Seminário

Sinergia entre Ambiente, Finanças Verdes e Economia Circular para um Futuro Sustentável

14 de novembro 16h00-17h30

Economia Circular

Cristina Sousa Rocha, Unidade de Economia de Recursos, LNEG

LABORATÓRIO NACIONAL DE
ENERGIA E GEOLOGIA
INVESTIGAÇÃO PARA A SUSTENTABILIDADE

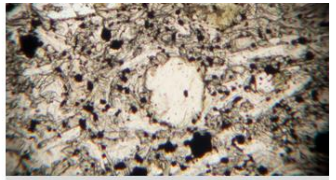
www.lneg.pt

At LNEG we do Science in **Energy, Geology** and **Geological Resources** with a view to its application in advanced solutions that allow the leverage of our Economy

Laboratory of Geology and Geological Resources


GEOLOGY, HYDROGEOLOGY AND COASTAL GEOLOGY UNIT


GEOSCIENTIFIC INFORMATION UNIT

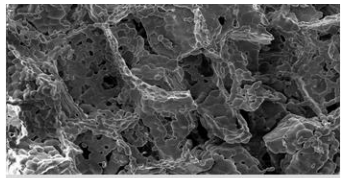

MINERAL SCIENCE AND TECHNOLOGY UNIT

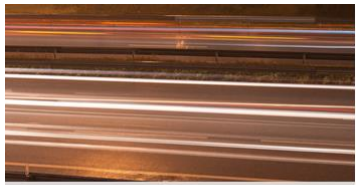

MINERAL RESOURCES AND GEOPHYSICS UNIT

Laboratory of Energy


RENEWABLE ENERGIES AND ENERGY EFFICIENCY UNIT


BIOENERGY AND BIORREFINERIES UNIT


MATERIALS FOR ENERGY UNIT


RESOURCE ECONOMICS UNIT

Can we save the planet by imitating nature?

https://static.xingcdn.com/content/insider/header_images/images/000/577/224/web_high/9c1f90e58f974b3418f185e524fe37eb54c2768bimage.jpg?1488548039

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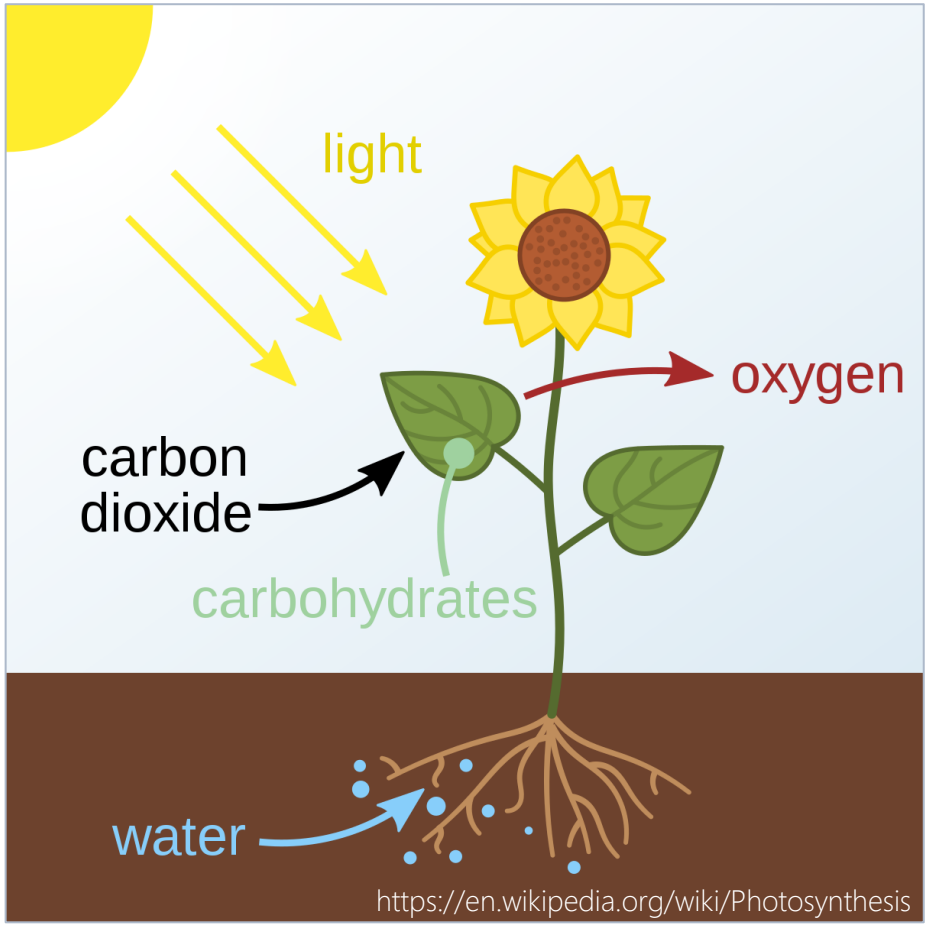
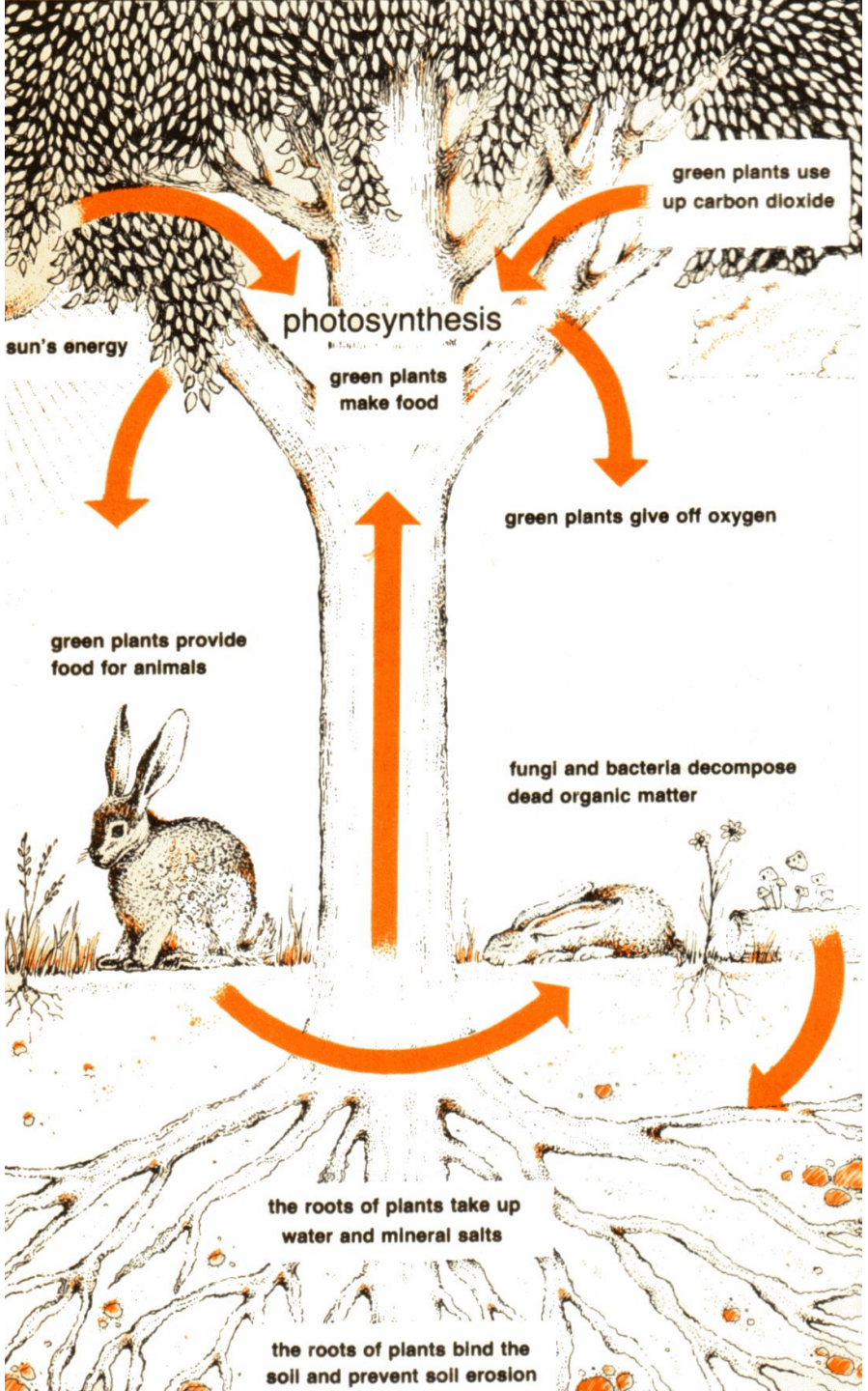


Generating energy from the sun

Life-friendly chemistry

Supporting biodiversity

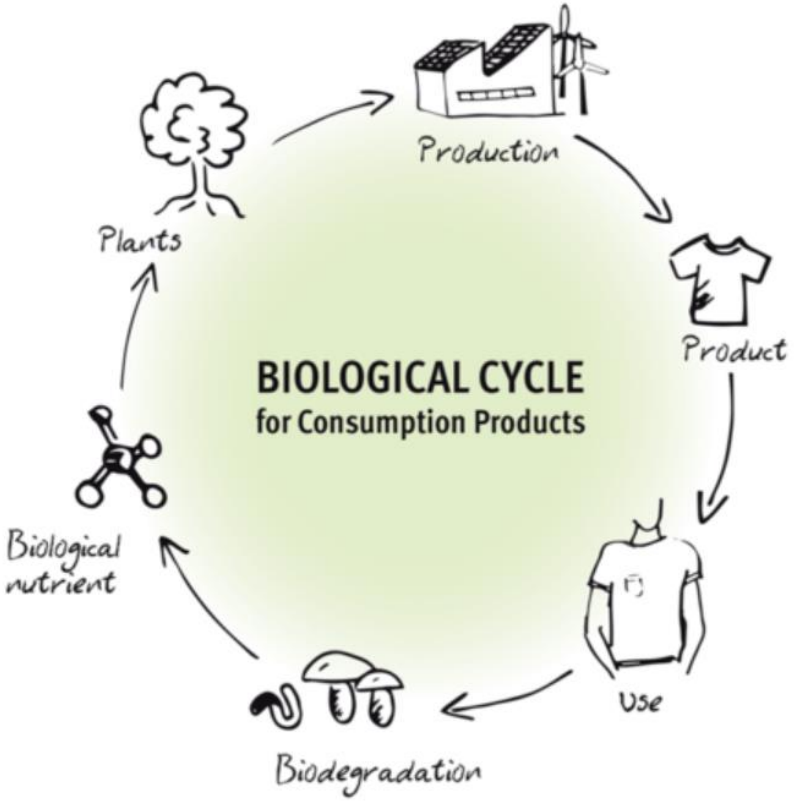
Recycling materials in endless cycles, energised by the sun

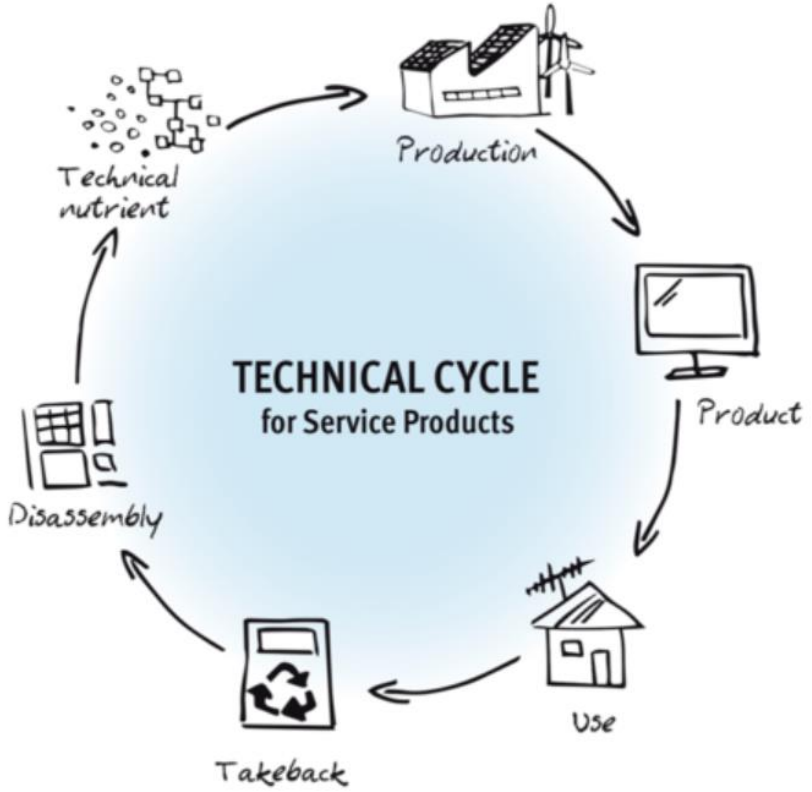


https://rnrbusiness.wordpress.com/2012/08/02/the-business-nature-model-6/

Just as in the natural world, in which one organism's “waste” cycles through an ecosystem to provide nourishment for other living things, **cradle**-to-**cradle** materials circulate in **closed**-**loop** cycles, providing nutrients for nature or industry.

https://mcdonough.com/writings/cradle-cradle-alternative/



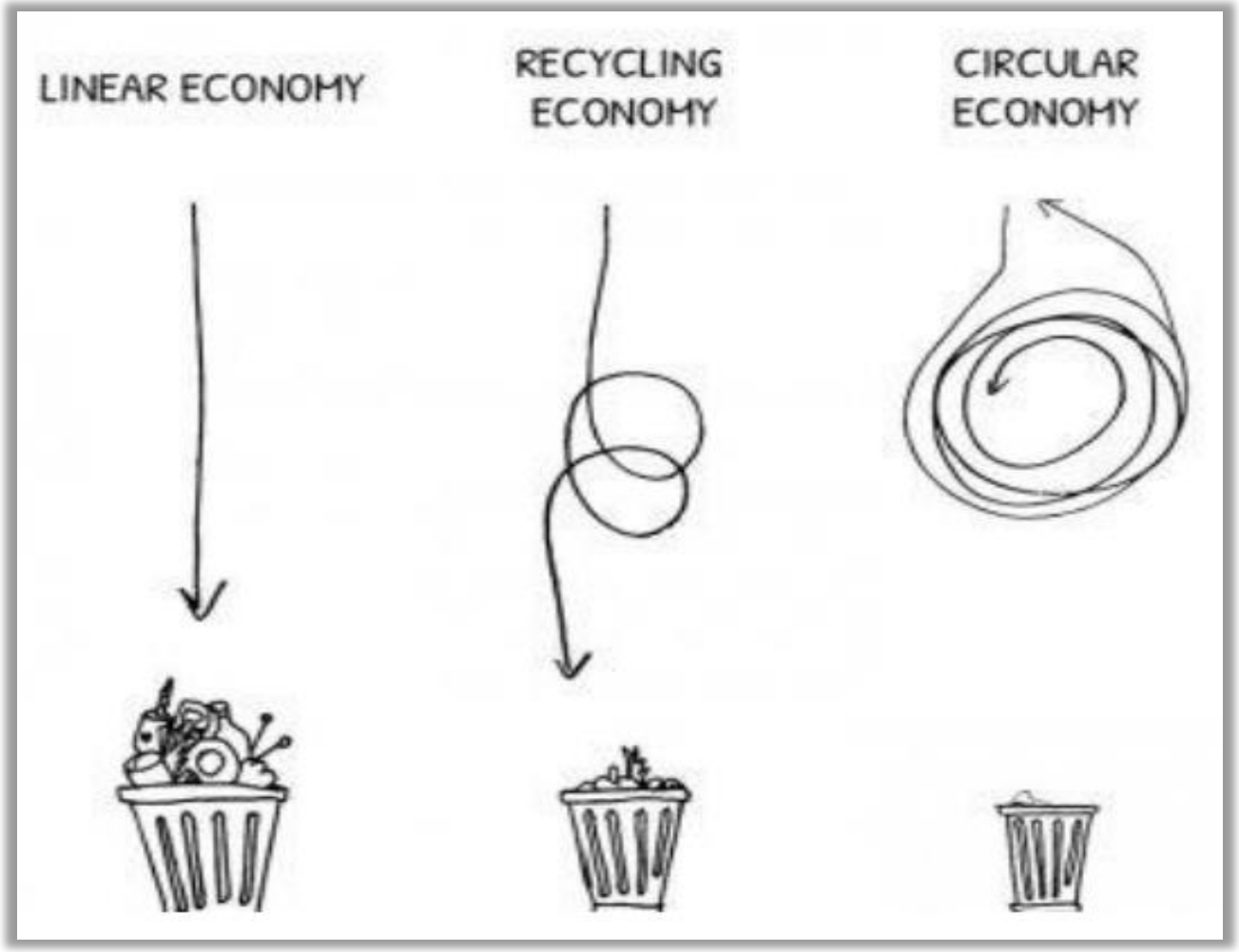


https://epea.com/en/about-us/cradle-to-cradle

Circular economy

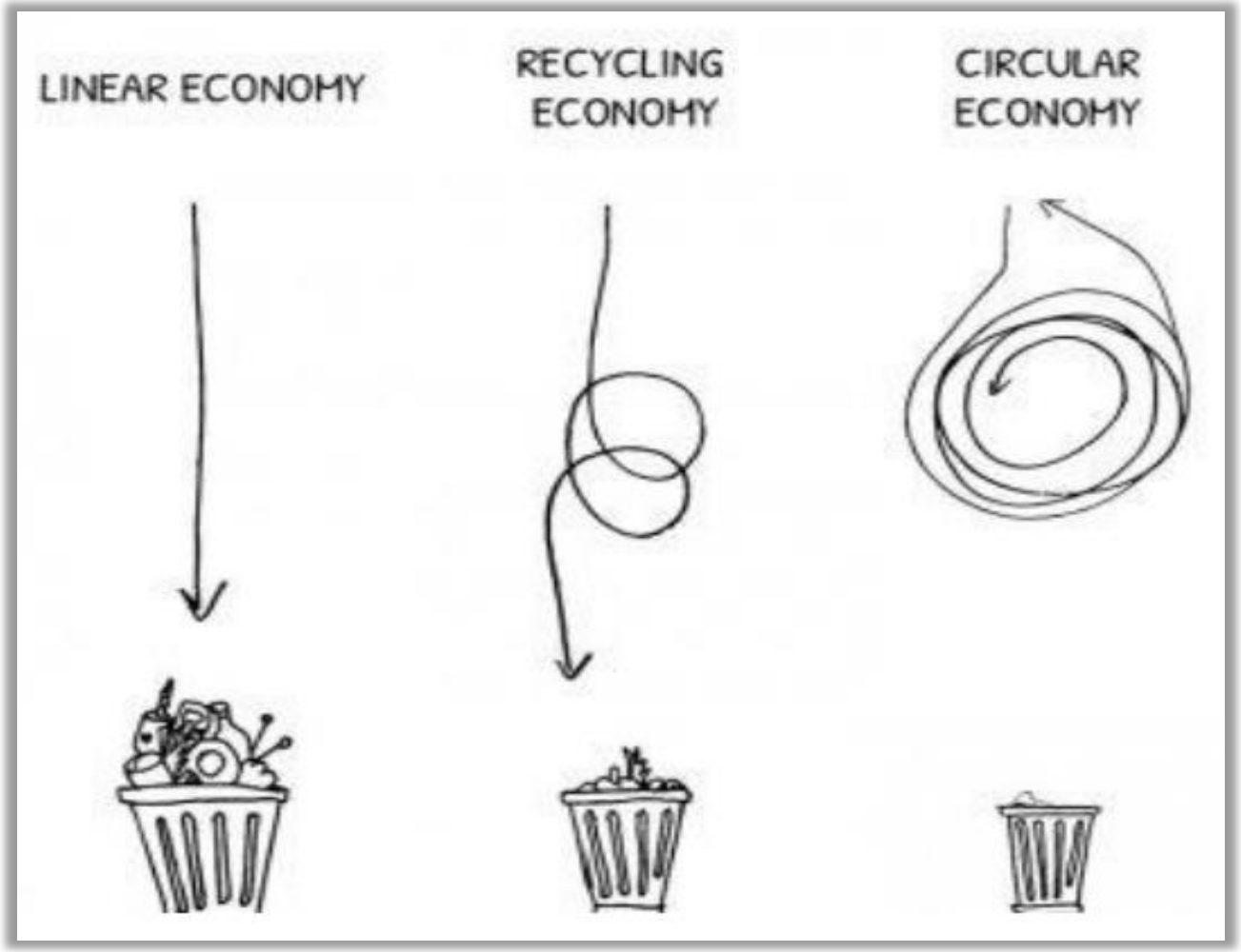
Principles for production and consumption radically different from the **“take-make-use-discard”** regime.

The **linear model** is based on the assumption that natural resources are available, abundant, cheap, easy to find and easy to dispose of.



Circular economy

An economic model of production and consumption in which renewable and non-renewable resources **circulate in the biosphere** and **technosphere**, at their **maximum value** and for the **longest possible time**, in cycles powered by renewable energies.



2018: 9,1%
2022: 8,6%
2023: 7,2%

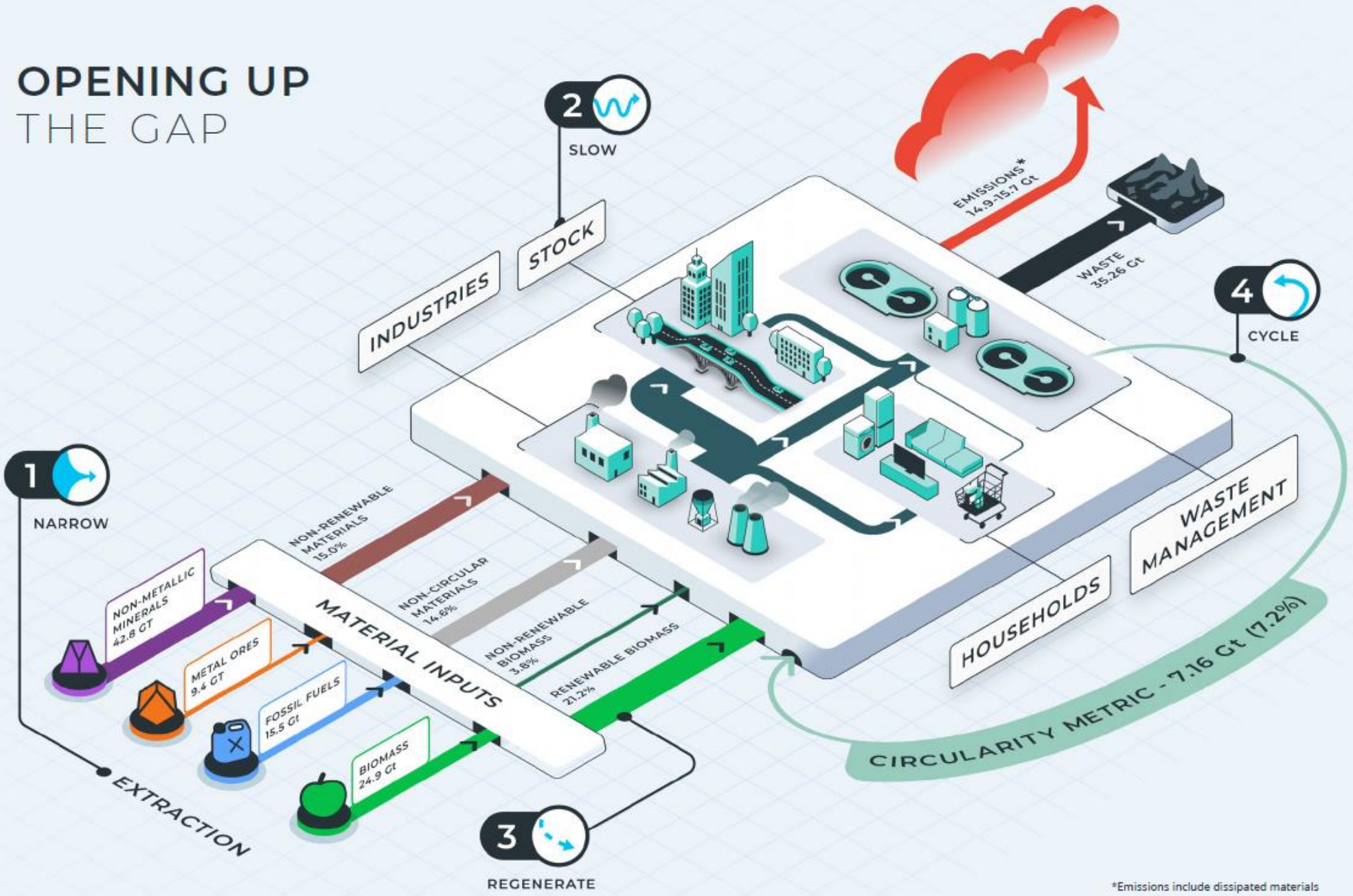
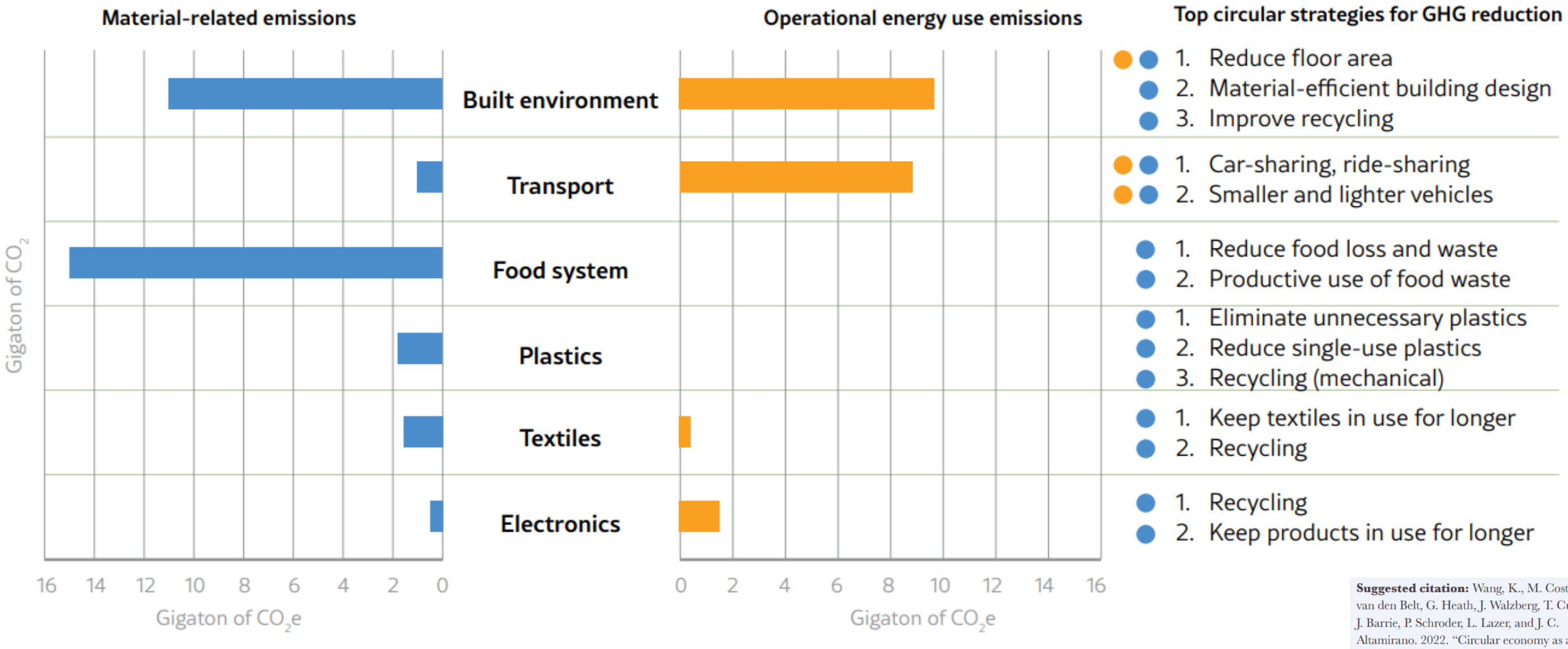


Figure one illustrates how key materials flow into different parts of the economy—including additions to stock and waste—and highlights where circular strategies (narrow, slow, regenerate and cycle) may be most appropriate.

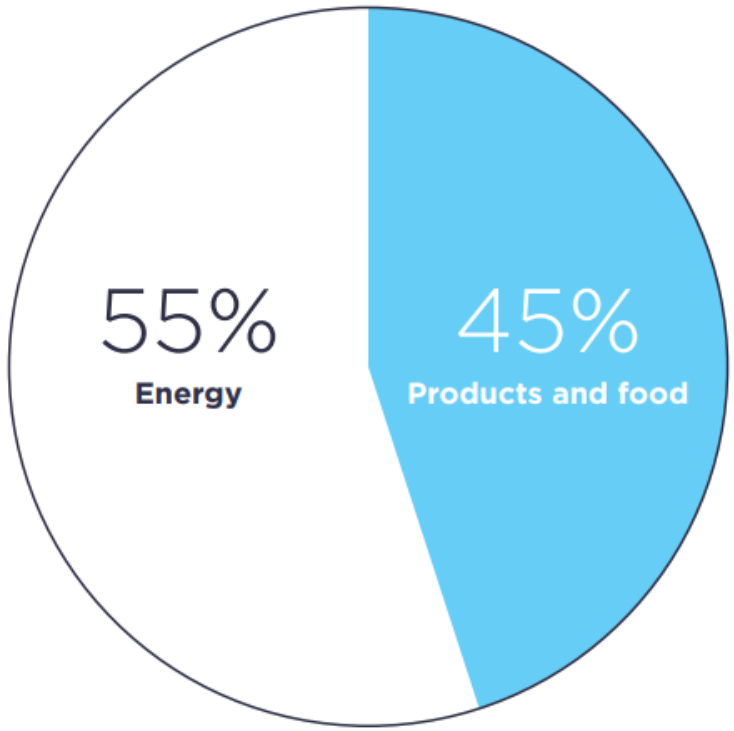
Figure 3 | **Materials-related and operational energy use emissions by sector, alongside the circular economy strategies with highest projected greenhouse gas reduction potential**



Suggested citation: Wang, K., M. Costanza-van den Belt, G. Heath, J. Walzberg, T. Curtis, J. Barrie, P. Schroder, L. Lazer, and J. C. Altamirano. 2022. "Circular economy as a climate strategy: current knowledge and calls-to-action." Working Paper. Washington, DC: World Resources Institute.

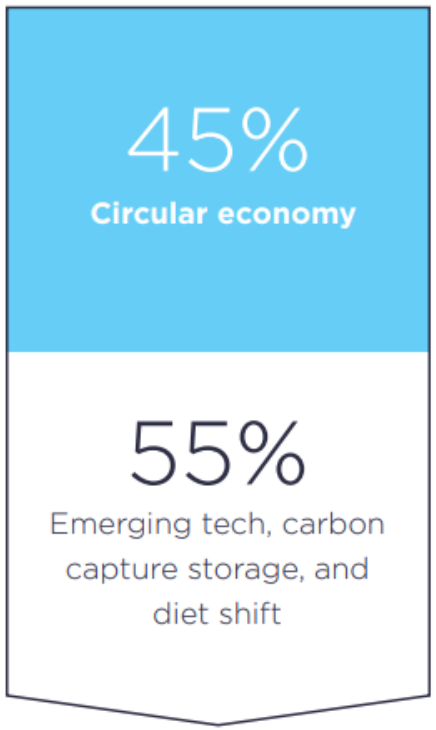
Completing the picture: tackling the overlooked emissions

Total current emissions



Examples covered in paper. (Food, steel, cement, plastic, and aluminium)

Emission reductions in 2050

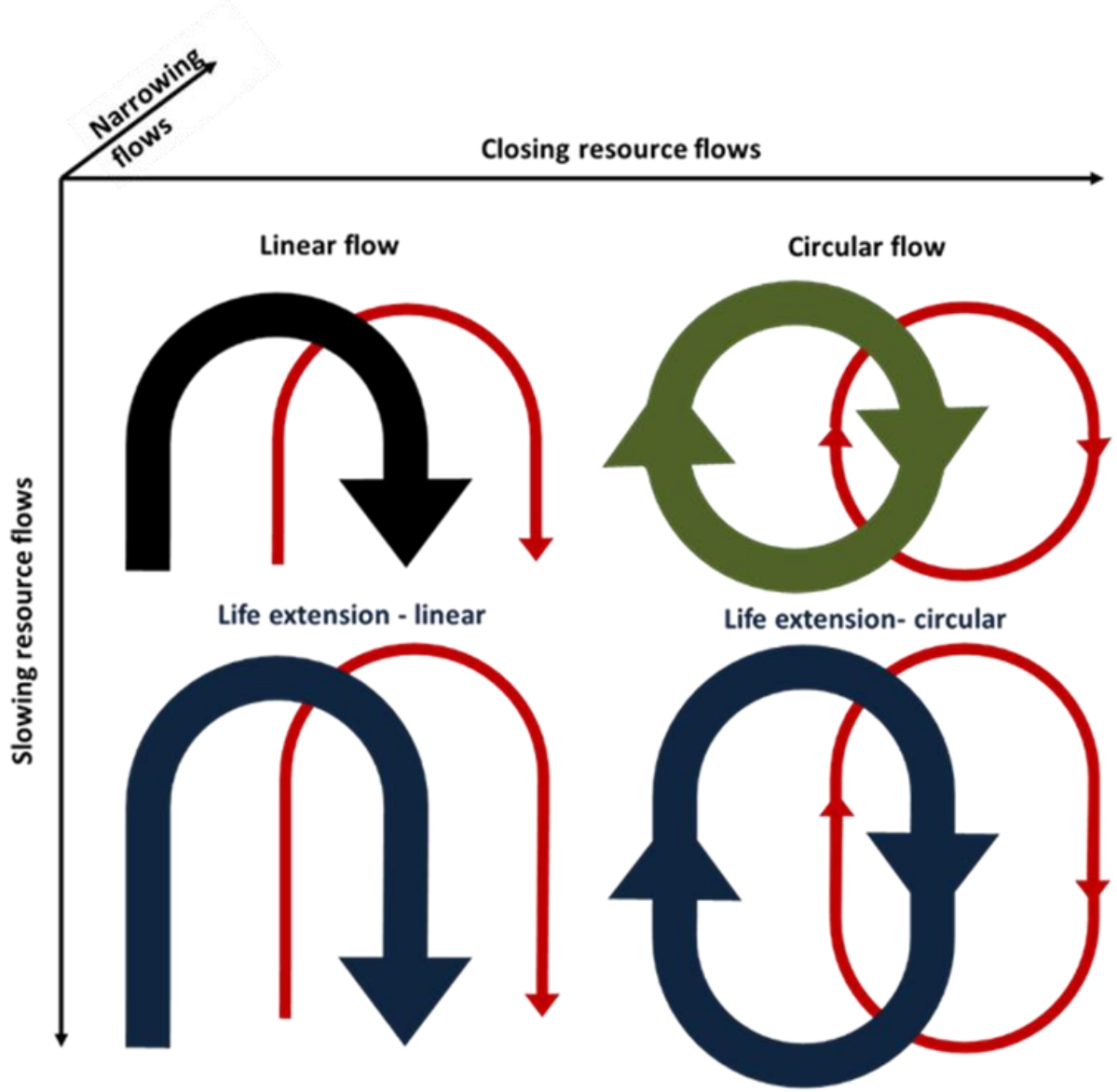


ZERO EMISSIONS

ellenmacarthurfoundation.org

- **Slowing, closing and narrowing loops**
  - Closing: recycle to close the loops (USE AGAIN)
  - Slowing: slowdown of resource consumption (USE LONGER)
  - Narrowing: use fewer resources per product (USE LESS)

- **Regenerating loops** (MAKE CLEAN)

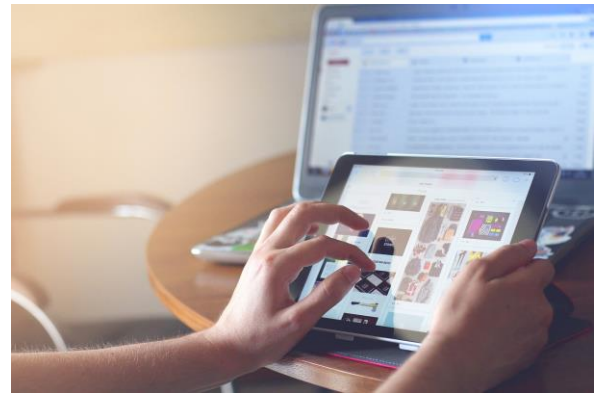


Circular design?

- Most products today are designed for fast replacement in the linear economy
  – just think of
    - Fashion, or
    - Electronic devices

- To create circular economy, circularity should be considered already in the design phase

https://cdn.pixabay.com/photo/2016/11/23/17/24/automobile-1853936_1280.jpg



https://cdn.pixabay.com/photo/2015/06/24/15/45/ipad-820272_1280.jpg

Circular design

https://www.pexels.com/pt-br/foto/branding-canetas-design-lapis-6444/

Most design decisions are not reversible

Potential of:

- Durability
- Repairability
- Maintenance
- Reuse
- Refurbishment
- Remanufacturing
- Recycling

"WE DON'T HAVE A WASTE PROBLEM WE HAVE A DESIGN PROBLEM."

- Michael Braungart & William McDonough

> 80% environmental impacts of a product in its life cycle are determined at the **design** phase

https://joint-research-centre.ec.europa.eu/scientific-activities-z/sustainable-product-policy_en

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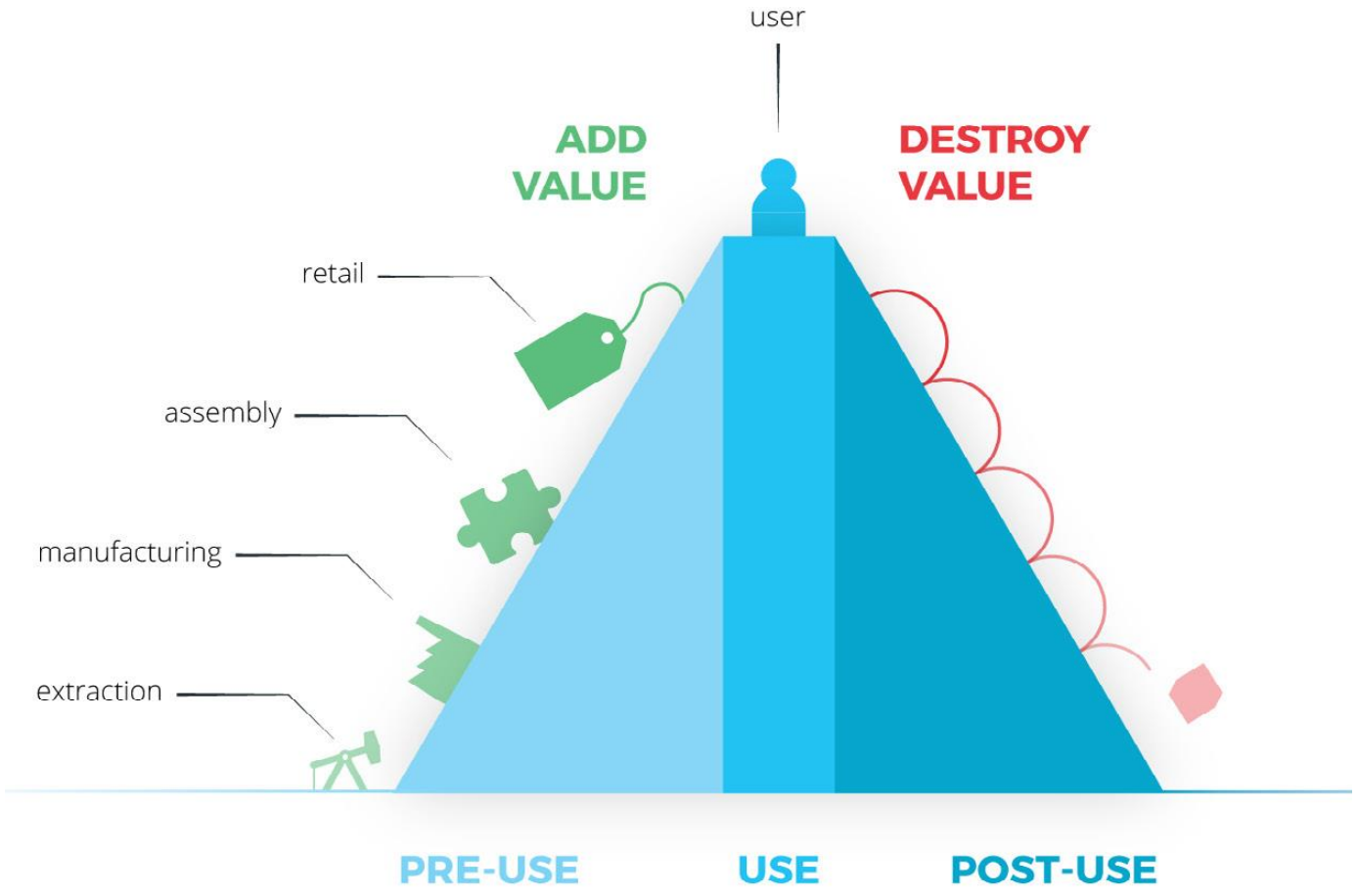
The circular economy is also about capturing and retaining value

The Value Hill

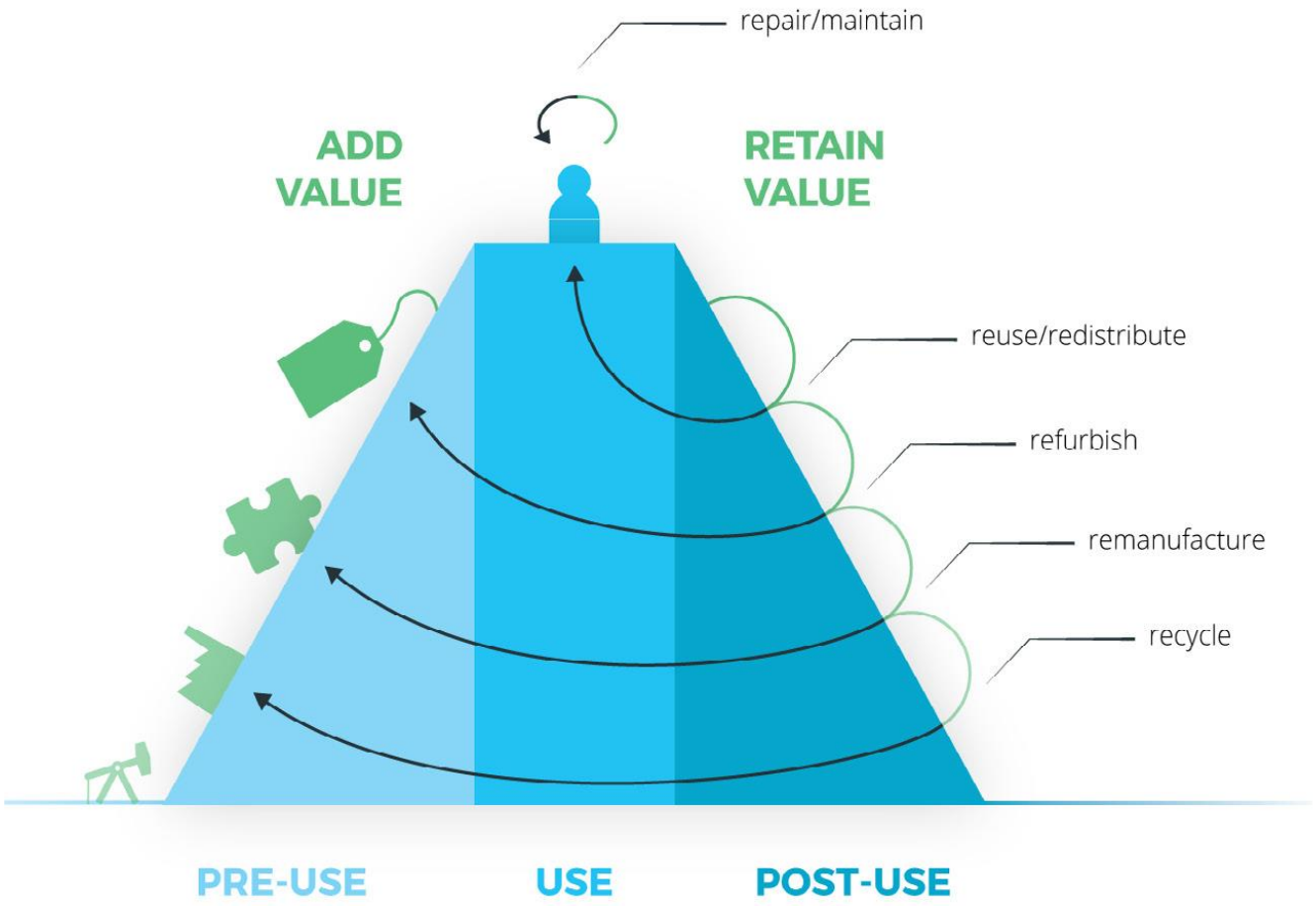


Achterberg, Hinfelaar, & Bocken (2016)

A PRODUCT'S LIFE CYCLE IN A LINEAR ECONOMY

- Higher sales = more profit
- Incentive for short product lifespans and resource squandering

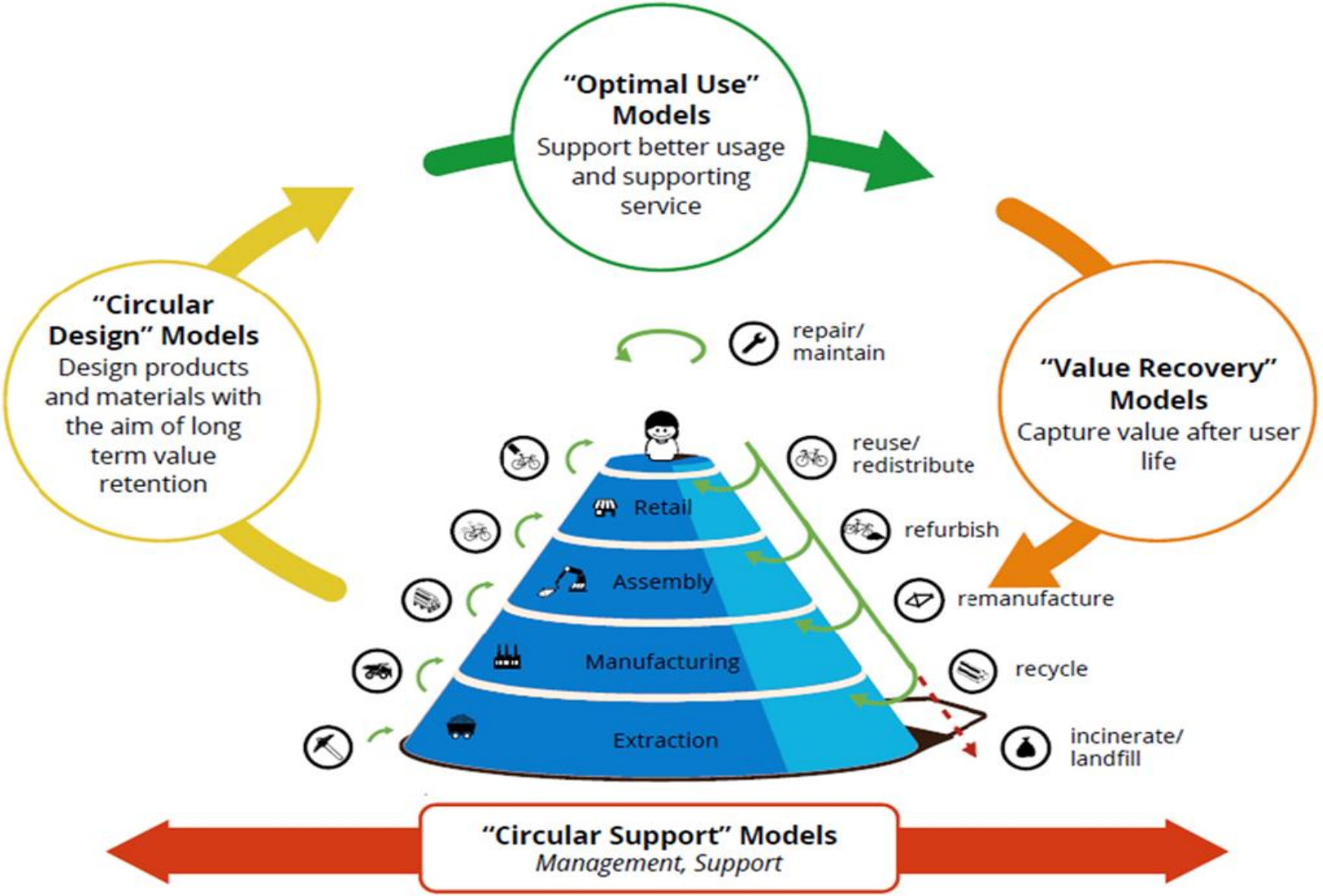
The Value Hill



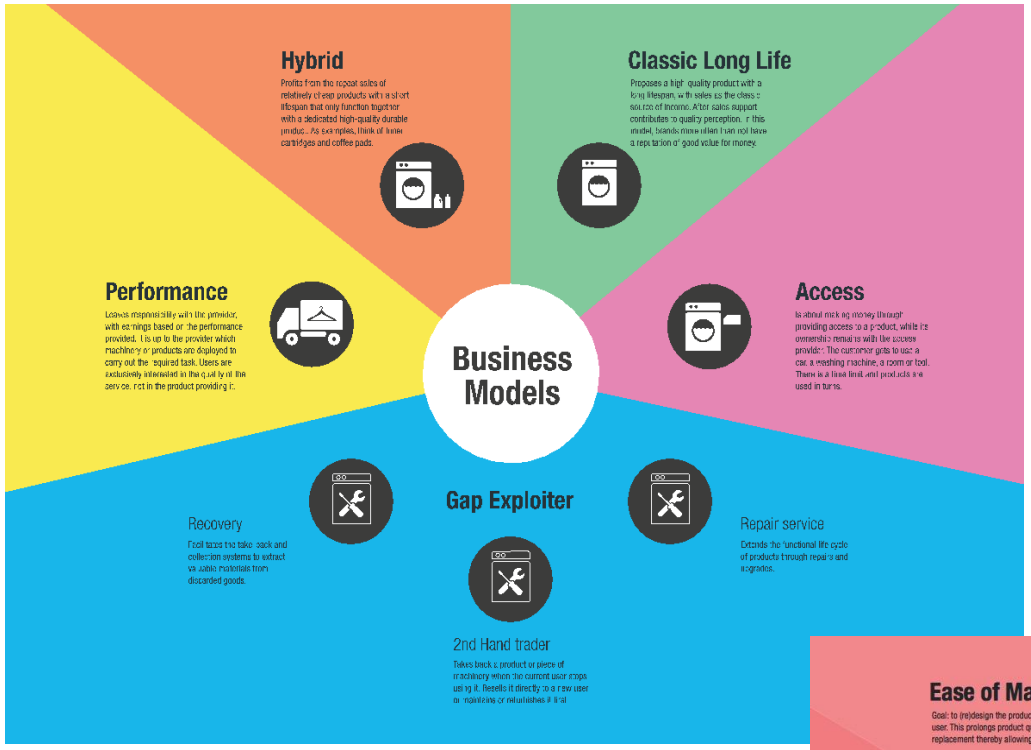
Achterberg, Hinfelaar, & Bocken (2016)

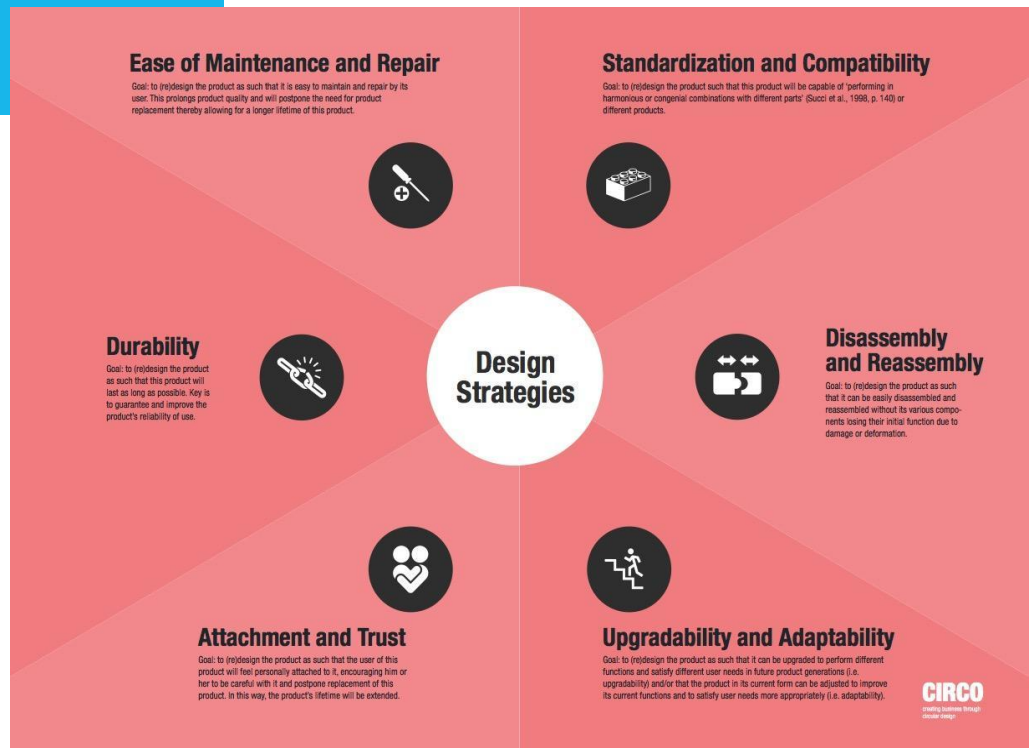
A PRODUCT'S LIFE CYCLE IN A CIRCULAR ECONOMY

- **Uphill: Products are designed to last**
- **Tophill: A long use phase is incentivised and supported**
- **Downhill: Options to recover the highest value possible are in place**



Sorce: Acterberg, E, et al.: The value hill busines model tool, 2016





Conny Bakker, Marcel Den Hollander, et al. (2014)
Delft University of Technology

CIRCO
Hub Portugal | CRIAR NEGÓCIOS ATRAVÉS DO DESIGN CIRCULAR

www.circohubportugal.lneg.pt

Business Models

Hybrid

Profits from the repeat sales of relatively cheap products with a short lifespan that only function together with a dedicated high-quality durable produc.. As examples, think of toner cartridges and coffee pads.

Classic Long Life

Proposes a high quality product with a long lifespan, with sales as the class s source of income. After sales support contributes to quality perception. n this model, brands more often than not have a reputation of good value for money.

Performance

Leaves responsibility with the provider, with earnings based on the performance provided. t is up to the provider which machinery or products are deployed to carry out the required task. Users are exclusively interested in the quality of the service, not in the product providing it.

Access

Is about making money through providing access to a product, while its ownership remains with the access provider. The customer gets to use a car, a washing machine, a room or tool. There is a time limit and products are used in turns.

Gap Exploiter

2nd Hand trader

Takes back a product or piece of machinery when the current user stops using it. Resells it directly to a new user or maintains or refurbishes it first

Recovery

Facil tates the take back and collection systems to extract va uable materials from discarded goods.

Repair service

Extends the functional life cycle of products through repairs and upgrades.

CIRCO

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Design Strategies

Ease of Maintenance and Repair

Goal: to (re)design the product as such that it is easy to maintain and repair by its user. This prolongs product quality and will postpone the need for product replacement thereby allowing for a longer lifetime of this product.

Standardization and Compatibility

Goal: to (re)design the product such that this product will be capable of 'performing in harmonious or congenial combinations with different parts' (Succi et al., 1998, p. 140) or different products.

Durability

Goal: to (re)design the product as such that this product will last as long as possible. Key is to guarantee and improve the product's reliability of use.

Disassembly and Reassembly

Goal: to (re)design the product as such that it can be easily disassembled and reassembled without its various components losing their initial function due to damage or deformation.

Attachment and Trust

Goal: to (re)design the product as such that the user of this product will feel personally attached to it, encouraging him or her to be careful with it and postpone replacement of this product. In this way, the product's lifetime will be extended.

Upgradability and Adaptability

Goal: to (re)design the product as such that it can be upgraded to perform different functions and satisfy different user needs in future product generations (i.e. upgradability) and/or that the product in its current form can be adjusted to improve its current functions and to satisfy user needs more appropriately (i.e. adaptability).

CIRCO
creating business through circular design

LNEG

PANANA
Banana cake
SONAE MC, Portugal
https://www.continente.pt

ECOVATIVE
Mycelium grown in agro by-products
ECOVATIVE, USA
https://ecovativedesign.com/

ECO TECH
Up to 100% recycled material from production
www.revigres.pt

SALE OF REFURBISHED PRODUCTS
Typically 1 year warranty
CANON USA
https://www.the-digital-picture.com/News/News-Post.aspx?News=24946

CRISSCROSS
Modular, versatile, low impact materials, durable furniture
Sam Wriler, designer, UK

CLICKBRICK
Bricks are dry stacked and assembled with steel clips, without using mortar
DAAS BAKSTEEN, NL
https://tinyurl.com/y7h6gpum

FAIRPHONE
Design for longevity, easy repair, and modular upgrades
FAIRPHONE, NL
https://www.fairphone.com

Windows with 30 years warranty.
Gaulhofer, Austria

www.gaulhoferwindows.com

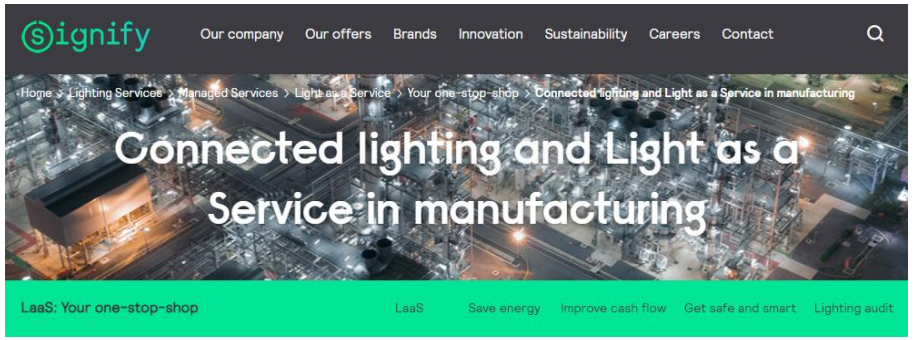
Co-work space

Power by the hour

Rolls-Royce

Light as a service

Signify

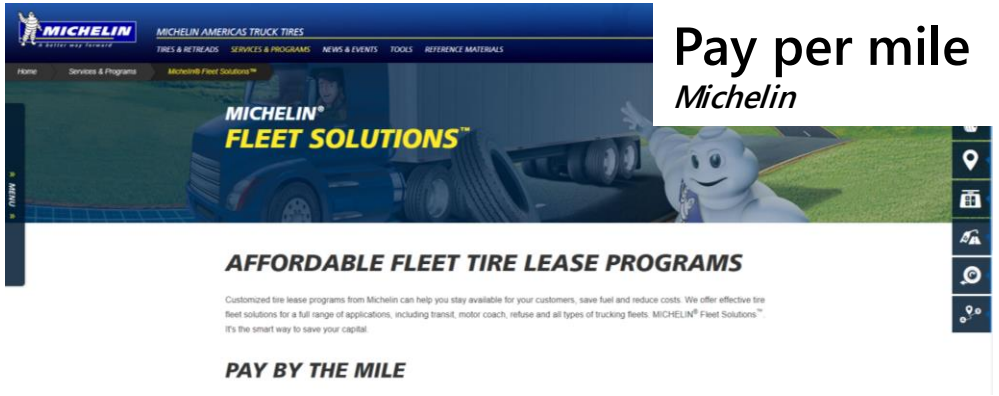


Hilti Fleet Management
Electric tools leasing

Formworks renting
DOKA, AT

Pay per mile

Michelin



ENFIN! RÉEMPLOI (Fainally! Reuse)

France, Savoie region

5 associations, companies and public institutions, €280,000

Objective: reduce material consumption and waste in the construction sector

- Collection of materials at the end of the 1st useful life: demolitions, scrap unsold products, construction surpluses, production leftovers
- Storage, repackaging and distribution (bricks and mortar)
- Resource diagnostics, project management and design studios to support reuse
- In the future: centre for the transformation and standardization of reused wooden products for professional purposes

2023:

- **88 t of materials sold on the Platform**
- **Ca. 1400 transactions**

Fonte: https://www.interregeurope.eu/sites/default/files/2024-03/Policy%20brief%20on%20Sustainable%20construction.pdf

DESIGN: SEVERAL LEVELS OF INTERVENTION

Systems design

- Objective: go beyond the value chain, involve multiple actors in dynamic, collaborative and competitive relationships, involved in a desired result
- Focus: local, regional and global actors

Business models design

- Objective: go beyond the product, rethink the function and new ways of satisfying customer and stakeholder needs and expectations and the value proposition
- Focus: organization and its value chain

Product design

- Objective: rethink the entire product life cycle
- Focus: multidepartment (organization)

Imitating nature requires system thinking

CREDIT: YUN HAN XU/GETTY IMAGES

- Bioplastic packaging requires dedicated collecting systems – they harm oil-based plastics recycling
- Extending the lifetime of appliances is effective in reducing materials and energy consumption at production stage, but it may increase energy consumption at the use stage
- The type and quality of materials recycled may considerably affect the net GHG savings of recycling, as does the sorting and reprocessing methods used, and the proximity/place of the recycling facilities (Iacovidou et al, 2020. doi: https://doi.org/10.1007/s11356-020-11725-9)

CIRCULAR ECONOMY

KATCH-e

10 ESSENTIALS

1. Think in **functionality** instead of products
2. Analyse where **value** is created and destroyed
3. Think circularity already in the **design phase**
4. Keep a **life cycle perspective**
5. Involve **stakeholders** in developing new solutions
6. Understand new **consumer** practices
7. Make the circular solutions **attractive**
8. Circular solutions should also be **sustainable**
9. Lead the **transition** to a circular economy
10. Consider the local, **social value**

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Thank you.

cristina.rocha@lneg.pt