Circular Economy
Automotive Remanufacturing

Peter Bartel
Circular Economy Solutions GmbH

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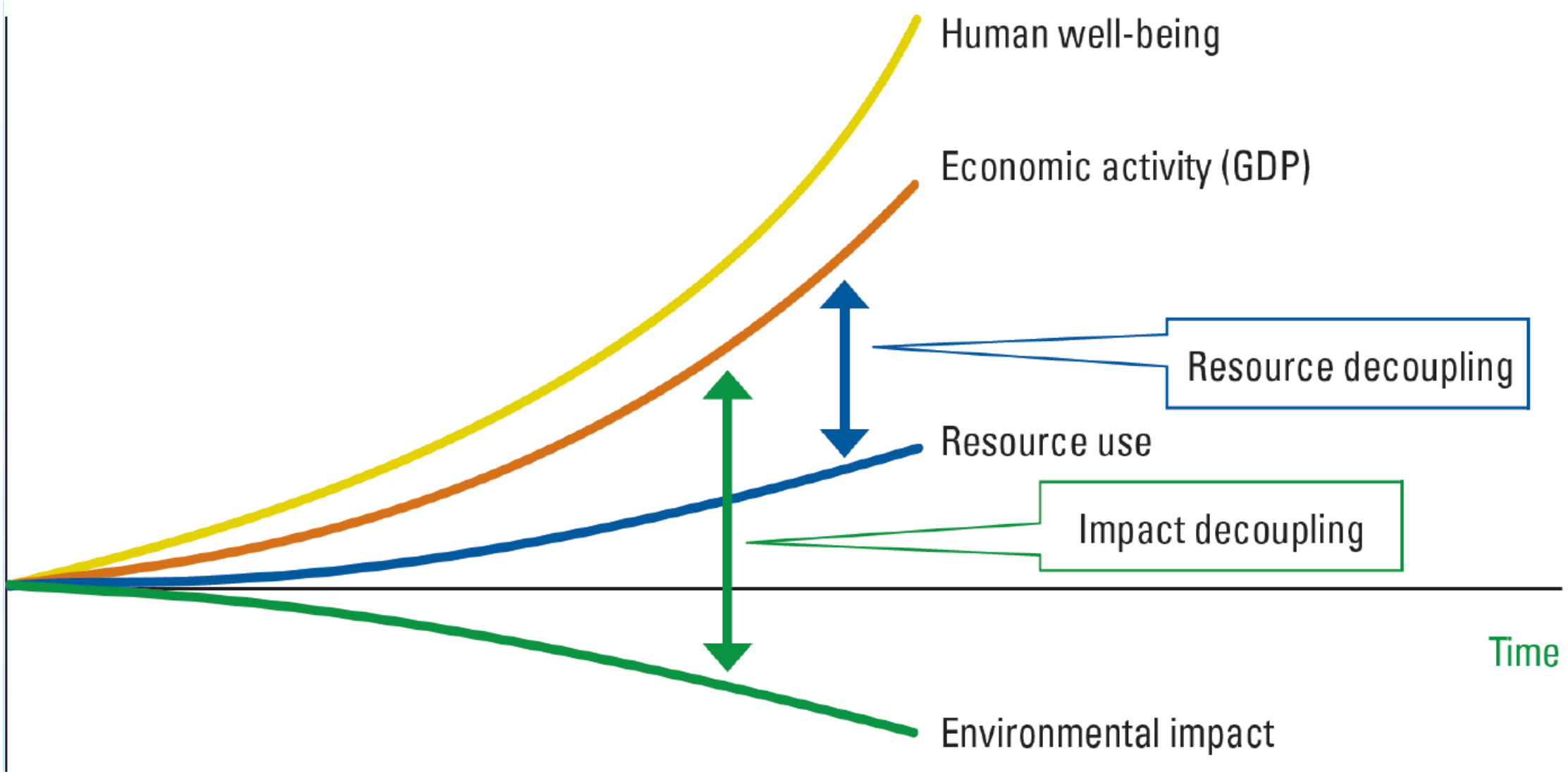
Decoupling “Environmental Impact” from “Wellbeing”



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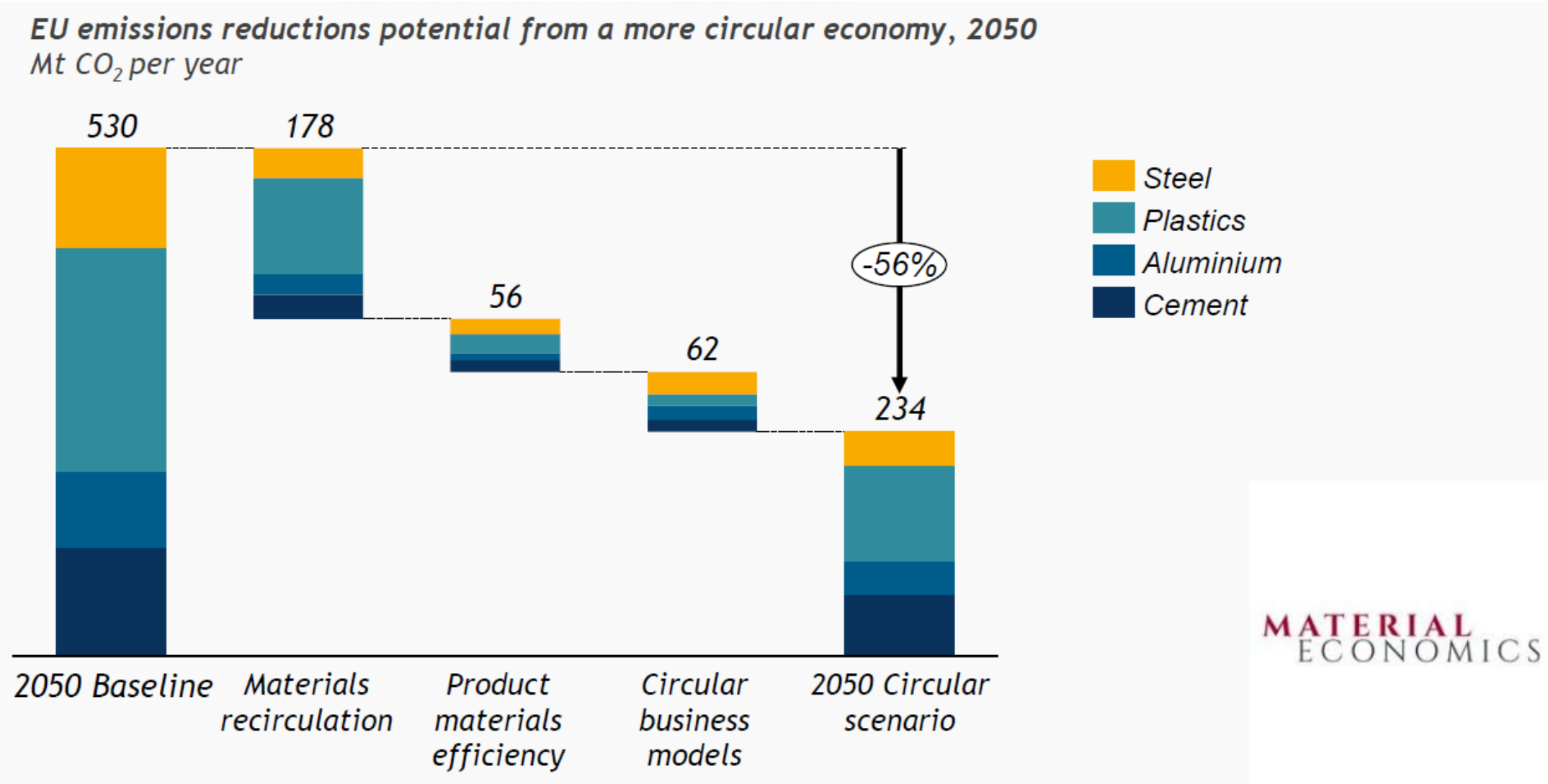

MATERIAL ECONOMICS

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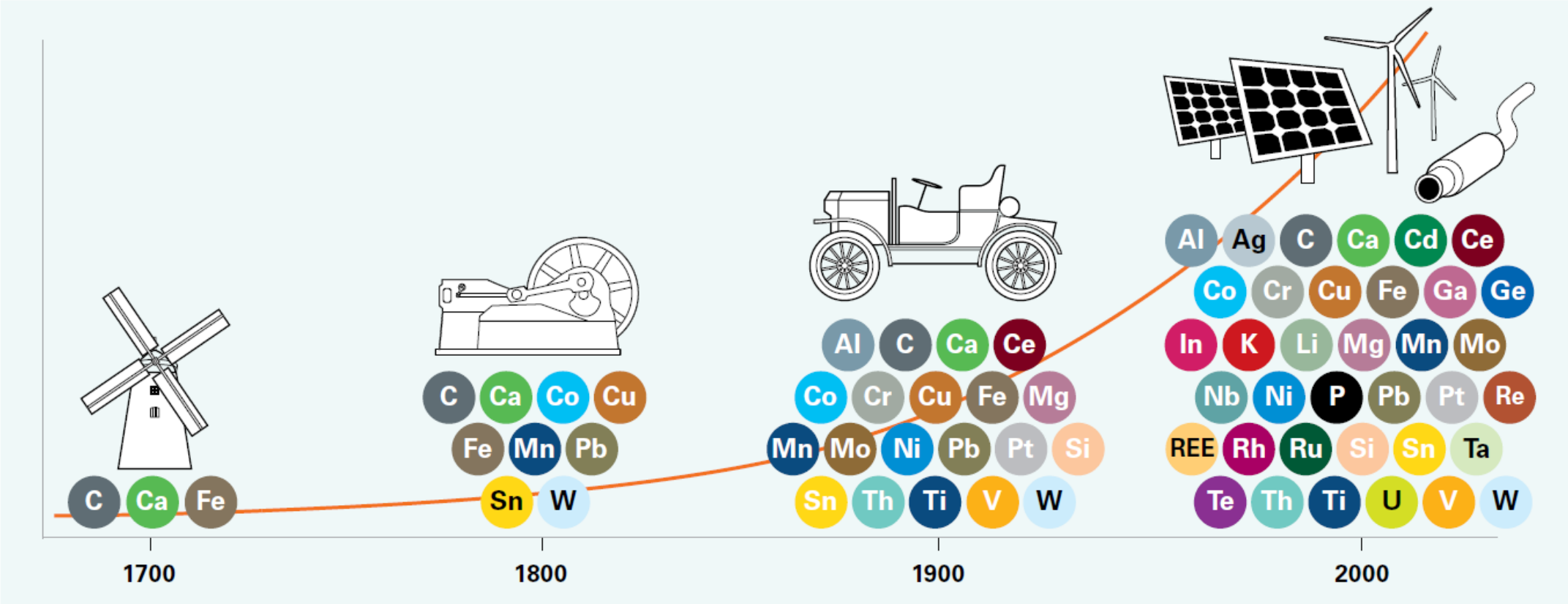
Utilization of Rare and Expensive Raw Materials



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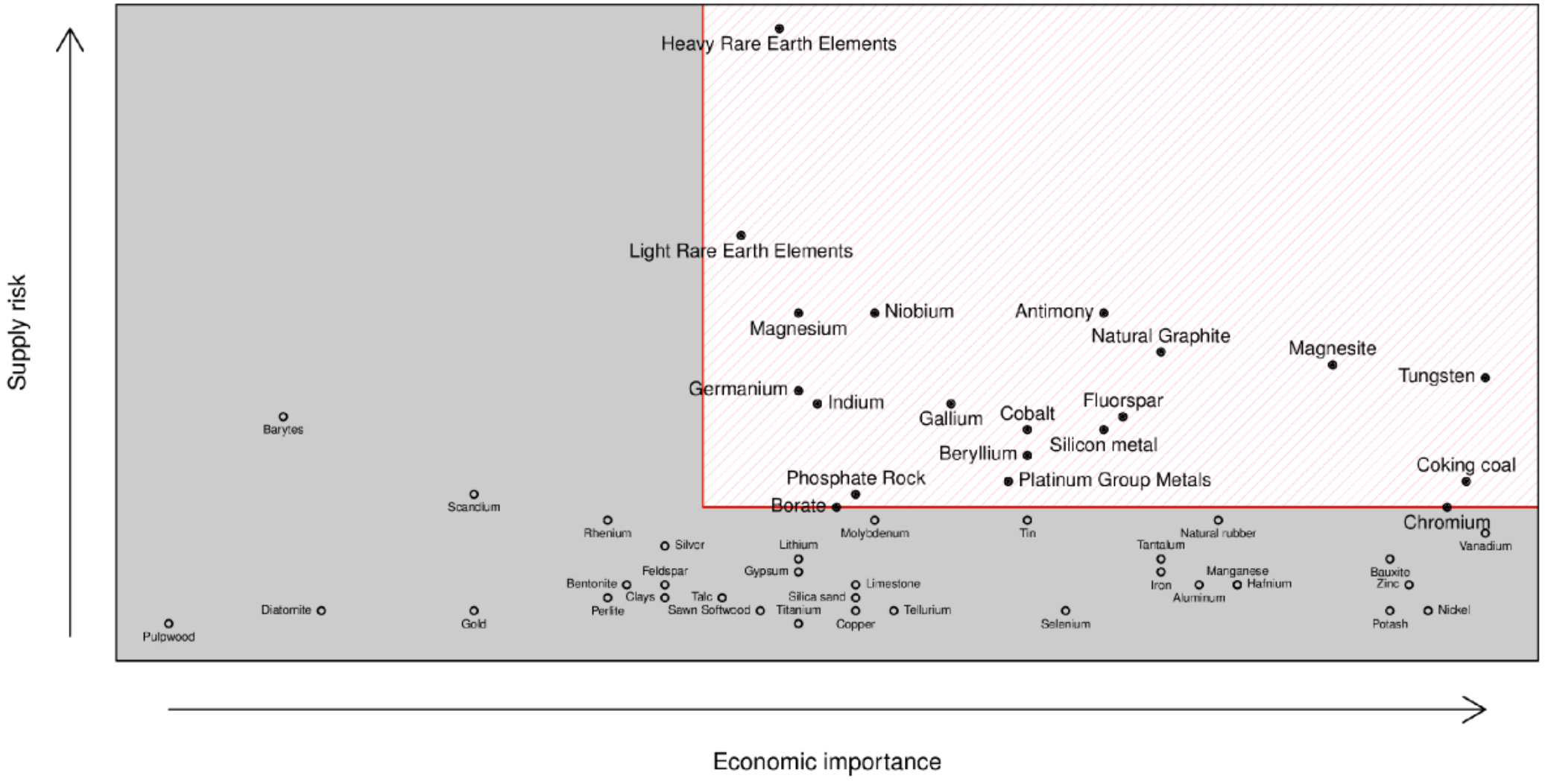
Critical Raw Materials according to the EC



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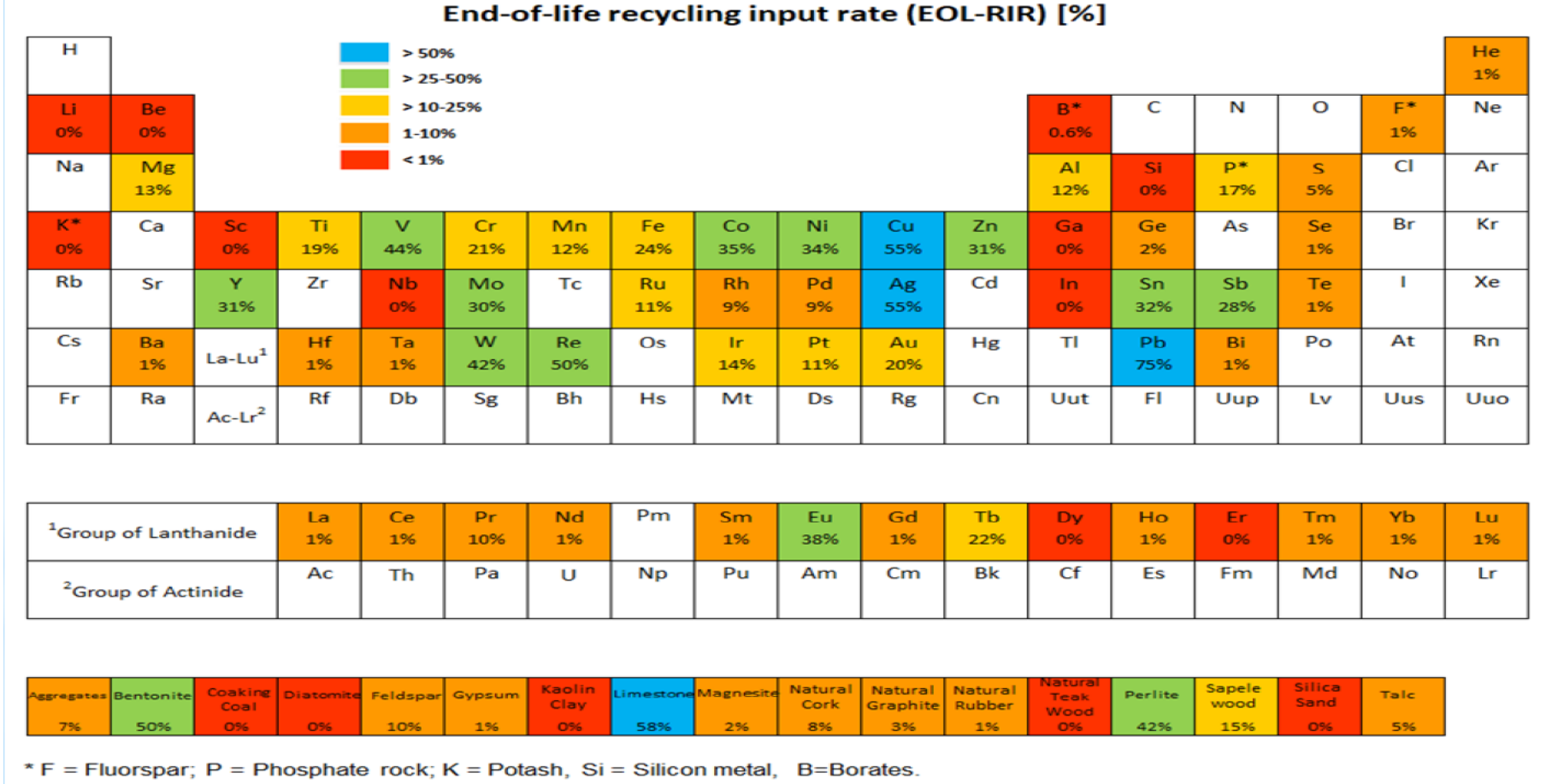
END OF LIFE RECYCLING INPUT RATE EU28 - 2017



Source: JRC elaboration based on the EC list of Critical Raw Materials (2017)

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The Waste Hierarchy

The target of the EU politic:

1. eliminate landfill
2. avoid recycling

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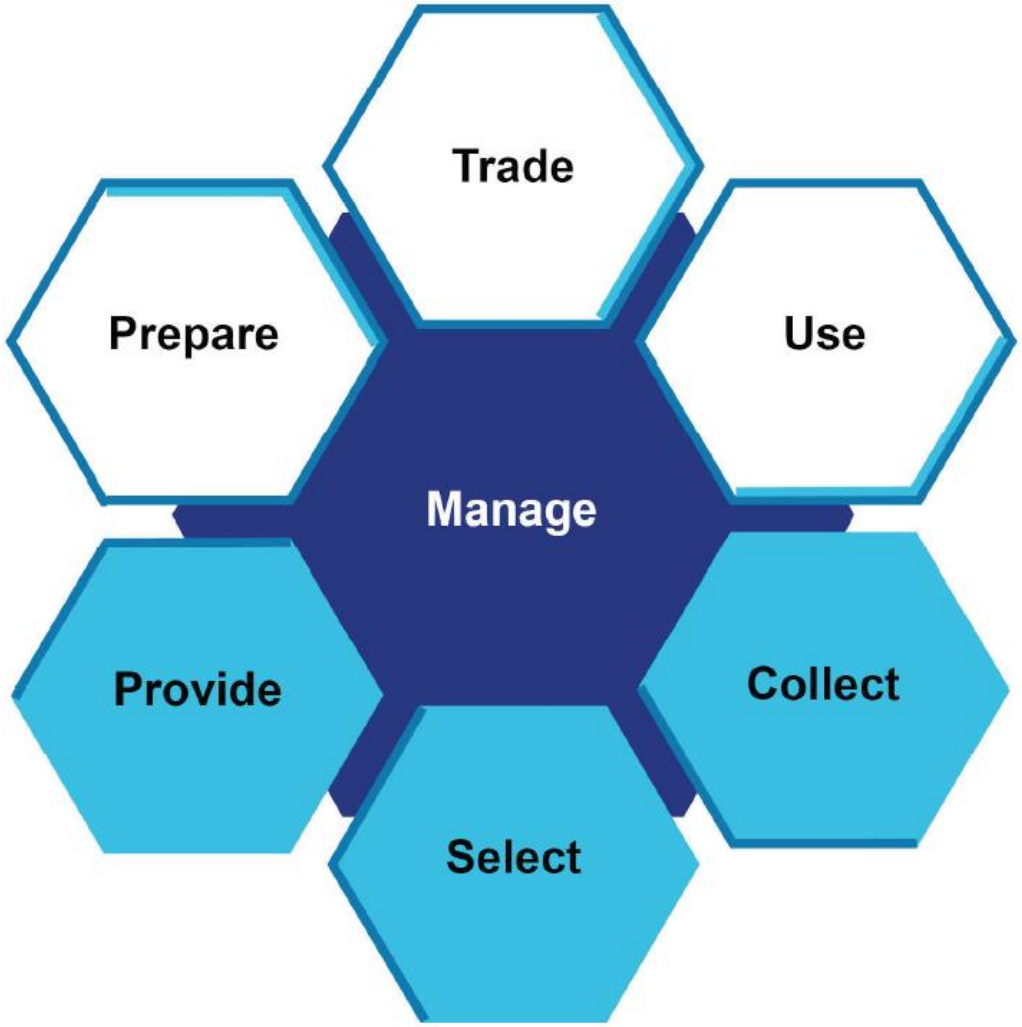
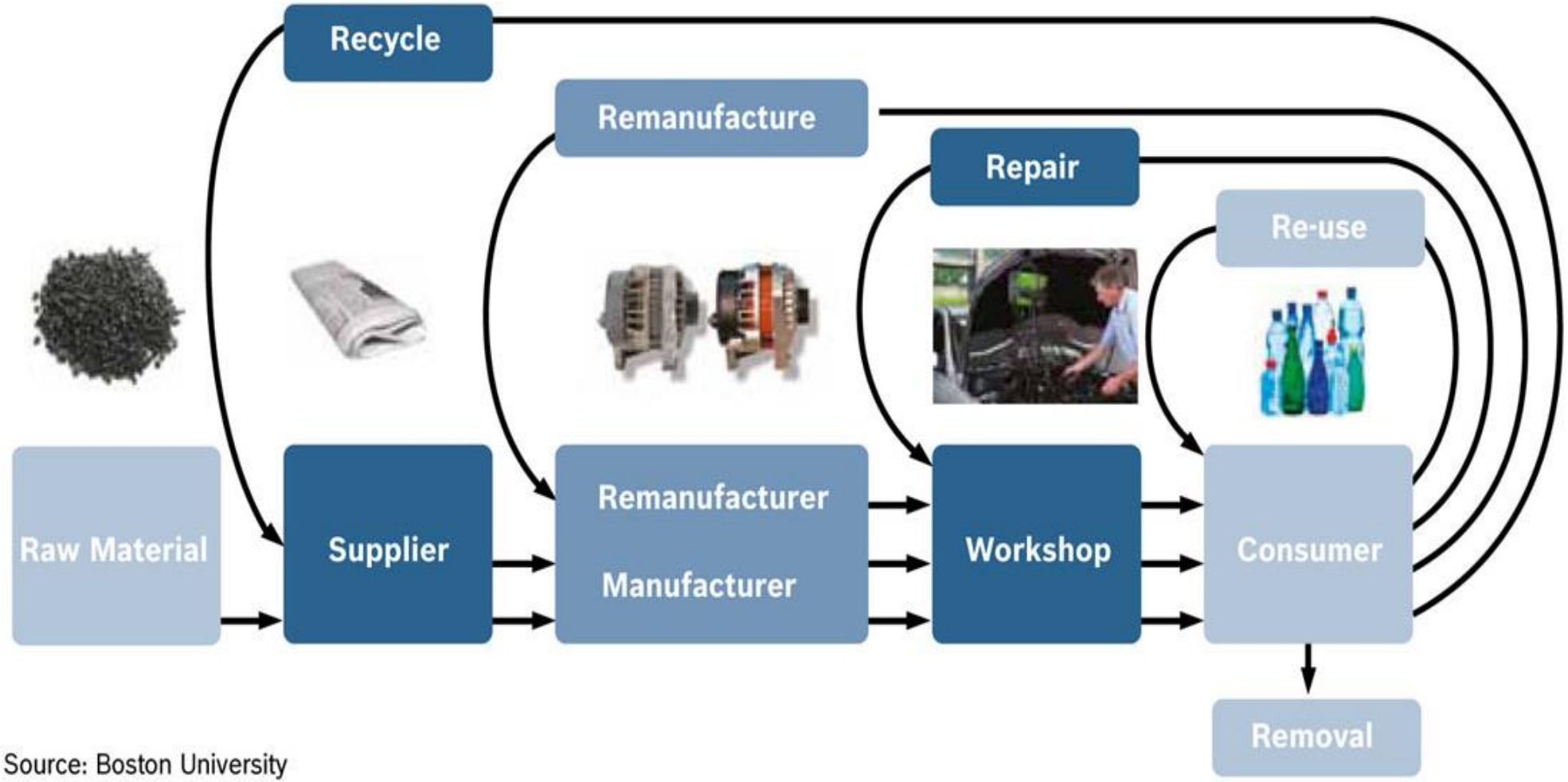


Different Circularity

Delimitation Remanufacturing vs. Recycling, Repair, Re-use



Source: Boston University

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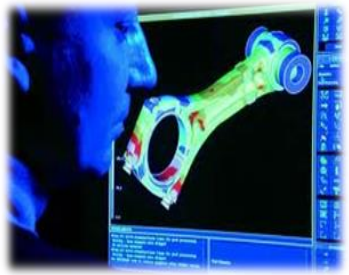
Facilitation of circular business models in the automotive industry

to be considered when developing new vehicles

OE-Production | Aftermarket Production | Service | „End of Life“





1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 **Year**

R&D | OE-Production | Aftermarket

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Remanufacturing

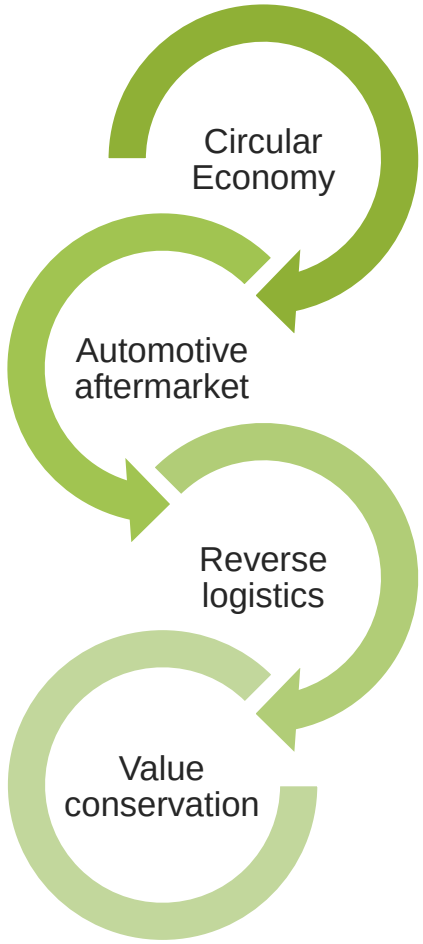


Image: Bosch


Image: Bosch/youtube

Remanufacturing

Recycling Repair

Reuse

Product recycling instead of material recycling
→ full value conservation
Remanufacturing output
→ remanufactured, equivalent to new part

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Remanufactured Products / Automotive Aftermarket

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What is the remanufacturing process?

Cores

- Collecting and sorting of cores (used parts)
- Complete disassembly
- Cleaning and testing
- Restoring of components / Replacement by new components
- Assembly
- End-of-line test
- Packaging

Remanufactured parts

Key elements:

- industrialized process
- no specific fault tracing
- upgrading employs state of the art technology and design
- same quality and guarantee as for new products

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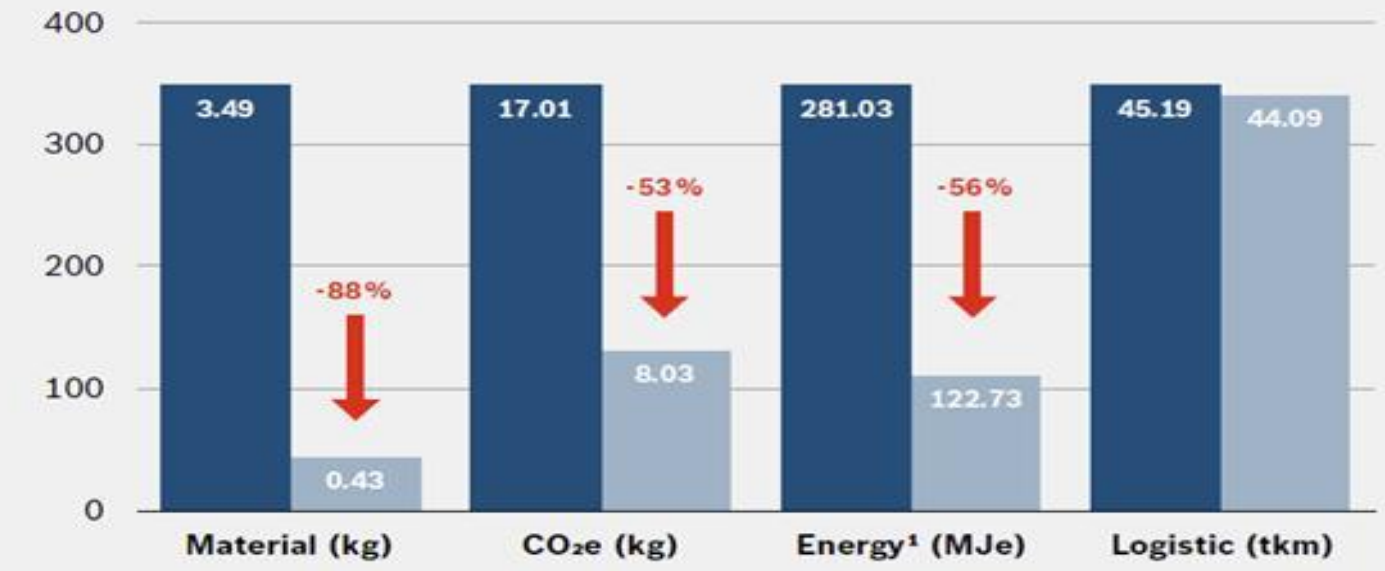
Ecological Impact of Remanufacturing

Eco Balance Value Chain:
Reman vs. New Production

Savings:

- 400 kt CO^2 (EU28)
- 88% raw material
- 56% energy
- 30-50% costs (comparing remanufacturing to new production)



Source: University of Bayreuth

¹ Values representative for electrical rotating machine (passenger car starter)
² Calculated with the method of "Cumulative Energy Demand Version 1.05*

Fraunhofer UP Lehrstuhl Umweltgerechte Produktionstechnik

Requirement:
Remanufacturer receive enough and the right cores for the manufacturing process → **Core Management!**

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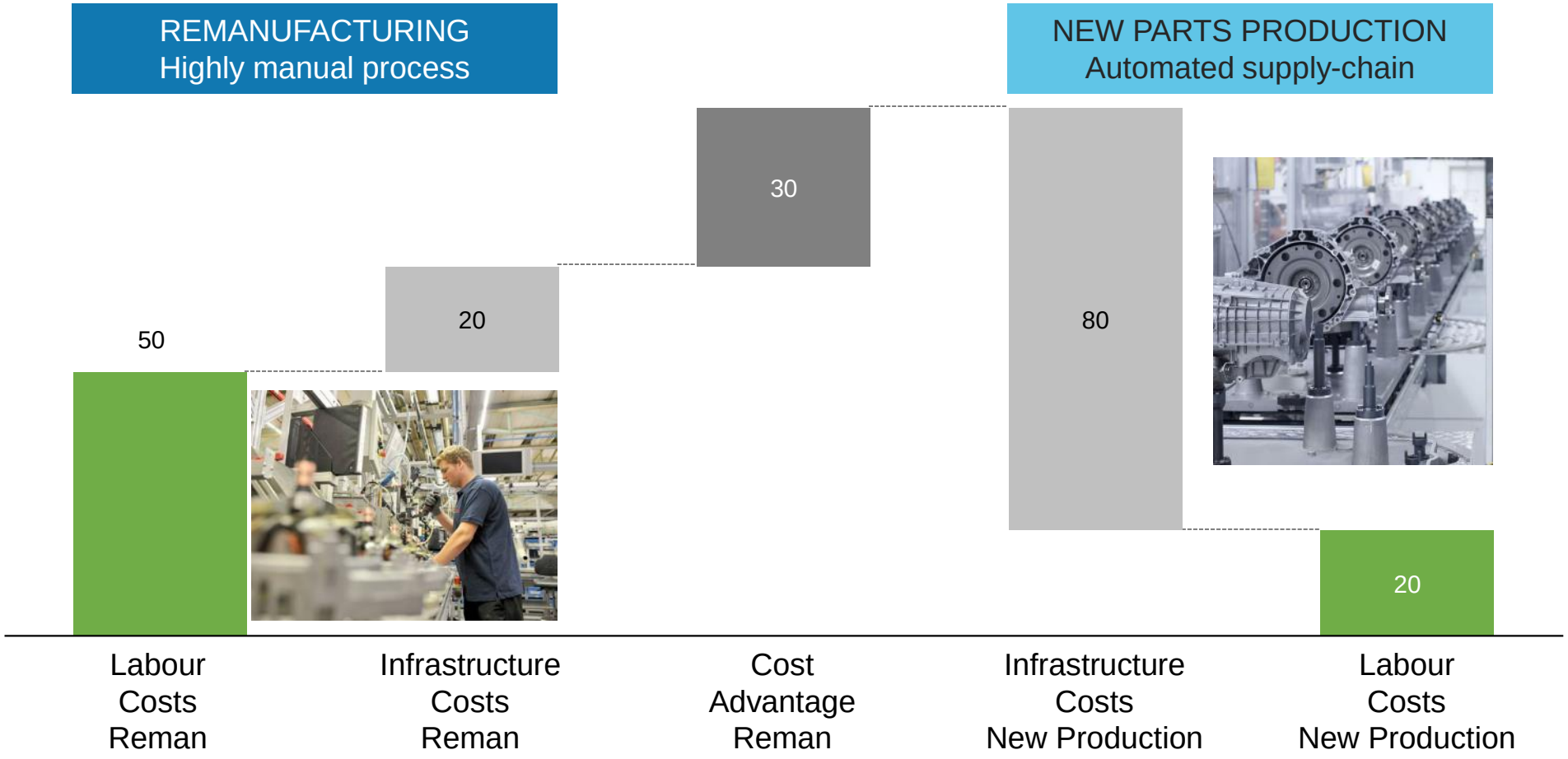
Remanufacturing creates more jobs

The social impact



Source: internal research

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The economic impact

- Users pay less for remanufactured products compared with equivalent new products
- Workshops are able to service vehicles at reasonable prices

Automotive Remanufacturing market size Europe (EU28)	
Turnover	7.4 bn EUR
Firms	2,363
Employment	43,000
Cores	27,286,000

Source: European Remanufacturing Network: Remanufacturing Market Study, 2015.

Image: Bosch

Image: Bosch/youtube

Remanufacturing is **a great deal** both for consumers and producers!

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Politicians support Remanufacturing

Political point of view

„Remanufacturing is **the most sustainable business model!**“
[Dr. Daniel. C. F. Koehler, Chairman APRA Europe]

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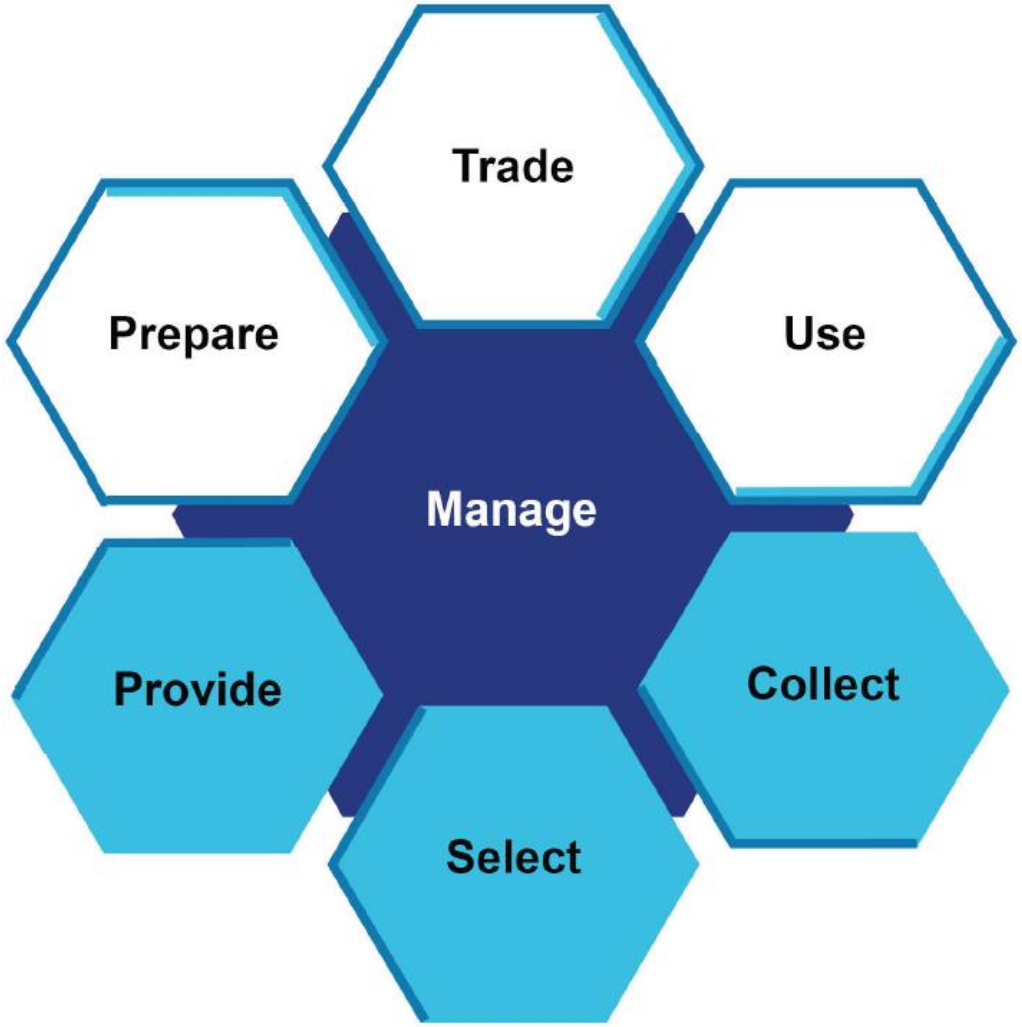
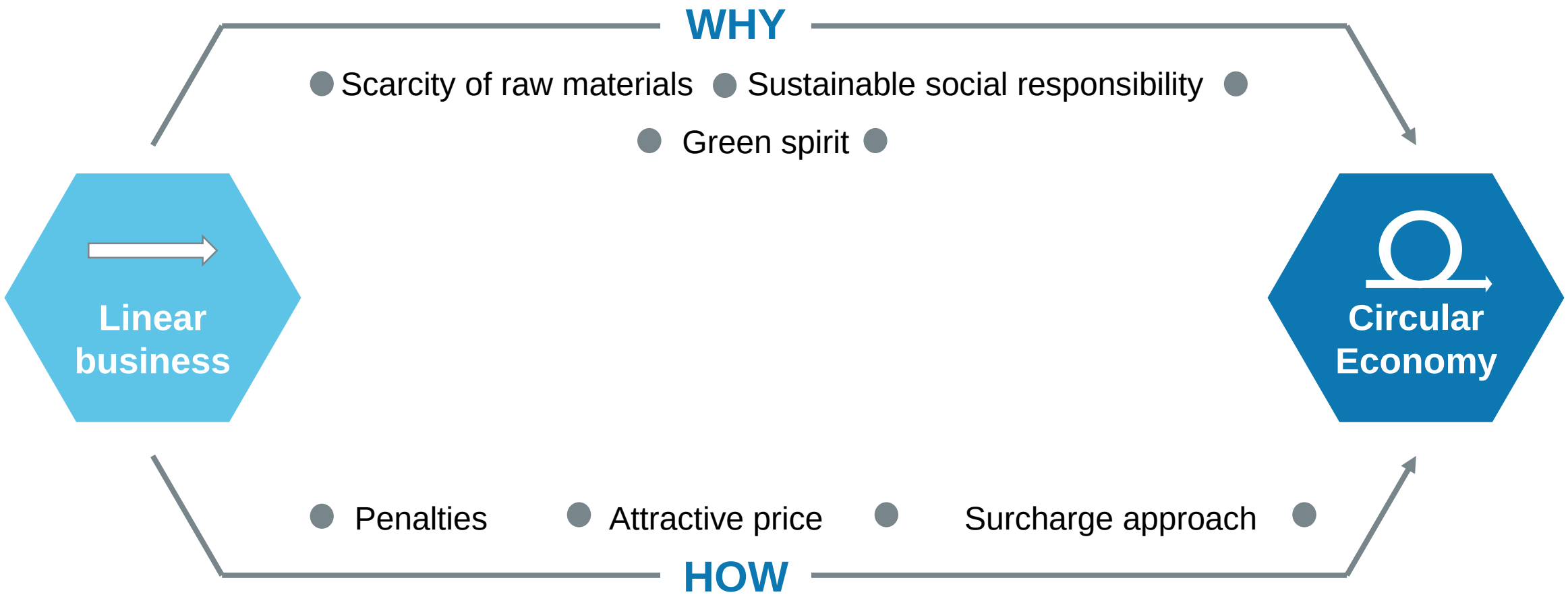


When Linear becomes Circular

Circular Economy overall context



Circular Economy doesn't work without an impulse by incentives and this needs to be managed

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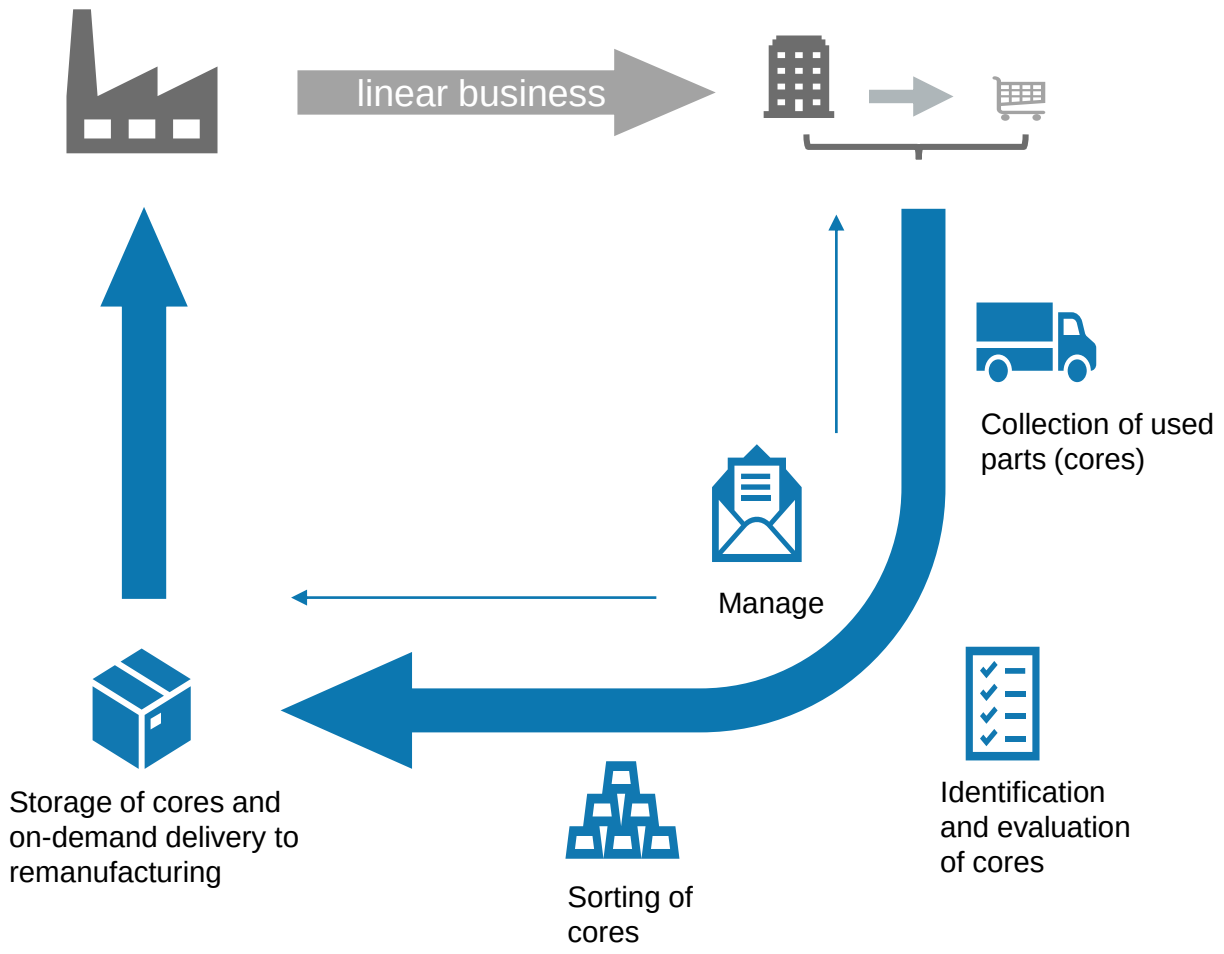
Service as Business Case

C-ECO provides all processes that enable the transformation from a traditional linear business into a circular.

Offer includes:

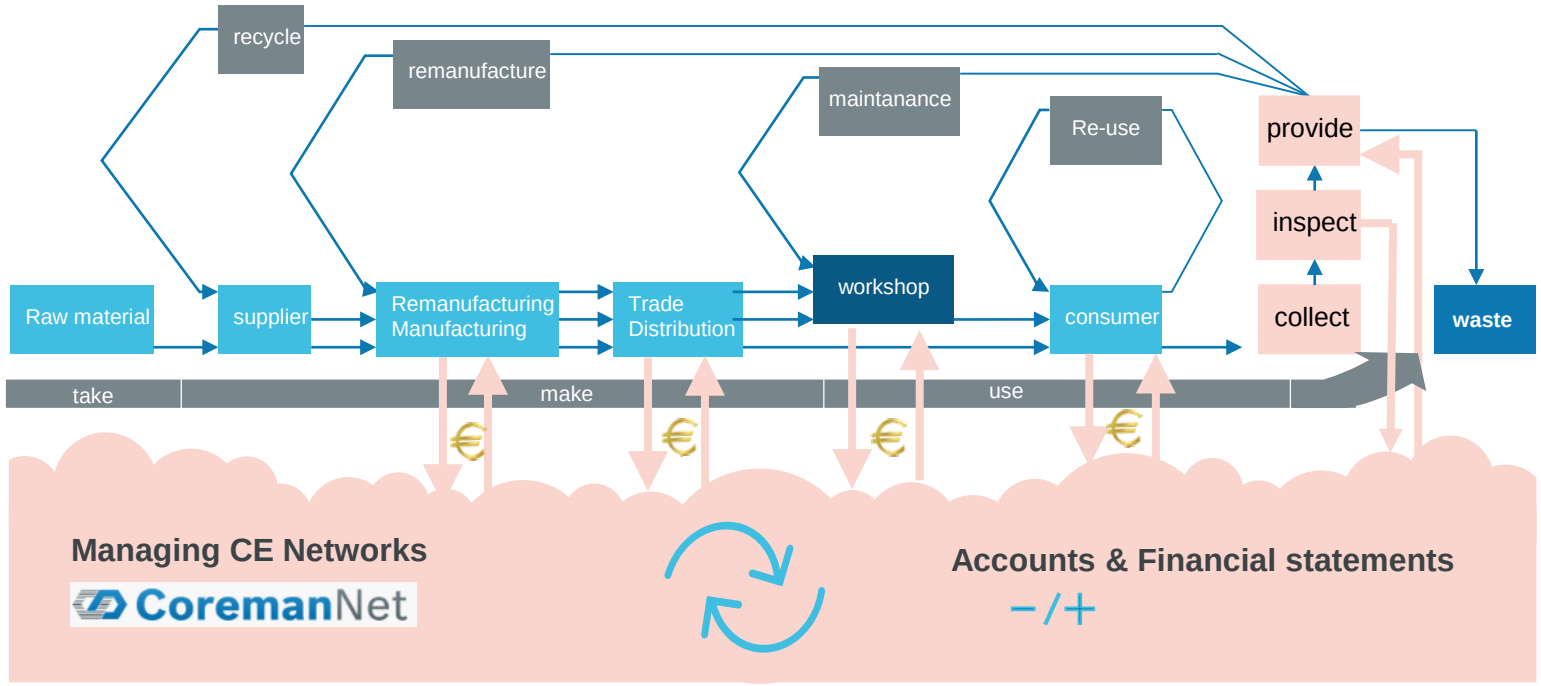
- Physical logistics
- Parts handling
- Commercial IT-Tools
- Consultancy



C-ECO in the Circular Economy

No matter what, …

- parts and parts usage,
- acceptance requirements,
- distribution channels,
- markets & regions,
- IT infrastructure,
- business approaches



… we enable and manage your reverse logistics processes - physically and financially.

C-ECO – Managing Circular Economy Networks

CoremanNet Service Offers

CoremanNet Service modules

MANAGE CE network

- SC control tower
- Commercial value engine
- Ready-to-reuse sorting

COLLECT

- Pick-up Transport
- Customs processing
- Empties-Management

INSPECT

- Type-based detailed inspection
- Logistic hub
- Customized documentation of specific information and conditions

PROVIDE

- Warehouse
- Outbound & shipment processing
- Outbound Transport

ADD-ONs

e.g. testing, cleaning, dismantling

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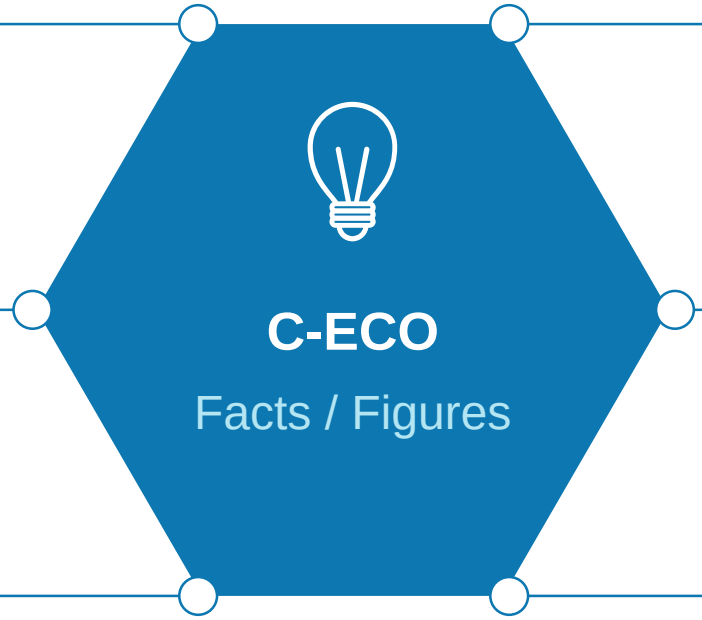
CoremanNet can

140.000 different products and variants

More than 10 different ERP Systems connected

More than 100 customer specific contracts variants



More than 36.000 pick-up point

Managing product specific acceptance criteria for 30 different product groups

Our customers save more than 35.000t CO^2 eq/year

C-ECO – handles typical CE challenges

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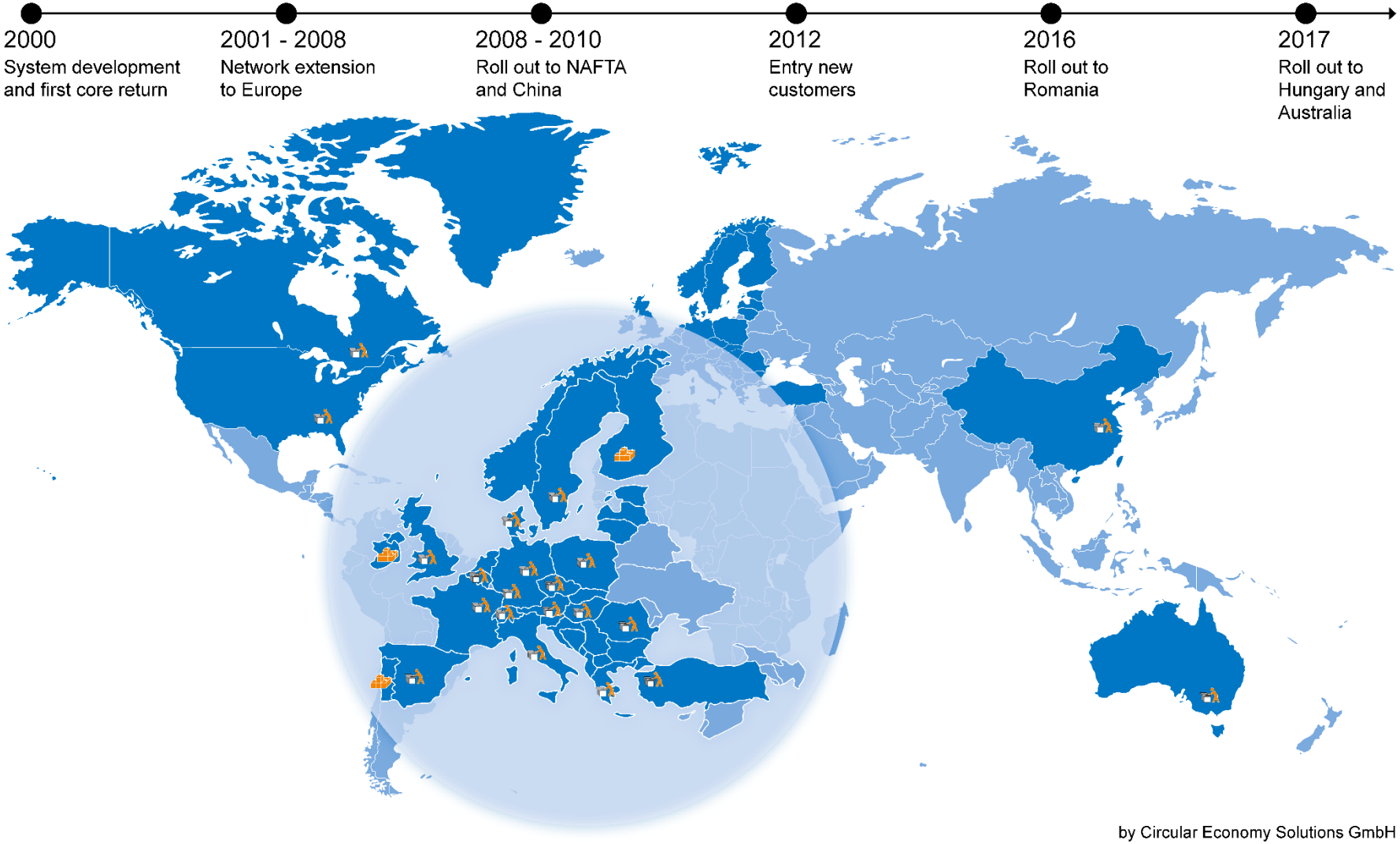
The CoremanNet Logistics Network



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Paradigm shift in the automotive industry

Paradigm shift

Traditional fuel cars → Electric & Hybrid Electric Vehicles (**E&HEVs**)

By 2040 the 35% of the newly sold vehicles will be electric

Source: BNEF 2016: Electric Vehicle Outlook

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776851

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Circularity of E&HEVs: technological barriers

New high added-value parts and components in E&HEVs

Battery system

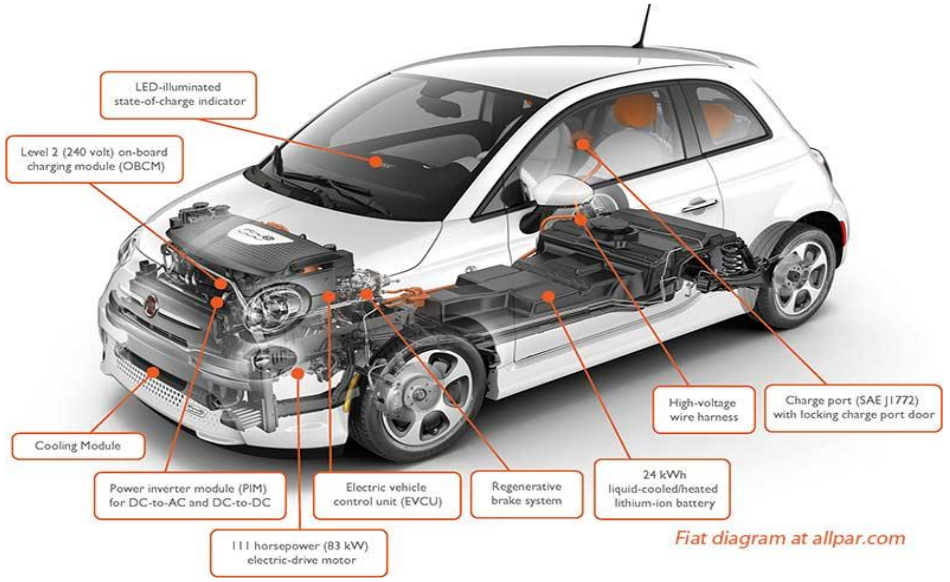
Techno polymers

Metal parts

Composites

Electronics

…



What to do with them at the EOL?

How to safely disassemble and treat for circularity?

- **Lack of consolidated processes and technologies**
- **Components are not designed to be re-used**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776851

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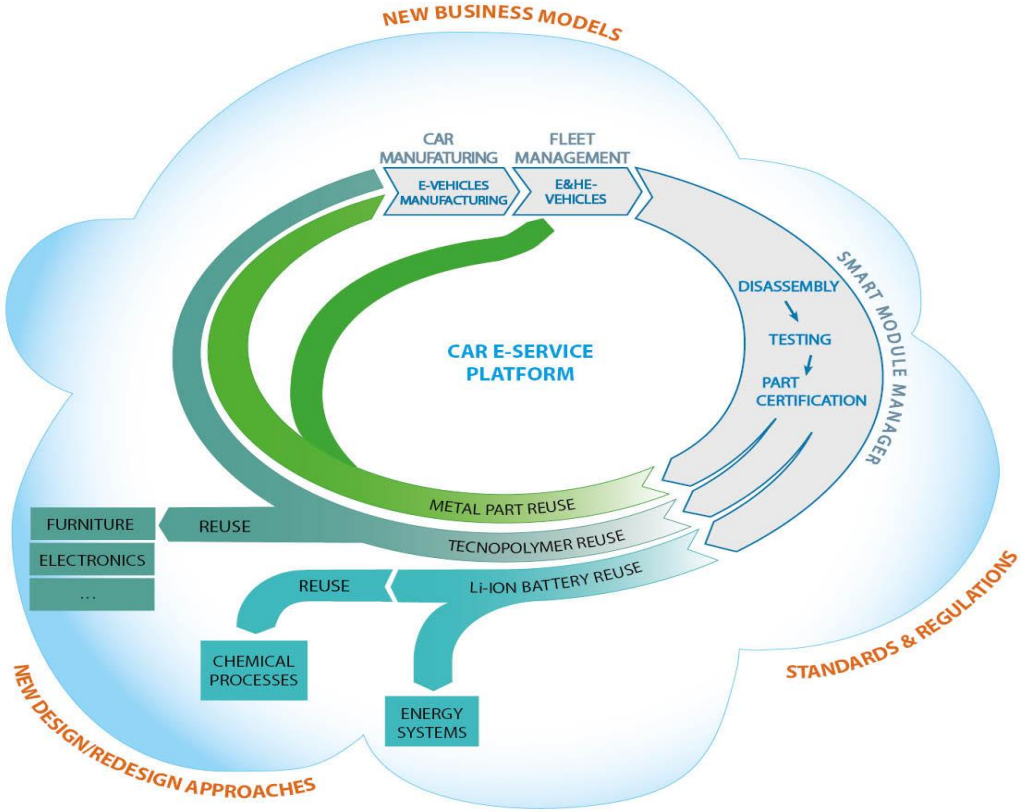
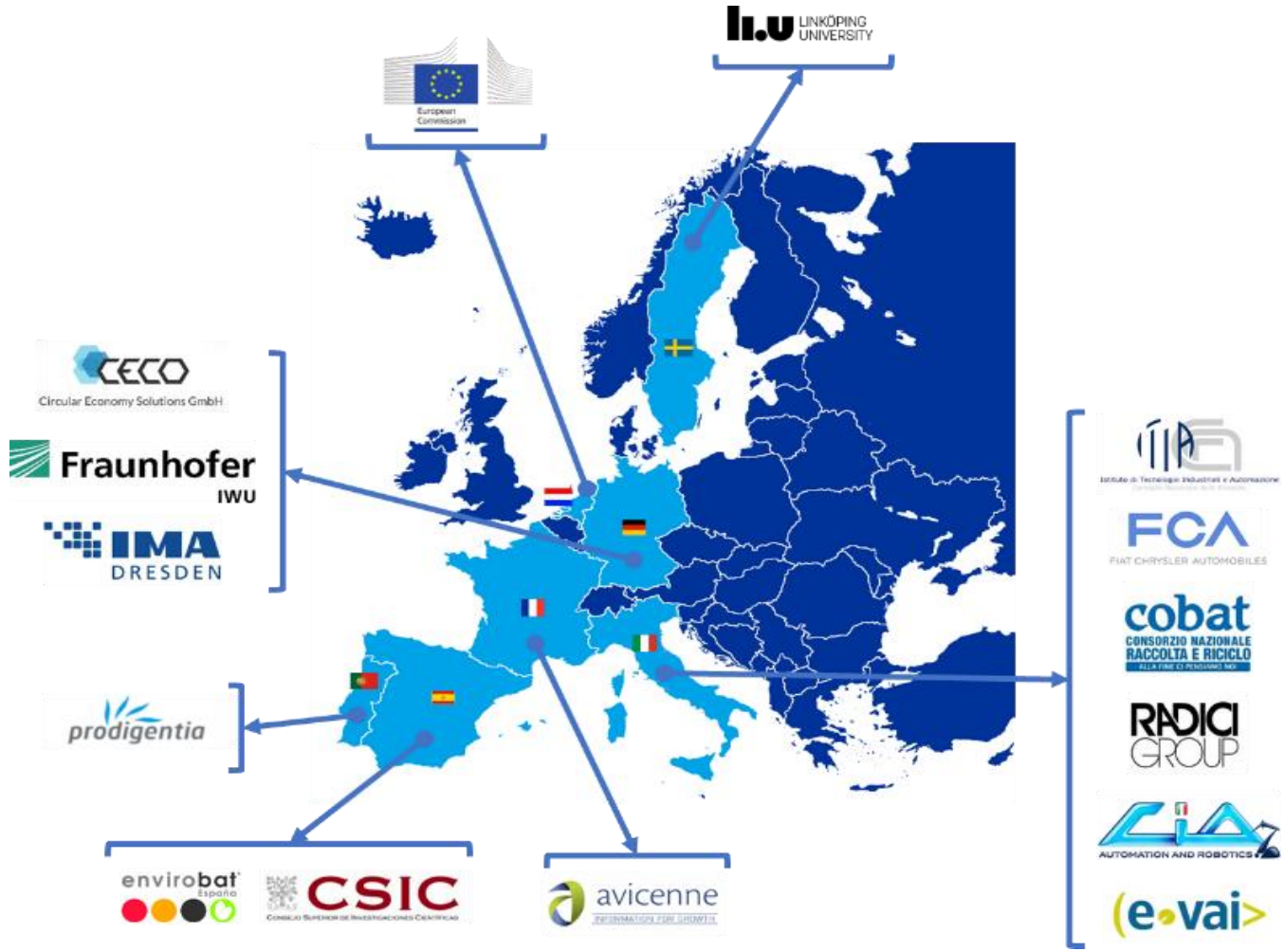
Concept and Partnership of CarE-Service





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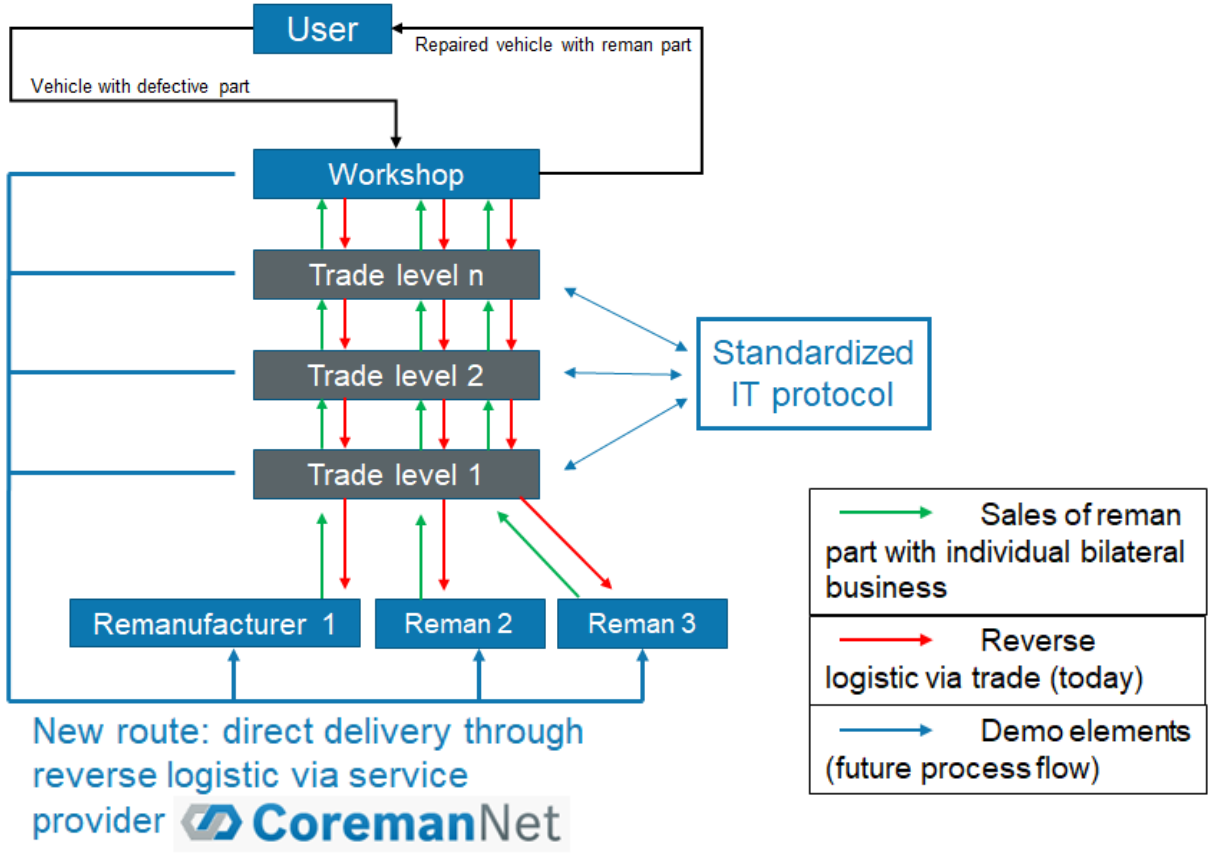
Streamline reverse logistic flow for all aftermarket stakeholders

ReCiPSS

- Increase efficiency and transparency of reverse logistic flow
- Close the loop by a standardized system
- Cores will be identified and evaluated only once
- Direct shipment to the final destination
- Development of a part data management platform supporting standard data exchange protocols to connect trade network



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ReCiPSS

Partners in automotive parts demonstrator

Users

Lorch

French automotive dealer network

Enablers

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SIVECO ROMANIA *Software that matters*

CirBES *Your partner to grow circular*

Supporting service network

CoremanNet

BOSCH

GCA STRIEBIG LOGISTIQUE CHARLES ANDRE

Research

KTH VETENSKAP OCH KONST

UNIVERSITAS MASARYKIANA BRUNENSIS

TU Delft

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776577-2

Synergetische Identifikation von Cores durch Mensch und System

GEFÖRDERT VOM
Bundesministerium für Bildung und Forschung

FONA Ressourceneffizienz BMBF

CECO Circular Economy Solutions GmbH
Leading provider for Circular Economy Services in the Automotive Aftermarket

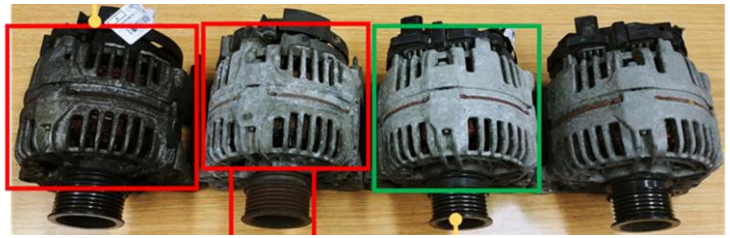
SUSTAINABLE ENGINEERING
Expert for sustainability assessment

EIBA

IWF
Expert in computer aided business data analysis

Fraunhofer IPK
Specialist for sensor-based identification of objects

acatech DEUTSCHE AKADEMIE DER TECHNIKWISSENSCHAFTEN
Specialist for strategic engineering and technology policy issues



Vielen Dank für Ihr Interesse

Peter Bartel