Economia Circular, Sostenibilidad y Eficiencia de los Recursos

Paradoja en la producción de Materias Primas en Europa: necesidad de una estrategia

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www.unioviedo.es/juanm

Universidad de Oviedo

Supported by eit RawMaterials Connecting matters

Funded by the European Union

EIT HEI Initiative eit-hei.eu

Escuela Politécnica de Mieres – Univ. de Oviedo

Universidad de Oviedo

- Primera escuela de enseñanza de la ingeniería en Asturias
- Fundada por Wilhelm Schulz en 1854
- El nuevo campus fue inagurado en 2002, financiado con fondos europeos

INDICE

- 20 minutos cada día de materias primas (RM)
- Paradoja socio-ambiental de la producción de RM
- Estrategia europea de RM
- Una mirada al futuro

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- **20 minutos cada día de materias primas (RM)**
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Pregunta clave

¿Es realmente necesario producir RM para nuestra vida diaria?

Comienza el día….

MINUTO 1


MON
6:00


06:00 AM
TUE


Stop
8:02
Shake for Snooze
Snooze


AM
8:30
SONY
8:30
6:55
9:30

Cobre

Acero

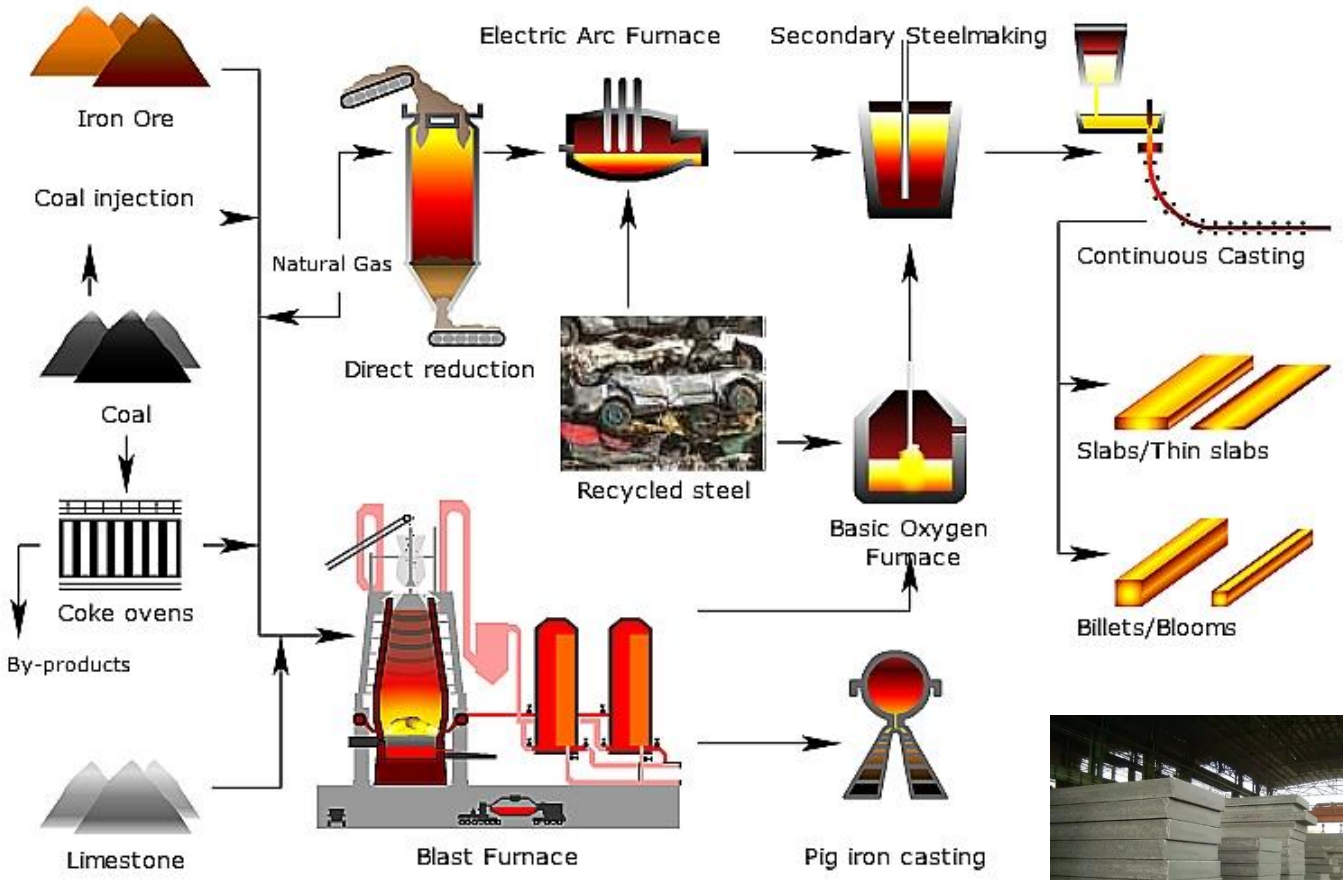
Vidrio

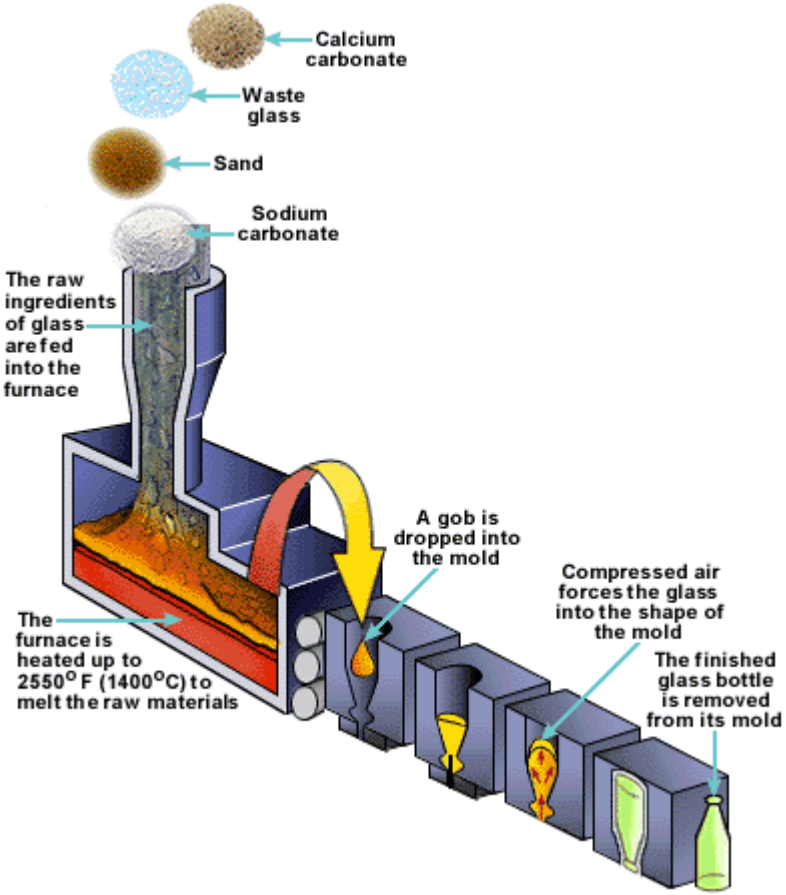
Plastico

....

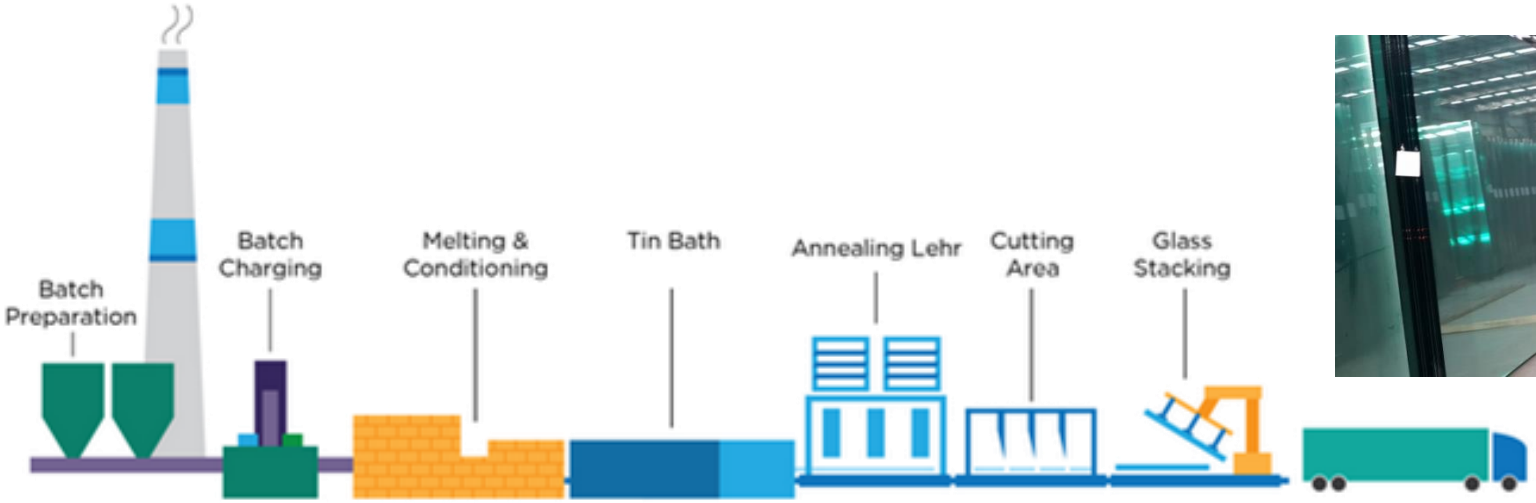
COBRE

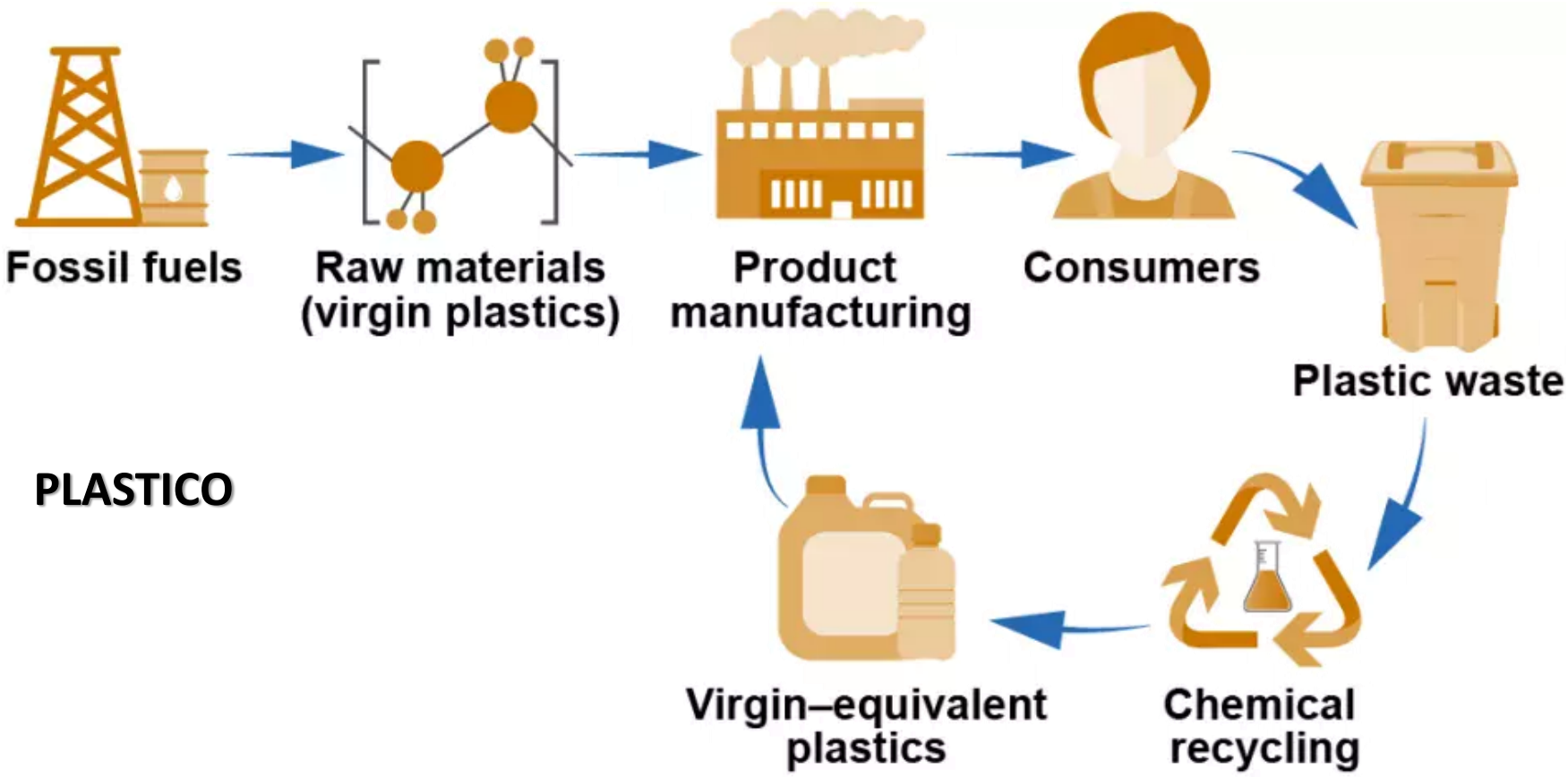
ACERO


Iron Ore
Coal injection
Coal
Coke ovens
By-products
Limestone
Natural Gas
Direct reduction
Electric Arc Furnace
Recycled steel
Secondary Steelmaking
Basic Oxygen Furnace
Blast Furnace
Pig iron casting
Continuous Casting
Slabs/Thin slabs
Billets/Blooms


Calcium carbonate
Waste glass
Sand
Sodium carbonate
The raw ingredients of glass are fed into the furnace
A gob is dropped into the mold
Compressed air forces the glass into the shape of the mold
The finished glass bottle is removed from its mold
The furnace is heated up to 2550° F (1400°C) to melt the raw materials

VIDRIO

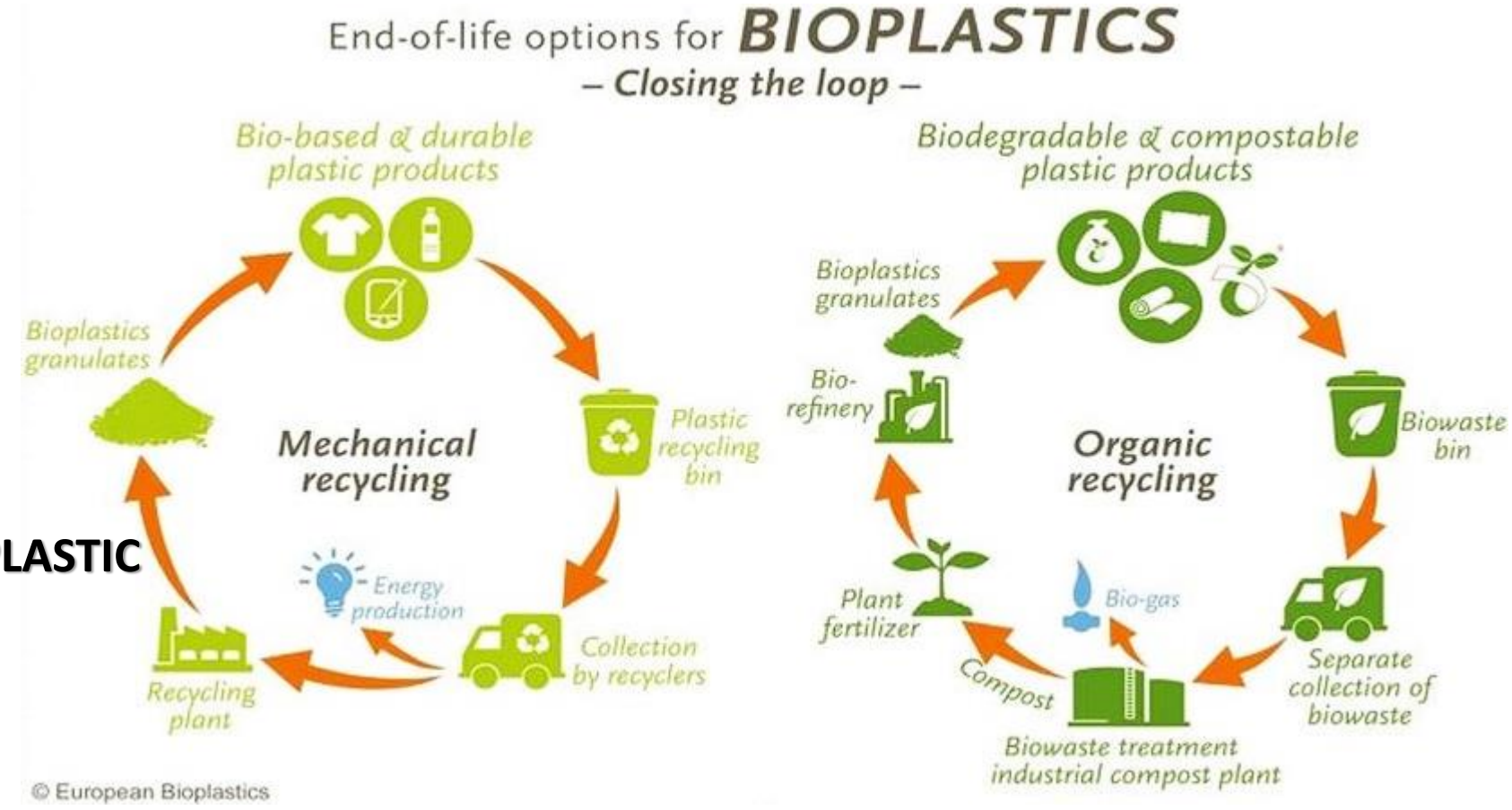

Batch Preparation
Batch Charging
Melting & Conditioning
Tin Bath
Annealing Lehr
Cutting Area
Glass Stacking



PLASTICO

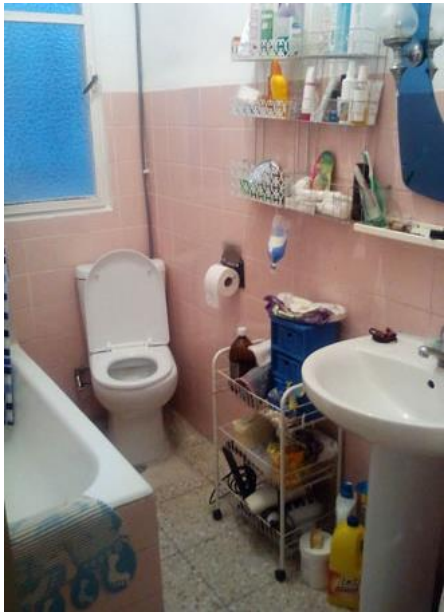
https://www.gao.gov/blog/can-chemical-recycling-reduce-plastic-pollution

PLASTIC


End-of-life options for BIOPLASTICS
– Closing the loop –
Bio-based & durable plastic products
Bioplastics granulates
Plastic recycling bin
Mechanical recycling
Energy production
Collection by recyclers
Recycling plant
Biodegradable & compostable plastic products
Bioplastics granulates
Bio-refinery
Biowaste bin
Organic recycling
Bio-gas
Plant fertilizer
Compost
Separate collection of biowaste
Biowaste treatment industrial compost plant
© European Bioplastics

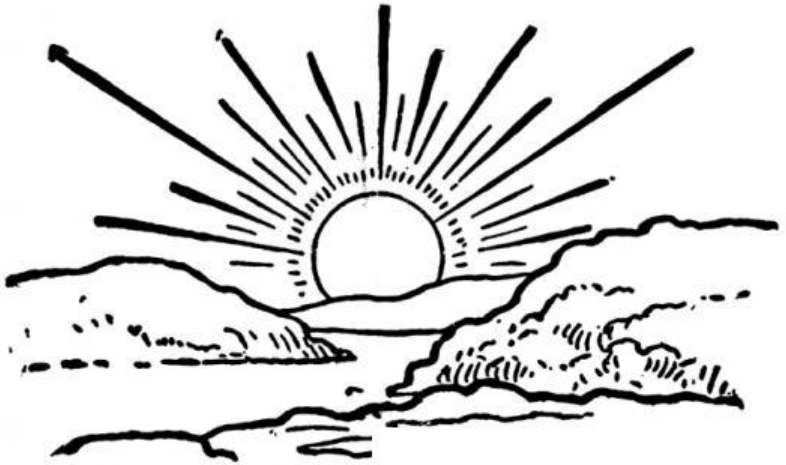
Comienza el día….

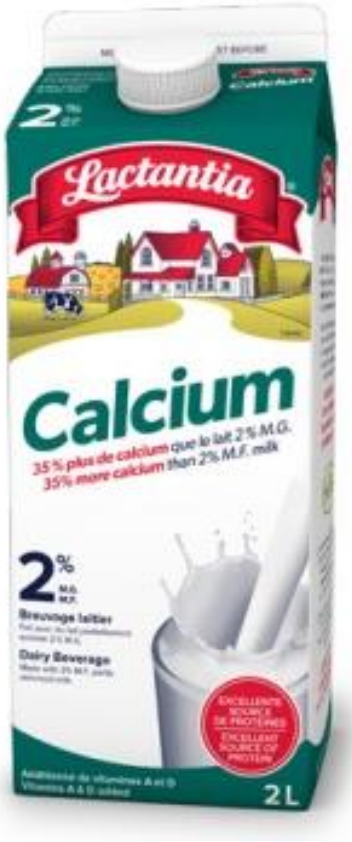
MINUTO 5



Comienza el día….

MINUTE 20




Lactantia
Calcium
35 % plus de calcium que le lait 2 % M.G.
35% more calcium than 2% M.F. milk
2 %
Breuvage laitier
Dairy Beverage
2L


AMIX
High Potency Essential
Vitamins & Minerals
Vit & Mineral
SUPER PACK

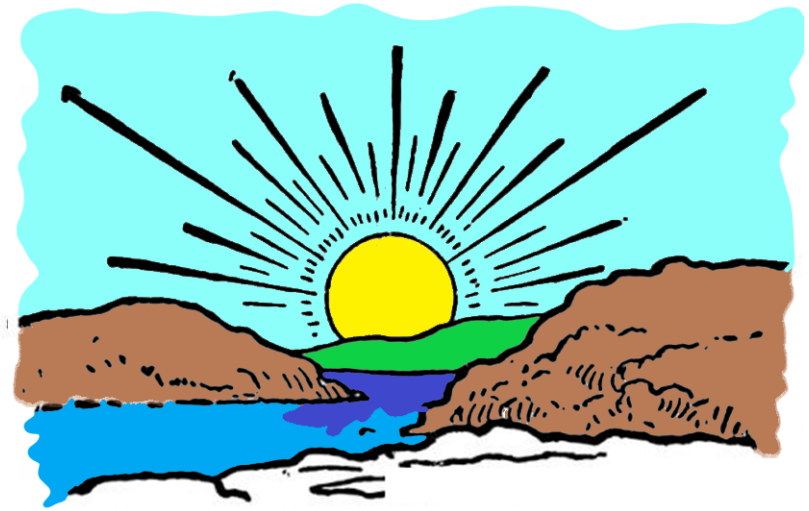

Cr
Mg
Fe
Se
Zn
Ca
Na
F
Cu


GIF

Los primeros 20 MINUTOS del día…

NO PODRÍAN SER POSIBLES SIN

MINERALES



¿Y el resto?….

Every American Born Will Need... **3.02 MILLION POUNDS** of minerals, metals, and fuels in their lifetime

- **1,832 lbs.** BAUXITE (ALUMINUM)
- **55,461 lbs.** CEMENT
- **10,685 lbs.** CLAYS
- **251,998 lbs.** COAL
- **1,018 lbs.** COPPER
- **1.34 Troy oz.** GOLD
- **18,317 lbs.** IRON ORE
- **814 lbs.** LEAD
- **1 lb.** LITHIUM
- **12,720 lbs.** PHOSPHATE ROCK
- **27,476 lbs.** SALT
- **4 lbs.** SILVER
- **1.36M lbs.** STONE, SAND & GRAVEL
- **468 lbs.** ZINC
- **+1.03M lbs.** OTHER MINERALS, METALS & FUELS

SME FOUNDATION

MEC

MINERALS EDUCATION COALITION

Learn more: **MineralsEducationCoalition.org**

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Paradoja socio-ambiental de la producción de materias primas

Versión 1.0: NIMBY

La sociedad **demanda** bienes de consumo que precisan de materias primas para su producción; pero la gente **no quiere aceptar** las consecuencias ambientales de esa producción.

Paradoja socio-ambiental de la producción de materias primas

Versión 2.0: NIMBY-YITBY

Los países del "primer mundo" se dotan de la legislación más garantista (ambiental, laboral), **imposibilitando** casi cualquier proyecto productivo local… y así **promoviendo** la producción, donde sea y como sea…

ODS y la producción de materias primas

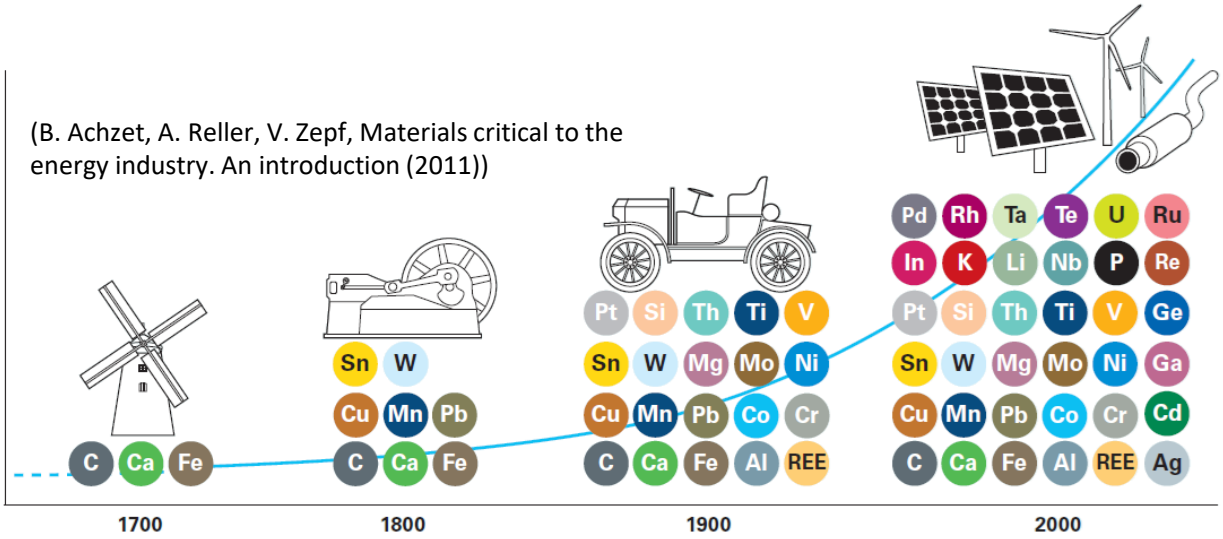
Resolviendo la paradoja: ODS y SC

SC: Dependencia del desarrollo tecnológico con las RM

Mapping Mining to the Sustainable Development Goals: An Atlas

https://www.undp.org/content/dam/undp/library/Sustainable%20Development/Extractives/Mapping_Mining_SDGs_An_Atlas_Executive_Summary_FINAL.pdf

(B. Achzet, A. Reller, V. Zepf, Materials critical to the energy industry. An introduction (2011))



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Estrategia europea

+30 million jobs depending on the availability of raw materials

2008

RM* Initiative

3 pillars

** RM: all raw materials except materials from agricultural production and fuels*

- Fair and sustainable supply of RM from global markets
- Sustainable supply of RM within the EU
- Resource efficiency and supply of 'secondary RM'

2010

CRM definition

2011 – 2014 – 2017 – 2020 - 2023

2020

EIP-RM

(The European innovation partnership on RM)

Stakeholder platform

SIP

Strategic implementation plan

CRM Action Plan

- Resilient value chains for EU industrial ecosystems
- Reduce dependency on primary CRM
- Strengthen domestic sourcing of RM
- Diversify sourcing from third countries

ERMA

European RM Alliance

2023

RM Act

https://ec.europa.eu/growth/sectors/raw-materials/specific-interest/critical_en

Informe UE CRM 2023

https://ec.europa.eu/docsroom/documents/54114/attachments/1/translations/en/renditions/native

Screened raw materials in 2023 assessment (new materials in blue)	
Industrial and construction minerals	aggregates, baryte, bentonite, borates, diatomite, feldspar, fluorspar, gypsum, kaolin clay, limestone, magnesite, natural graphite, perlite, phosphate rock, phosphorus, potash, silica sand, sulphur, talc
Iron and ferro-alloy metals	chromium, cobalt, manganese, molybdenum, nickel, niobium, tantalum, titanium, titanium metal, tungsten, vanadium
Precious metals	gold, silver, and Platinum Group Metals (iridium, palladium, platinum, rhodium, ruthenium)
Rare earths	heavy rare earths - HREE (dysprosium, erbium, europium, gadolinium, holmium, lutetium, terbium, thulium, ytterbium, yttrium); light rare earths - LREE (cerium, lanthanum, neodymium, praseodymium and samarium); and scandium
Other non-ferrous metals	aluminium/bauxite, antimony, arsenic, beryllium, bismuth, cadmium, copper, gallium, germanium, gold, hafnium, indium, lead, lithium, magnesium, rhenium, selenium, silicon metal, silver, strontium, tellurium, tin, zinc, zirconium
Bio and other materials	natural cork, natural rubber, natural teak wood, sapele wood, coking coal, hydrogen, helium, roundwood, neon, krypton, xenon

Informe UE CRM 2023

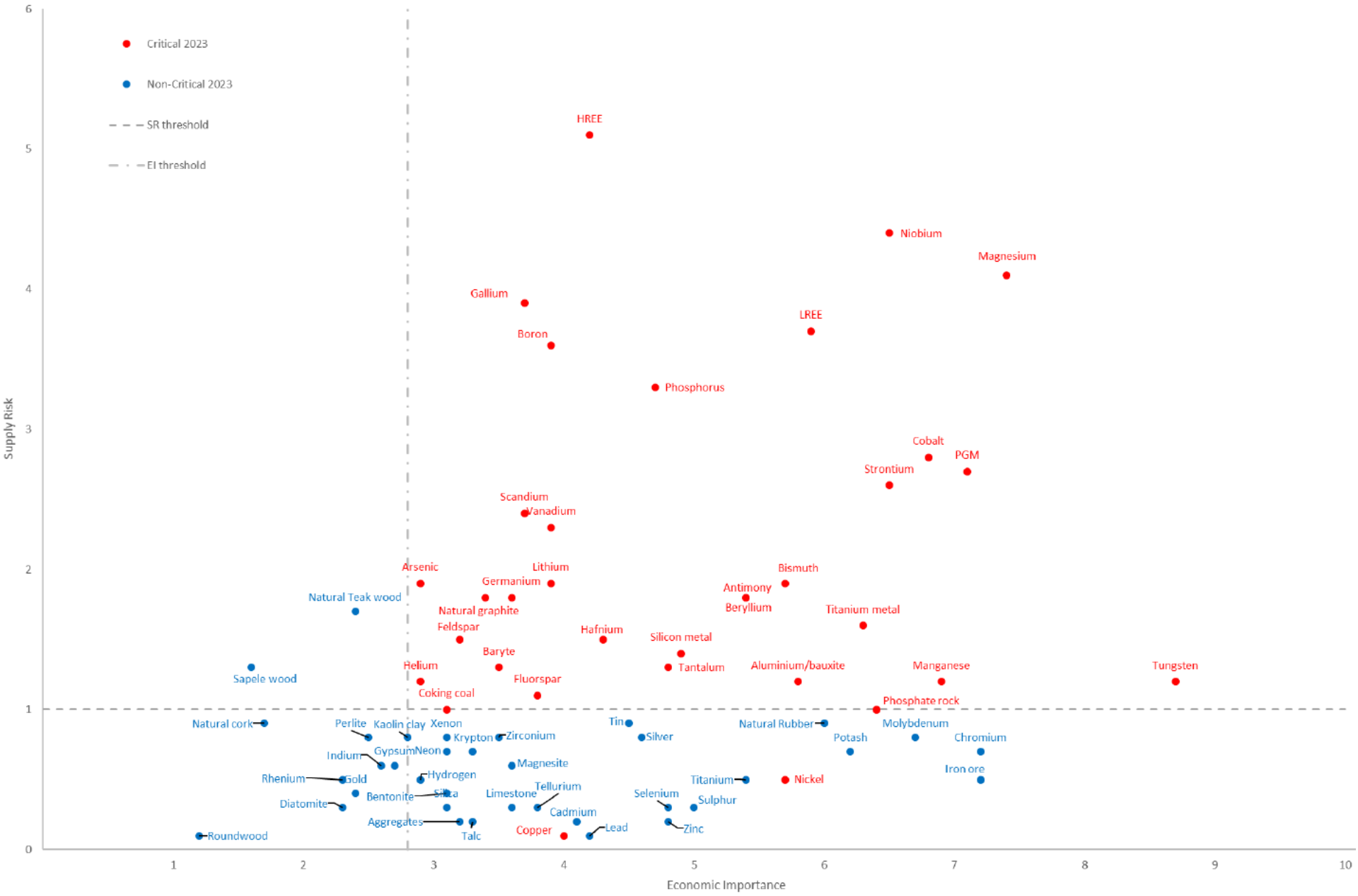
https://ec.europa.eu/docsroom/documents/54114/attachments/1/translations/en/renditions/native

2023 CRMs vs. 2020 CRMs			
aluminium/bauxite	gallium	phosphate rock	vanadium
antimony	germanium	phosphorus	arsenic
baryte	hafnium	PGM	feldspar
beryllium	HREE	scandium	helium
bismuth	lithium	silicon metal	manganese
borate	LREE	strontium	copper
cobalt	magnesium	tantalum	nickel
coking coal	natural graphite	titanium metal	~~*indium*~~
fluorspar	niobium	tungsten	~~*natural rubber*~~

Legend:
Black: CRMs in 2023 and 2020
Red: CRMs in 2023, non-CRMs in 2020
~~*Strike:*~~ Non-CRMs in 2023 that were critical in 2020

Informe UE CRM 2023

https://ec.europa.eu/docsroom/documents/54114/attachments/1/translations/en/renditions/native



Informe UE CRM 2023

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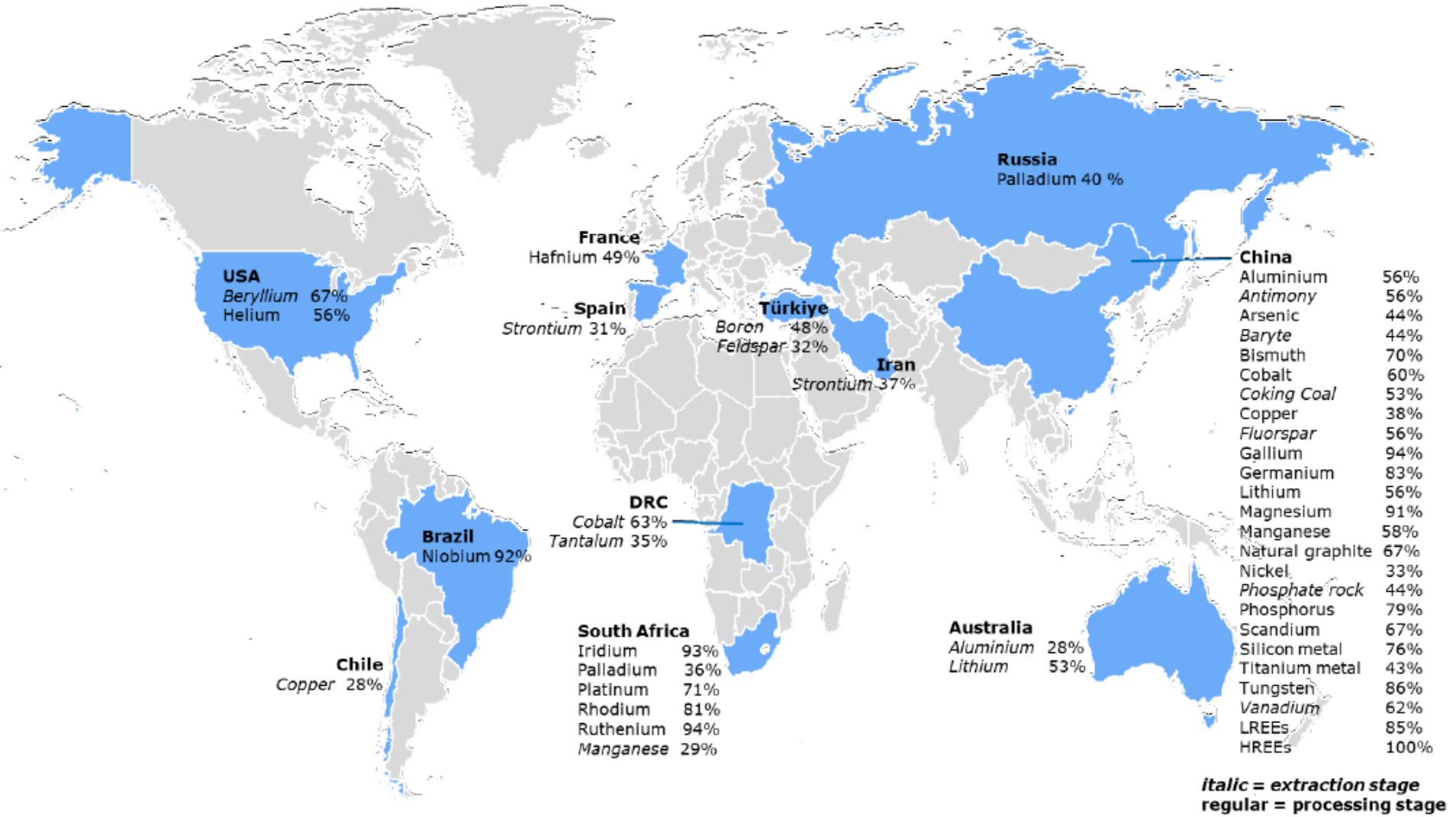

Countries accounting for largest share of global supply of CRMs

Informe UE CRM 2023

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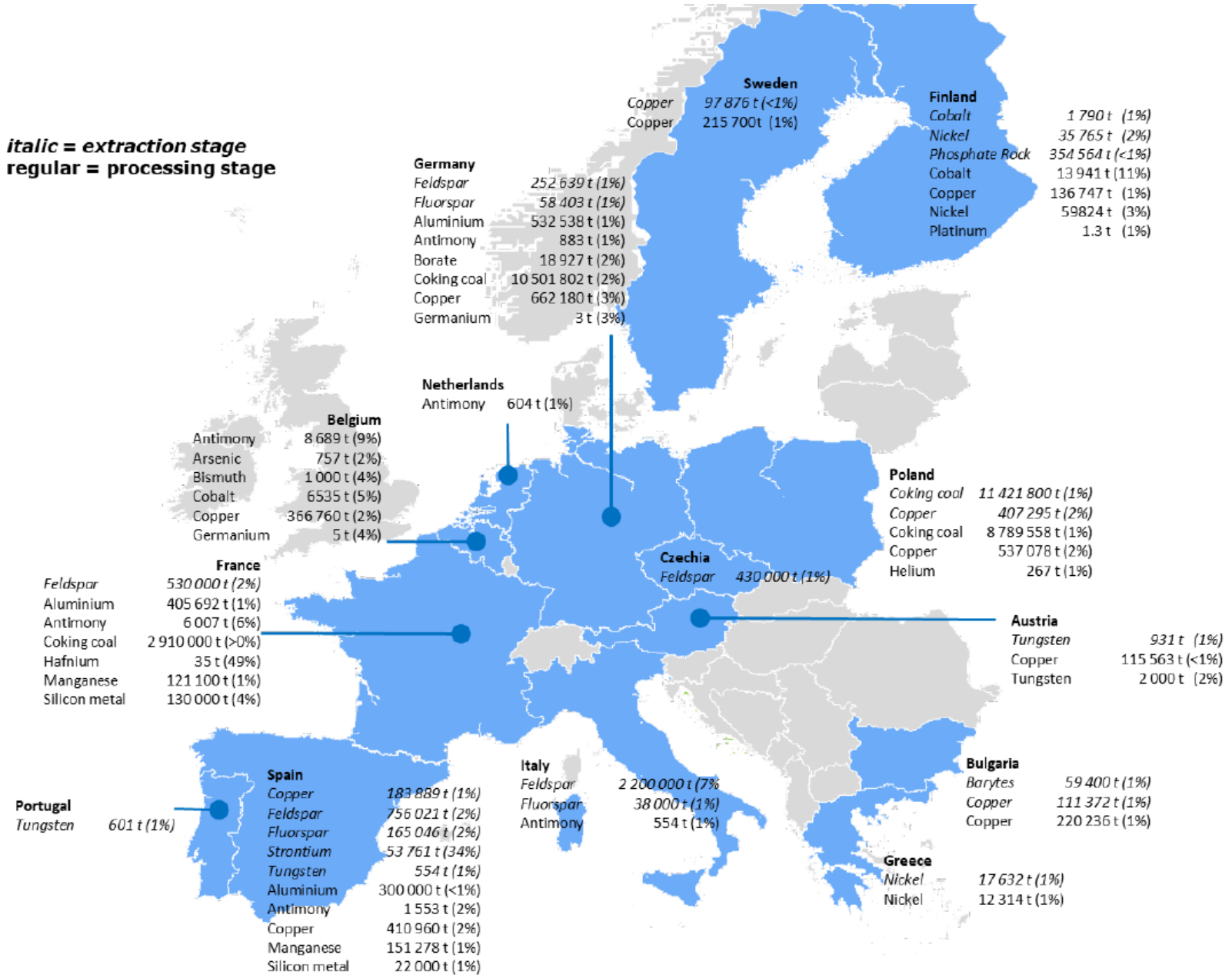

Informe UE CRM 2023

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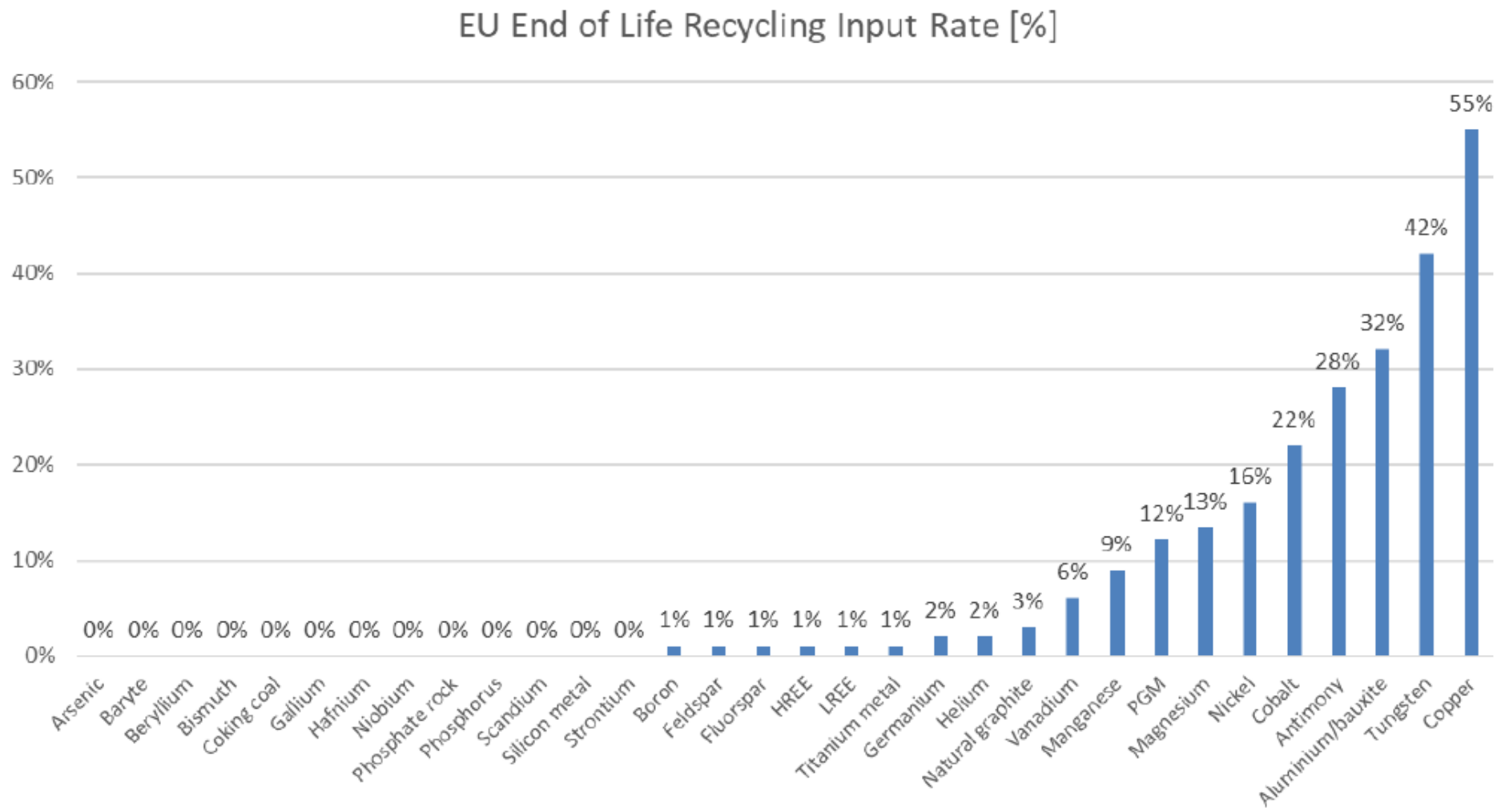
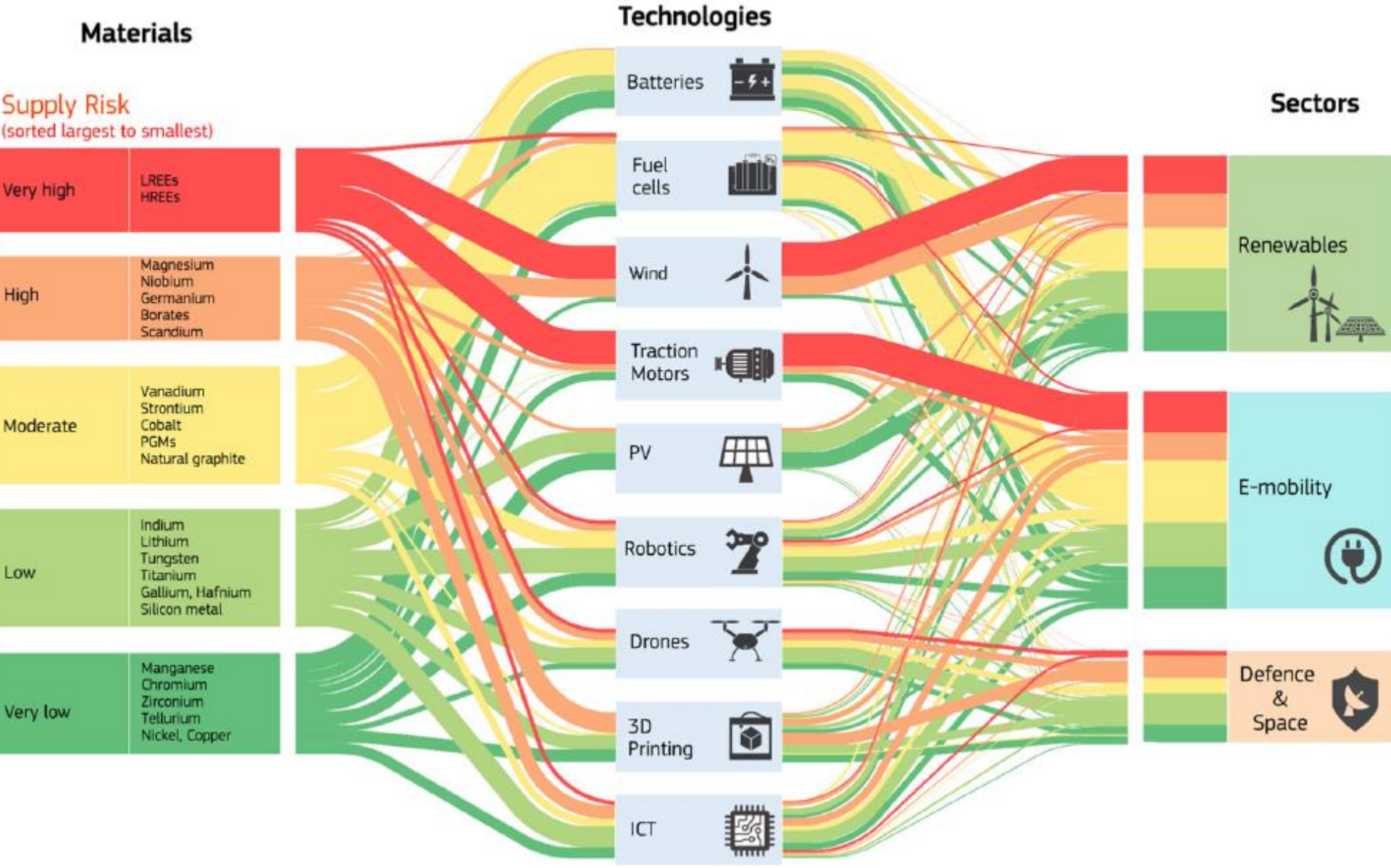


Recycling's contribution to meeting materials demand

Dependencia de CRM en sectores y tecnologías clave

CRM Action Plan 2020

https://ec.europa.eu/docsroom/documents/42852



Dependencia de CRM y SRM en sectores y tecnologías clave

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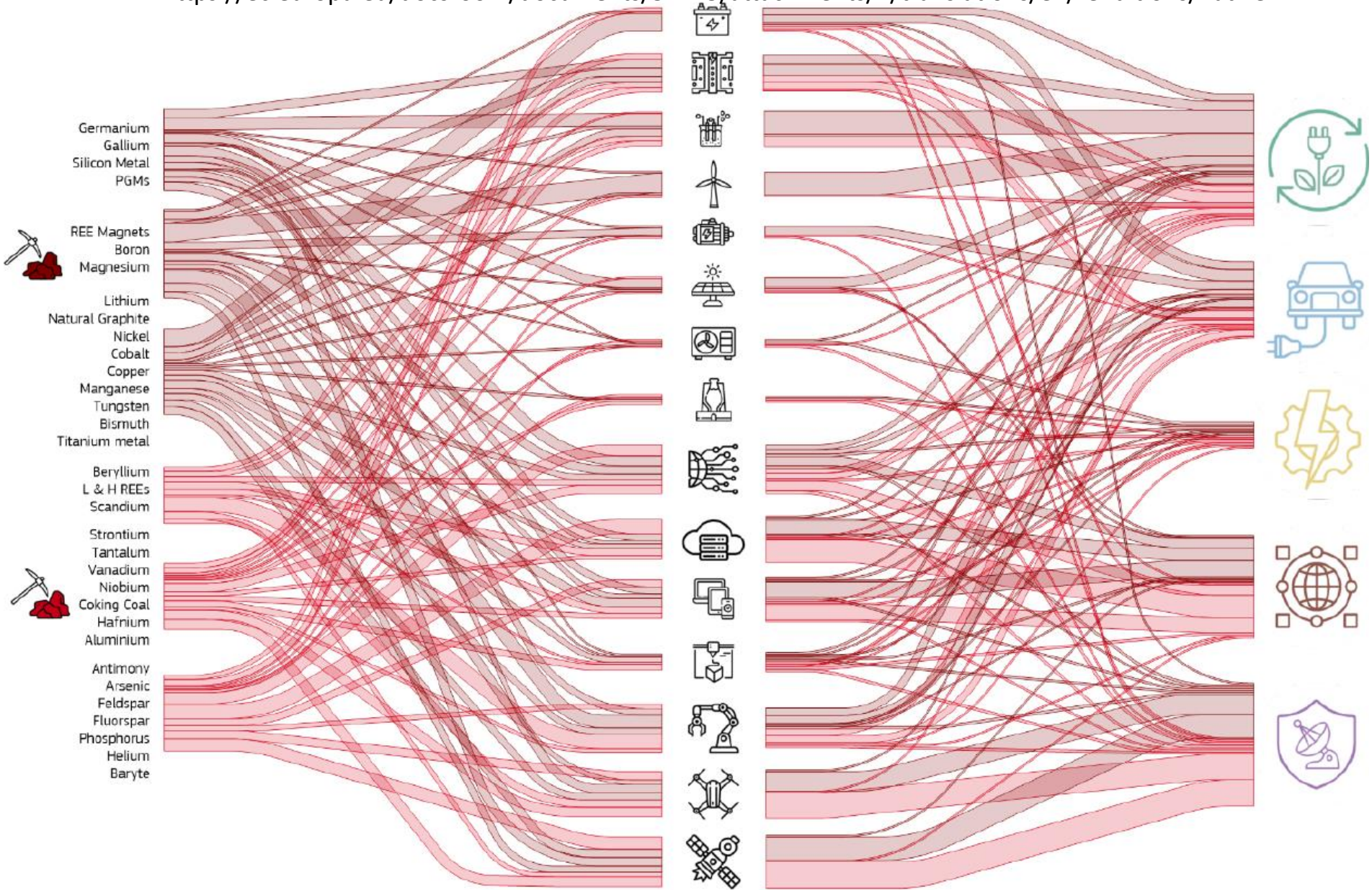

Dependencia de CRM y SRM en sectores y tecnologías clave

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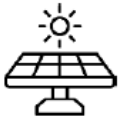
Li-ion batteries

Fuel cells

Electrolysers

Wind turbines

Traction motors



Solar photovoltaics (PV)

Heat pumps

Hydrogen direct reduced iron and electric arc furnaces (H2-DRI)

Data transmission networks

Data storage and servers

Smartphones, tablets and laptops

Additive manufacturing (AM)

Robotics

Drones

Space launchers and satellites

Dependencia de CRM y SRM en sectores y tecnologías clave

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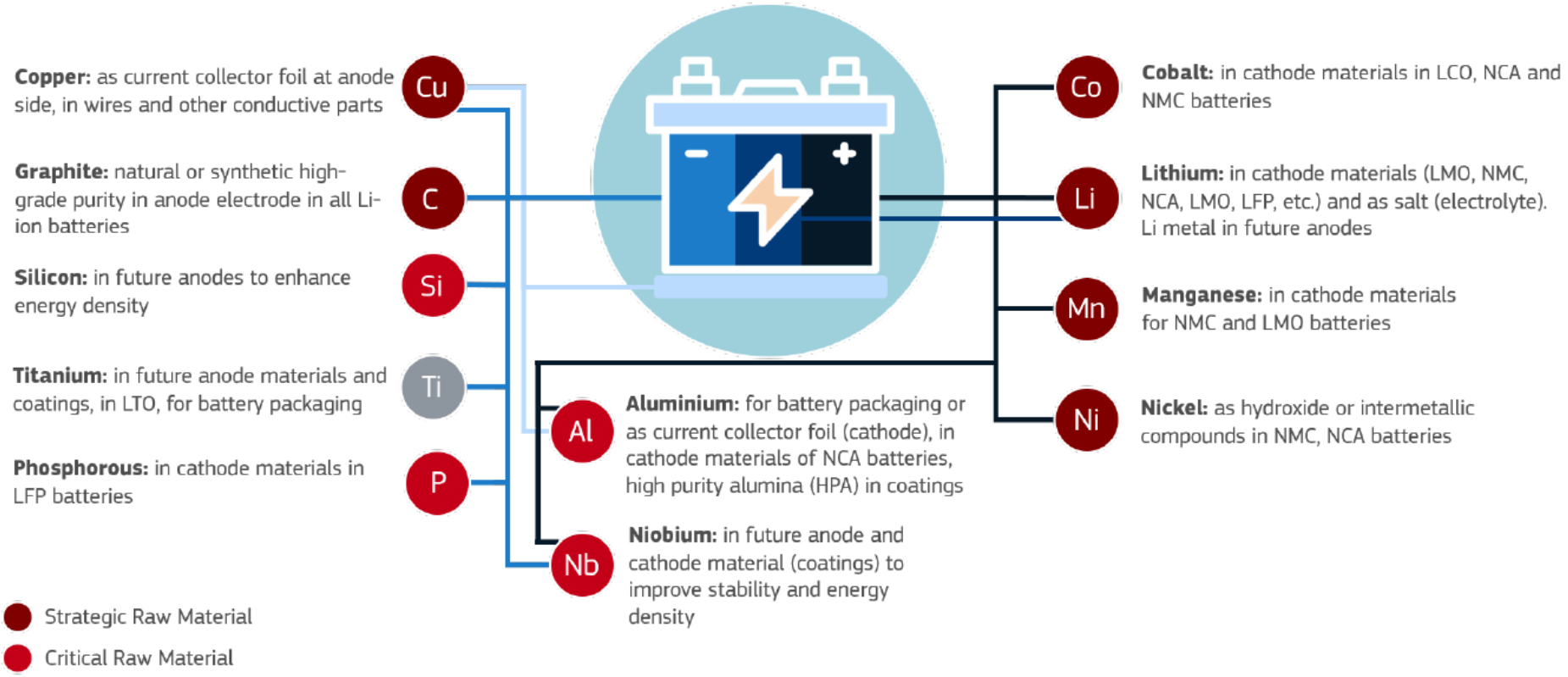

Selection of raw materials used in Li-ion batteries and their function

Dependencia de CRM y SRM en sectores y tecnologías clave

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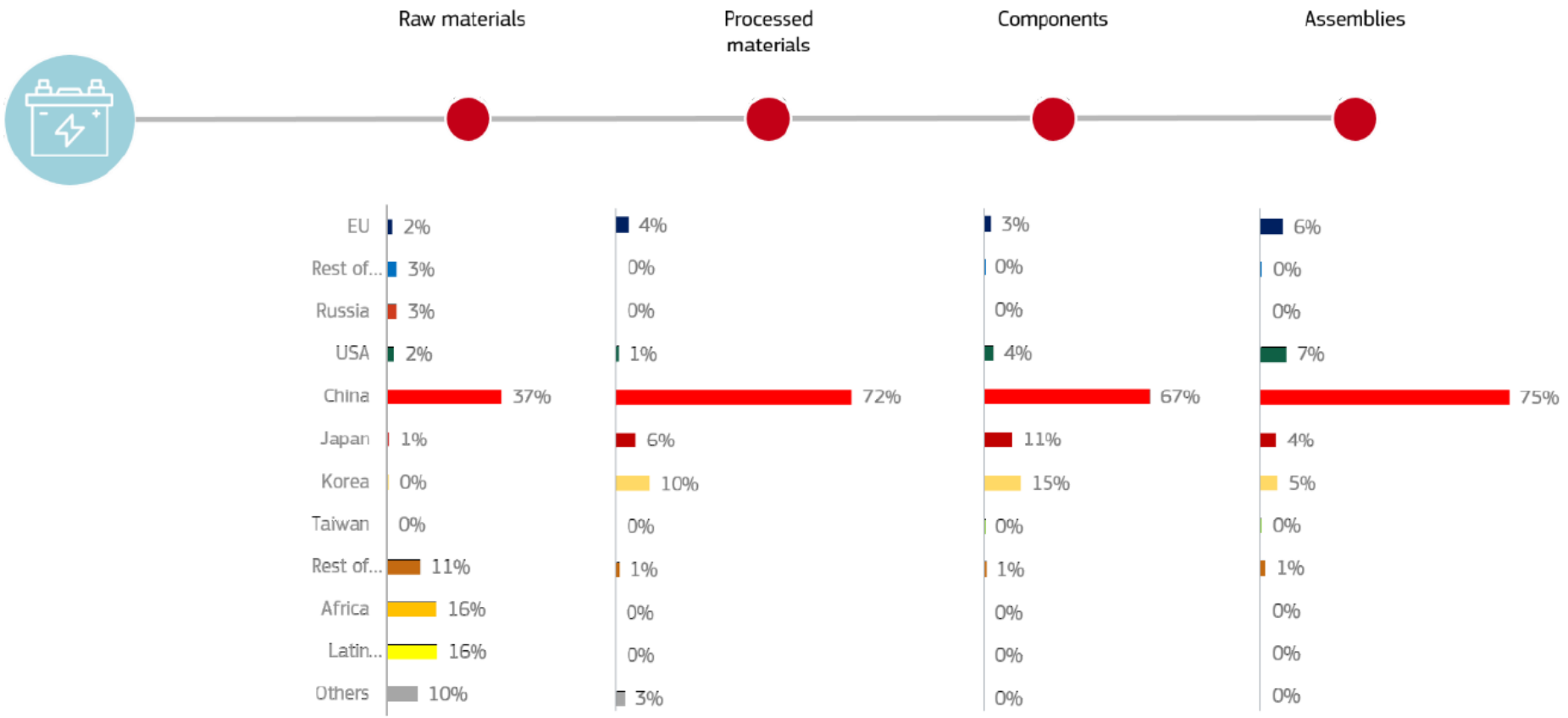

An overview of supply risks, bottlenecks, and key players along the supply chain of Li-ion batteries

Dependencia de CRM y SRM en sectores y tecnologías clave

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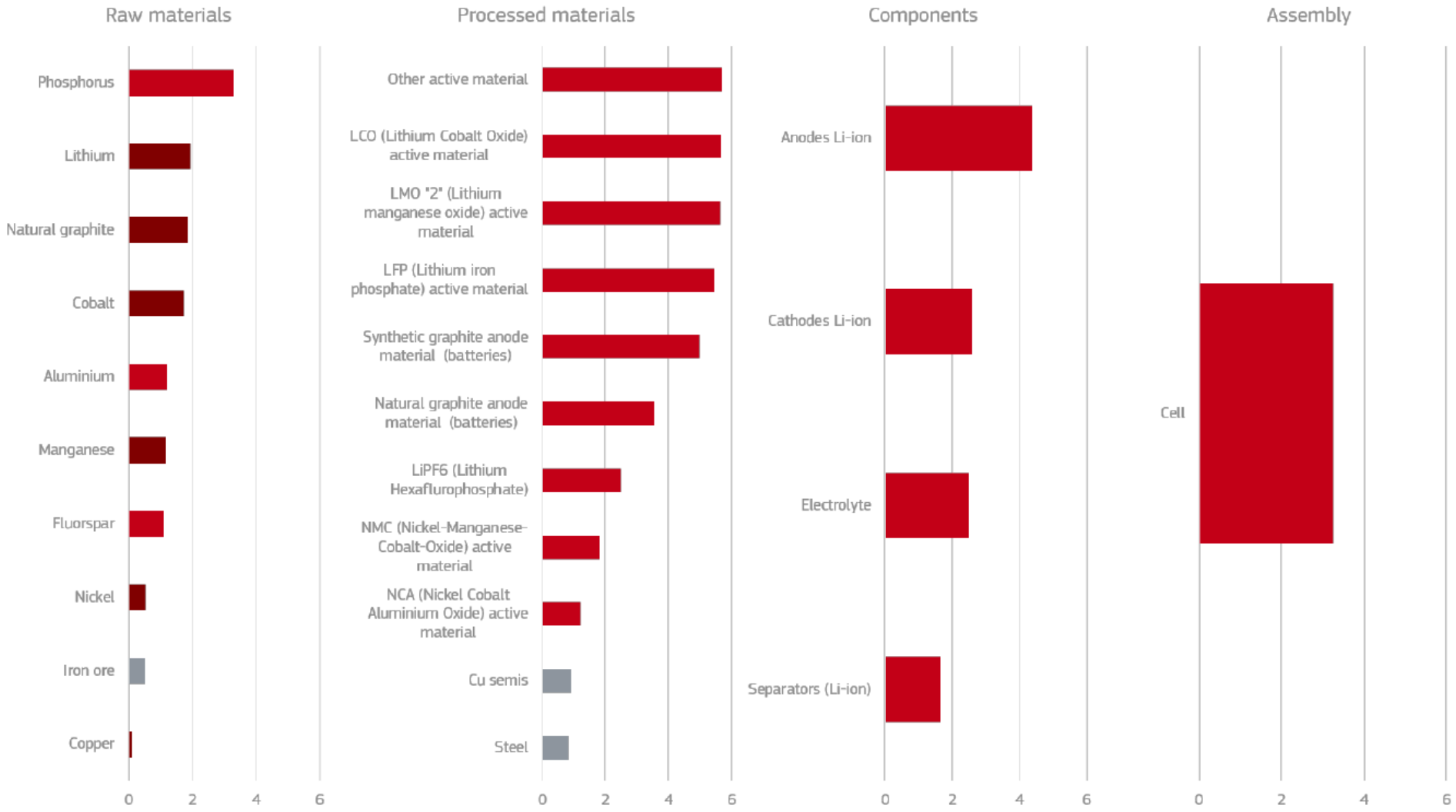
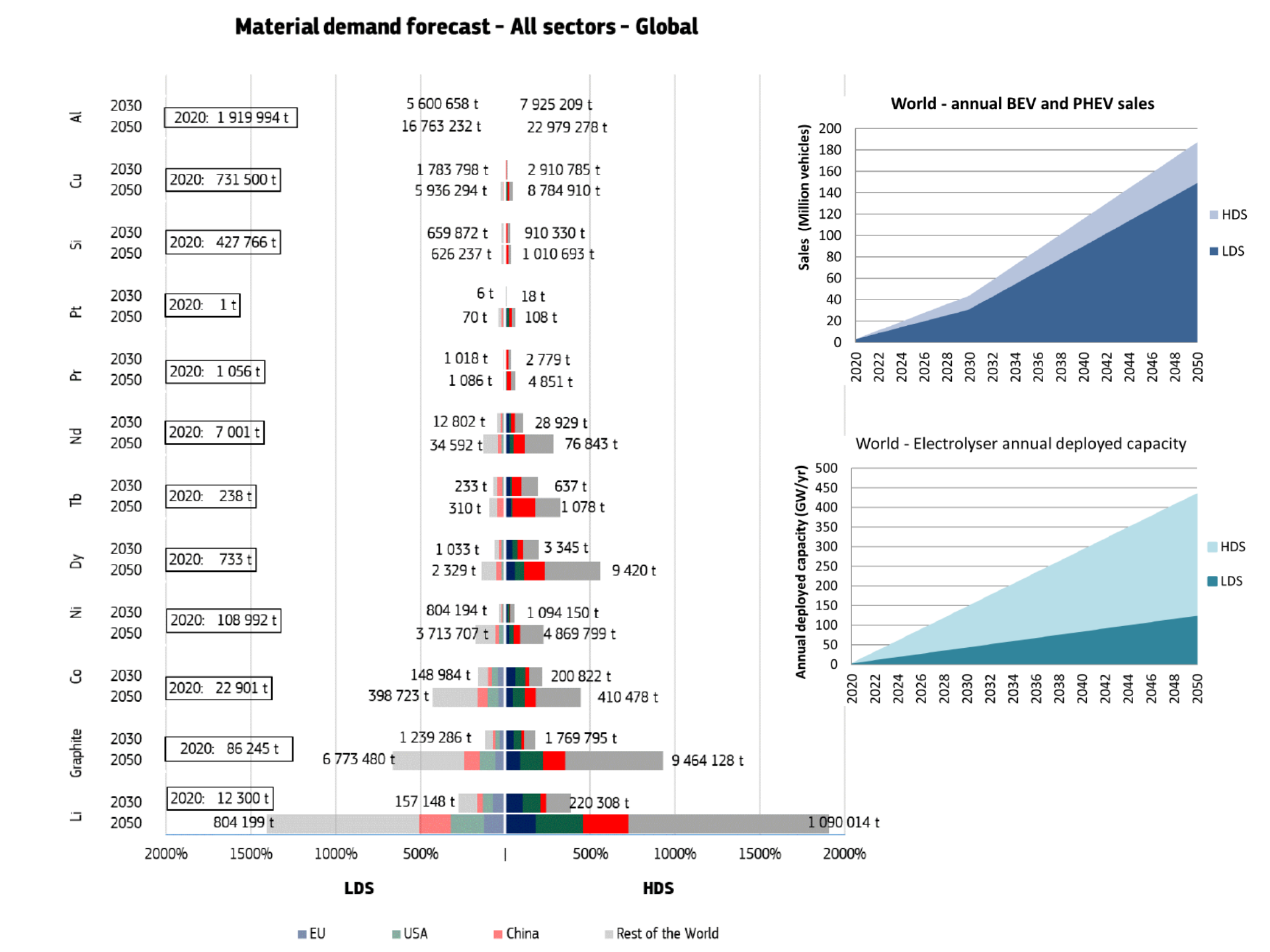


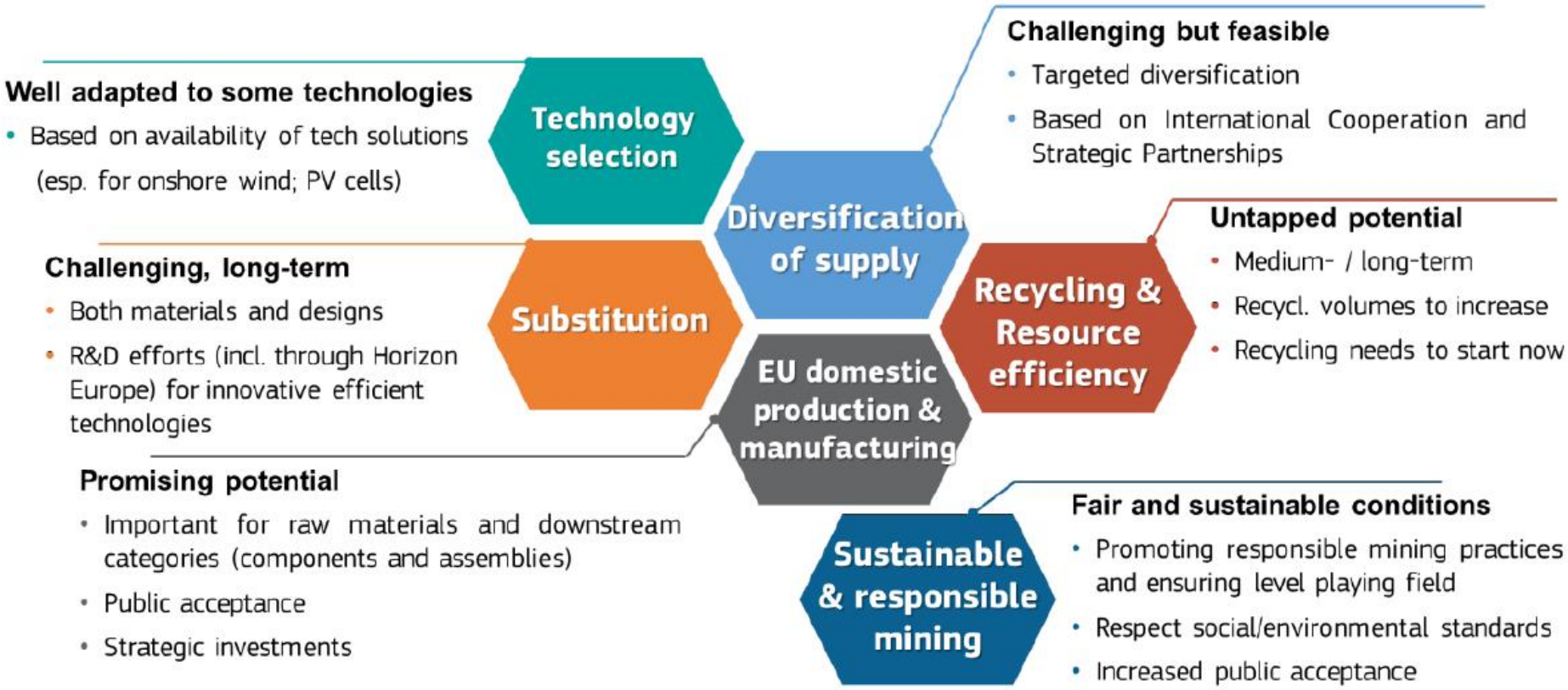
Detailed Supply Risk of all elements in the Li-ion battery supply chain


Material demand forecast - All sectors - Global
Al
2030
2050
2020: 1 919 994 t
5 600 658 t
16 763 232 t
7 925 209 t
22 979 278 t
Cu
2030
2050
2020: 731 500 t
1 783 798 t
5 936 294 t
2 910 785 t
8 784 910 t
Si
2030
2050
2020: 427 766 t
659 872 t
626 237 t
910 330 t
1 010 693 t
Pt
2030
2050
2020: 1 t
6 t
70 t
18 t
108 t
Pr
2030
2050
2020: 1 056 t
1 018 t
1 086 t
2 779 t
4 851 t
Nd
2030
2050
2020: 7 001 t
12 802 t
34 592 t
28 929 t
76 843 t
Tb
2030
2050
2020: 238 t
233 t
310 t
637 t
1 078 t
Dy
2030
2050
2020: 733 t
1 033 t
2 329 t
3 345 t
9 420 t
Ni
2030
2050
2020: 108 992 t
804 194 t
3 713 707 t
1 094 150 t
4 869 799 t
Co
2030
2050
2020: 22 901 t
148 984 t
398 723 t
200 822 t
410 478 t
Graphite
2030
2050
2020: 86 245 t
1 239 286 t
6 773 480 t
1 769 795 t
9 464 128 t
Li
2030
2050
2020: 12 300 t
157 148 t
804 199 t
220 308 t
1 090 014 t
2000%
1500%
1000%
500%
500%
1000%
1500%
2000%
LDS
HDS
EU
USA
China
Rest of the World
World - annual BEV and PHEV sales
Sales (Million vehicles)
200
180
160
140
120
100
80
60
40
20
0
2020
2022
2024
2026
2028
2030
2032
2034
2036
2038
2040
2042
2044
2046
2048
2050
HDS
LDS
World - Electrolyser annual deployed capacity
Annual deployed capacity (GW/yr)
500
450
400
350
300
250
200
150
100
50
0
2020
2022
2024
2026
2028
2030
2032
2034
2036
2038
2040
2042
2044
2046
2048
2050
HDS
LDS

Acciones para incrementar seguridad de suministro y sostenibilidad de las RM europeas

JRC Report 2023

https://ec.europa.eu/docsroom/documents/54115/attachments/1/translations/en/renditions/native



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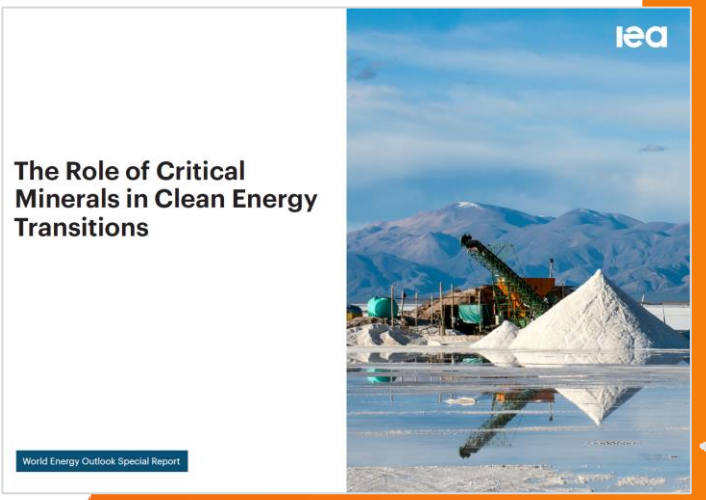
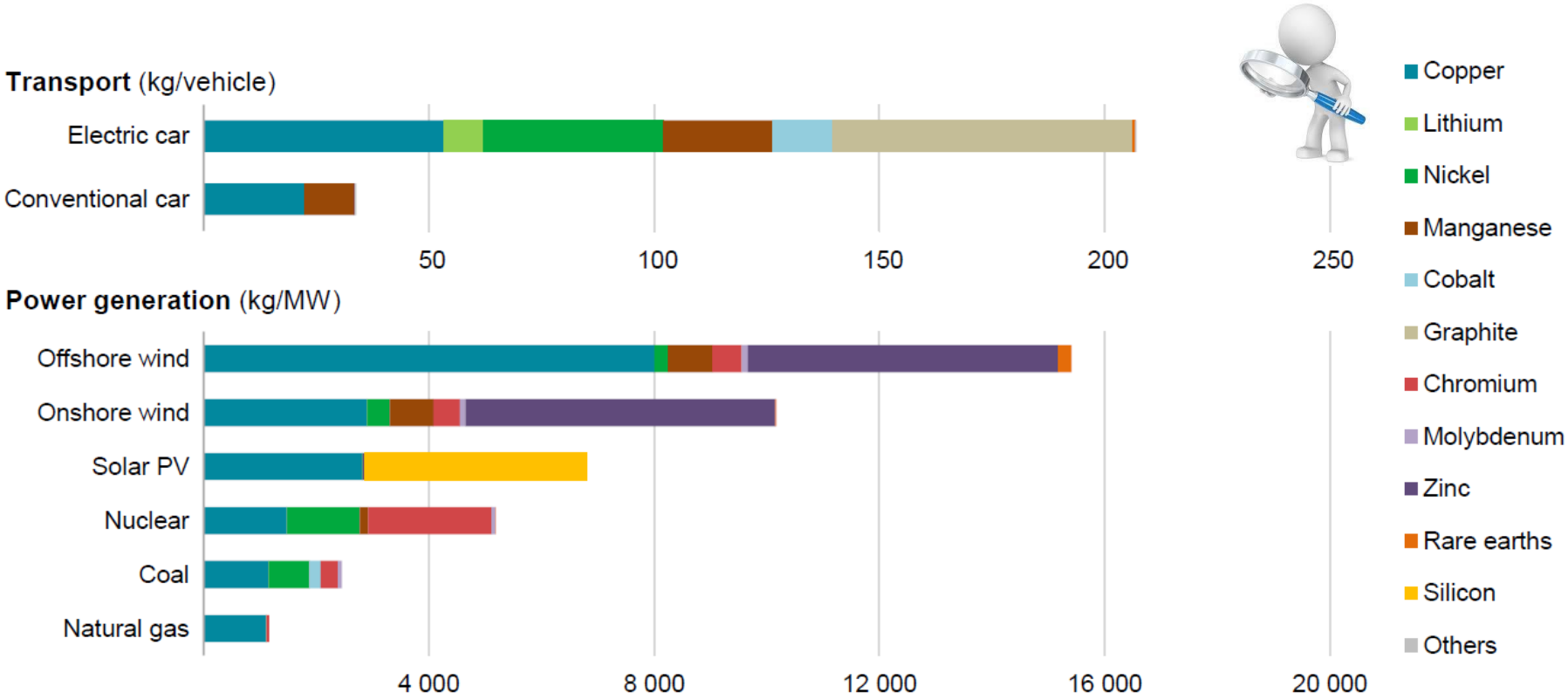
- Paradoja socio-ambiental de la producción de RM
- Estrategia europea de materias primas (RM)
- Estrategias regionales – caso de Asturias
- **Una mirada al futuro**



Una mirada al futuro

Minerales utilizados en tecnologías convencionales vs tecnologías limpias

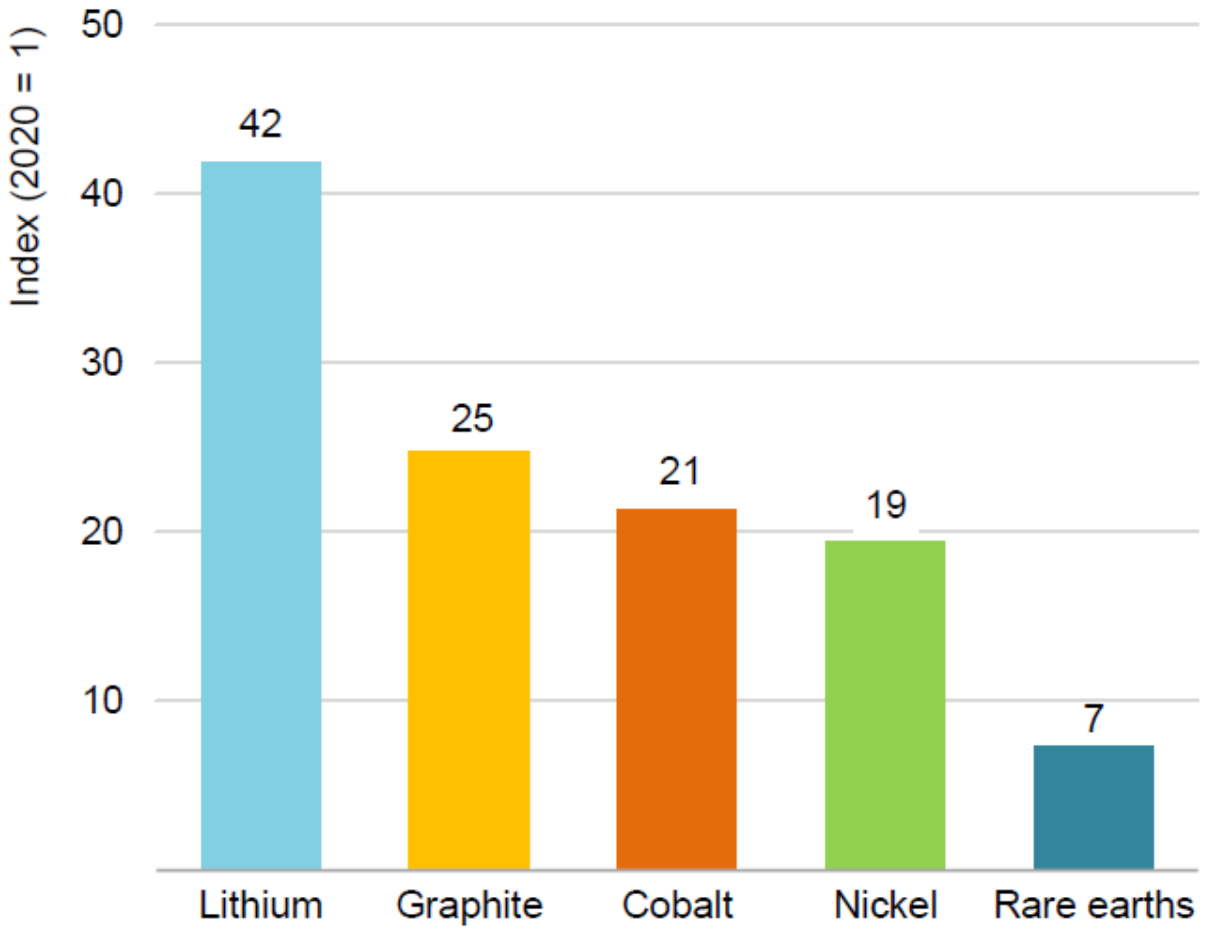


Notes: kg = kilogramme; MW = megawatt. Steel and aluminium not included. See Chapter 1 and Annex for details on the assumptions and methodologies.

https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions

Una mirada al futuro

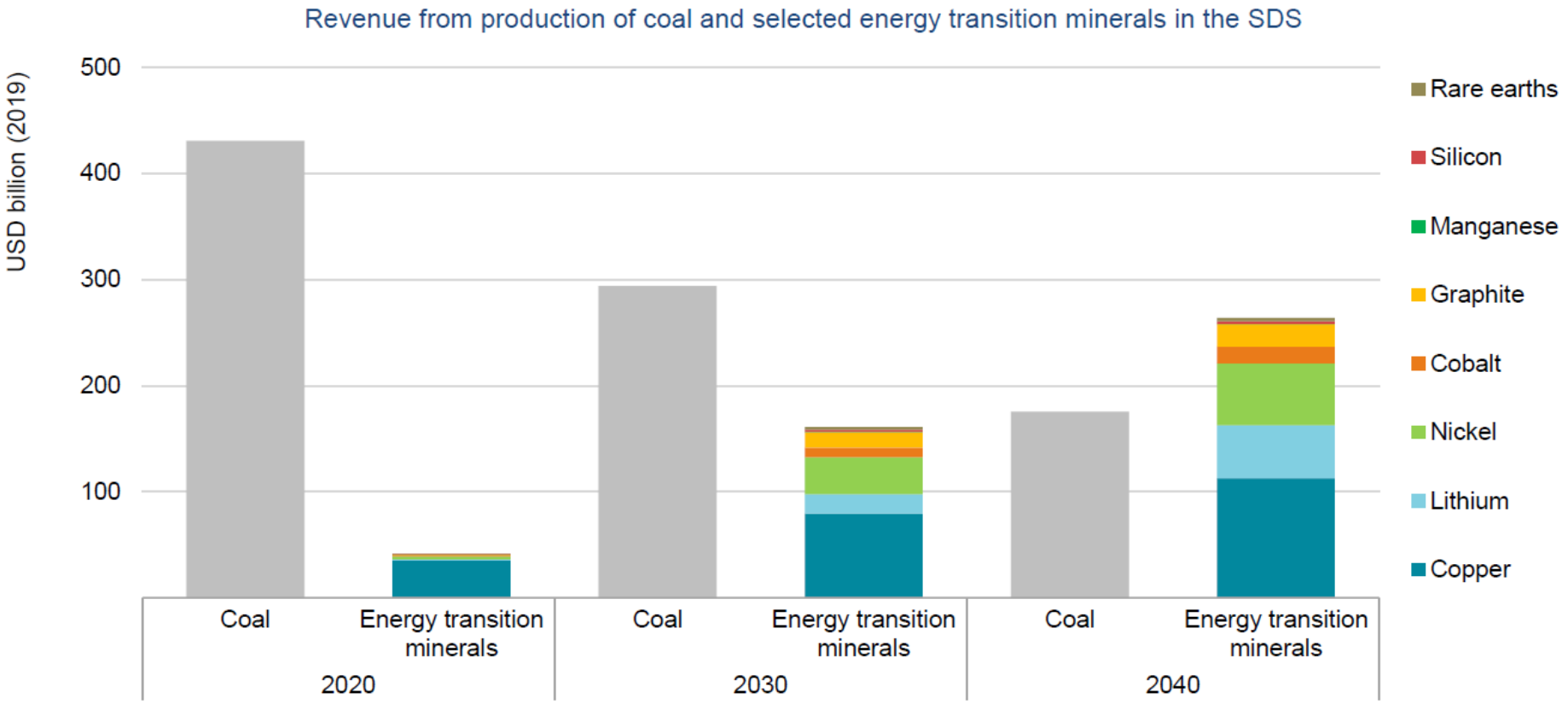
Crecimiento en la demanda de RM en 2040 (Escenario ODS–referencia 2020)



https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions

Una mirada al futuro

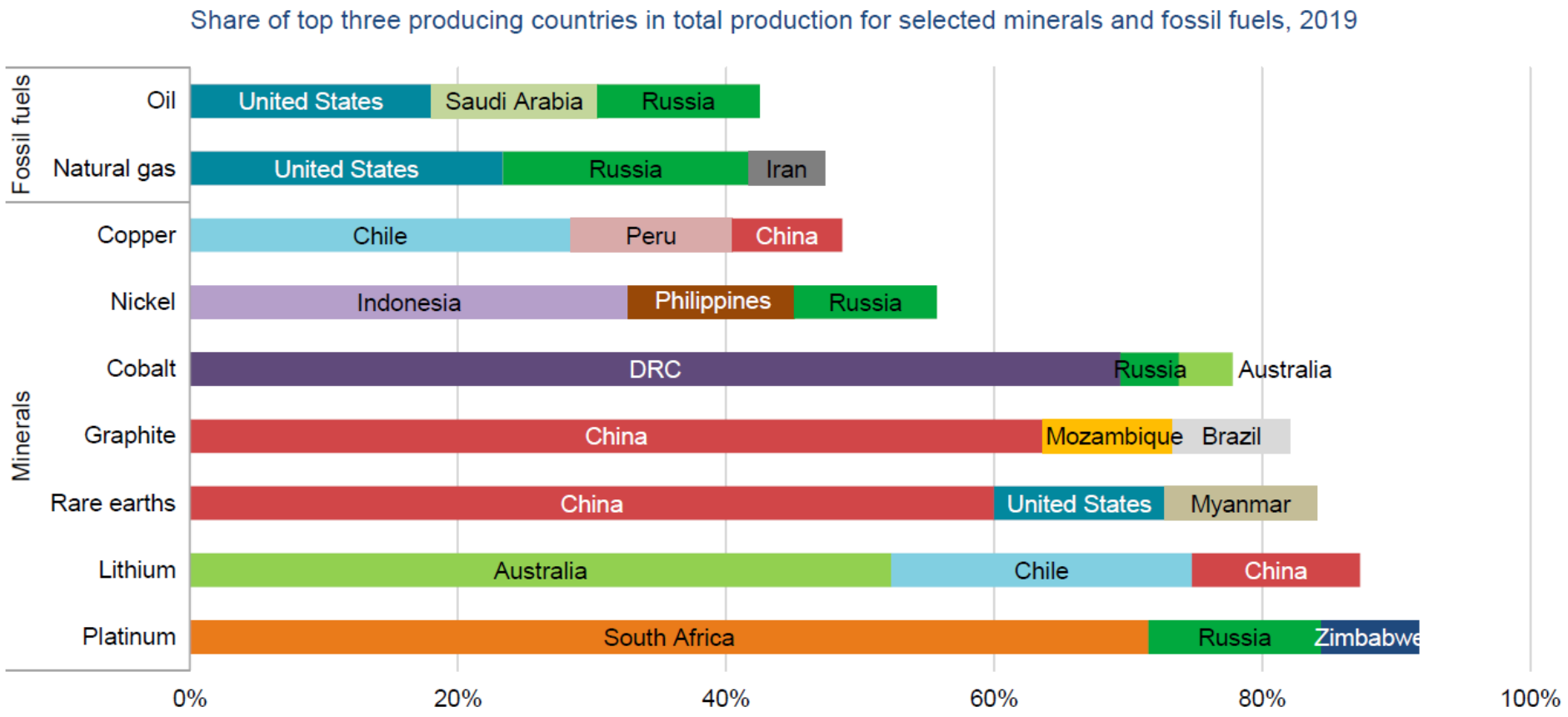
Variación en volumen de negocio de varios RM (Escenario ODS)



https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions

Una mirada al futuro

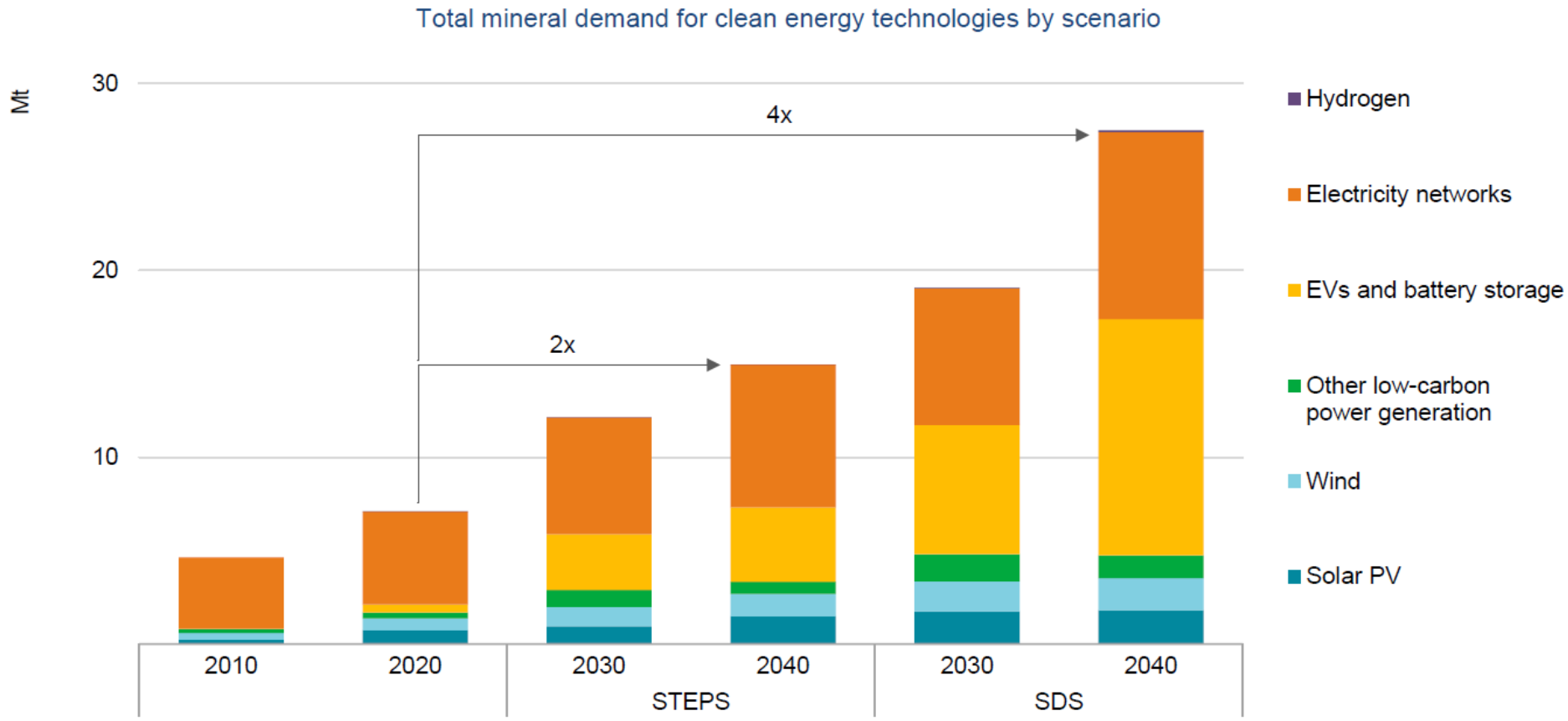
Aumento de la concentración de recursos en menos países



https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions

Una mirada al futuro

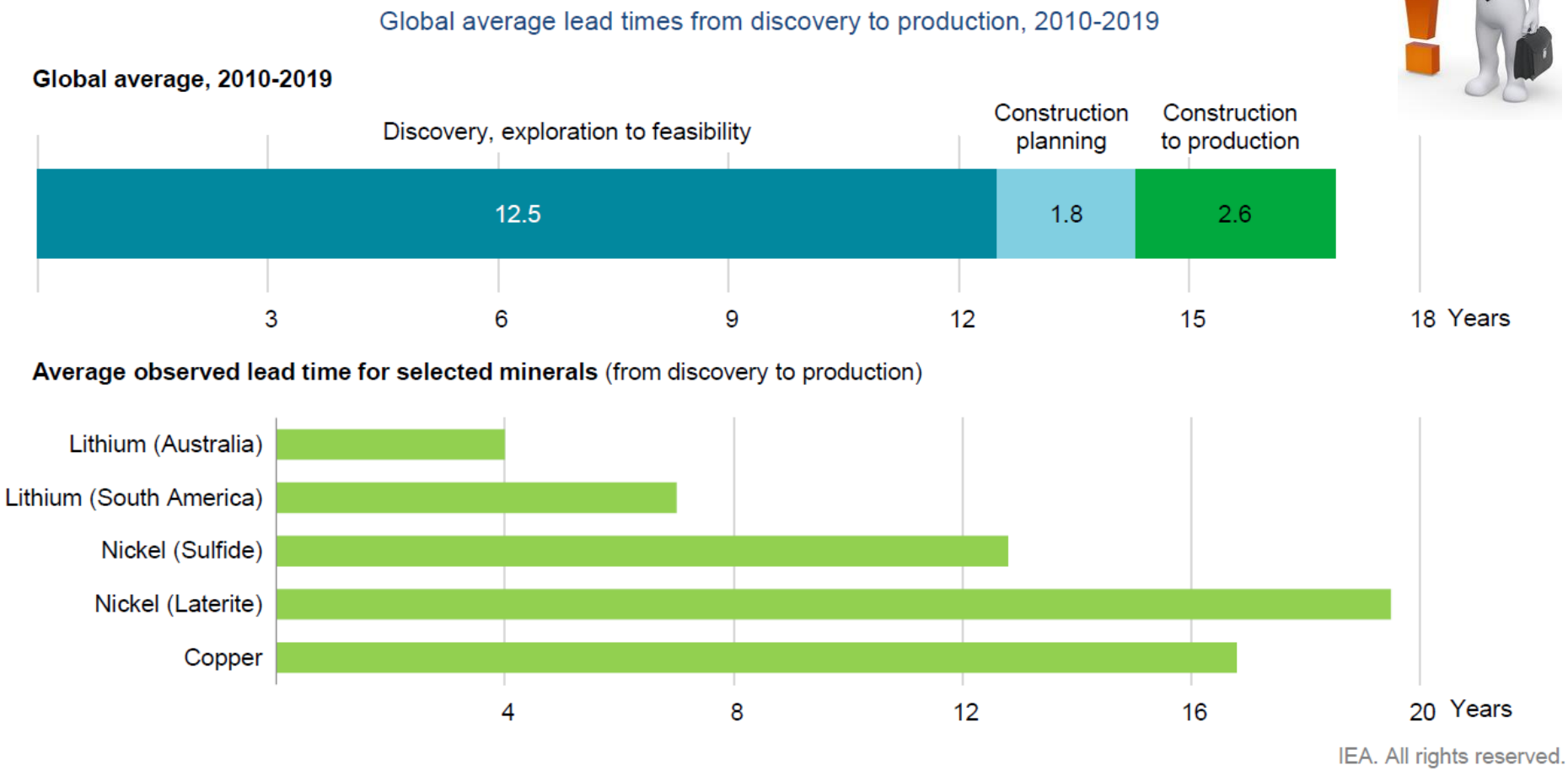
Previsión de demanda en diferentes escenarios



https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions

Una mirada al futuro

Tiempo de puesta de marcha de una nueva mina (promedio global)



Note: Global average values are based on the top 35 mining projects that came online between 2010 and 2019.
Source: IEA analysis based on S&P Global (2020), S&P Global (2019a) and Schodde (2017).

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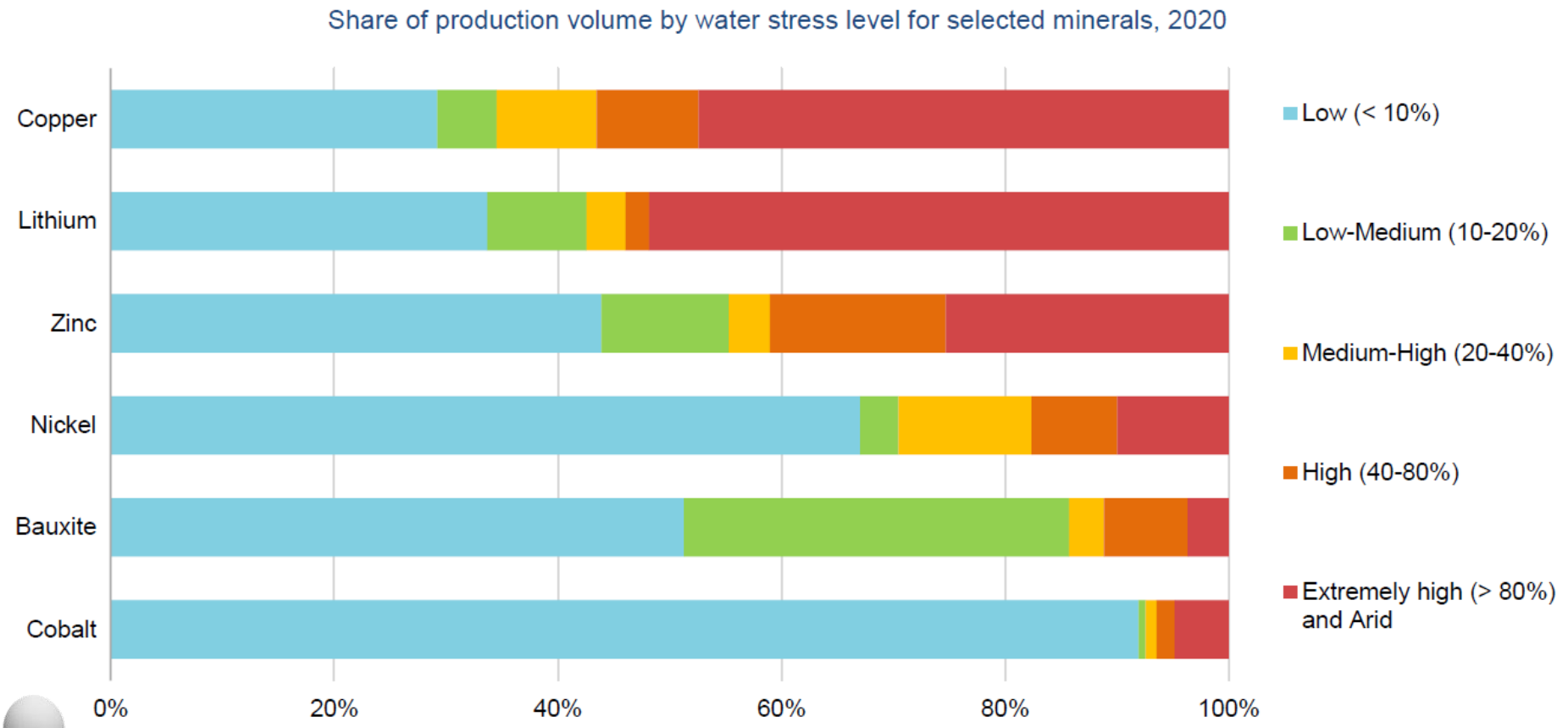
Una mirada al futuro

Porcentaje de producción de varios RM en zonas de diferente estrés hídrico



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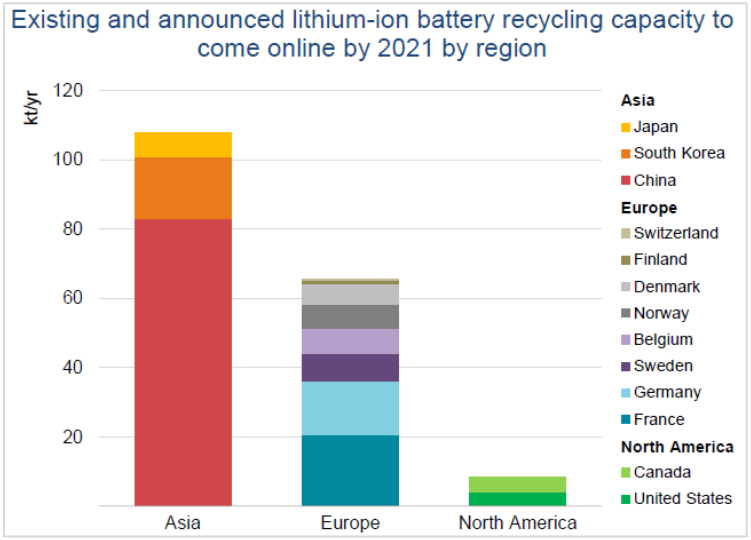
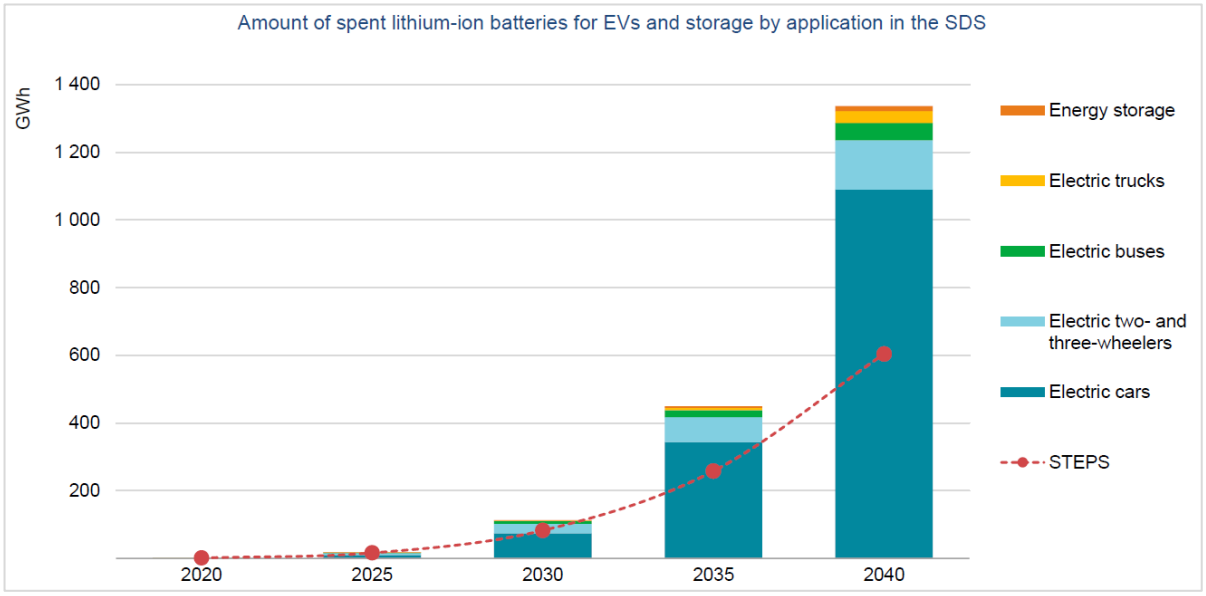
Una mirada al futuro

El reto del reciclaje





https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions

CONCLUSIÓN

Es **necesaria** una estrategia de RM multinivel (europeo-nacional-regional-local) para garantizar la **soberanía productiva** en el futuro

Debemos conseguir que **otra minería sea posible**:

más circular, más eficiente, más responsable, más sostenible…