

Venlo as a Circular Hotspot. Materials drivers to a circular transition

Result of applying the CRM methodology, 2023

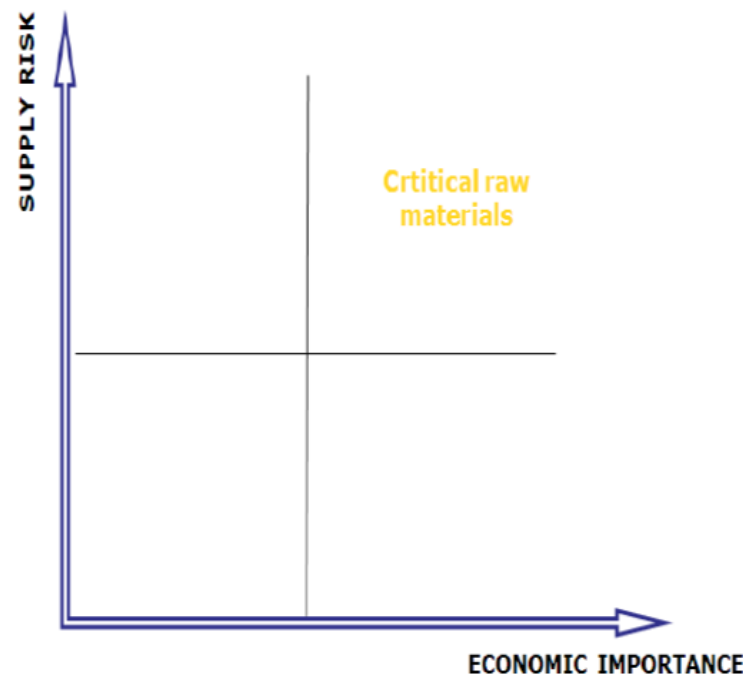
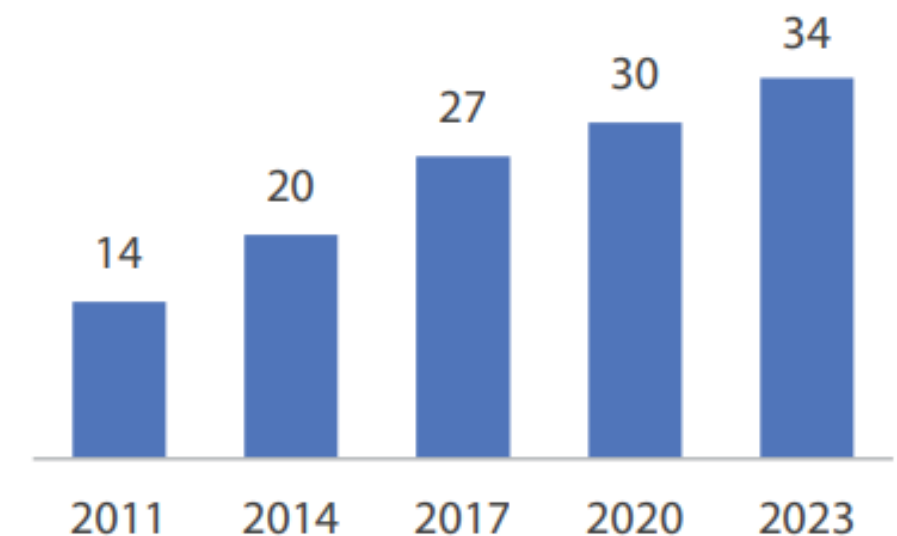


Figure 2 – Number of CRMs for the EU



Source: EPRS.

2023 Critical Raw Materials (*new CRMs in italics*)

aluminium/bauxite	coking coal	lithium	phosphorus
antimony	<i>feldspar</i>	LREE	scandium
<i>arsenic</i>	fluorspar	magnesium	silicon metal
baryte	gallium	<i>manganese</i>	strontium
beryllium	germanium	natural graphite	tantalum
bismuth	hafnium	niobium	titanium metal
boron/borate	<i>helium</i>	PGM	tungsten
cobalt	HREE	phosphate rock	vanadium
		<i>copper*</i>	<i>nickel*</i>

2023 Critical Raw Materials (*Strategic Raw Materials in italics*)

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		<i>copper*</i>	<i>nickel*</i>

* Copper and nickel do not meet the CRM thresholds, but are included as Strategic Raw Materials.

Critical materials – it is all about demand and supply

Time is key. ‘When’ really matters.

Table 1 – EU material demand forecast examples, high demand scenario

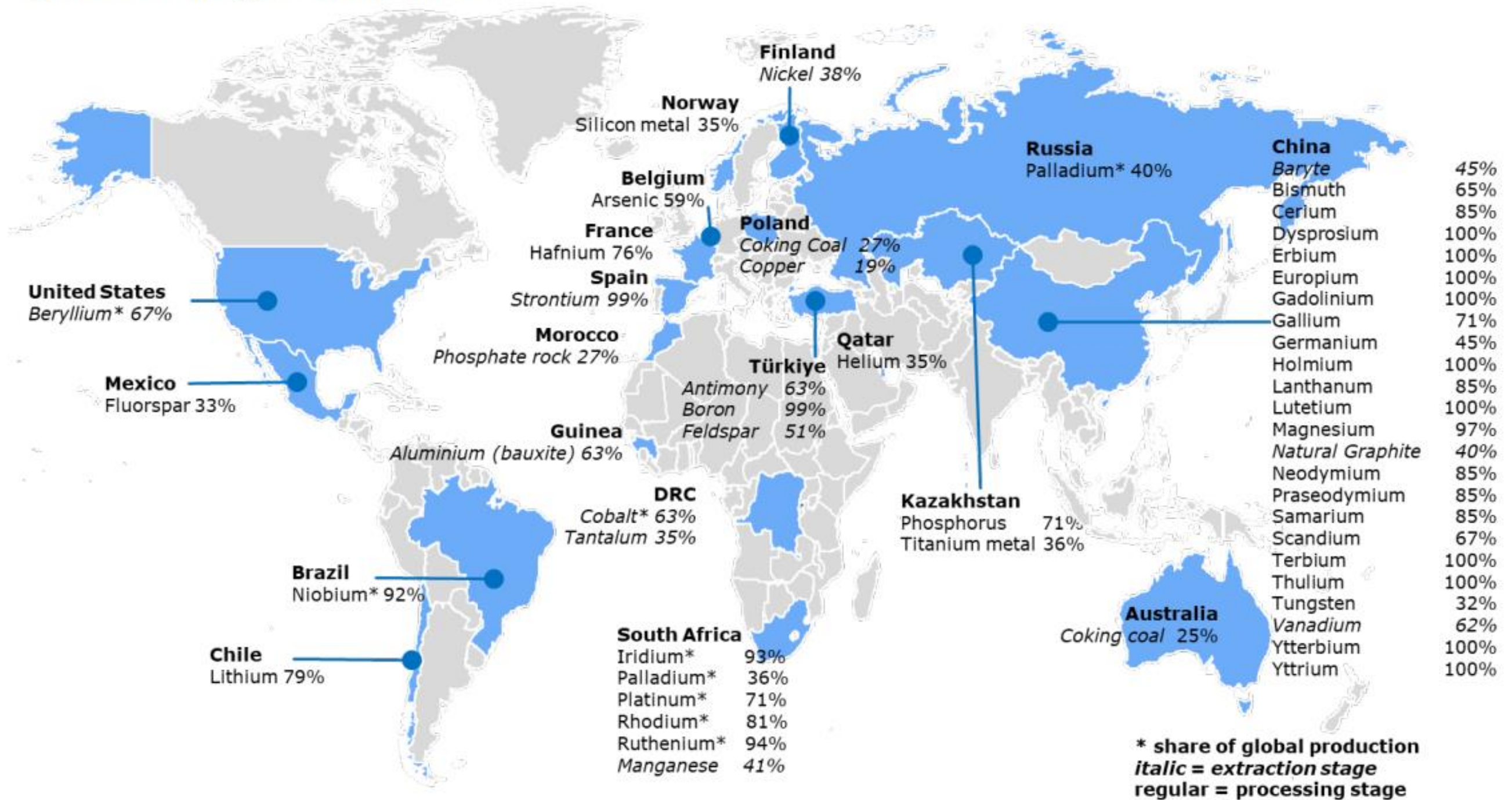
	EU demand in 2030 compared with 2020	EU forecasted demand in 2050 compared with 2020
Lithium	x 12	x 21
Graphite	x 14	x 26
Nickel	x 10	x 16
Dysprosium	x 6	x 7
Neodymium	x 5	x 6
Platinum	x 30	x 200
Aluminium	x 4	x 6

Data source: [European Commission, Joint Research Centre, 2023.](#)

Demand driven by dramatic need for energy transition tech, digital tech, aerospace and defence tech..

Country supply into EU concentration

Figure 5: Main EU suppliers of individual CRMs



Materials – products...the made in EU vs imported.

Table 2 – Supply risks for the EU and EU share of global production volumes (examples)

15 key technologies	Supply chain steps					
	Raw materials	Processed materials	Components	Assemblies	Super assemblies	Systems
Li-ion batteries	2 %	4 %	3 %	6 %		
Fuel cells	3 %	15 %	25 %	12 %		
Wind turbines	2 %	15 %	24 %	18 %	34 %	
Traction motors	2 %	12 %	9 %	19 %		
Solar photovoltaics	4 %	12 %	11 %	2 %		
Drones	4 %	18 %	9 %	11 %	6 %	

Data source: [European Commission, Joint research Centre](#), 2023. Note: % indicates average EU share in global production for the supply chain step. In red: EU is vulnerable. In black: EU is not vulnerable.

Short term, recycling is challenging

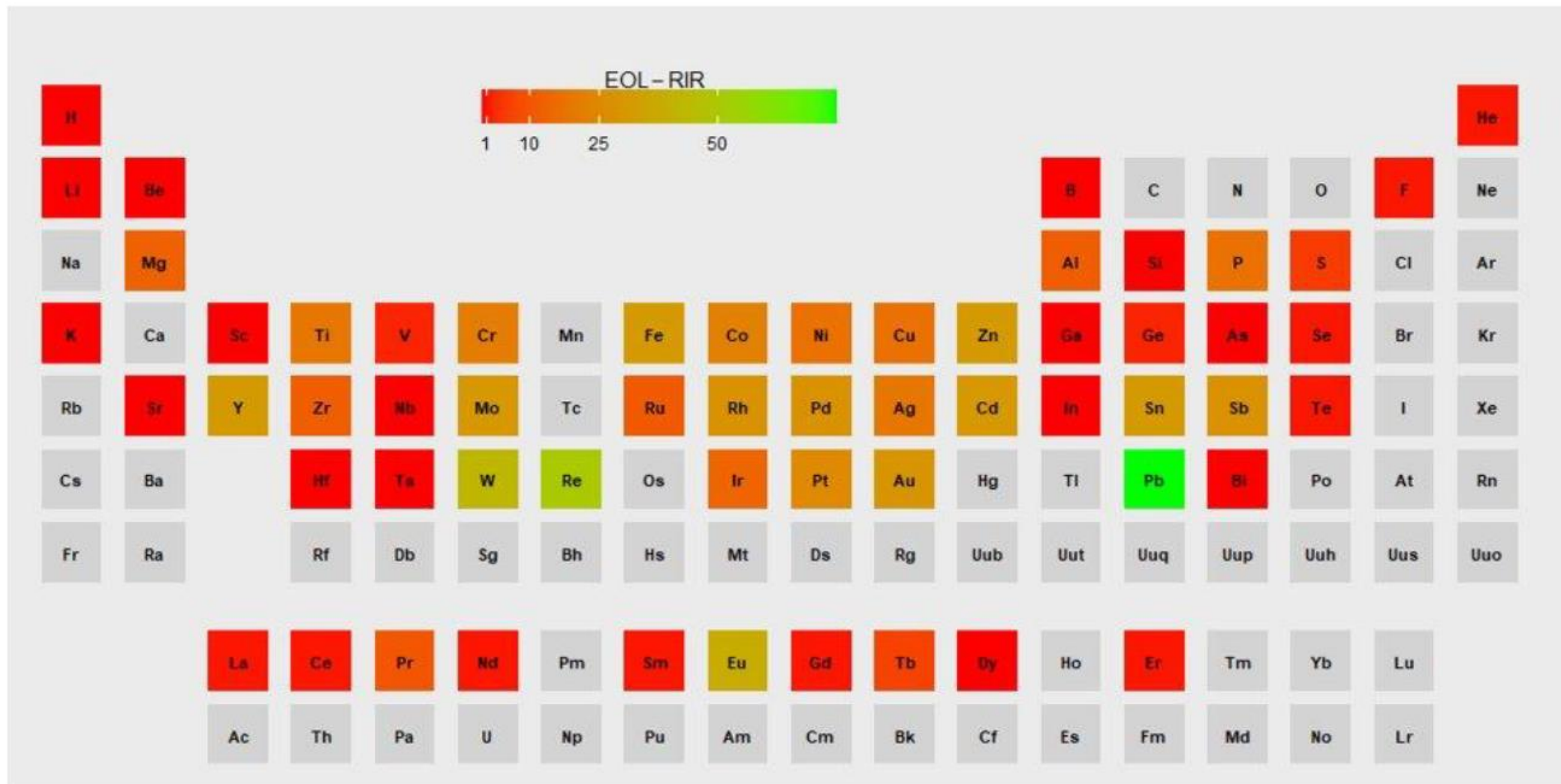


Figure 2. Heatmap created based end of life recycling input rate (EOL-RIR) data (Directorate-General for Internal Market *et al.*, 2020).

The Critical Raw Materials Act Targets by 2030



EU EXTRACTION:

at least **10%** of the EU's annual consumption from EU extraction



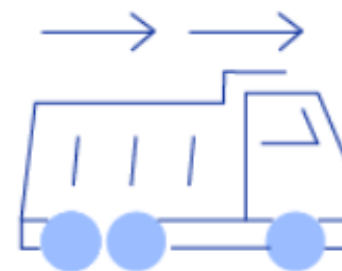
EU PROCESSING:

at least **40%** of the EU's annual consumption from EU processing



EU RECYCLING:

at least **25%** of the EU's annual consumption from domestic recycling



EXTERNAL SOURCES:

not more than **65%** of the Union's annual consumption of each strategic raw material at any relevant stage of processing from a single third country

Manufacturing companies

- Large companies, who manufacture strategic technologies
- And consume a significant amount of strategic materials,
 - Audit supply chains and report to their board of directors
 - Take into account supply risks & develop mitigation strategies
 - Run regular supply stress tests

David Peck

Circularity

- Each MS shall, **within 3 years**, adopt or implement measures;
 - Increase collection of waste products containing CRM
 - **Promote reuse of products containing CRM**
 - Increase secondary recycled CRM content in product; also for public sector procurement products
 - Increase technological maturity of recycling tech & promote substitution
 - Include support actions in national R&I programmes

Eco design for sustainable products regulation shall apply in relation to removability (disassembly) requirements.

David Peck

Circular Economy

Circular economy

Strategies



Smarter
product
use and
manufacture

R0 Refuse

R1 Rethink

R2 Reduce



Missing. May be essential.

Extend lifespan
of product and
its parts

R3 Reuse

R4 Repair

R5 Refurbish

R6 Remanufacture

R7 Repurpose



Life extension mainly missing.
Life extension slows down
demand.

Useful
application of
materials

R8 Recycle

R9 Recover



Main policy CE focus is
secondary supply.

Linear economy

Circular Economy and the CRM Act....Eco Design

Step 1: shortlist the CRMs potentially in the product group

Material	Application	Share	NACE-2 sector	EOL-IR	EOL-RR	High priority	RECYCLE MORE or ADD RECYCLED CONTENT	DECLARE Q.LTY	EXTEND LIFE
Beryllium	Electronic telecommunications equipment	42%	C26 - Manufacture of computer, electronic and optical products	0%	0%	X		X	
Beryllium	Transport and Defence: Vehicle electronics	17%	C26 - Manufacture of computer, electronic and optical products	0%	0%	X			
Cobalt	Magnets	7%	C27 - Manufacture of electrical equipment	22%	32%	X	X		
Cobalt	Battery	3%	C27 - Manufacture of electrical equipment	22%	32%	X	X		
Dysprosium	Magnets	100%	C25 - Manufacture of fabricated metal products, except machinery and equipment	0%	0%	X		X	
Erbium	Lighting	26%	C27 - Manufacture of electrical equipment	1%	1%	X		X	
Europium	Lighting	100%	C27 - Manufacture of electrical equipment	38%	34%	X		X	
Fluorspar	Refrigeration and air conditioning	9%	C27 - Manufacture of electrical equipment	1%	4%	X			
Gadolinium	Magnets	38%	C25 - Manufacture of fabricated metal products, except machinery and equipment	1%	1%	X		X	
Gadolinium	Lighting	25%	C27 - Manufacture of electrical equipment	1%	1%	X		X	
Gadolinium	Magnetic Resonance Imaging - MRI	8%	C21 - Manufacture of basic pharmaceutical products and pharmaceutical preparations	1%	1%	X			
Gallium	Integrated circuits	70%	C26 - Manufacture of computer, electronic and optical products	0%	0%	X		X	
Gallium	Lighting	25%	C27 - Manufacture of electrical equipment	0%	0%	X		X	
Gallium	ClGS solar cells	5%	C26 - Manufacture of computer, electronic and optical products	0%	0%	X			
Germanium	Infrared optics	43%	C26 - Manufacture of computer, electronic and optical products	2%	12%	X		X	

Step 2: collect quantitative data on the Bill of Material for the shortlisted CRMs

Step 3: look at available information from criticality assessment to define possible strategies, e.g.:

- Declare quantity (when data is not available)
- Extend lifetime (especially in the case of low substitutability)
- Improve recyclability and/or recycled materials (especially in the case of low substitutability)

Circular CRMs – extension via remanufacturing, multi cycles, then recycled

Circular economy

Strategies



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Smarter
product
use and
manufacture

R0 Refuse
R1 Rethink
R2 Reduce

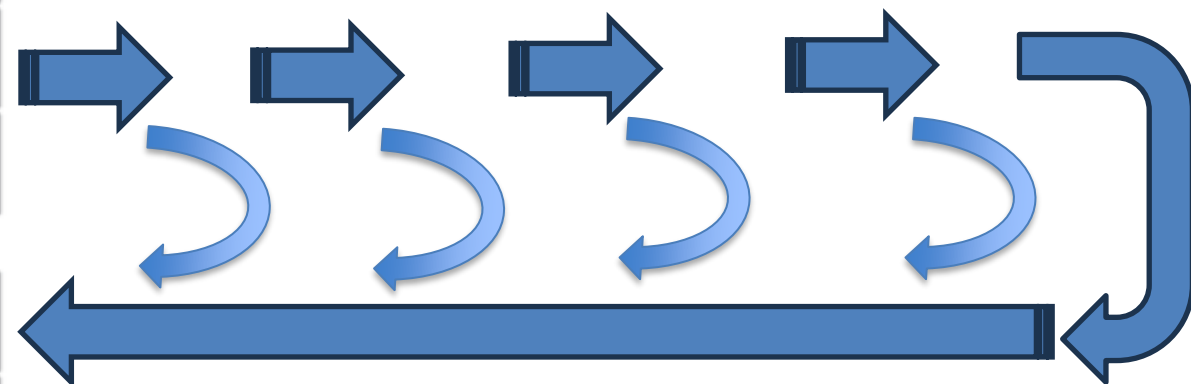
Extend lifespan
of product and
its parts

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R5 Refurbish
R6 Remanufacture
R7 Repurpose

Useful
application of
materials

R8 Recycle
R9 Recover

Reman cycles and recycling loops



Linear economy

Not reused, Not repaired, not refurbished, but through a factory, in a box, as good as (or better than) new, with a warranty, and **you can't tell the difference.**

Some numbers in Venlo / Limburg / Cross Border?

Remanufacturing

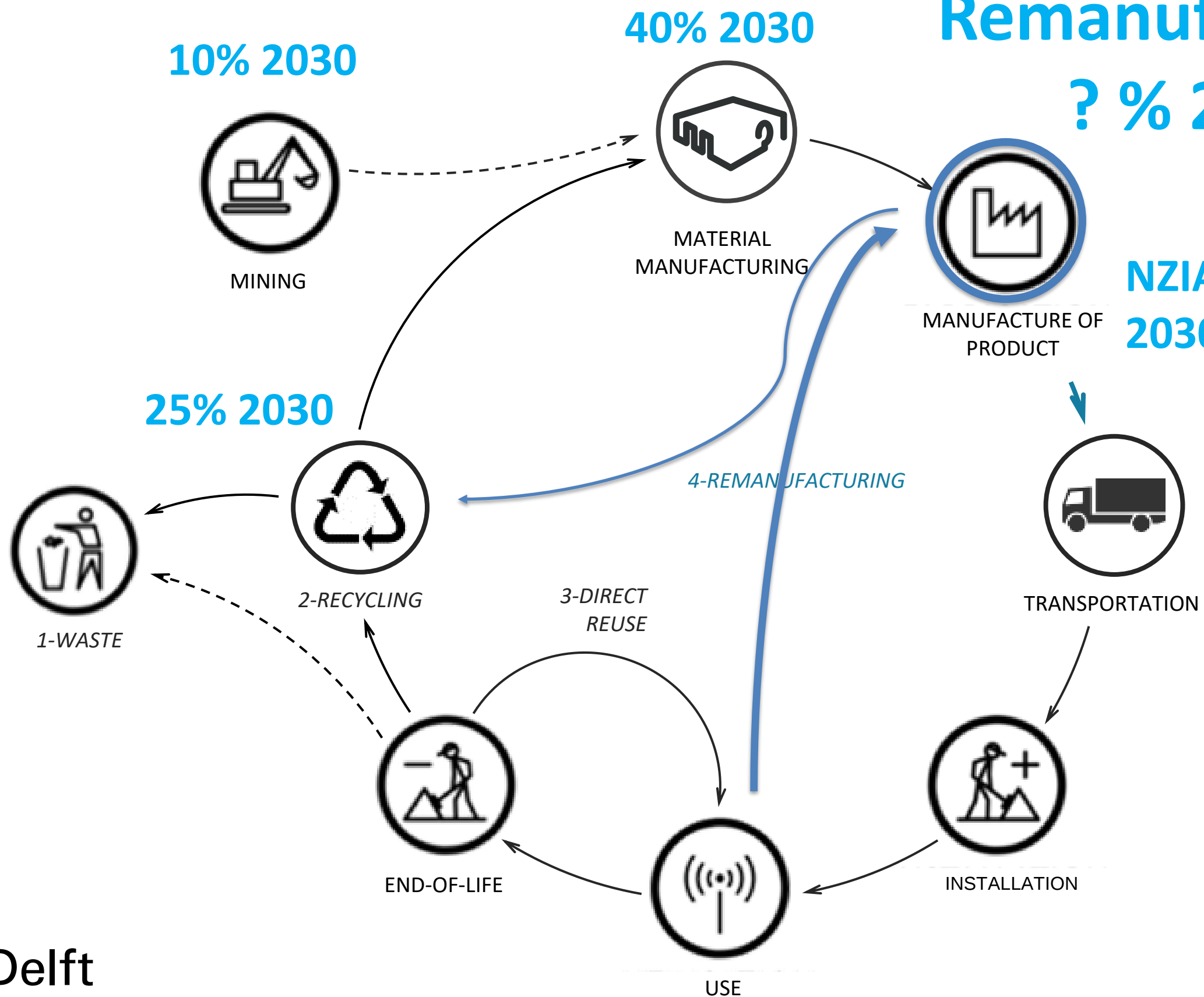
? % 2030

NZIA 40%
2030

40% 2030

10% 2030

25% 2030





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CIRCLETECH 101079354 Funded by the European Union - Twinning partnership to deliver enhanced networking for circular technological and socio-economic impact, raising research excellence and strengthening management capacity.

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Thank you