Supply chain analysis and materials demand forecast in strategic technologies and sectors in the EU

EC-JRC and IEA-EGRD workshop: Improving the resilience of the complete clean energy supply chains – from raw materials to advanced materials, manufacturing and end-of-life

Petten, 12-13.12.2023

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Role of Materials and Strategic Supply Chains in the Energy Transition

Energy transition:

Rapid deployment of renewables in order to meet the climate targets

Shift of focus: from *fuels* to *technologies, manufacturing, materials*

Materials such as Rare Earths, Lithium, Graphite, etc. are strategic

- The **energy transition** is a **materials transition**





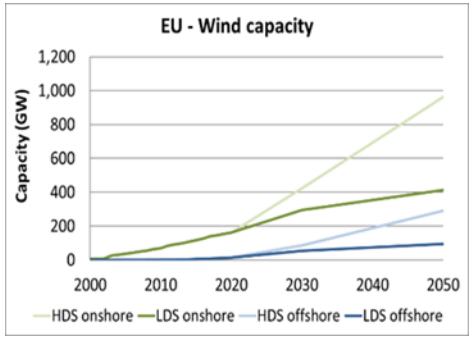
- Finally, the **undisrupted supply** of clean energy materials and components is not only an issue of **sustainability,** but also of **competitiveness** and **strategic autonomy**

Materials and Supply Chains for the Energy Transition

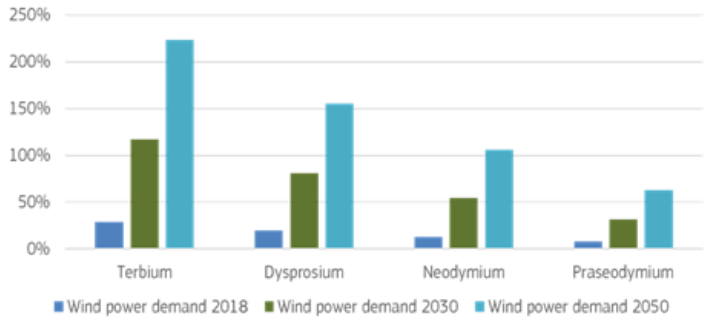
Which **materials/components** supply chains are **necessary** for clean energy technologies and **how resilient** are the clean energy supply chains?

- Systematic analysis of **vulnerabilities**, **dependencies** and disruption **risks** along the complete value chain, and
- **Foresight analysis** of materials demand and supply chain bottlenecks

Example: From **REPowerEU** to the **Critical Raw Materials Act**



REPowerEU ambitious targets

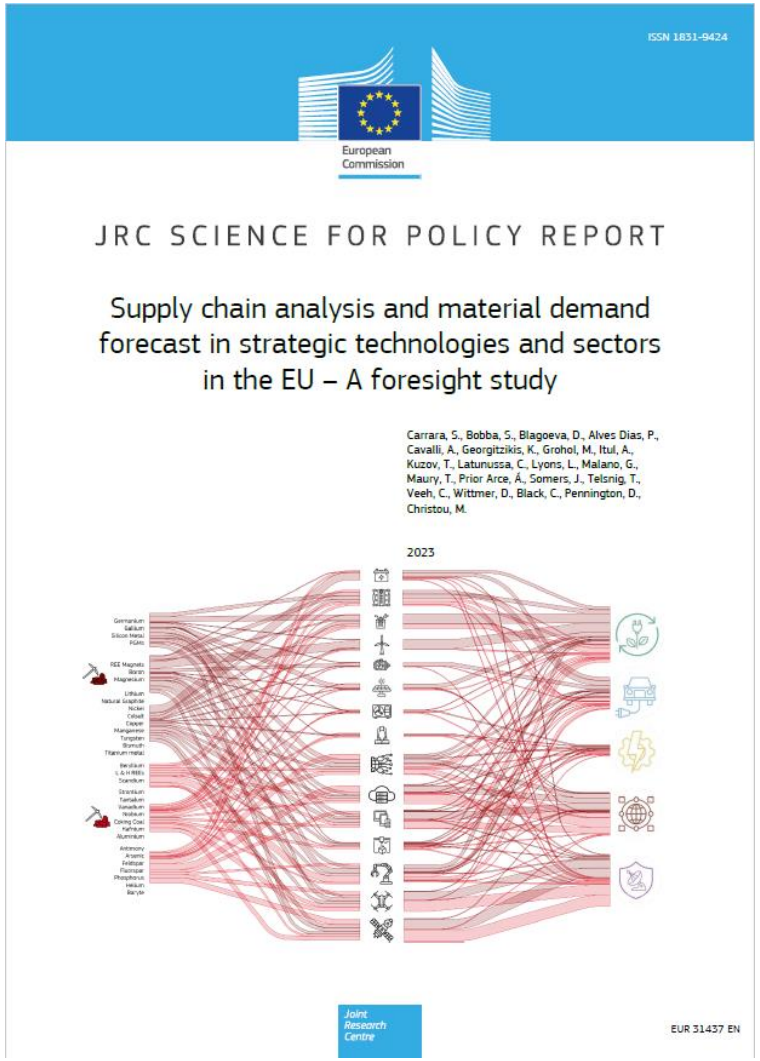


Material needs to achieve these targets



Critical Raw Materials Act

Materials and supply chains – Foresight study



Two main dimensions:

- Supply chain analysis
- Demand forecast and supply/demand balance

Foresight report:

- Forward looking
- 15 technologies in 5 strategic sectors (renewable energy, e-mobility, energy-intensive industry, ICT, aerospace & defence)

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Supply chain analysis

What are the components, the processed and the raw materials used in clean energy technologies?

Is the EU exposed to any vulnerabilities along the supply chains? Which countries and how reliable is this supply?

What actions can be taken to overcome these bottlenecks?

How can the European industrial development be supported?

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Supply chain analysis – Wind: raw materials

Iron: as cast iron or in steel composition for tower, nacelle, rotor and foundation; in neodymium–iron–boron (NdFeB) permanent magnets

Chromium: essential for stainless steel and other alloys in rotor and blades

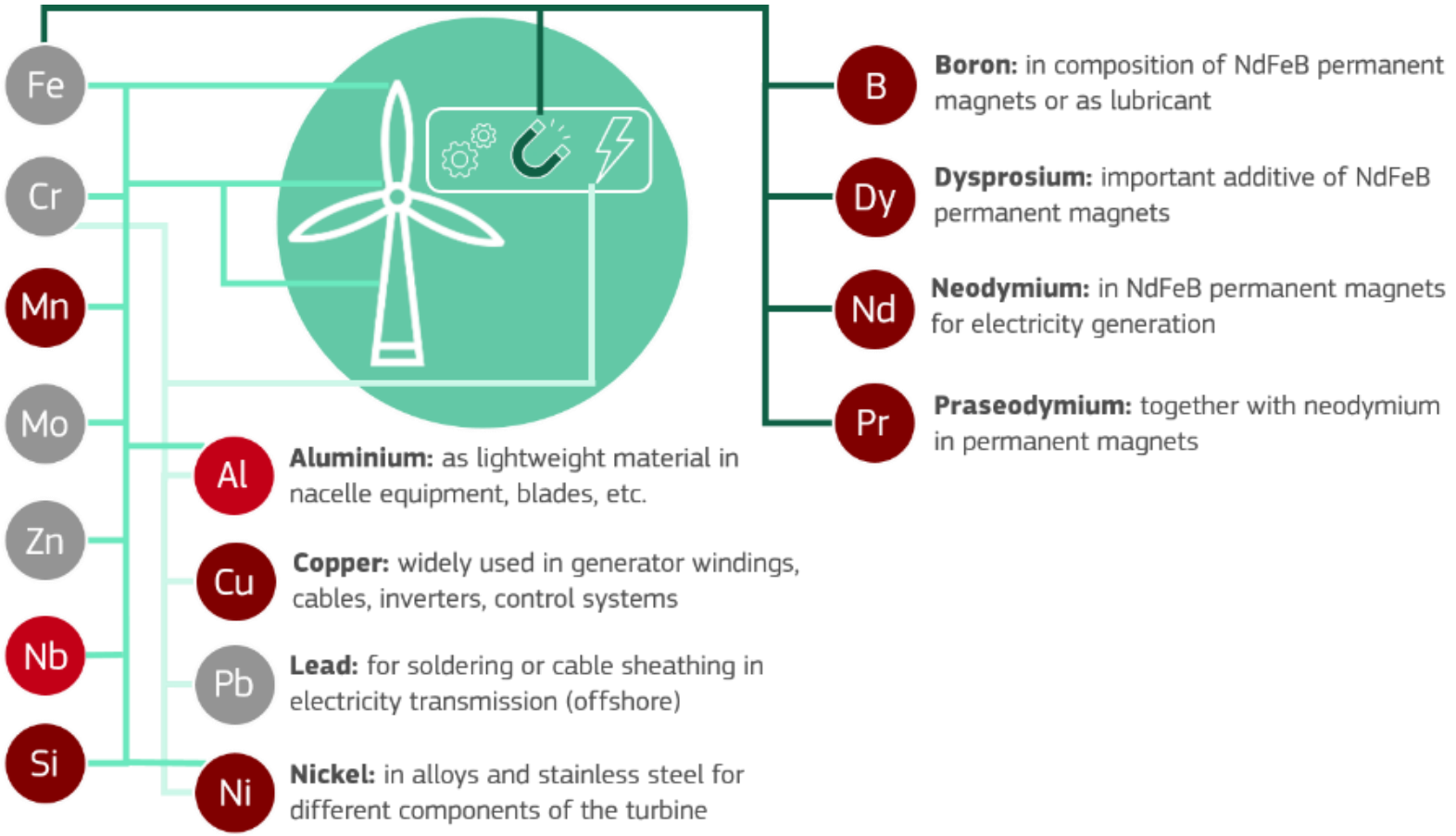
Manganese: essential for steel production used for many parts of a turbine

Molybdenum: in stainless steel composition for many components of the turbine

Zinc: in protective coatings against corrosion

Niobium: a microalloying element in high strength structural steel for towers of a turbine

Silicon: as alloying element in high-performance steels and as silicone in polymers (sealants, adhesives, lubricants)

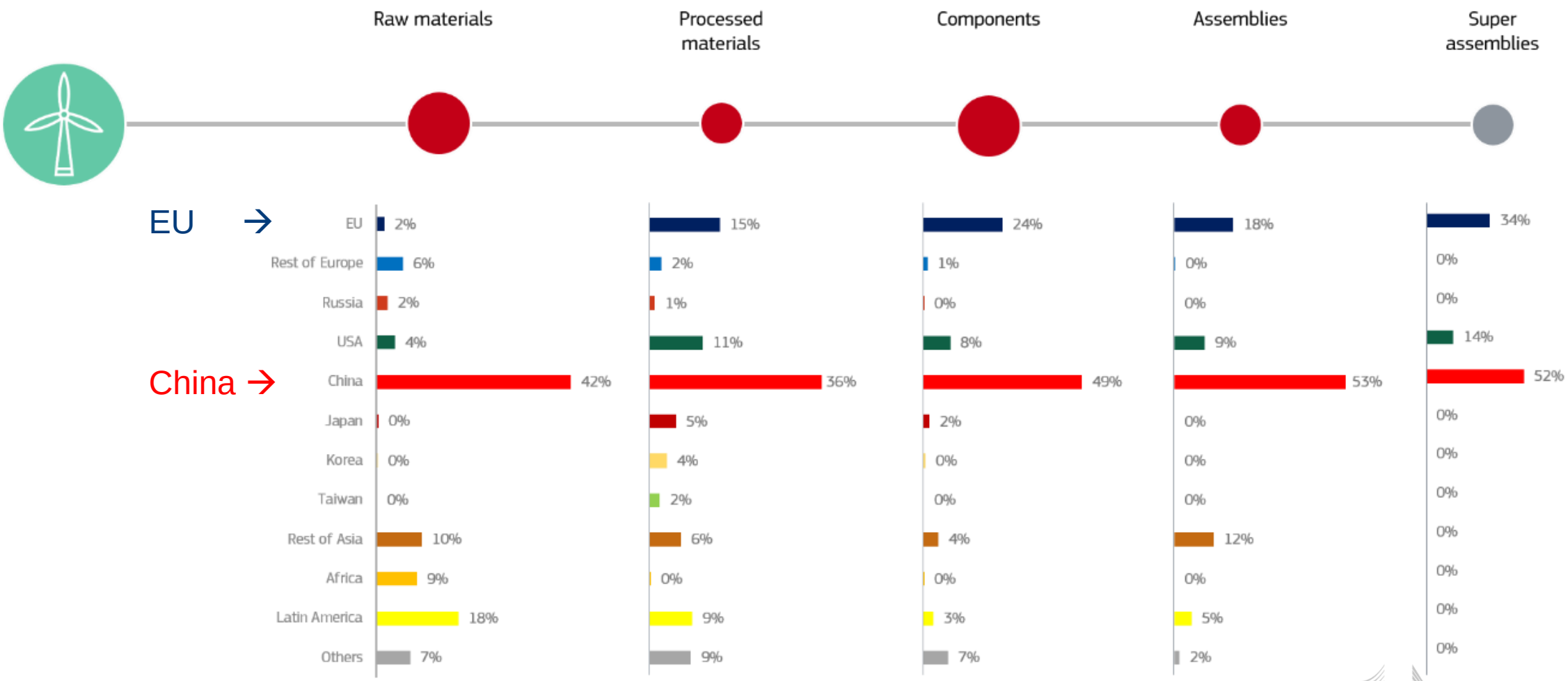


Strategic Raw Material

Critical Raw Material

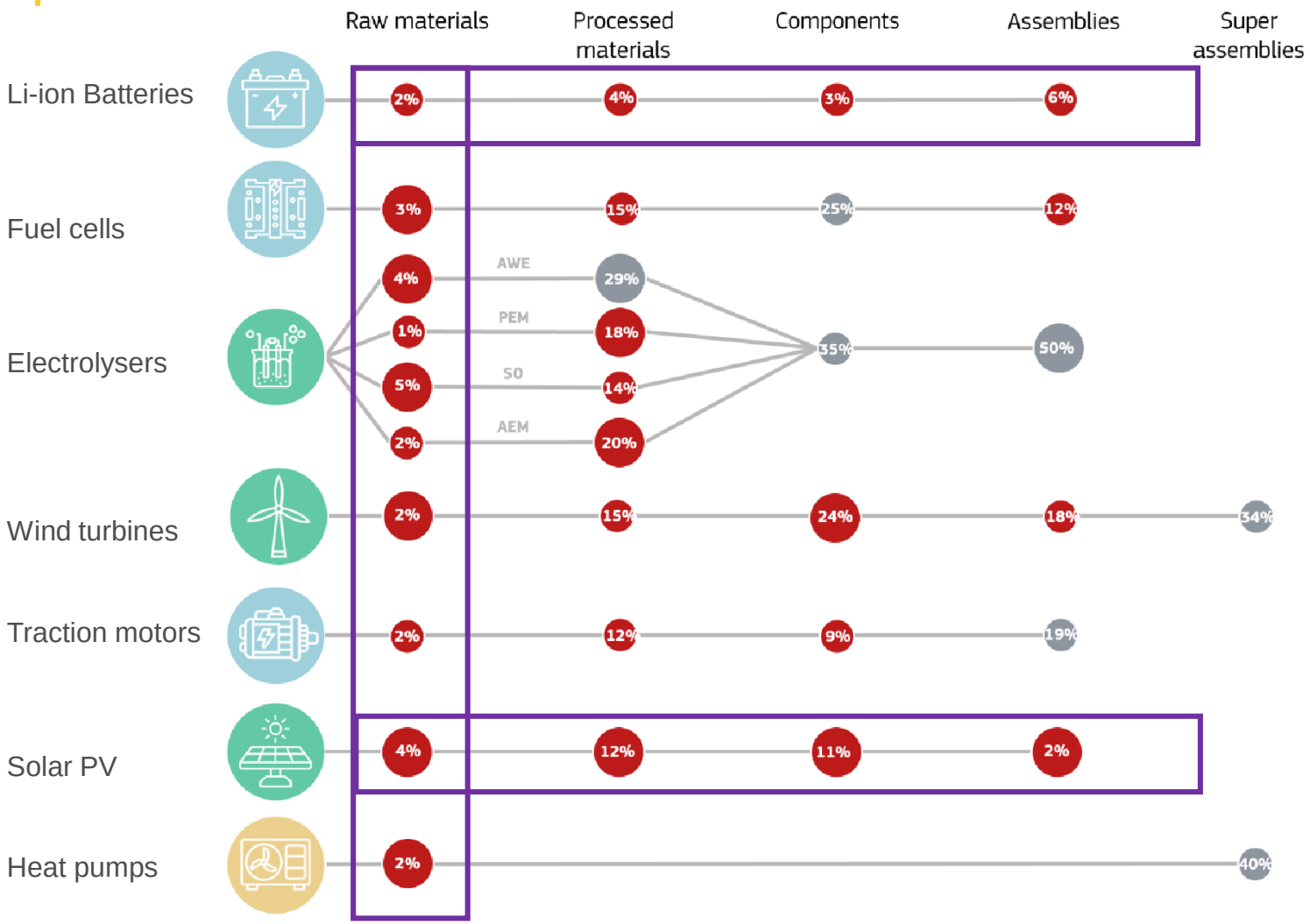
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Supply chain analysis – Wind turbines



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Supply chain analysis – Technology overview(RES)



Vulnerabilities

- **EU shows significant vulnerability along the analysed supply chains**

  RED bubbles indicate dependence

- **The raw materials step is systematically critical**.

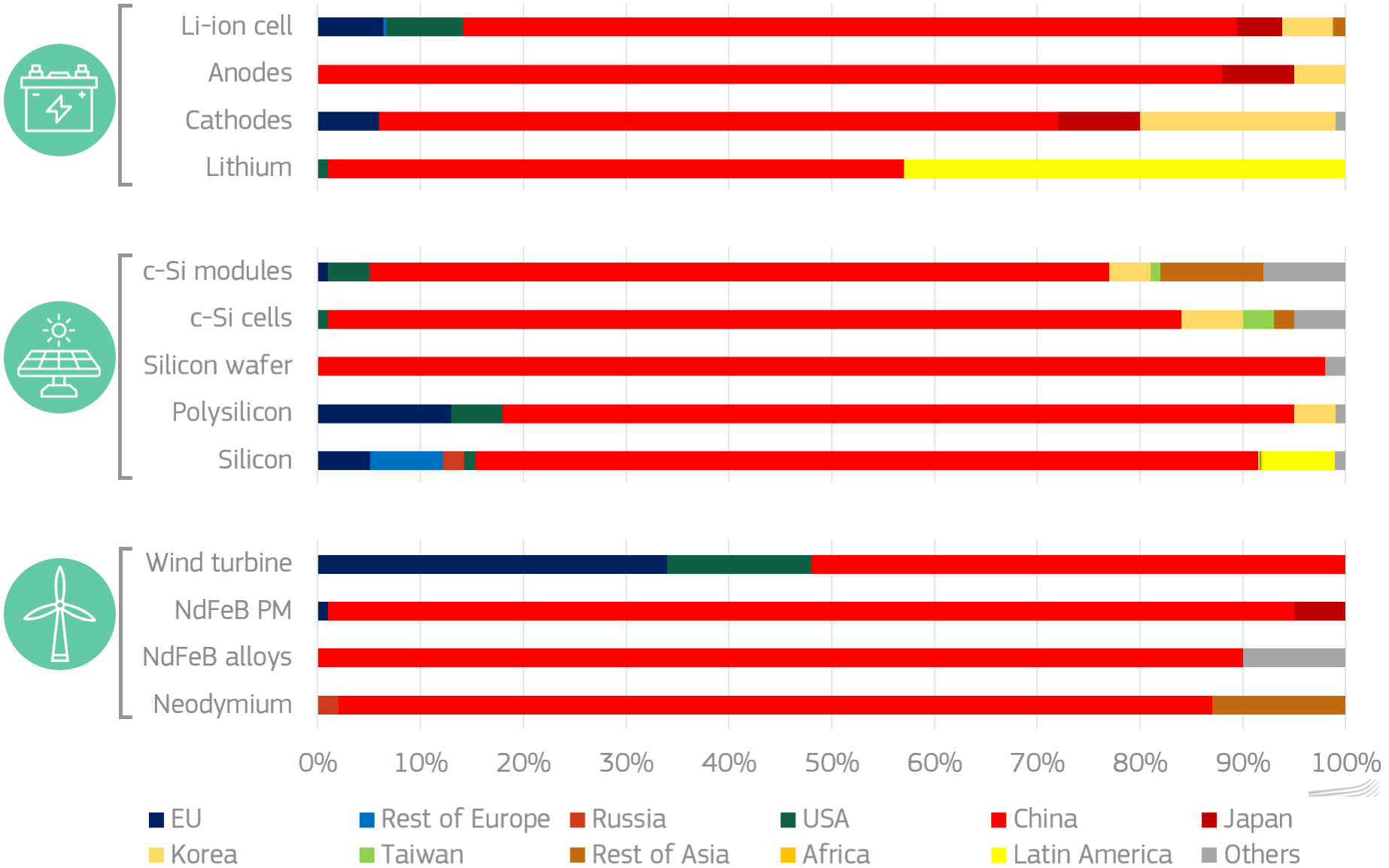
  EU share in global production is never higher than 7%.

- The EU is **reasonably strong in the manufacturing** of the final technologies.

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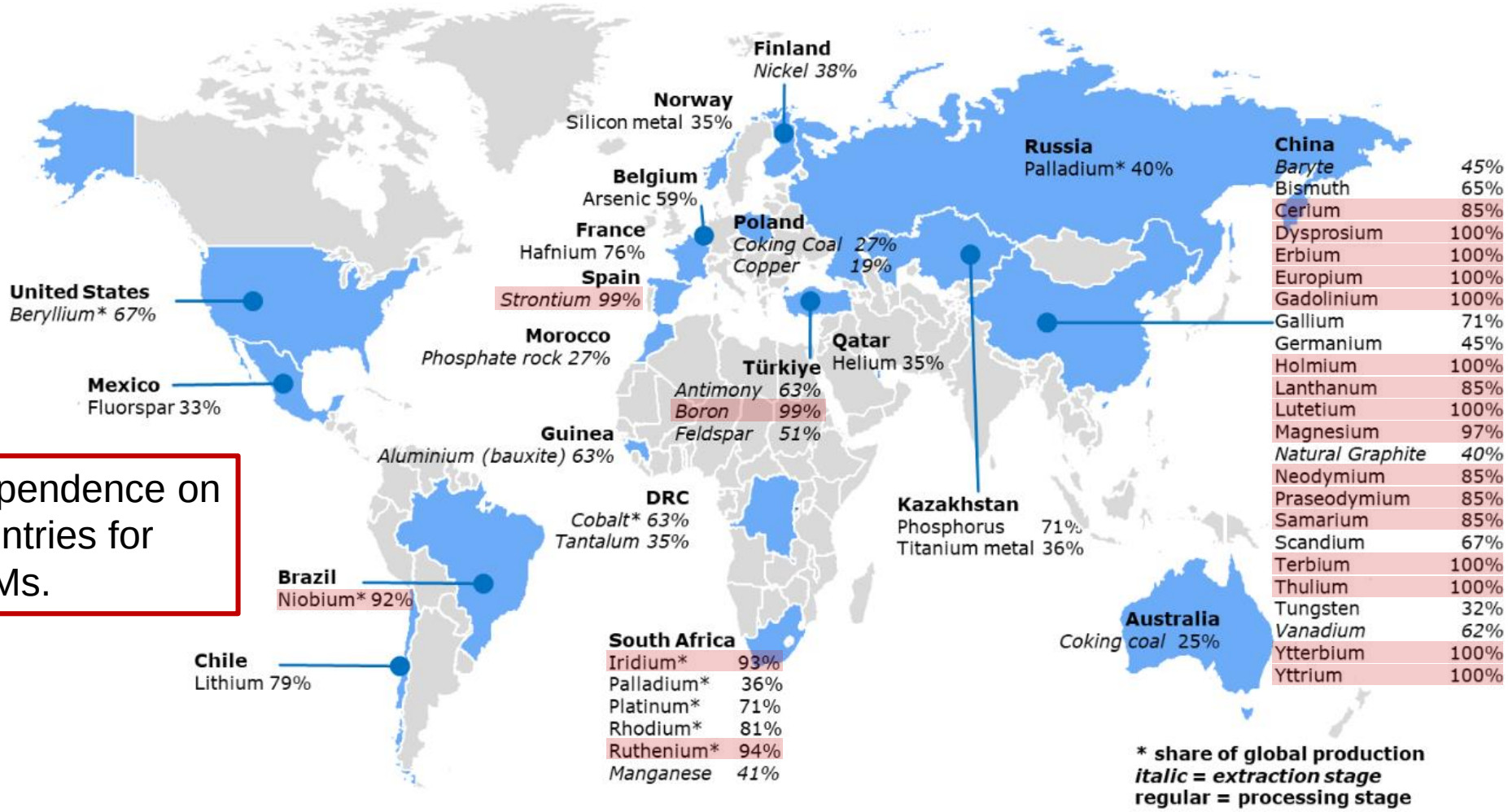
RES production global shares

Propagation of dependencies along the value chain



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Dependencies – Source country



Major supplier = strongest dependence: China

Strong dependence on single countries for some CRMs.

Source: *European Commission, Study on the Critical Raw Materials for the EU 2023 – Final Report*

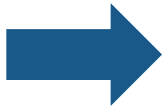
Demand foresight – Framework

Raw material demand scenarios are built via the combination of three drivers:

Technology deployment

Sub-technology market shares

Material intensity and efficiency

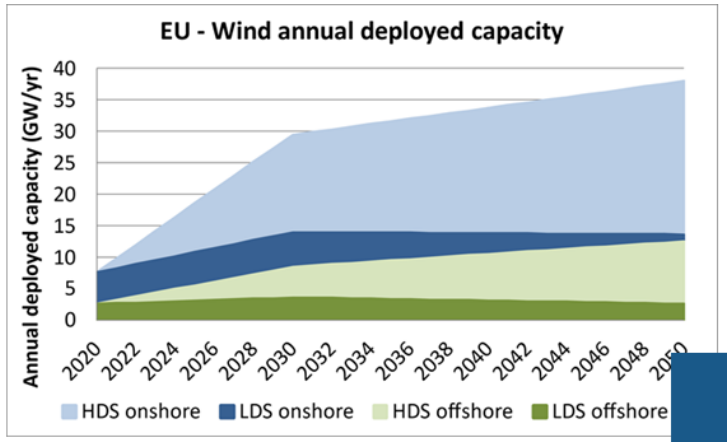


High Demand Scenario – HDS

Low Demand Scenario – LDS

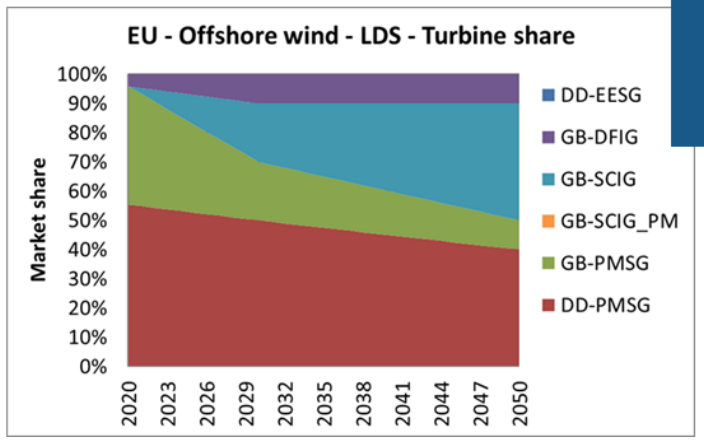
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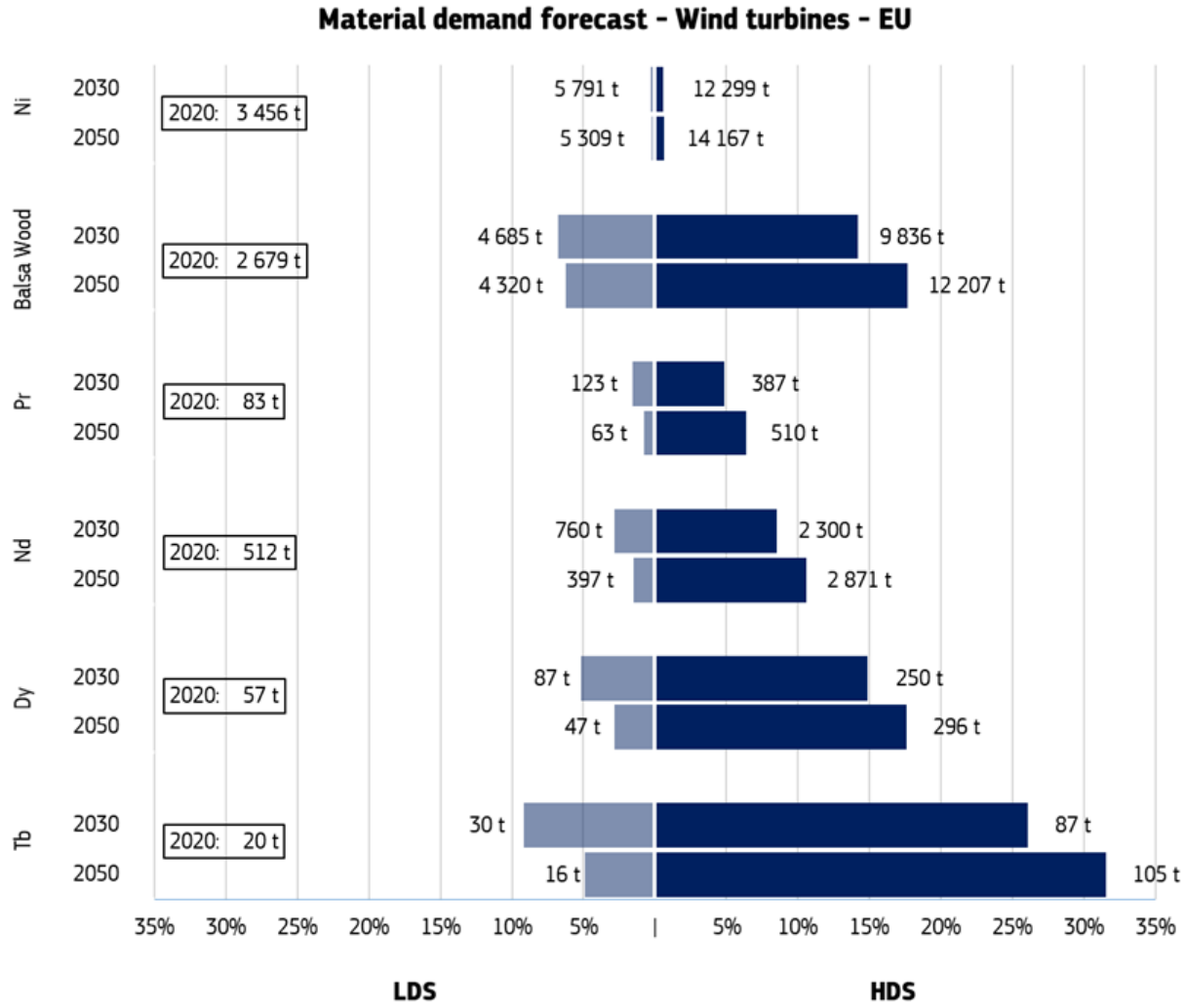
Forecast analysis – Material demand scenarios



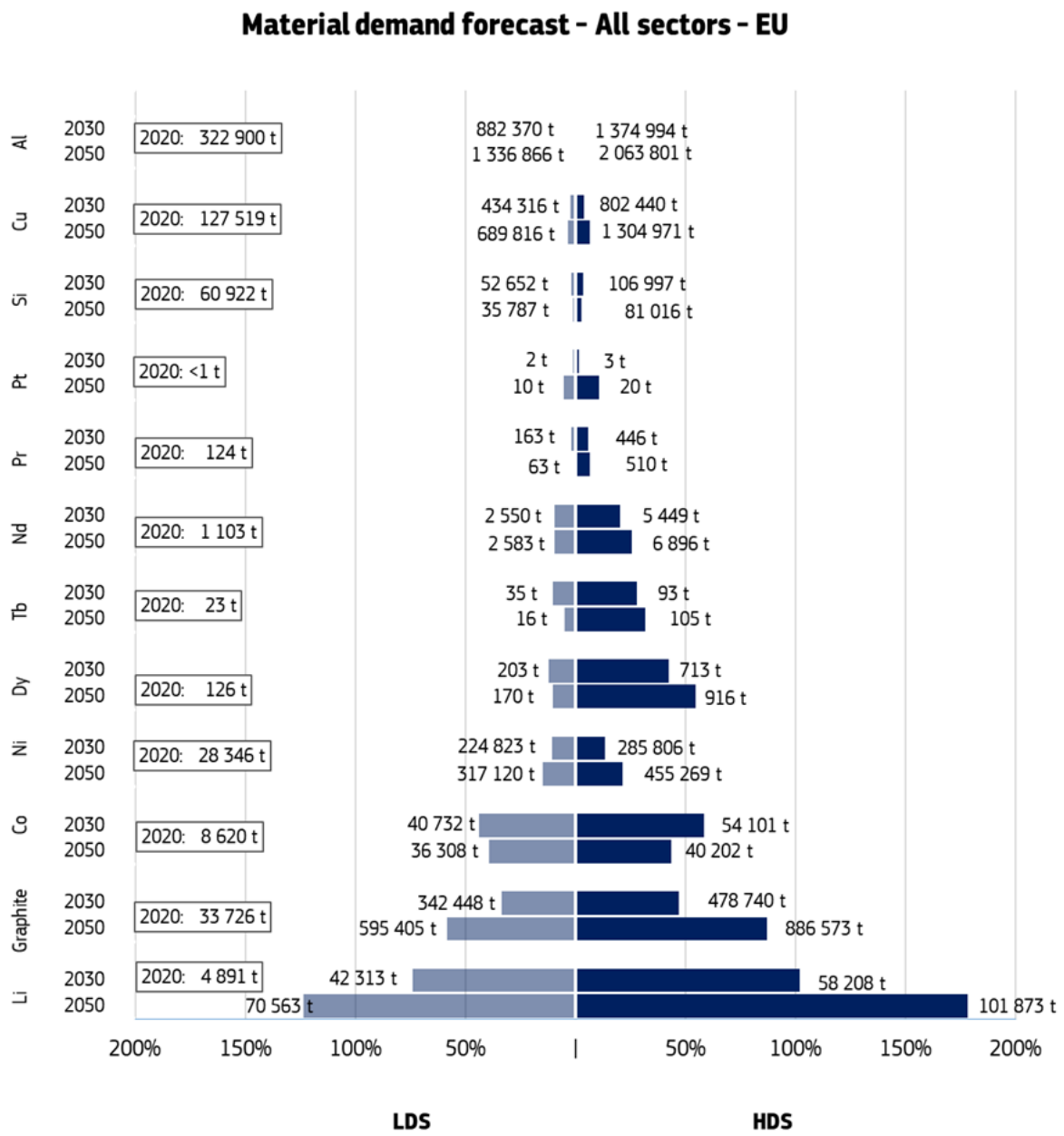


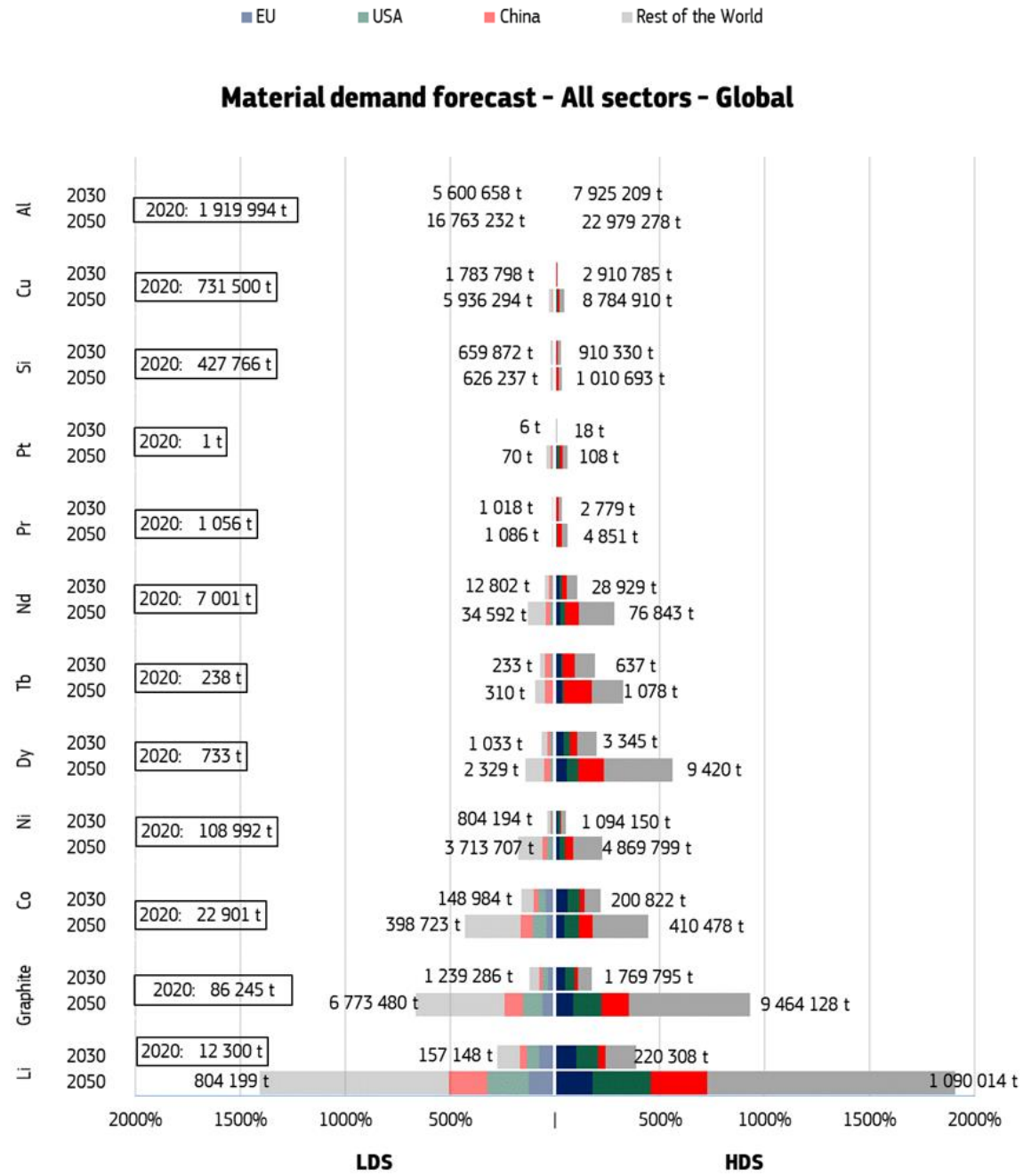
Materials intensities
for the different technologies





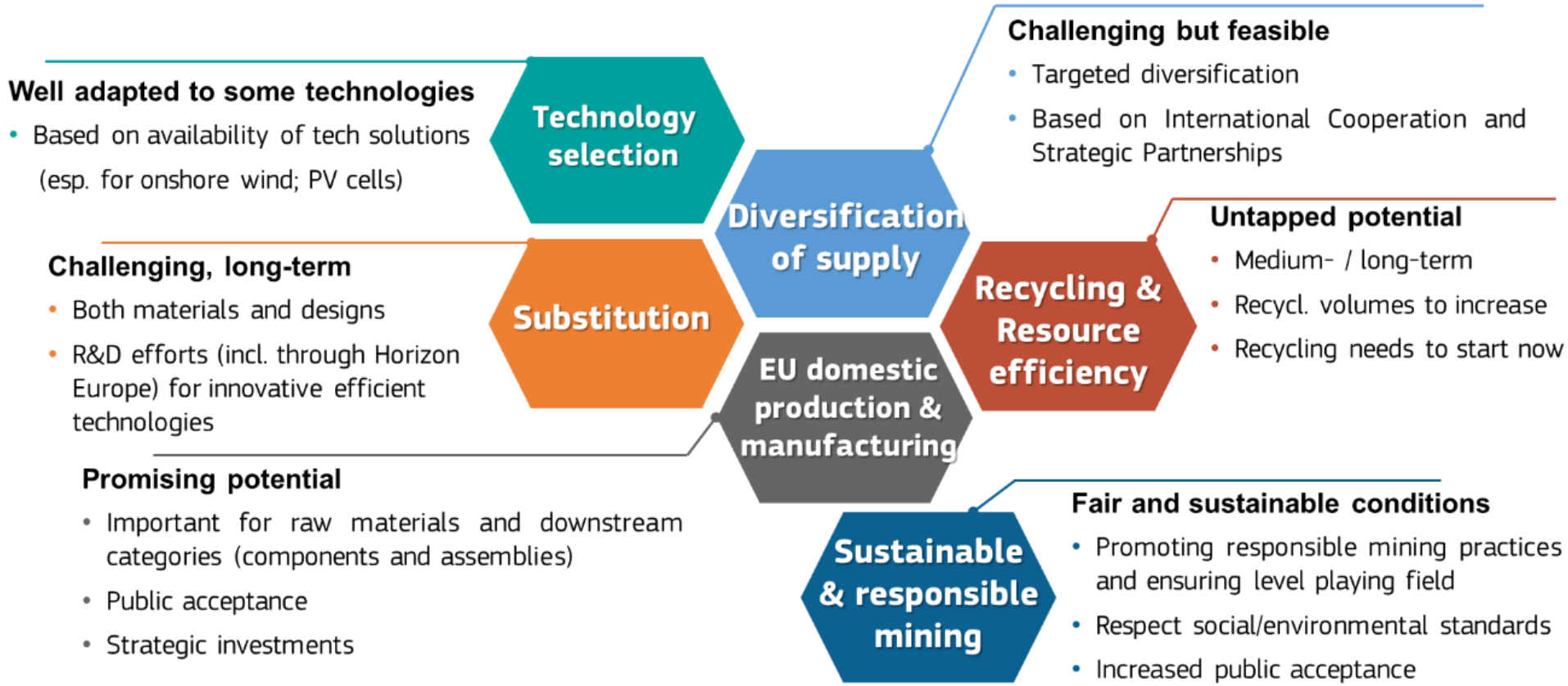
Raw Materials Foresight





Objective: support CRMA policy

Possible actions to increase resilience of supply chains



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Our next steps:
Support to policy, Partnerships and collaboration

Support the implementation of CRM Act through:

- On **Foresight**: Demand mitigation; Rapidly evolving technologies; New technologies
- On **Materials**: Substitution, esp. with advanced materials; recycling → ***SETplan***
- On **management of disruption risk: Monitoring resilience (**Stress-test methodology) and **preparedness** measures, incl. **early-warning mechanism**

Partnerships

- **Across the Commission:** Across the JRC, DG GROW, DG ENER, DG RTD, …
- **External collaborations**:

On methodological issues and availability of open data:

- Geological surveys (incl. specialised Offices for CRMA); EU and int'l research centres

Conclusions

- **Dependencies and vulnerabilities are present in various steps of the value chain of strategic technologies in the EU**: in detail, the raw materials step is systematically critical for all technologies, while the EU is stronger in the manufacturing of the final technologies.

- Meeting the EU's ambitious policy targets will drive an **unprecedented increase in materials demand** in the run up to 2030 and 2050, which will be the case at global level as well. While CRM markets are demand-driven and supply follows the demand, there is often a delay in new development projects. This raises concerns about a potential **gap between demand and supply** for many raw materials.

- Diversifying material supply sources, increasing domestic manufacturing capacity, enhancing recycling and reuse for a stronger circular economy, exploring substitution routes are among the possible **strategies to strengthen the supply chains**.

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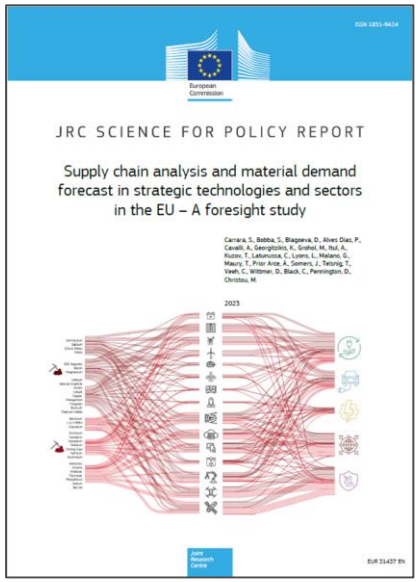

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Thank you



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https://rmis.jrc.ec.europa.eu/uploads/CRMs_for_Strategic_Technologies_and_Sectors_in_the_EU_2023.pdf

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