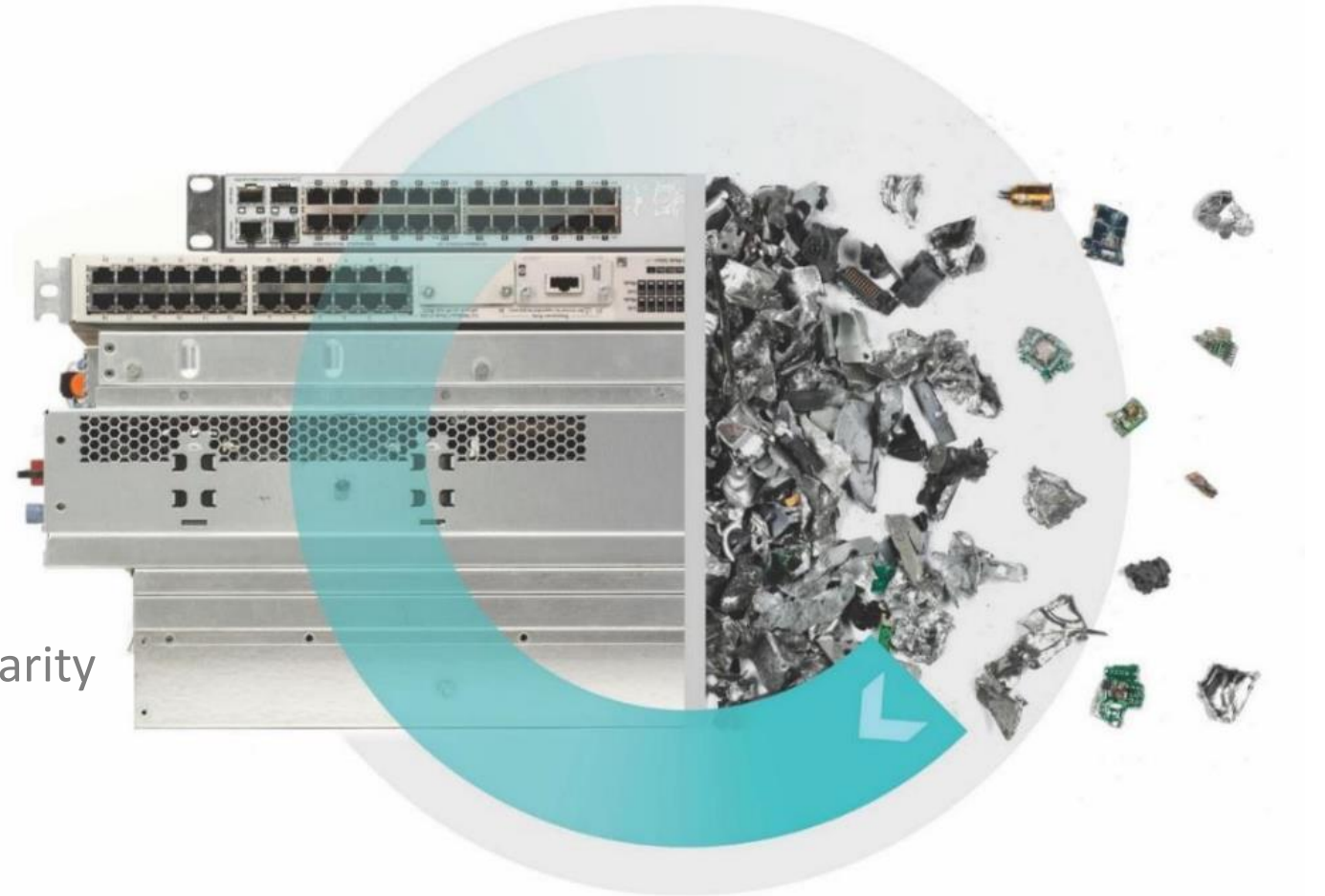


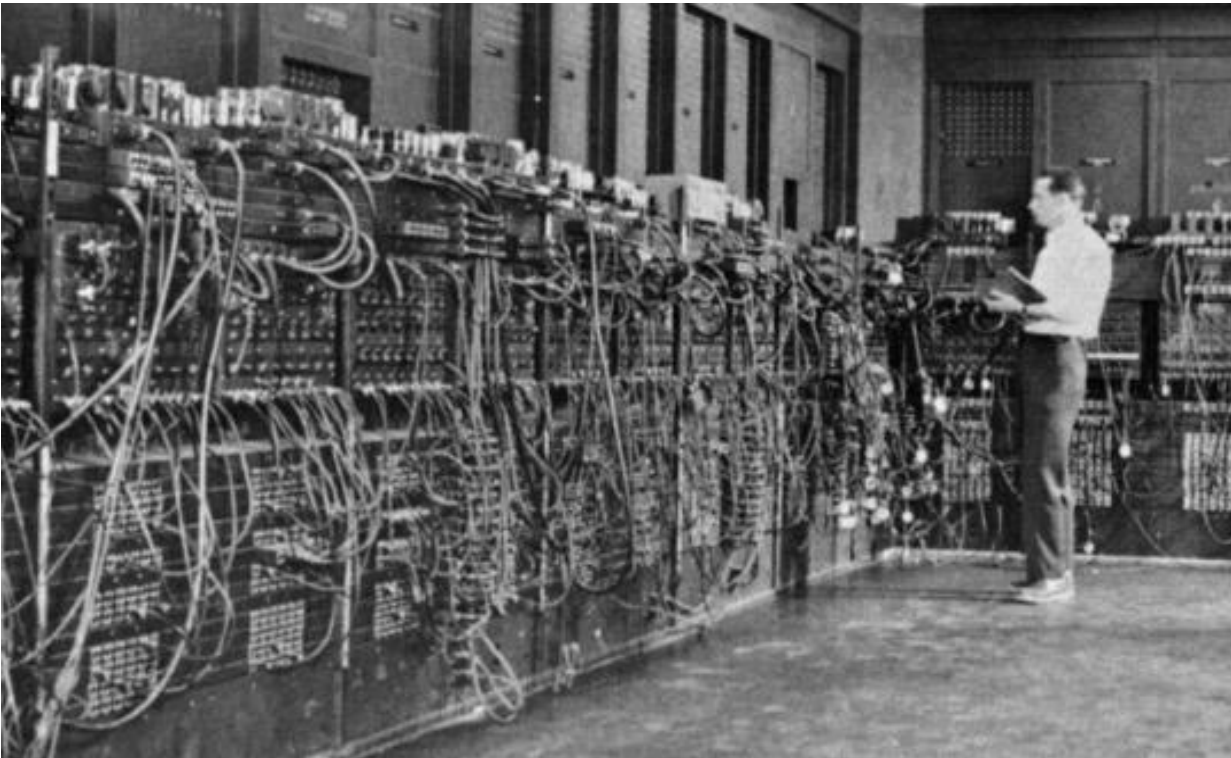


Kickstarting a Circular Economy for the Data Centre Industry

Deborah Andrews
Professor of Design for Sustainability & Circularity
School of Engineering
London South Bank University
CEDaCI - Academic Lead



Connectivity – 55% global population / data traffic = 4.2 trillion gigabytes / yr

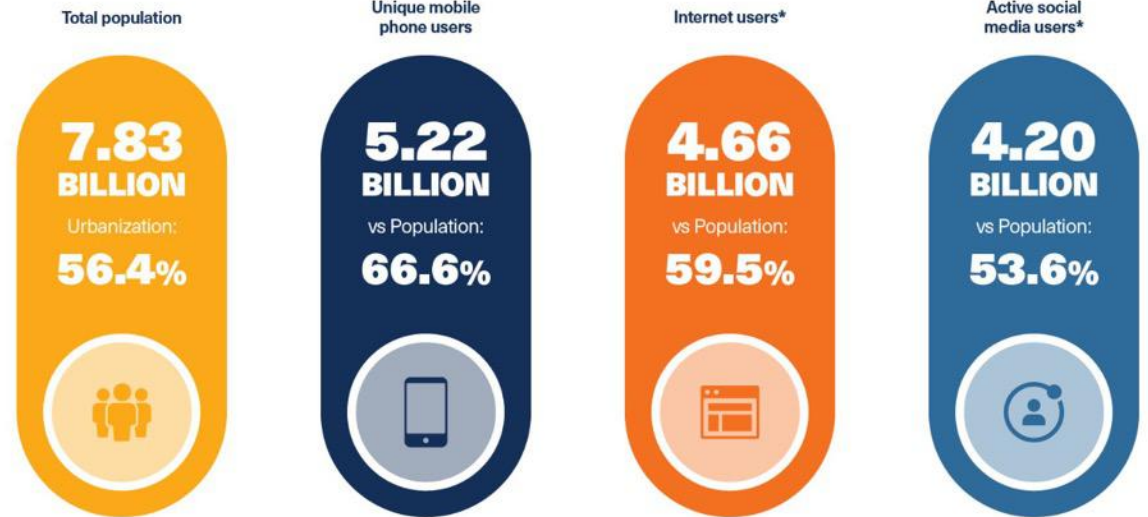


JANUARY 2021

Digital around the world

Essential headlines for mobile, internet, and social media use

● Internet user numbers no longer include data sourced from social media platforms, so values are not comparable to previous reports



Sources: The U.N.; local government bodies; GSMA Intelligence; ITU; GWI; Eurostat; CNNIC; APiI; social media platforms' self-service advertising tools; company earnings reports; Mediascope.
*Advisories: Internet user numbers no longer include data sourced from social media platforms, so values are not comparable to data published in previous reports. Social media user numbers may not represent unique individuals. **Comparability advisory:** Source and base changes.

Hootsuite*

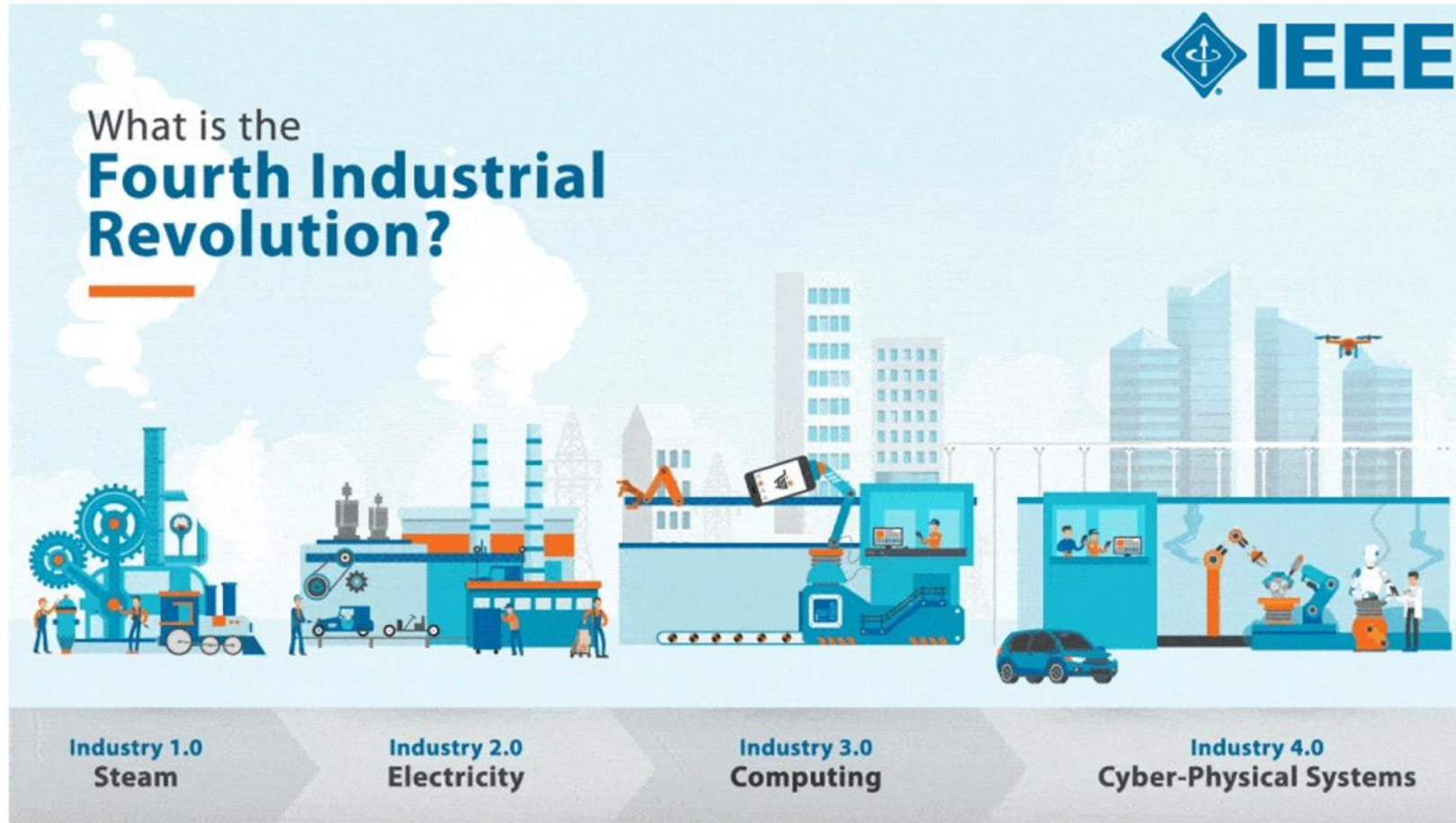
Data Centres

7.2m globally / concentration in EU - UK, Germany, France & Netherlands

2010-2020 – \$100bn investment in sector – focus on **24/7 operation and energy efficiency**



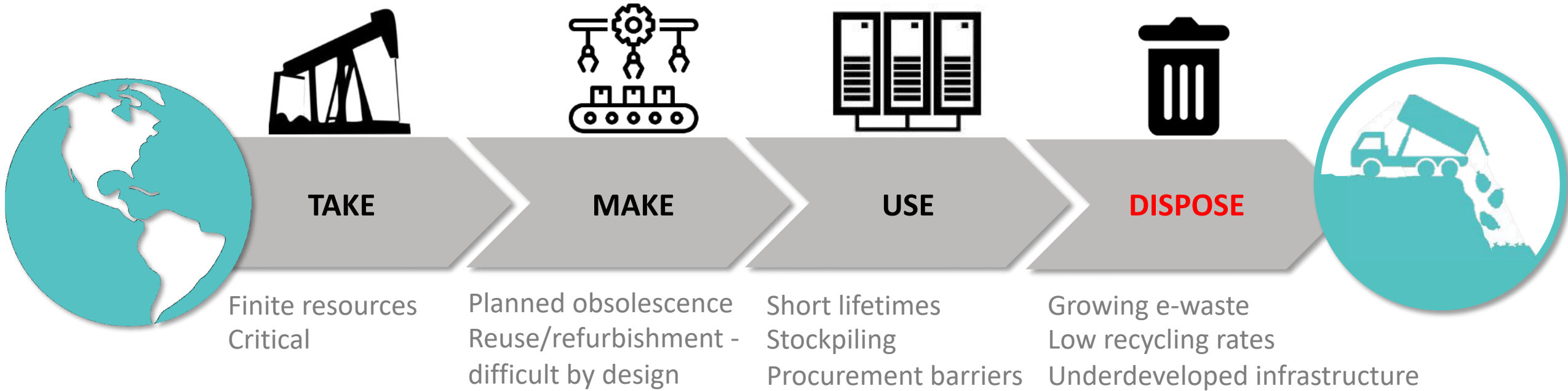
DC growth – 300% in EU by 2025 / 500% global 2030



<https://innovate.ieee.org/innovation-spotlight-ieee-fueling-fourth-industrial-revolution/>

Speed of sectoral development & emphasis on service provision....

Linear model of consumption



Benefits / value of CDCC e-waste

Annual – 2020 ~50 million tonnes – 6kg per person
Business as usual - 2050 – 120 million tonnes

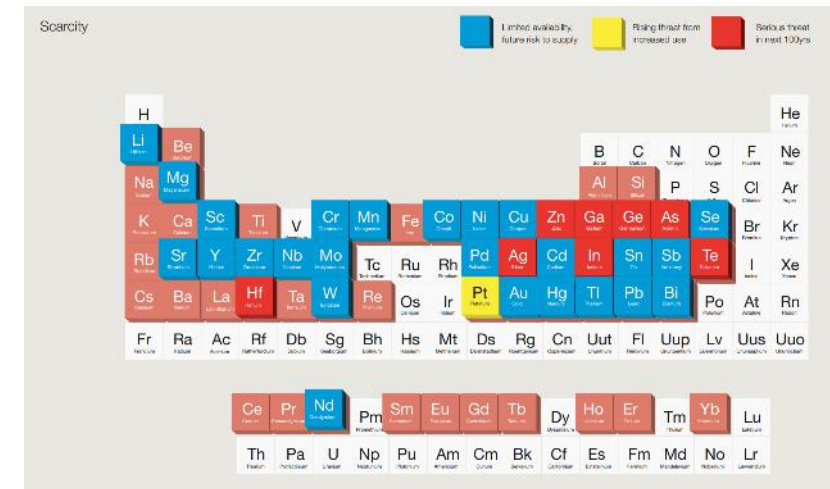
Global - < 20% is formally collected and recycled
Current value - >\$62.5 billion

69 elements in EEE
2015 – EU 7-10 Critical Raw Materials

Export of e-waste



Source: Greenpeace, Basel Action Network



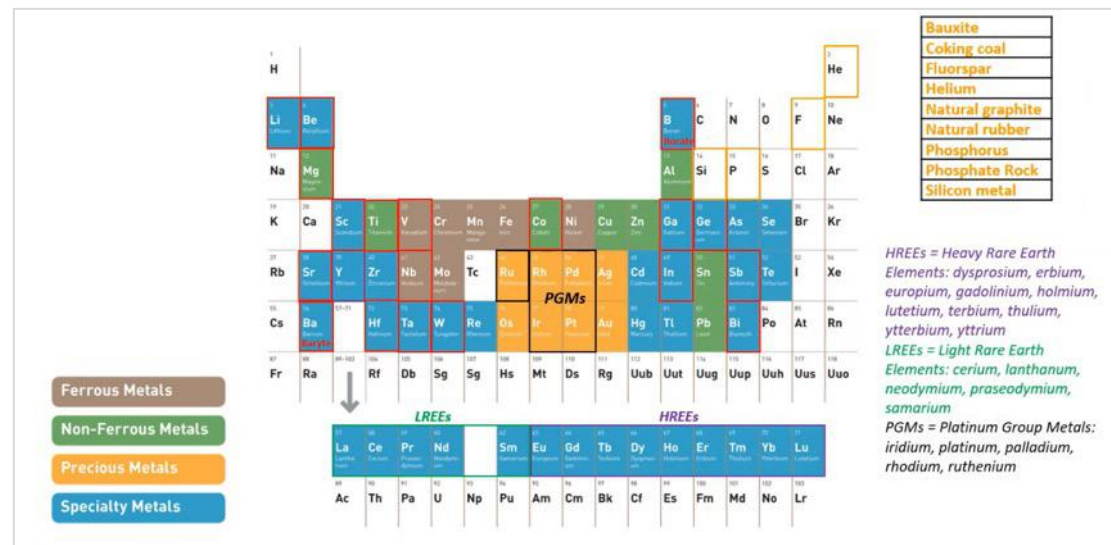
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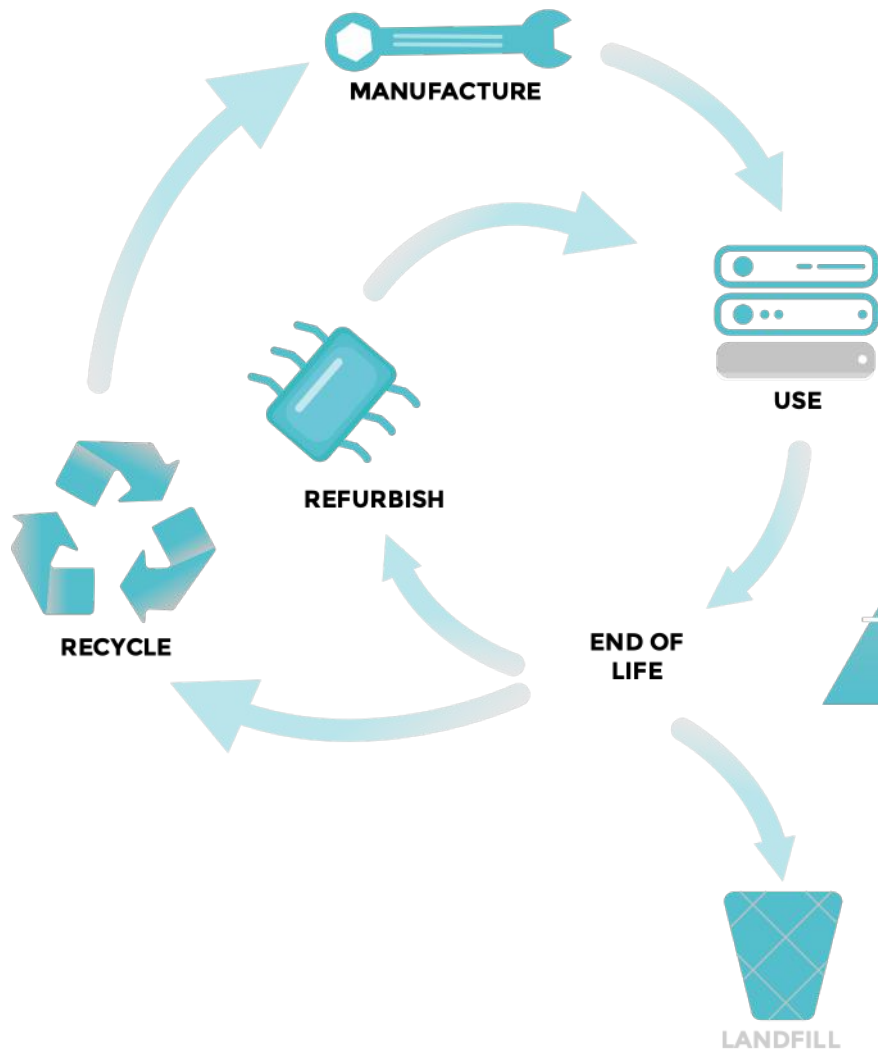
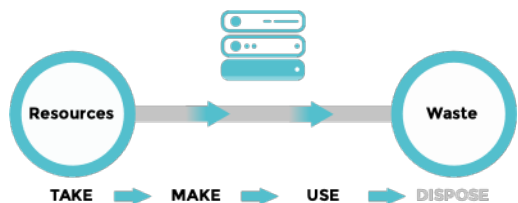
69 elements in EEE
2021 – EU - 20 Critical Raw Materials

Export of e-waste

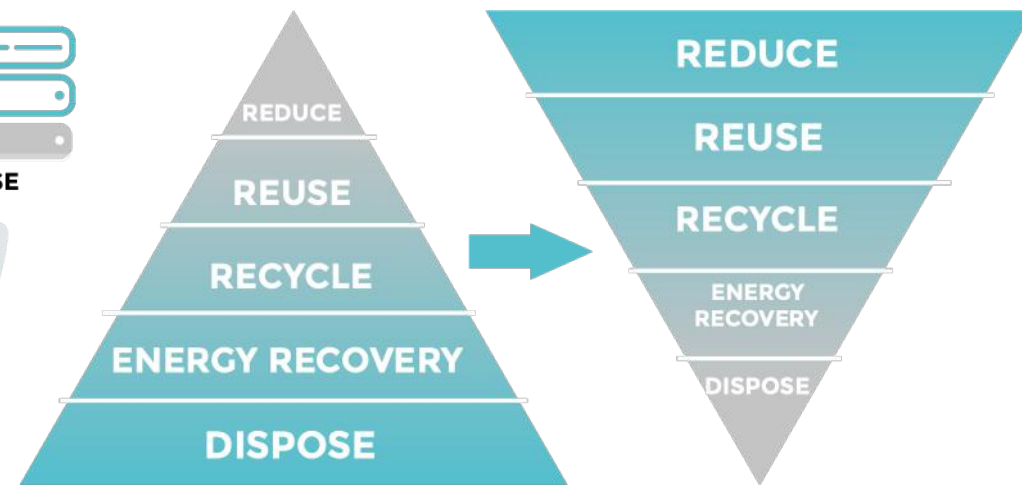


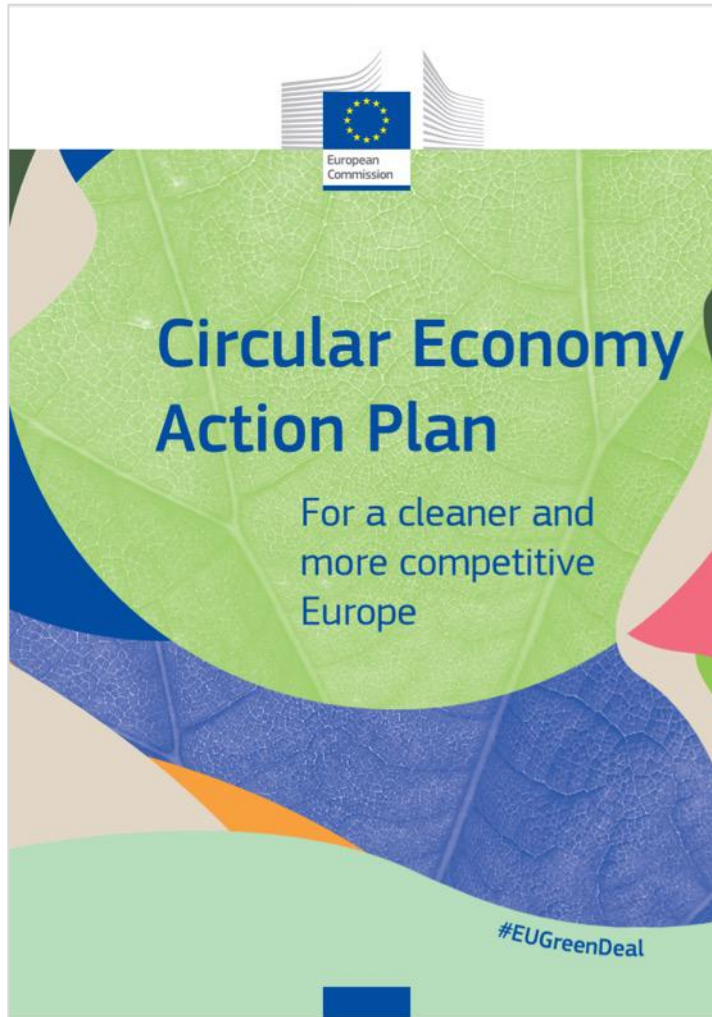
Circular Economy

Linear Economy



Waste Management Hierarchy



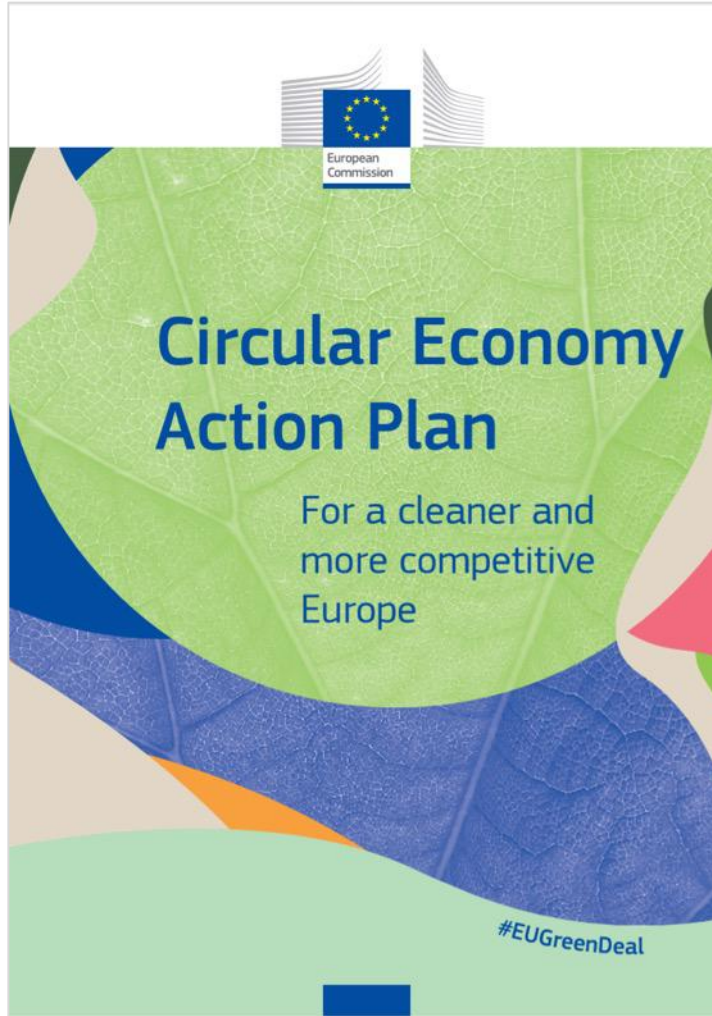


First CE Action Plan – Closing the Loop 2015

CE Action Plan – 2020

Actions

- Make sustainable products the norm in the EU
- Empower consumers and public buyers;
- **Focus on the sectors that use most resources and where the potential for circularity is high such as: electronics and ICT; batteries** and vehicles; packaging; plastics; textiles; construction and buildings; food; water and nutrients;
- Ensure less waste;
- Make circularity work for people, regions and cities,
- Lead global efforts on circular economy.




First CE Action Plan – Closing the Loop 2015

CE Action Plan – 2020

2012 – 2018

5% increase in CE linked jobs

4 million jobs
linked to the
circular economy
in the EU



24 / 35 key actions directly relate to DCI

DATE

KEY ACTIONS

A SUSTAINABLE PRODUCT POLICY FRAMEWORK

→	Legislative proposal for a sustainable product policy initiative	2021
→	Legislative proposal empowering consumers in the green transition	2020
→	Legislative and non-legislative measures establishing a new "right to repair"	2021
→	Legislative proposal on substantiating green claims	2020
→	Mandatory Green Public Procurement (GPP) criteria and targets in sectoral legislation and phasing-in mandatory reporting on GPP	as of 2021
→	Review of the Industrial Emissions Directive , including the integration of circular economy practices in upcoming Best Available Techniques reference documents	as of 2021
→	Launch of an industry-led industrial symbiosis reporting and certification system	2022

KEY PRODUCT VALUE CHAINS

→	Circular Electronics Initiative, common charger solution, and reward systems to return old devices	2020/2021
→	Review of the Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment and guidance to clarify its links with REACH and Ecodesign requirements	2021
→	Proposal for a new regulatory framework for batteries	2020
→	Review of the rules on end-of-life vehicles	2021
→	Review of the rules on proper treatment of waste oils	2022
→	Review to reinforce the essential requirements for packaging and reduce (over)packaging and packaging waste	2021
→	Mandatory requirements on recycled plastic content and plastic waste reduction measures for key products such as packaging, construction materials and vehicles	2021/2022
→	Restriction of intentionally added microplastics and measures on unintentional release of microplastics	2021
→	Policy framework for bio-based plastics and biodegradable or compostable plastics	2021
	EU Strategy for Textiles	2021
	Strategy for a Sustainable Built Environment	2021
	Initiative to substitute single-use packaging, tableware and cutlery by reusable products in food services	2021

LESS WASTE, MORE VALUE

→	Waste reduction targets for specific streams and other measures on waste prevention	2022
→	EU-wide harmonised model for separate collection of waste and labelling to facilitate separate collection	2022
→	Methodologies to track and minimise the presence of substances of concern in recycled materials and articles made thereof	2021
→	Harmonised information systems for the presence of substances of concern	2021
→	Scoping the development of further EU-wide end-of-waste and by-product criteria	2021
→	Revision of the rules on waste shipments	2021

MAKING THE CIRCULAR ECONOMY WORK FOR PEOPLE, REGIONS AND CITIES

	Supporting the circular economy transition through the Skills Agenda , the forthcoming Action Plan for Social Economy , the Pact for Skills and the European Social Fund Plus	as of 2020
→	Supporting the circular economy transition through Cohesion policy funds, the Just Transition Mechanism and urban initiatives	as of 2020

CROSSCUTTING ACTIONS

→	Improving measurement, modelling and policy tools to capture synergies between the circular economy and climate change mitigation and adaptation at EU and national level	as of 2020
→	Regulatory framework for the certification of carbon removals	2023
	Reflecting circular economy objectives in the revision of the guidelines on state aid in the field of environment and energy	2021
→	Mainstreaming circular economy objectives in the context of the rules on non-financial reporting , and initiatives on sustainable corporate governance and on environmental accounting	2020/2021

LEADING EFFORTS AT GLOBAL LEVEL

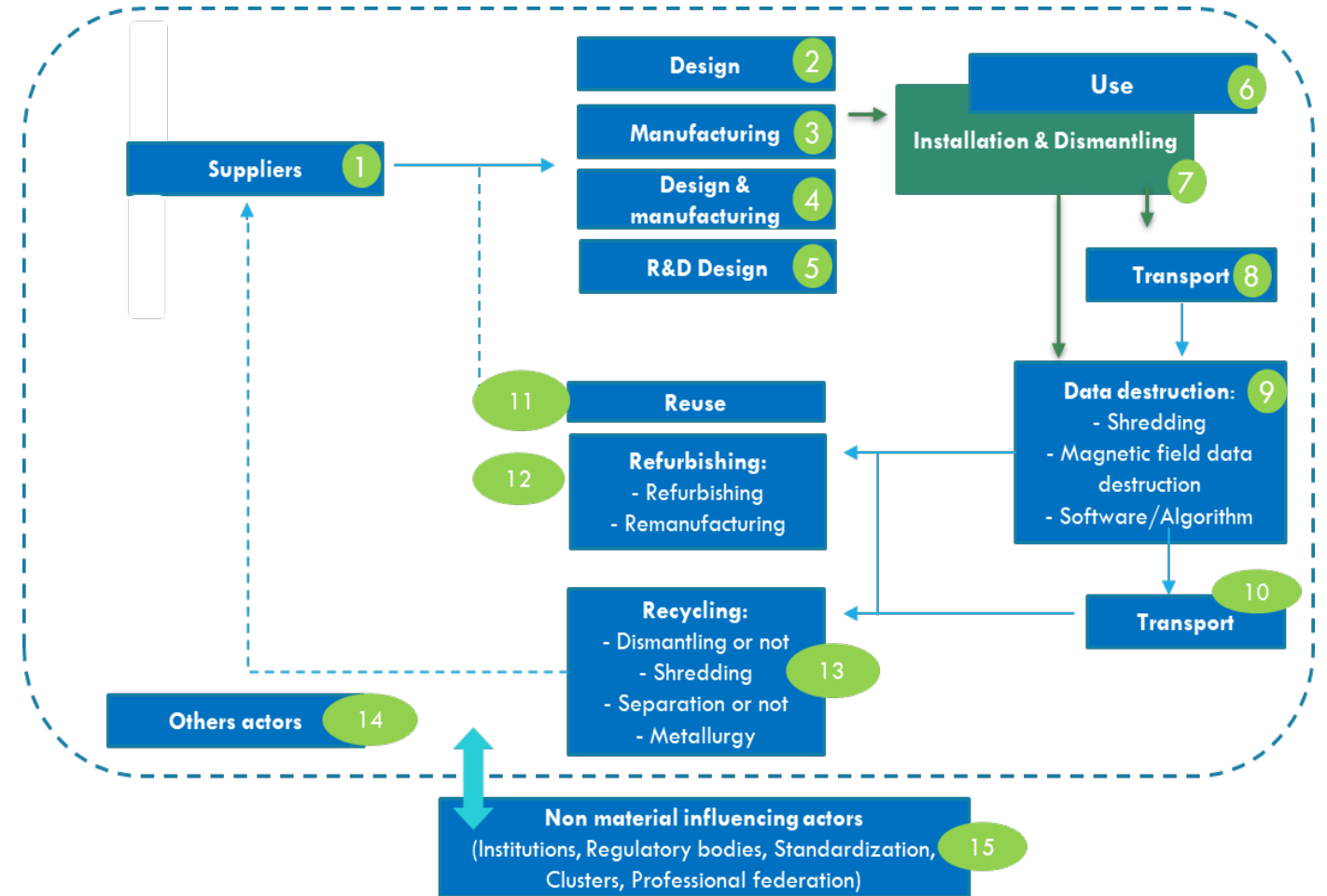
	Leading efforts towards reaching a global agreement on plastics	as of 2020
	Proposing a Global Circular Economy Alliance and initiating discussions on an international agreement on the management of natural resources	as of 2021
	Mainstreaming circular economy objectives in free trade agreements , in other bilateral, regional and multilateral processes and agreements, and in EU external policy funding instruments	as of 2020

MONITORING THE PROGRESS

	Updating the Circular Economy Monitoring Framework to reflect new policy priorities and develop further indicators on resource use , including consumption and material footprints	2021
--	---	------

CEDaCI

- unique, interdisciplinary, multi-output initiative
- uses **whole-life thinking**
- **brings together representatives from all 14 DCI sub-sectors** to share knowledge
- accelerating development of sectoral Circular Economy
- **supports CE Action Plan**
- reduce waste
- prevent supply chain problems
- secure uninterrupted DC operation and service



Primary source data collection – all partners

inventory building / improving recycling / CRM reclamation / building LCA, LCC and S-LCA models for Pilots (design / manufacture, second-life, end-of-life) and CEDaCI Compass





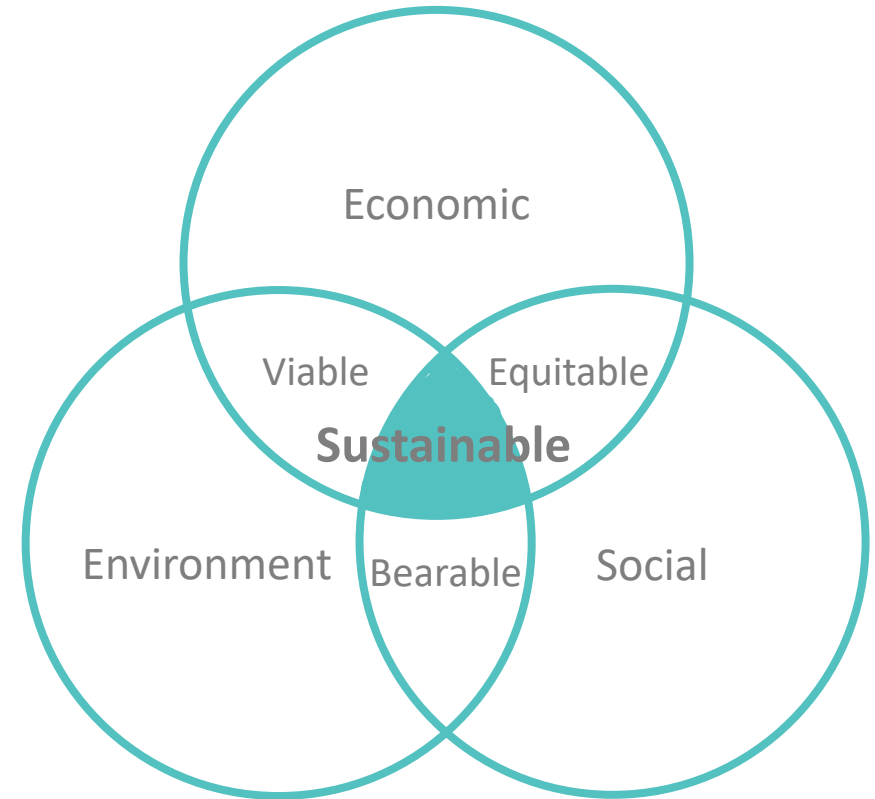
CDCC

Circular Data Centre Compass

Key Output – free on line resource

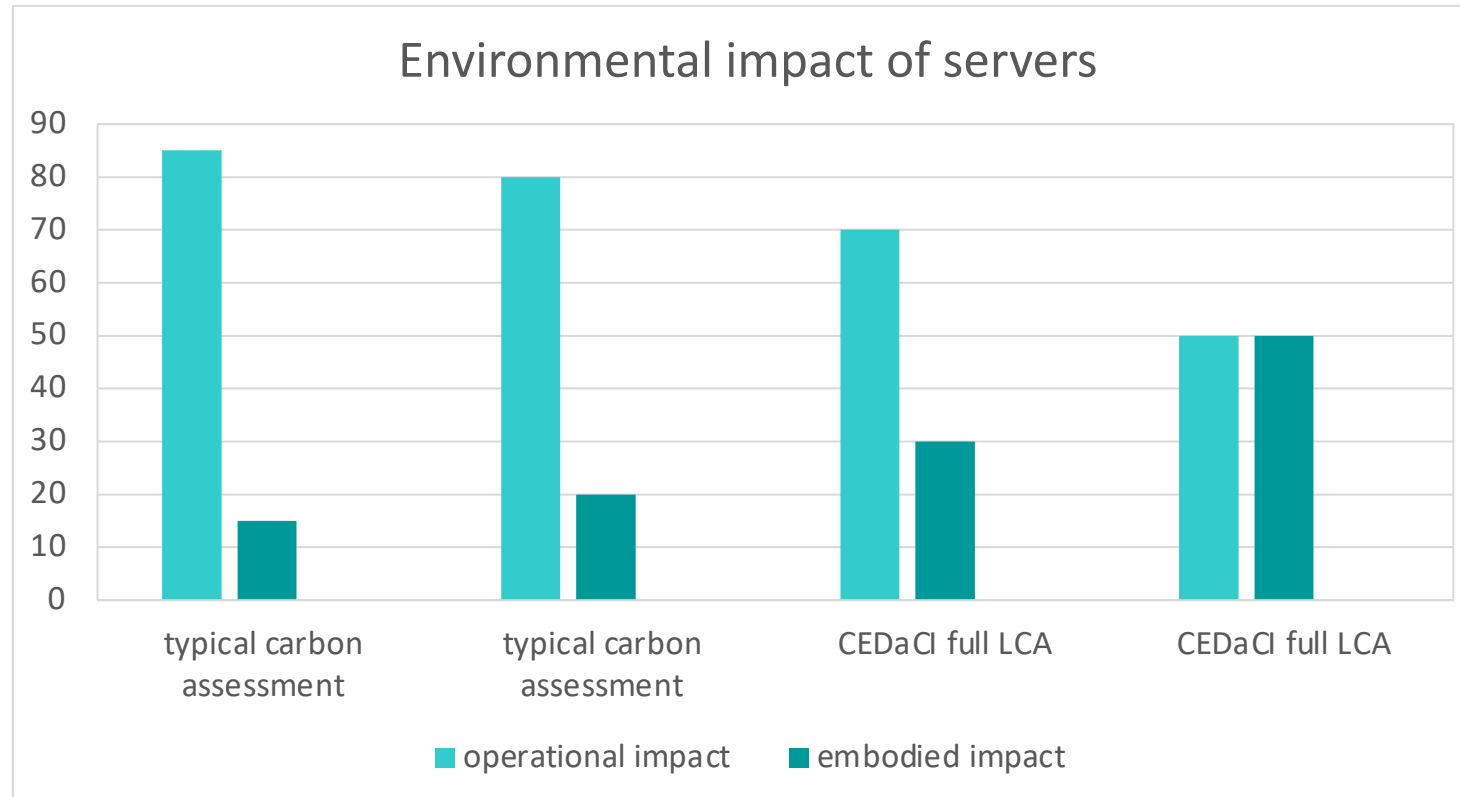
Product Sustainability and Circularity Indicator
Enables business to compare environmental, social and economic impacts and materials' criticality of different servers

Identify preferred Circular business option based on company and/or performance requirements



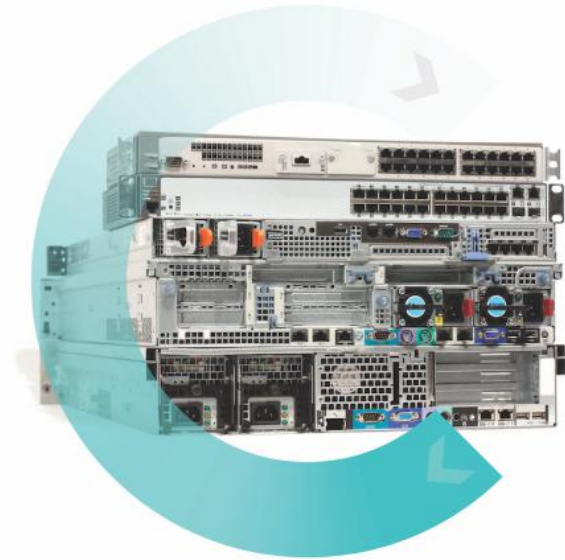
Life Cycle SUSTAINABILITY Assessment + Criticality Indicator

Compare carbon assessments / preliminary LCA results – indicate much higher embodied impact





Welcome to Compass



Username

Exampleuser

Password

Login

or

Sign up

[Forgot your password?](#)



Tool Options

Welcome to the Circular Data Centre Compass (CDCC). Choose from the following tool options: Compare, Ecodesign Evaluator and End-of-Life to assess your Data Centre equipment at various stages of its life.

All options were developed in-line with **the EU Circular Economy Action Plan 2020** and other eco-design directives and regulations as well as the **empirical data collected by CEDaCI** from the material breakdown and assessment of various server models.

Compare

Evaluator

End of life

Compare

Compare the specifications and environmental, social and economic impact of two servers based on a chosen configuration and generate a free PDF report.

Start

End-of-Life

Explore end-of-life options for a given server and choose the most beneficial outcome from a social, economic, and environmental perspective.

Start

Eco-design Evaluator

Check the circularity of your server design in compliance with Ecodesign and Design for Circularity guidelines.

Start

Compare

The CDCC Compare tool uses **Life Cycle Assessment (LCA)** to assess the entire life cycle of the equipment including the extraction of raw materials, manufacturing/assembly, transportation, use and end-of-life stages. **The Circular Footprint Formula** is used to account for benefits and burdens, resulting from the use of secondary and virgin materials, and recycling and energy recovery.

To find out which equipment is most circular, **select and configure** two servers, **compare** the specifications and impacts and **download** the full PDF report.

[How do I use it? ↗](#)

Choose Servers to Compare:

Server 1

Select

- Dell Poweredge R740
- HPE DL380 Gen 10**
- HPE DL360 Gen 9

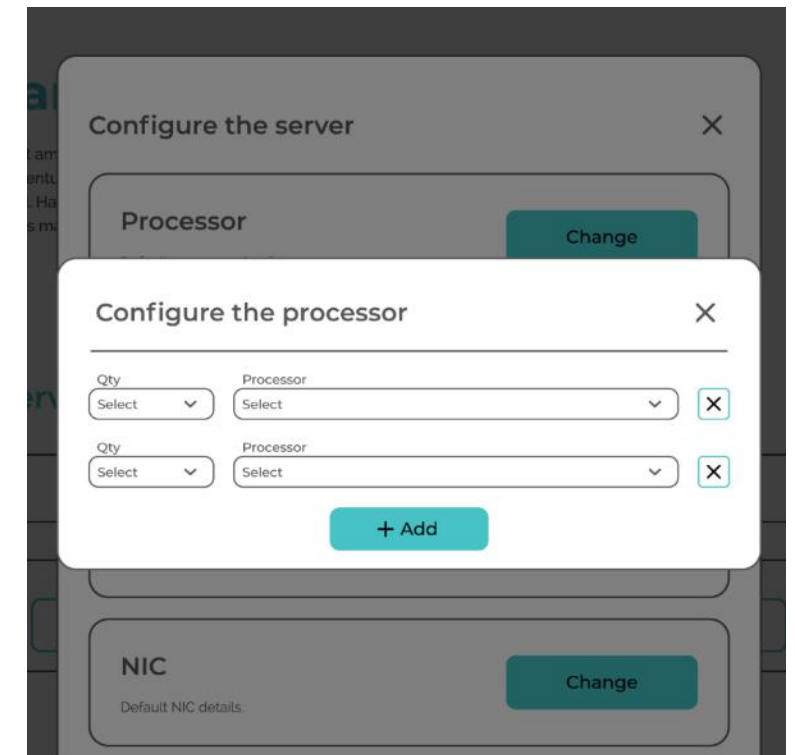
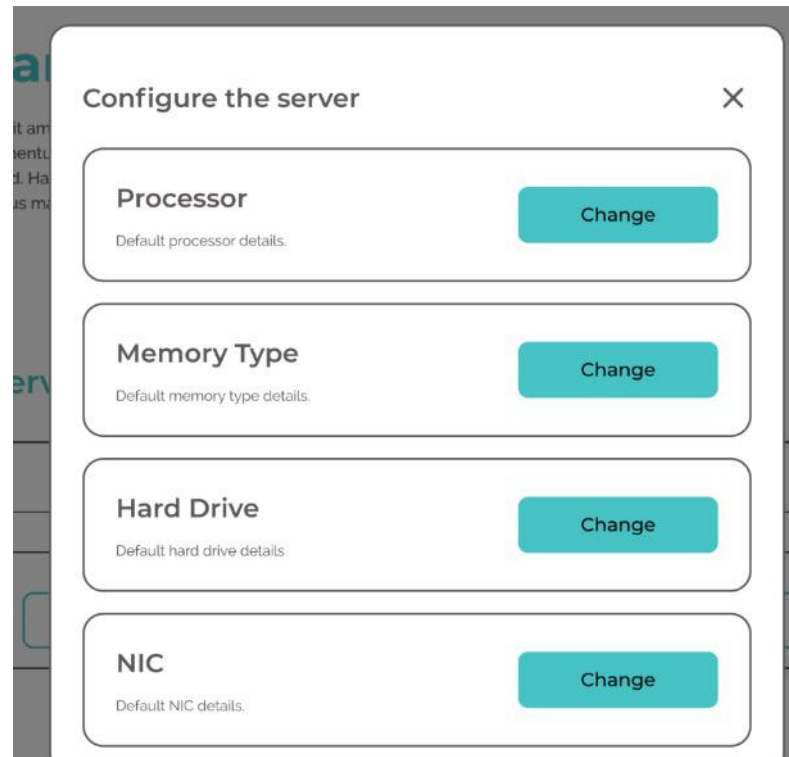
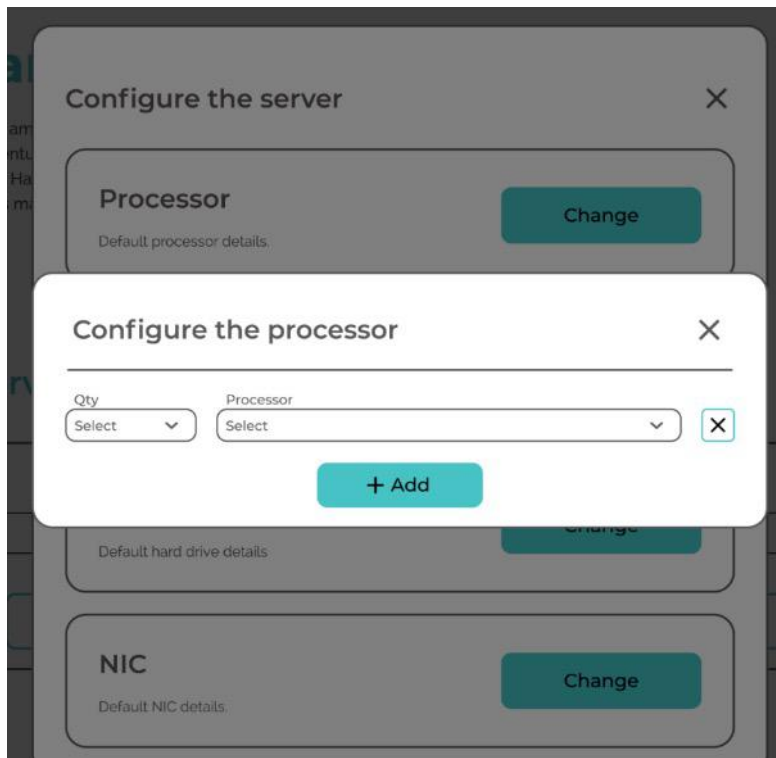
Server 2

Select

Compare tool uses LCA to assess entire life cycle of the equipment – extraction of raw materials, manufacturing/assembly, transportation, use and end-of-life stages

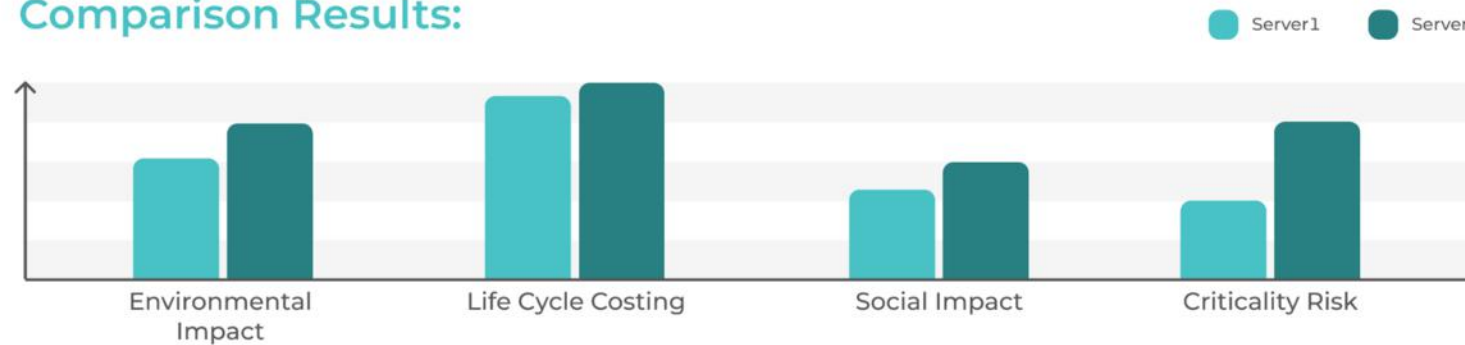
Circular Footprint Formula - accounts for benefits and burdens, resulting from the use of secondary and virgin materials, and recycling and energy recovery.

Compare - find out which equipment is most circular - **select** and **configure** two servers



Server Specifications	Dell Poweredge R740	HPE DL380 Gen 10
Chassis Type	Rack	Rack
Form Factor	2U	2U
Year of Release	2017	2017
Country of Assembly	Unknown	Czech Republic
Provider Company	TechBuyer	TechBuyer
Provider Country	UK	UK
Dimensions (LxWxH) (cm)	8.7x43.4x73.7	8.7x44.6x73
Weight (g)	14500	14250

Comparison Results:



[Download](#)



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[Compare](#)

[Evaluator](#)

[End of life](#)

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Check the circularity of your server design in compliance with Ecodesign and Design for Circularity guidelines.

[Start](#)



End-of-Life

The End-of-Life (EoL) tool aims to encourage more sustainable considerations once a server reaches the end of its usable lifetime for a given user.

Assess and compare impacts and criticality risk of different end-of-life scenarios, including refurbishment, recycling using current industry methods, recycling using CEDaCI recommendations and landfill.

[How do I use it? ↗](#)

Compare reuse options

Are you considering buying a new server to replace an existing product? Compare server models across social, economic, and environmental impacts and criticality risk.

Compare

Compare the end-of-life options

The server has reached the end of its first life. Compare the total impacts of various disposal options: refurbishment, recycling using CEDaCI recommendations, recycling with current industry methods and landfill.

Compare

End-of-Life (EoL) tool encourages more sustainable considerations once a server reaches the end of its usable lifetime for a given user.

Assess and compare impacts and criticality risk of different end-of-life scenarios

- refurbishment / reuse
- recycling - current industry methods
- recycling - CEDaCI recommendations
- landfill



Choose Server:

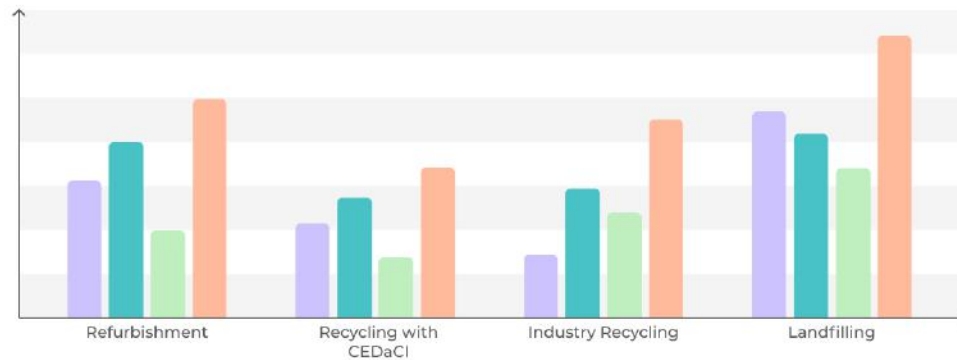
Server

HPE DL360 Gen 10

[Configure](#) [Results](#)

Comparison Results:

■ Environmental Impact
 ■ Life cycle costing
 ■ Social impact
 ■ Criticality risk



Environmental Impact

Environmental impact of the equipment throughout its lifetime.

Life Cycle Costing

Total cost of the equipment throughout its lifetime.

Social Impact

Social footprint of the equipment throughout its lifetime.

Criticality Risk

Estimates threats to the supply chain: geopolitical factors, unmined reserves, percentage / volume currently recycled.

[Download](#)



Tool Options

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Eco-design Evaluator

Check the circularity of your server design in compliance with Ecodesign and Design for Circularity guidelines.

Start

Up to
80%



of products' environmental impacts are determined at the design phase

Ecodesign Evaluator

The Ecodesign Evaluator is a set of consolidated **EU Ecodesign Criteria** reorganised in one place, making it much easier for the designers to follow. The tool includes Ecodesign guidelines from both the EU Circular Economic Action Plan and CEDaCI.

[How do I use it? ↗](#)

[Video ↗](#)

Check the overall circularity of your server design by **answering questions** about various criteria considered important for circularity.

Ecodesign Evaluator

consolidates EU Ecodesign Criteria in one place – easy for designers to follow

Tool includes Ecodesign guidelines from EU Circular Economic Action Plan and CEDaCI

Design and Manufacture

Can the following parts be used/re-used across different product generations?

▼

Can the following parts be used/re-used across different product models?

▼

Can the following parts be used/re-used across different product brands?

▼

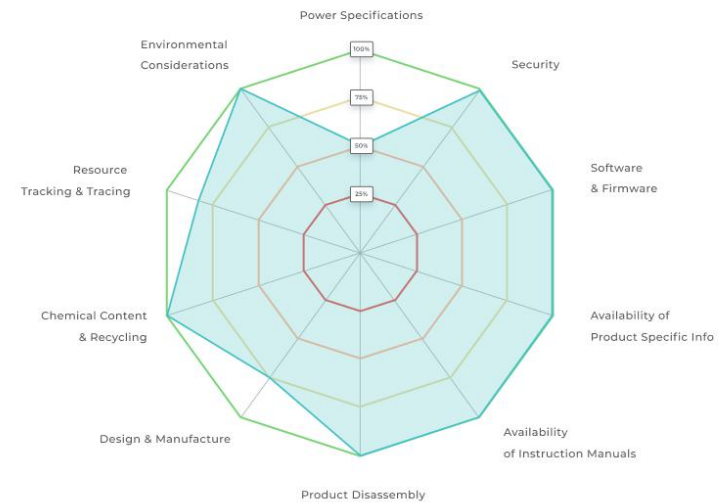
Can the product be used as a service?

▼

Is the product designed to become obsolete prematurely?

▼

◀ ● ● ● ● ● ● ● ▶





The CEDaCI Circular Server

Chassis mass:

CEDaCI server = 14kg

Standard server = 22kg

Total components:

CEDaCI server = 65

Standard server = 117

Mass of plastics :

CEDaCI server = 85.69g

Standard server = 889.45g

Thank you for listening

CEDaCI – runs until Sept 2023

Join us - fully funded SME training sessions
25 April and 25 May

follow us - cedaci.org

 <https://www.linkedin.com/company/cedaci>

 https://twitter.com/cedaci_project

