

Second Life EV Batteries



# Circular Design and the value chain

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under the grant agreement No. 101037141. This material reflects only the views of the Consortium, and the EC cannot be held responsible for any use that may be made of the information in it.

# In this video you will learn:

- What is Circular Economy
- R-ladder: Practical CE principles
- Things to consider
- The value chain and partners



SESA



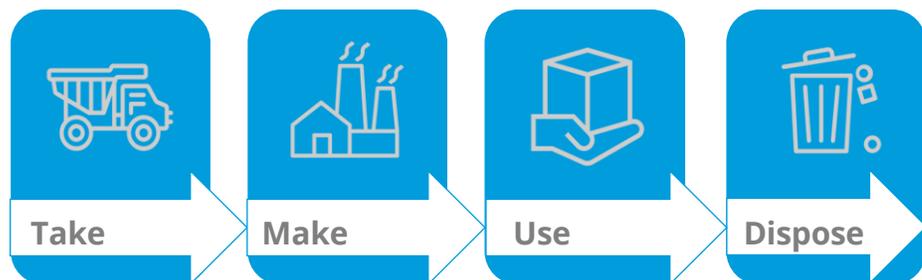
# What is Circular Economy?

*... in a nutshell*



# The fundamental difference

Conventional practice  
→ a *LINEAR* approach



Sustainable practice  
→ a *Circular* approach



“ In a Circular Economy, waste and emissions do not exist and resources are infinitely reused in balance with nature and people ”



# Circularity for Renewable Energy?

A deforested farm in Yanonge in the DRC  
Image source: investmentmonitor.ai



Lithium mine (unknown location)  
Image source: miningdigital.com



Communities in Argentina's Jujuy province protest lithium mine  
Image source: <https://dialogochino.net>



Man sorts dead-batteries Dhaka-Bangladesh  
Image source: Alamy\_D4MJEE

“ A Circular Economy gives us the tools to tackle climate change as well as biodiversity loss, while addressing important social needs. It gives us the power to grow prosperity, jobs, and resilience while cutting greenhouse gas emissions, waste, and pollution. ”

Source: [ellenmacarthurfoundation.org](http://ellenmacarthurfoundation.org)



# Links to the SDGs

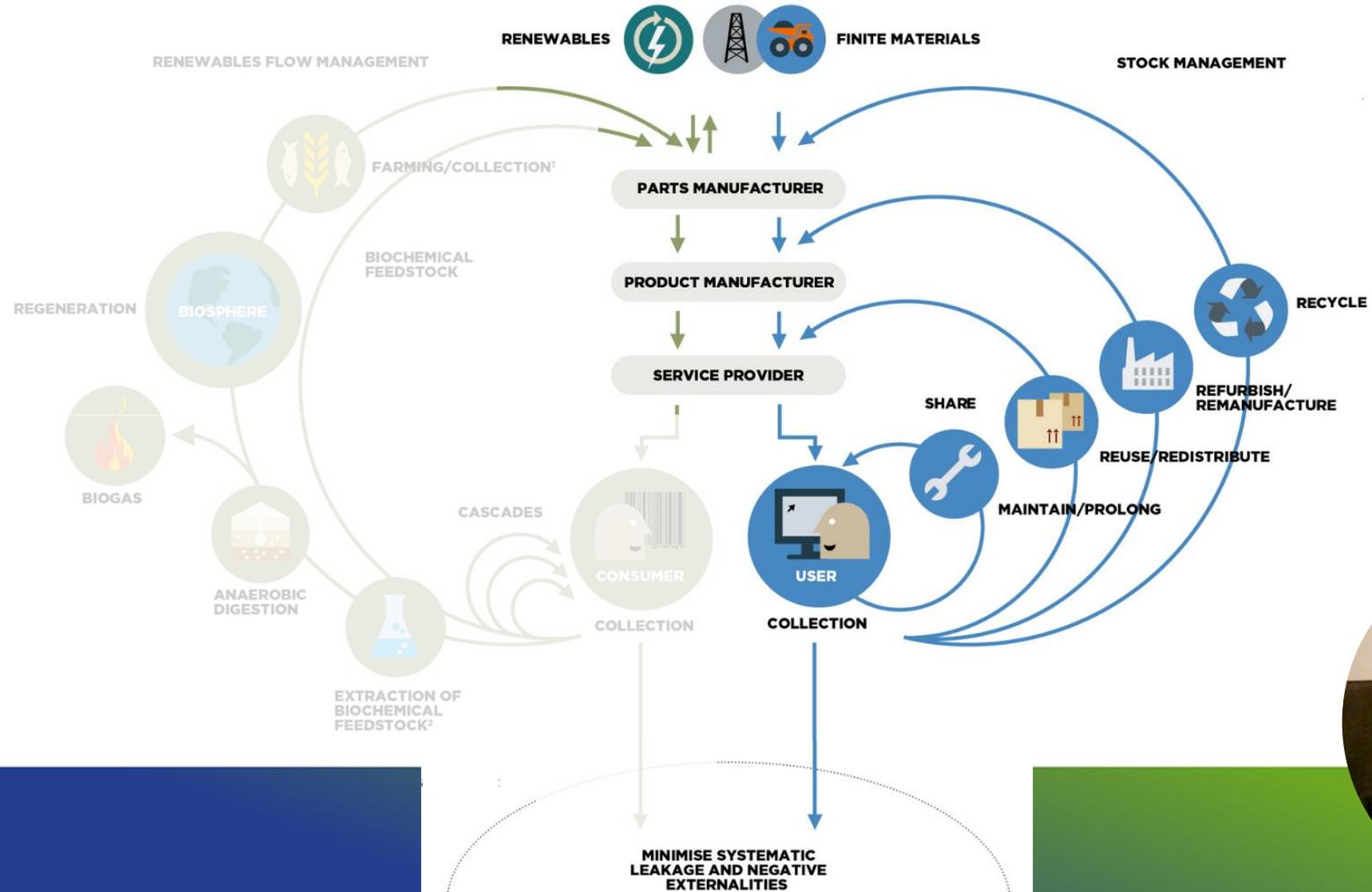


Image source:  <https://www.un.org/sustainabledevelopment/sustainable-development-goals/>

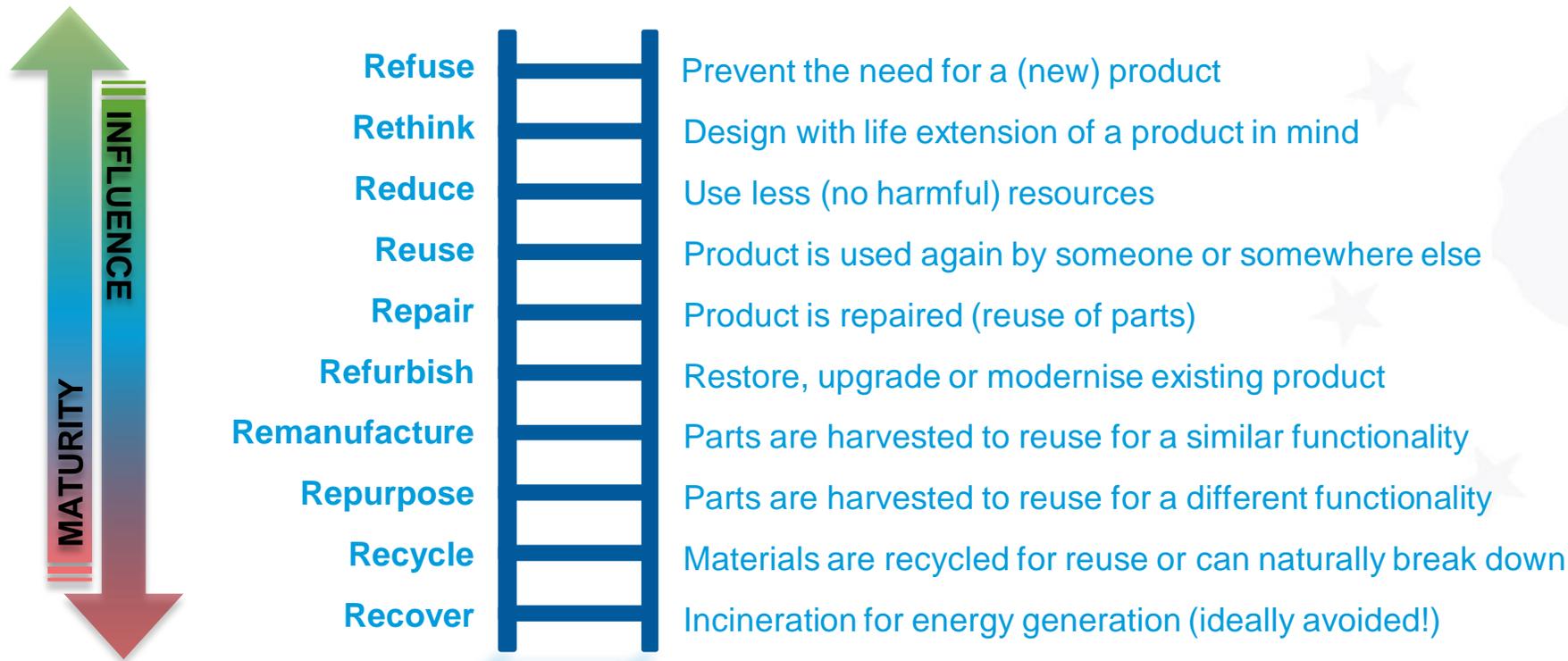
# 2nd life Batteries: The 'R-ladder' in practice



# Translating CE to practical principles



# Circular Principles of the R-ladder



The higher up the ladder you apply...

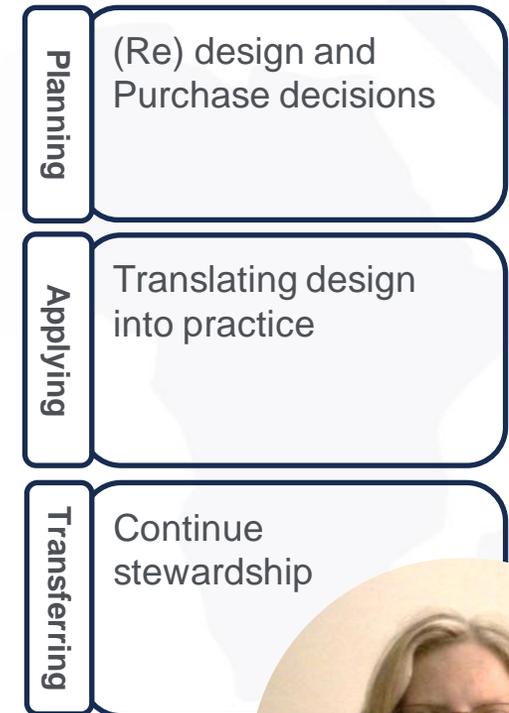
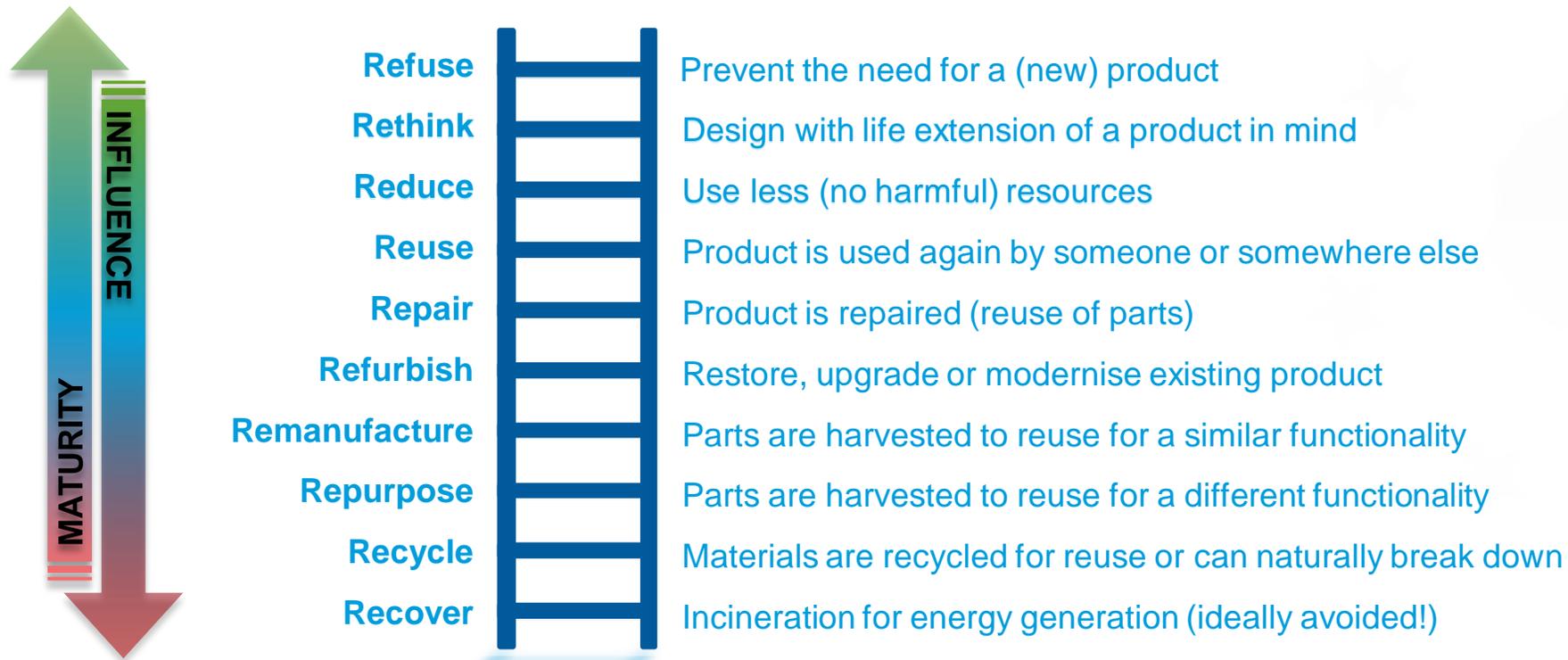
- the more mature the product can be

The further down the ladder you start

- the smaller your sphere of influence



# Things to consider (for the Rs)



# Common areas & criteria

Summary of the common areas and example criteria for avoiding negative or creating positive impact:

See full list under additional information for further viewing



# The value chain and partners



# From value chain to value cycle

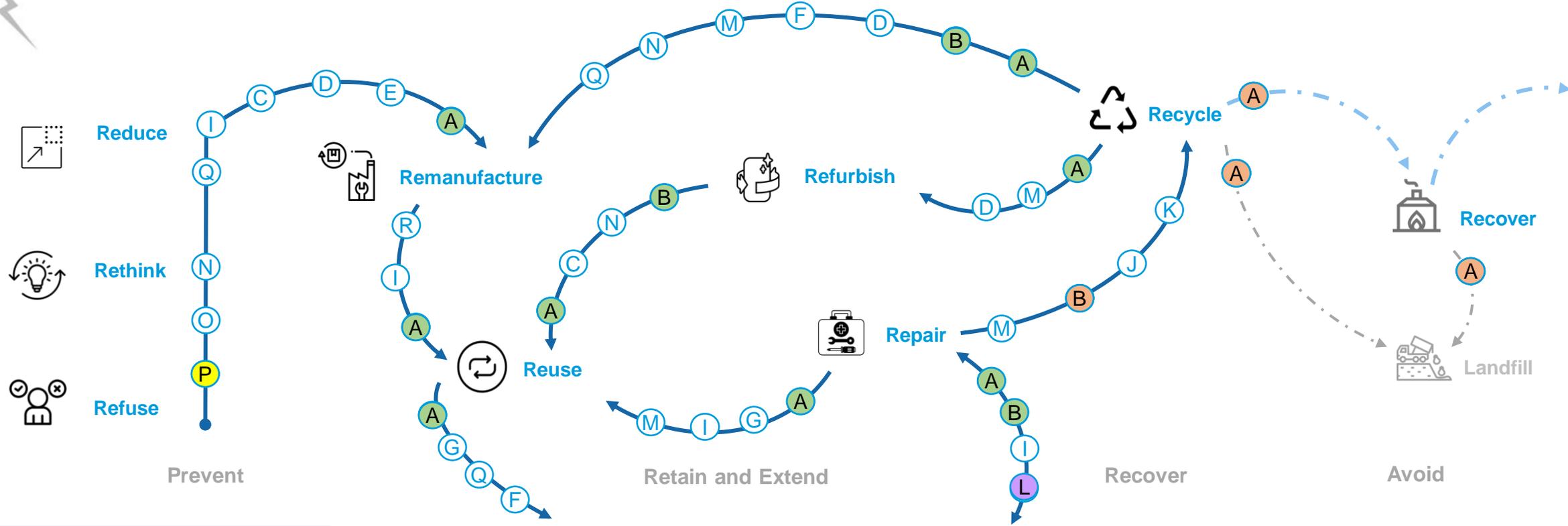
Circular economy relies on accepting shared responsibilities of what happens during the battery's lifespan

Circular economy thinks in creating value cycles (instead of value chains), where multiple parties cooperate to realise value retention and value creation

Who will be your partners?



# Partners for the battery value cycle



Examples of potential value cycle partners – What supplies are needed, which services are needed, what skills and knowledge is needed?

- |                                   |                             |                                |                               |                               |
|-----------------------------------|-----------------------------|--------------------------------|-------------------------------|-------------------------------|
| <b>A</b> Distribution (transport) | <b>E</b> Facility provider  | <b>I</b> Assembly provider     | <b>M</b> Training Services    | <b>Q</b> Branding & Marketing |
| <b>B</b> Collection (transport)   | <b>F</b> Packaging Supplier | <b>J</b> Disassembly provider  | <b>N</b> Recruitment Services | <b>R</b> Financial Services   |
| <b>C</b> Battery supplier         | <b>G</b> Installer          | <b>K</b> Shredder & Recycler   | <b>O</b> Investor             | <b>?</b> ...                  |
| <b>D</b> Parts supplier           | <b>H</b> IT Services        | <b>L</b> Maintenance & Repairs | <b>P</b> Designer             |                               |



# Summary

- Circular economy focuses on **shared value creation and shared responsibilities**
- CE is geared to achieve **economic** development in a way that does not put unsustainable pressure on **nature and people**
- R-ladder translates CE to **practical principles** as steps in **maturity** and level of **influence** achievable
- Strategy: Link your ambitions to the Rs: keep **feasible objectives (goals)** for the short term and identify those for the longer term as a **basis for continuous improvement**
- There are **Key considerations** across common areas of impact and across the Rs
- Decisions often involve weighing off **trade-offs** between circular economy criteria
- A successful **value proposition** identifies what **value** a partner **brings and** what value a partner **receives** in their functional role of the circular business model (for a specific 'R'). Value can be economic, environmental and social in nature.



Please find additional useful links and image credits in next slides

# THANK YOU

*Esther van Bergen - Cenex Nederland*

[sesa-euafrica.eu/](https://sesa-euafrica.eu/)  
[toolbox.sesa-euafrica.eu/](https://toolbox.sesa-euafrica.eu/)



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# Additional information and useful links



Summary of the common areas and example criteria for avoiding negative or positive impact:

**Material Selection:** choosing the type of materials and treatments of battery, components and consumables

- a. use **recycled** materials
- b. Use **recyclable** materials
- c. **Low-energy content** materials

**Transport & Packaging:** how the battery is transported, and which materials are used for this.

- a. Less/cleaner/reusable/biodegradable or compostable **packaging**.
- b. Energy-efficient and low (or zero) carbon **transport modes**
- c. Transport **distances** (suppliers, customers)

**(Re)Make:** how the battery system is designed and made to function

- a. Fewer **consumables** needed
- b. **Modular** design for easy access, repairs, upgrades or dismantling
- c. **Waste** is avoided
- d. Lower energy **consumption**
- e. Higher **reliability** of product and parts
- f. Reliability long-term parts **availability**

**End-of-Life:** waste management from environmental and social perspectives

- a. Harvest **reusable parts** for repairs or repurposing
- b. Harvest **materials** for downcycling, recycling or upcycling
- c. Recovery **biodegradables / compostables** for a separate biowaste stream
- d. Avoid **exposure** of hazardous / toxic materials (environment and people)
- e. **Safe** incineration, **recover energy** by using the heat
- f. **Safe storage** in landfill

Note: e and f are avoided as much as possible for circular products

**Added functional value:** add value in addition to its primary function

- a. **Shared** use of the product
- b. Function provides **additional value** e.g., reusing by-products
- c. **Optimise** underused battery **capacity** by adding a different use
- d. Add performance sensors for **preventive maintenance**

**General:** for all areas

Work with local **partners**, aim for local **customers** to stimulate economic development, skills and jobs creation, community health benefits etc.

# Additional information and useful links

- <https://www.ellenmacarthurfoundation.org/circular-economy-diagram>
- [https://circulareconomy.europa.eu/platform/sites/default/files/organising\\_for\\_the\\_circular\\_economy\\_ebook.pdf](https://circulareconomy.europa.eu/platform/sites/default/files/organising_for_the_circular_economy_ebook.pdf)
- <https://pacecircular.org/sites/default/files/2020-01/CEC%20Circular%20Value%20Creation.pdf>
- <https://www.circularonline.co.uk/wp-content/uploads/2022/01/Circularity-Gap-Report-2022.pdf>
- <https://www.youtube.com/watch?v=Tu5N3-JIW2k> (Second Life Batteries: The Solution For Sustainable Mobility?)
- [https://www.changing-transport.org/wp-content/uploads/2021/07\\_GIZTraCS\\_DealingwithEoLLiBs.pdf](https://www.changing-transport.org/wp-content/uploads/2021/07_GIZTraCS_DealingwithEoLLiBs.pdf)
- <https://www.exro.com/industry-insights/battery-degradation-explained>
- <https://www.sciencedirect.com/science/article/pii/S2352146521007249> (temp)
- <https://www.sciencedirect.com/science/article/abs/pii/S2352152X22021636> (moisture)
- <https://www.researchgate.net/publication/265297746> The effects of moisture contamination in the Li-O2 battery
- <https://www.uyilo.org.za/facilities-services/battery-testing-laboratory-iso17025/lithium-ion-cell-testing/>
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- <https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/battery-recycling-takes-the-drivers-seat>



# Image credits

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- <https://www.thethirdpole.net/en/pollution/south-asias-toxic-battery-recycling-problem-2-2-2/>
- <https://www.cenexgroup.nl>
- <https://www.ellenmacarthurfoundation.org>
- <https://sdgs.un.org/goals>
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