate Impact Lab makes data publicly available under the [CC BY 4.0 license](https://creativecommons.org/licenses/by/4.0/).

**FIGURE 2.7 Global material extraction, four main material categories, 1970 - 2017, million tons. Obtained by totalling domestic material extraction for all individual nations**



Source: UNEP & IRP, 2018

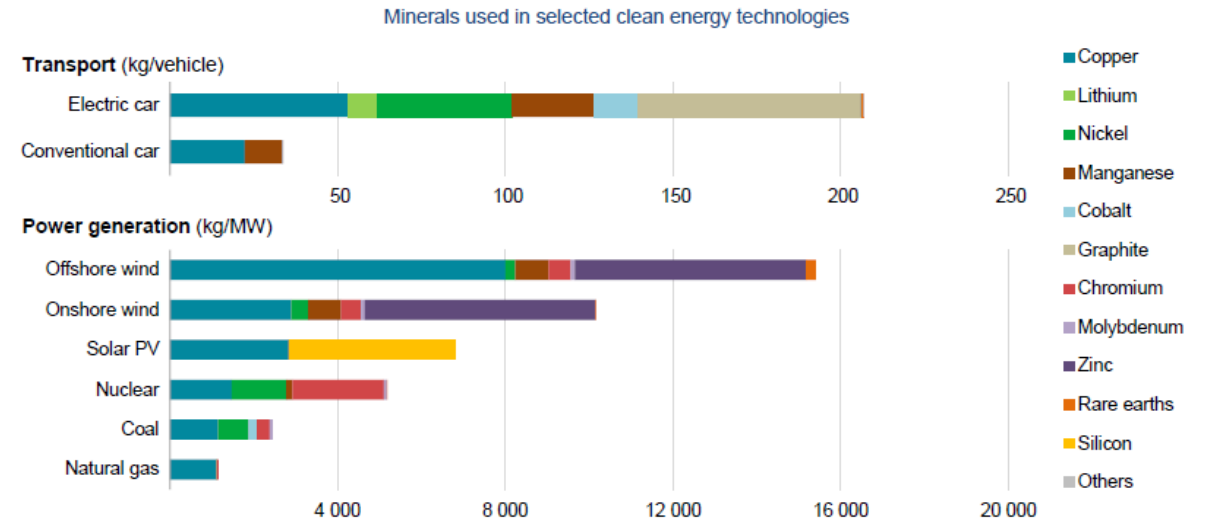
# The climate and resource challenges are connected

## The Role of Critical Minerals in Clean Energy Transitions



World Energy Outlook Special Report

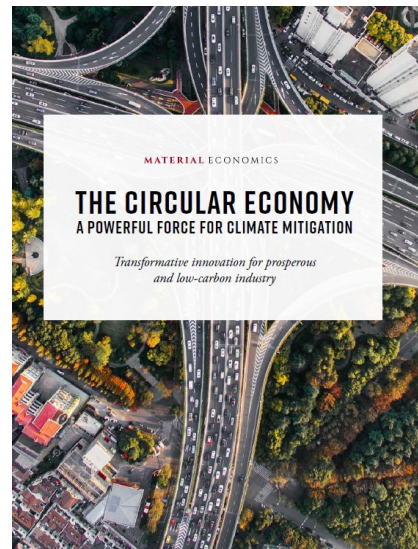
The rapid deployment of clean energy technologies as part of energy transitions implies a significant increase in demand for minerals



Notes: kg = kilogramme; MW = megawatt. Steel and aluminium not included. See Chapter 1 and Annex for details on the assumptions and methodologies. IEA. All rights reserved.

# The Circular economy & the climate challenge: synergies

- The Circular economy has high climate potential
- Longer-lasting products and materials & re-use can cut greenhouse gas emissions



COMPLETING THE PICTURE  
HOW THE CIRCULAR ECONOMY  
TACKLES CLIMATE CHANGE

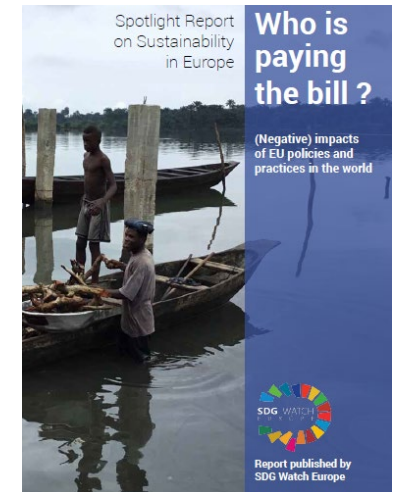
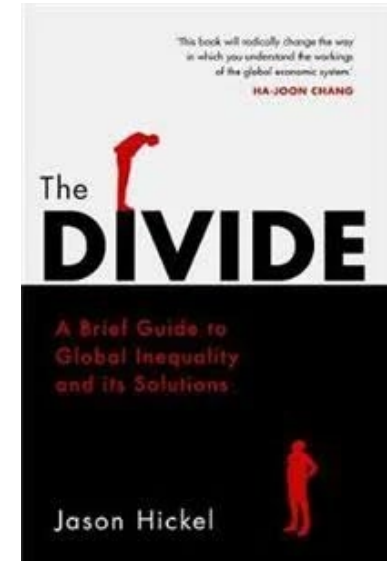


ELLEN MACARTHUR  
FOUNDATION

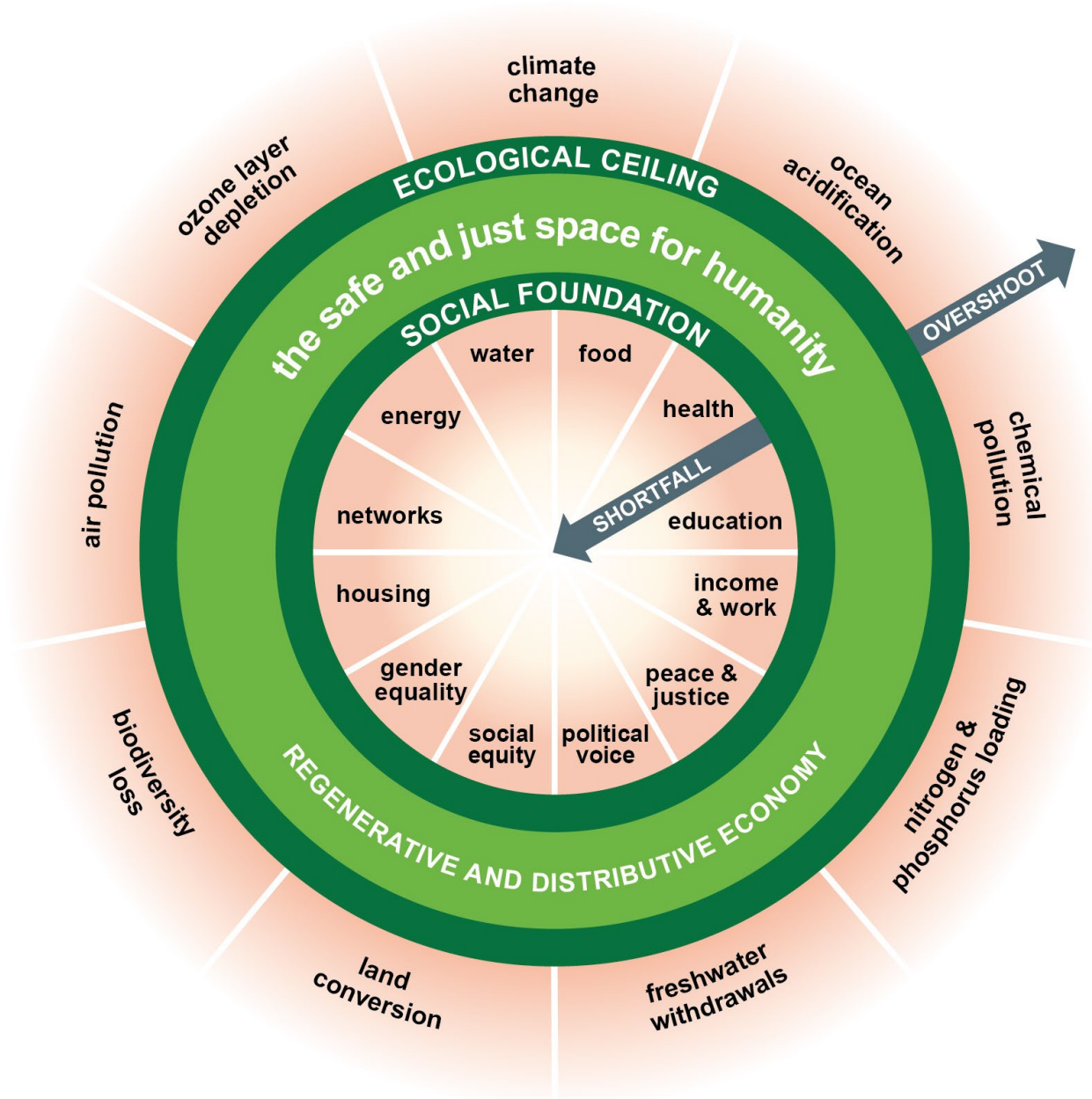
MATERIAL  
ECONOMICS

# Who takes the resources?

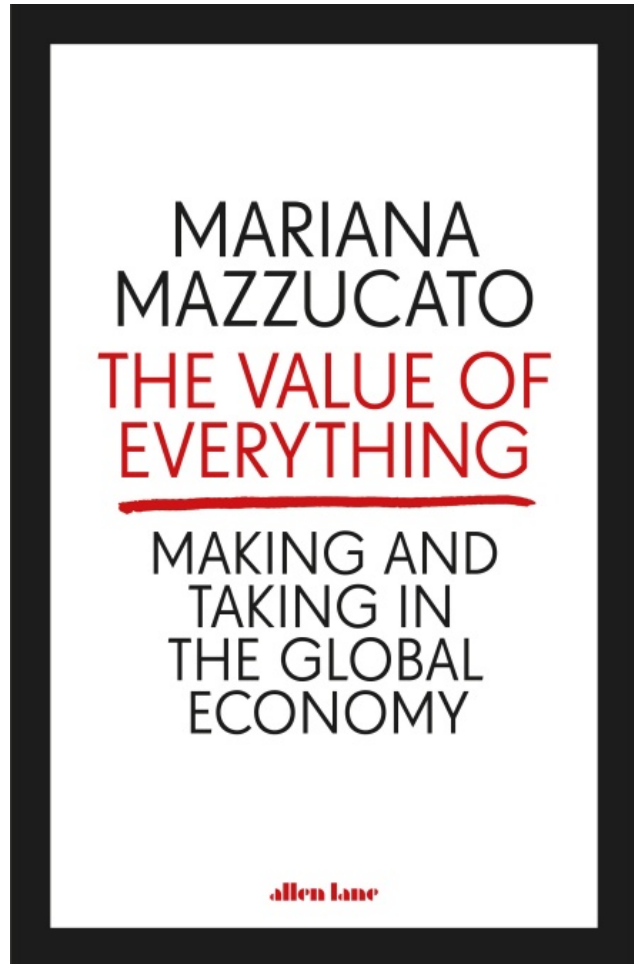
- Resource use per capita points to "neo-colonial" structures: some countries seems to take a bigger and bigger slice of the "pie"
- Poverty is not an accidental by-product of the current economic system, but rather "created" through it







'The Doughnut'  
Kate Raworth



**‘In modern capitalism, value-extraction is rewarded more highly than value-creation:** the productive process that drives a healthy economy and society. From companies driven solely to maximize shareholder value to astronomically high prices of medicines justified through big pharma's 'value pricing', **we misidentify taking with making, and have lost sight of what value really means. ..’**

**STRONG**  
SUSTAINABLE CONSUMPTION

**WEAK**  
SUSTAINABLE CONSUMPTION



**REDUCE**

**SUFFICIENT  
CONSUMPTION**

*If the "pie" isn't growing,  
there is a need to consider  
fairness & justice*

**CHANGE**

**DIFFERENT  
CONSUMPTION**

*"Niche" activities, slow  
progress, limited  
environmental potential*

**IMPROVE**

**BETTER  
CONSUMPTION**

*"The central challenge... is to  
decouple growth absolutely  
from material and energy  
intensity" (UNEP, 2011).*

“I prefer a ‘provocative pessimism’ to an  
‘impotent optimism’ that assumes that  
markets can resolve most problems”

von Wright 1993

“Reality is that which, when you stop  
believing it, doesn’t go away.”

Philip K. Dick

# The necessary response?

- A low-carbon economy
- **A circular economy**
- A toxic-free economy
- A fair economy
- A just transition
- .....

# The linear economy we live in...

- A four-gram golden ring has a 'backpack' of 2 000 kilos of resources that are used in its production (von Geibler et al. 2003)
- **99% of the material content of goods become waste within 6 weeks and 80% of all products are one-way products (Allenby and Richards 1994)**
- **Roughly one third of the food produced in the world for human consumption every year - approximately 1.3 billion tonnes - gets lost or wasted (FAO)**
- **Some buildings are teared down after 50 years, even if they could be renovated**

**Modelling suggests that the sum of unsold textiles and electronics destroyed in the European Union is expected to reach €21.74 billion by 2022**

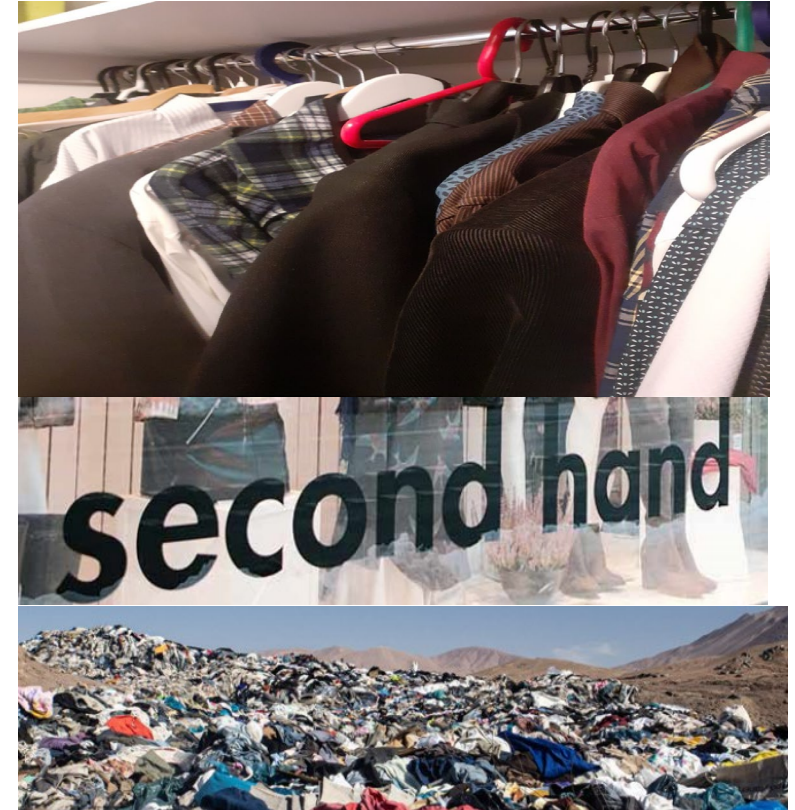
(Rödiger et al. 2021)



# 100 billion textiles each year...

- In Sweden: 15 kg/person/year
- Used on average 7 times...
- Stuff has to be somewhere...

*“Private consumption: Textiles EU's fourth largest cause of environmental pressures after food, housing, transport” EEA*





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# The Circular Economy



Source: Porto protocol



## What is a circular economy?

In our current economy, we take materials from the Earth, make products from them, and eventually throw them away as waste – the process is linear. In a circular economy, by contrast, we stop waste being produced in the first place.

The circular economy is based on three principles, driven by design:

- Eliminate waste and pollution
- Circulate products and materials (at their highest value)
- Regenerate nature

# It's not mainly about recycling!

“In a circular economy, the value of products and materials is maintained for as long as possible.”

European Commission



Term	User	Level
Repair & maintenance	First user	Product
Re-use	Second Hand	Product
Refurbish	Second Hand	Product
Repurpose	Second hand in another application	Product
Remanufacture	Second Hand	Component
Recycle	Same industry (closed) Any other industry (open)	Material
Recovery	Any	Energy/material

# Circular Business models



## Bioeconomy

New products and markets (e.g. wood construction, biobased plastics & products, biorefineries, wood-based textiles), industrial ecology in supply chains etc.



## Manufacturing

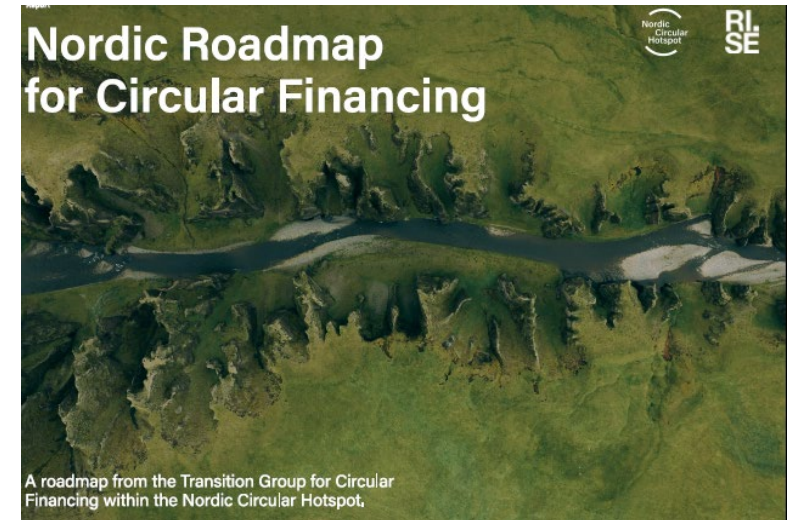
Durable & sustainable products, remanufacturing, repair, re-use, sharing & renting (cars, tools etc.), PSS, modular design, design for durability & repair, software support & upgrading etc., recycling of materials



# Supporting circular business models

- Public procurement of reconditioned furniture, ICT, biobased plastics, wood construction
- Light-as-a-service
- Reduced value added tax for the repair sector
- Financing
- Education ( e g repairers)
- Addressing throwaway culture

**BRIGHTCO**



## Increasing product lifetimes by...

- Ban product destruction: unsolds goods and e-returns
- Better design
  - Design for longevity, design for disassembly, design for maintenance etc...
  - Software: updates and obsolescence
- Increase repairability
  - Design, access to spare parts, cheaper repair services, repair cafés and education etc.

## Designers and engineers have a role to play...

- But often limited freedom! That is why we need regulation!

*‘Our industry is stuck in an unsustainable loop that can only be broken through strong regulation’*

Designer, cell phone manufacturer

*“The allegation of a deliberately intended premature product obsolescence was vehemently rejected by all designers. The limitations through obsolescence are caused by ... rising complexity, increasing speed of innovation cycles and high cost pressure. These conditions and their constraints leave little space to single actors of the development process and to companies. In this sense obsolescence is systemic.”*

Longmuss & Poppe 2017 (interviews with German designers)



Long-lived buildings, easy to maintain, modular design etc.



Recycle the building and use recycled materials in new buildings



Bioeconomy solutions – built with natural materials

What is a **circular building**? Should it have a long lifetime, be easy to take apart and re-use/recycle materials? Should it be built with natural materials?

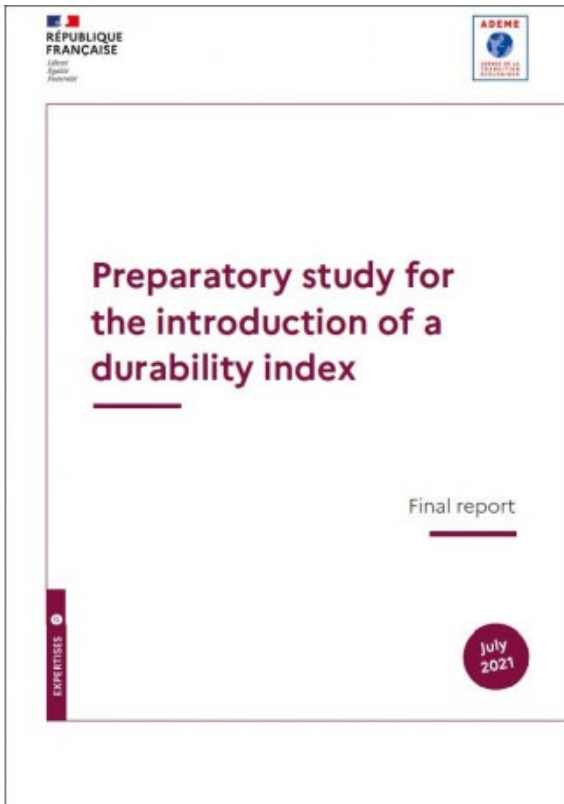
# How promote product durability directly?

- **EU Ecodesign requirements - product design**
  - Exists for vacuum cleaners, light bulbs
  - Vacuums: motor lifetime and hose stability
  - Light bulbs: lifetime, different dimensions
  - Recently proposed MEPS/Energy Label, phones & Tablets: battery longevity, protection from dust and water, resistance to accidental drops
- ...but difficult to regulate for many product groups – need for standards
- Problem of testing products



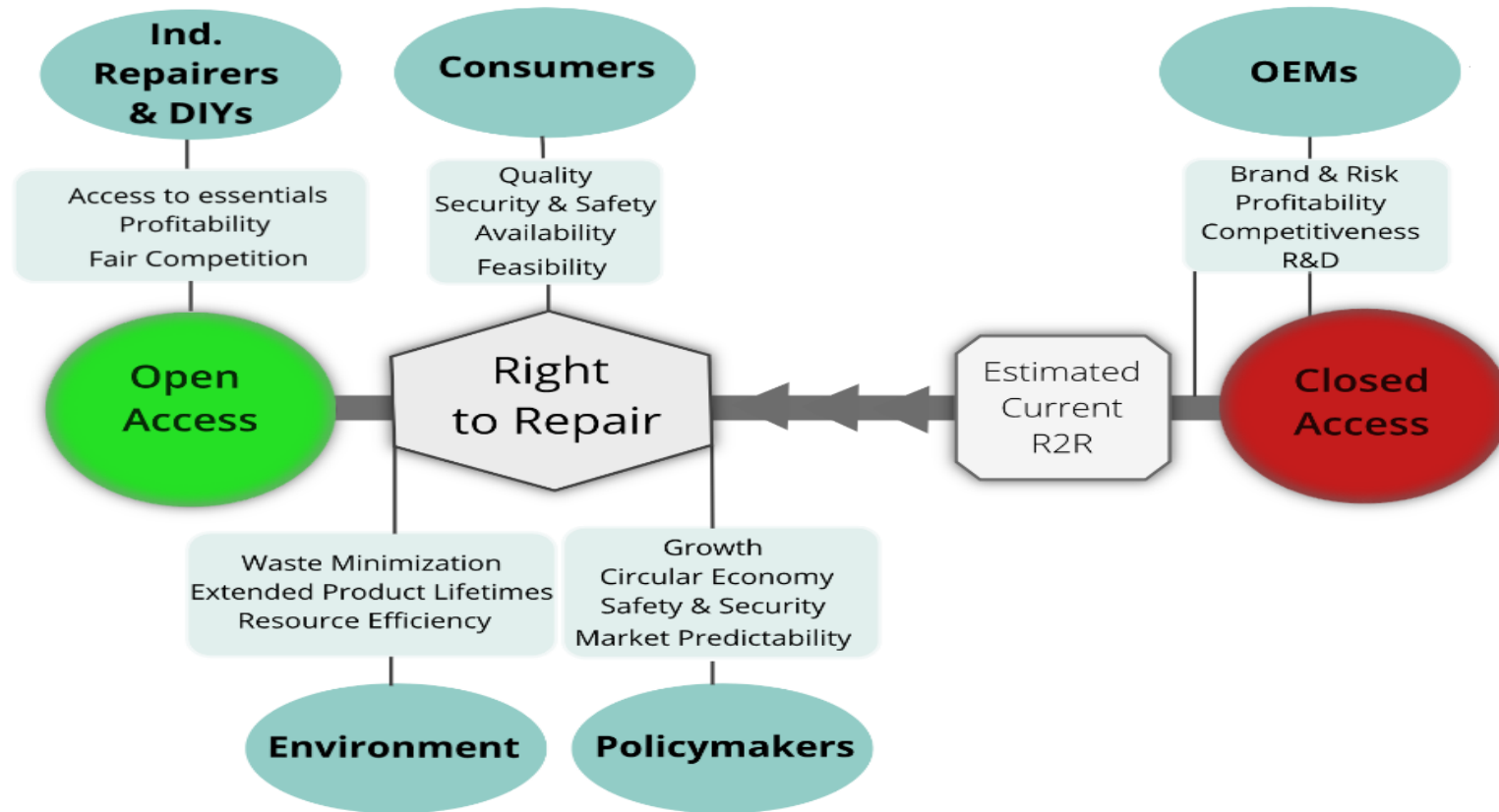


# How promote product durability 'indirectly'?



- Longer consumer guarantees in consumer law
  - Some countries have a three year mandatory guarantee
- Criminalization of planned obsolescence (FR)
- Using competition law to fine companies for slowing down cell phones due to software updates (IT)
- Proposed: French 'durability index'

# Promoting 'right-to-repair' (R2R)



# Promoting 'right-to-repair' (R2R)

- EU Ecodesign Directive: manufacturers must provide spare parts, repair manuals, software to independent repairers and consumers
- EU Consumer law: R2R proposal, more rights for consumers
- New Ecodesign Regulation: More information about repairability, spare parts, software updates

# Promoting 'right-to-repair' (R2R)

- French repair index



# 5. METHOD FOR THE CALCULATION OF THE REPAIRABILITY INDEX OF SMARTPHONES AND SLATE TABLETS

## 5. METHOD FOR THE CALCULATION OF THE REPAIRABILITY INDEX OF SMARTPHONES AND

The Repairability Index is an aggregated and normalised score, as a calculated value derived from six

— SDD is the ‘Disassembly Depth’ score.

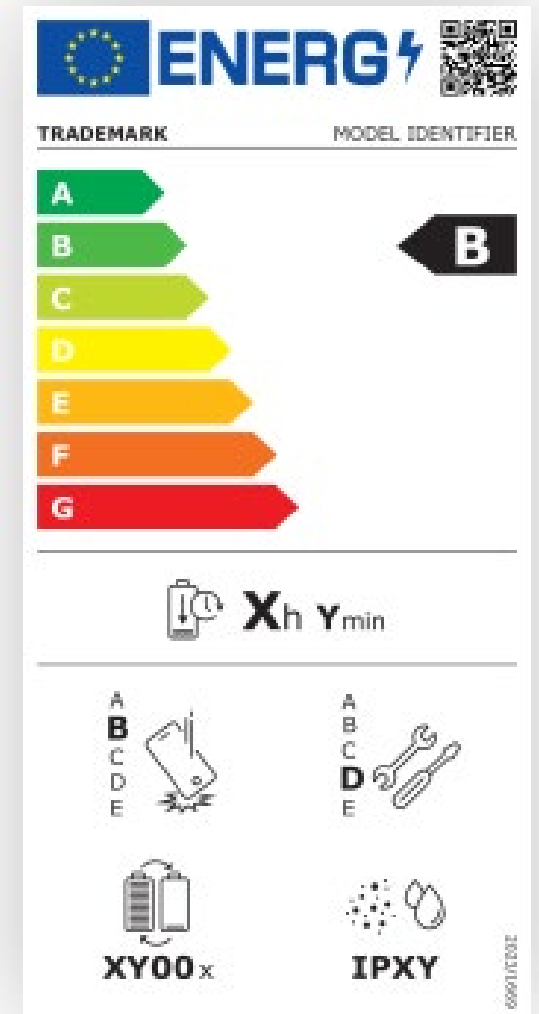
— SF is the ‘Fasteners (type)’ score.

— ST is the ‘Tools (type)’ score.

— SSP is the ‘Spare Parts’ score.

— SSU is the ‘Software Updates (duration)’ score.

— SRI is the ‘Repair Information’ score.



# Destruction of unsold/returned products

- **EU proposal**

- Reporting obligations
- Direct ban on destruction of textiles

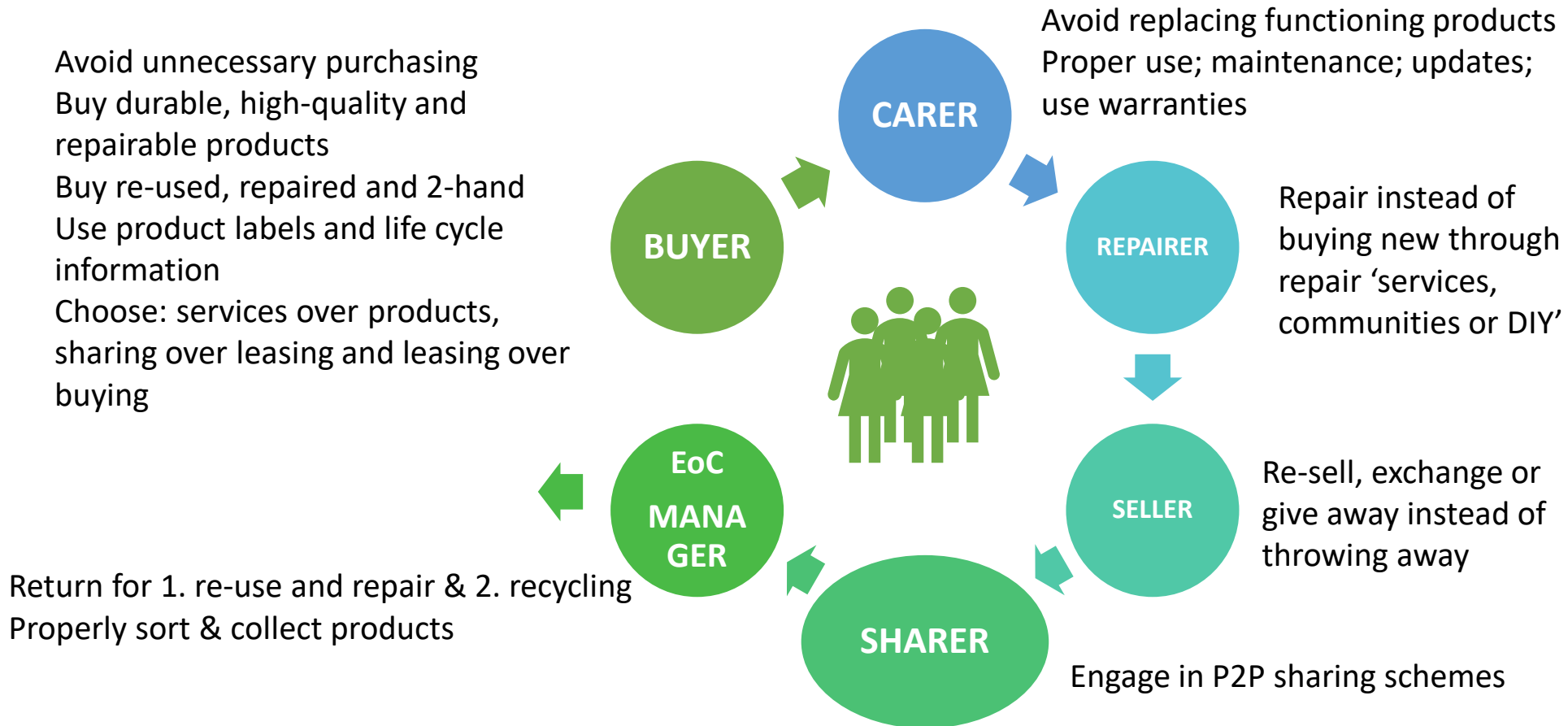
- **National measures**

- Ban on destruction (France)
- Reduced VAT for donations (Belgium)
- Reporting requirements (Germany)

**Modelling suggests that the sum of unsold textiles and electronics destroyed in the European Union is expected to reach €21.74 billion by 2022**

(Rödиг et al. 2021)

# Citizen roles in "circular" consumption



Source: O. Mont., based on Maitre-Ekern & Dalhammar



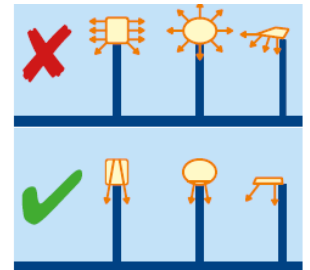
# Lighting

- We have made one 'transition' - aided by public policies
- As the energy efficiency improvements ebb out, time to focus on replacement and lifetime?
- Rebound effects, light pollution, biodiversity implications etc.
- Solutions such as 'light-as-a-service' shows that you can both improve experience and sustainability
  - But most people give little thought to lighting



## How to protect biodiversity from light pollution<sup>2,3,4</sup>

- ▶ Reduce the overall light output.
- ▶ Use luminaires with direct light distribution (full cut off lighting).
- ▶ Choose warm white light colour for public lighting.
- ▶ Provide regulations for the maximum luminance level, size, and placement for advertising panels.
- ▶ Restrict sky beamer light shows (or limit to minimum periods).
- ▶ Install insect-tight luminaires.
- ▶ Reduce illumination in areas close to nature and parks.
- ▶ Use light control systems to lower the illumination level during the times of low traffic.



Source: LUCIA project



# Digital product passports (ESPR & Battery Regulation)

Supporting standards for products, materials, reporting and monitoring etc.  
Legal framework for sustainable finance, e.g. reporting and taxonomy

## Upstream – supply chains

## Design, production, information

## Point of sale

## Product destruction

## Use phase

## End-of-use

### *Examples of EU policies*

- Proposal for a Regulation on deforestation-free products
- Conflict Minerals Regulation
- Proposal: Carbon border adjustment mechanism
- Timber Regulation
- Proposal: Directive on Corporate Sustainability Due Diligence
- Proposal: Regulation on prohibiting products made with forced labour on the EU market
- Critical Raw Materials

- Proposal Ecodesign Regulation (ESPR)
- Ecodesign Directive
- REACH, RoHS, ELV Directive etc.

- Rules on consumer rights, guarantees, marketing
- Proposals for consumer information: Empowering consumer green transition
- Proposed labeling in proposal for Ecodesign Regulation (ESPR)
- Proposed Directive on Green Claims
- Mandatory energy labeling
- EU Eco-label (voluntary)

- Rules on reporting/bans on unsold goods in proposal for Ecodesign Regulation (ESPR)

- Legal proposal on right-to-repair in consumer law
- Proposed Battery Regulation: easier to replace batteries in products
- Rules on right-to-repair in Ecodesign Directive (and forthcoming ESPR): provision of spare parts, tools, manuals etc.

- Rules on producer responsibility and packaging
- Standards on e.g. remanufacturing
- New legal definition on e.g. refurbishment & remanufacturing, ESPR

### *Examples of national, regional and local policies*

- Supply Chain Due Diligence Act (Ger)
- Fashion Sustainability and Social Accountability Act (NY State)
- Corporate responsibility for human rights (Can)
- Transparency Act (Nor)

- Mandatory labeling information (Fra)
- Repair fund (Fra)
- Criminalisation of planned obsolescence (Fra)

- Repair index (Fra)
- Proposed durability index (Fra)
- Longer guarantees in consumer law (several EU MS)
- Voluntary eco-labels

- Partial ban, destruction on unsold goods (Fra)
- Duty of Care (Ger)
- No VAT on donated goods (Bel)

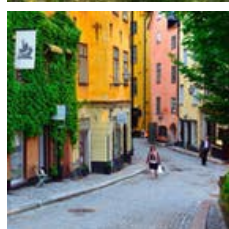
- Repair fund (Fra)
- Tax reductions on repairs (Swe)
- Repair vouchers & repair networks (Vienna, Graz)

- Re-use options at recycling stations
- Public procurement of remanufactured goods
- Local re-use centers and support to second-hand sector

# Tack så mycket! Thank you!

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- Sharing Cities: Governance and Urban Sustainability  
How can we govern the sharing economy in our cities?