



Raw materials and circularity for wind energy



ETIP Wind workshop “Delivering circularity through innovative materials and recycling technology and Consumption, 4 May 2021

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Unit I1 - «Energy intensive industries and Raw Materials»

**Raw
Materials**

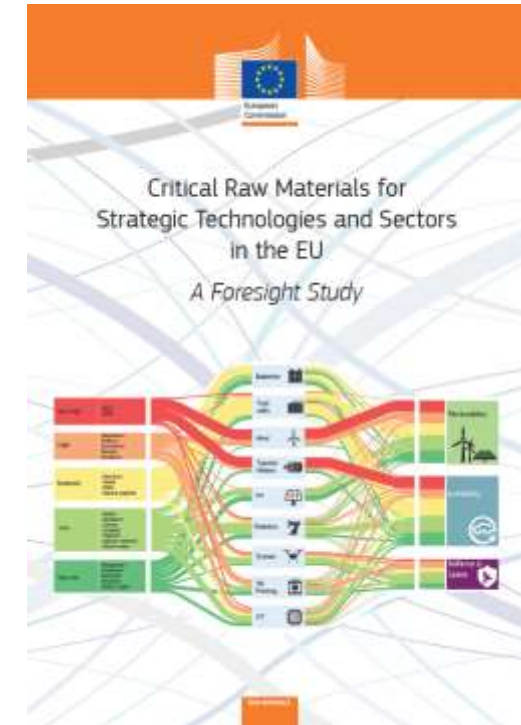
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Policy developments

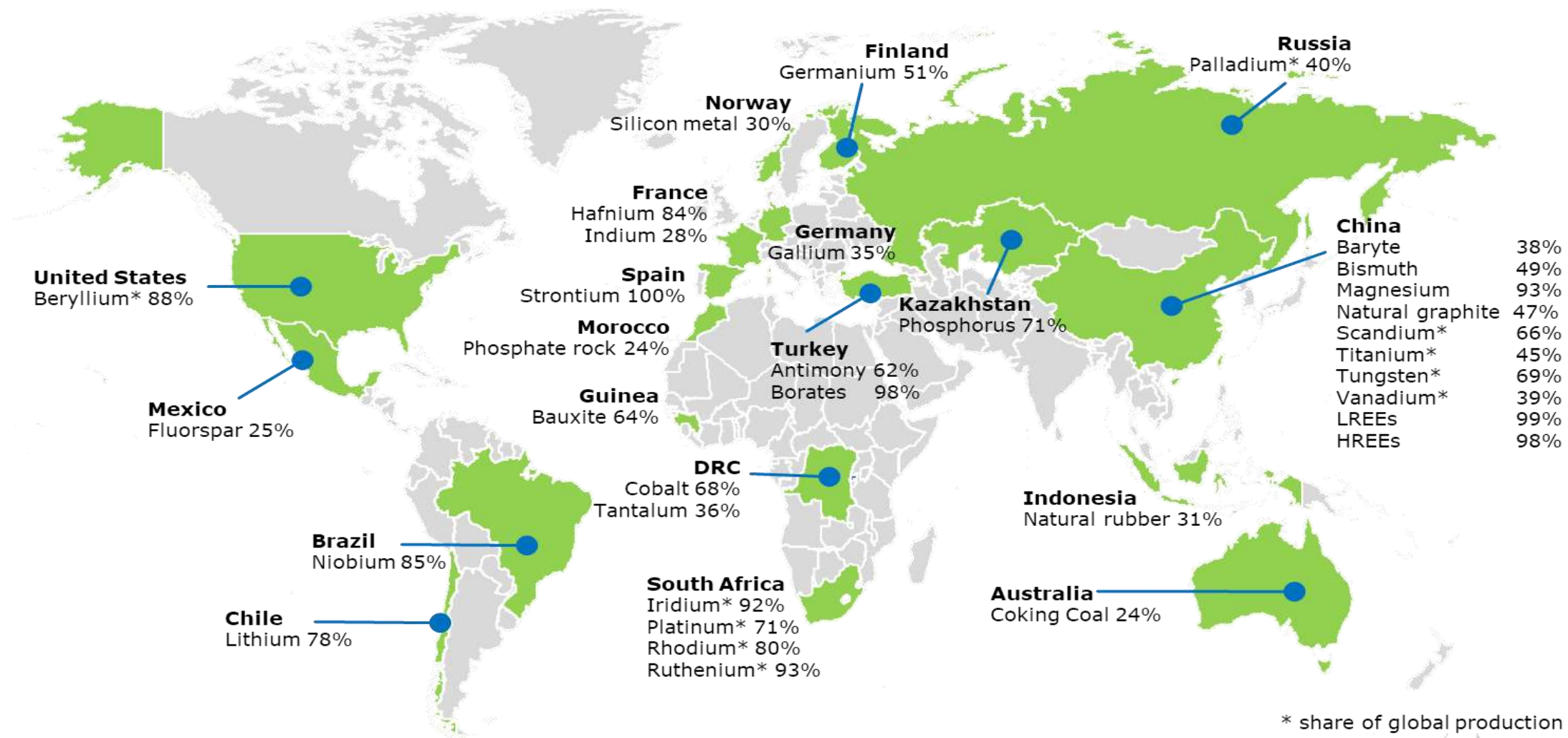
- **Renewable energy sources targets 2018** (32% (at least) share of renewable energy sources in the EU by 2030)
- **Energy system integration strategy 08/07/2020** (electrification, circularity...)
- **Offshore Renewable Energy strategy 19/12/2020** (capacity increase from 12GW to more than 60GW by 2030 and 300GW by 2050)
- **Renewable Energy Directive II** (ongoing Impact Assessment study of the revision of the Renewable Energy Directive II)
- **Circular economy AP** (a sustainable products policy initiative including a revision of the Ecodesign Directive (PV, batteries))
- **Critical Raw Materials communication 03/09/2020** (2020 List of Critical Raw Materials, Action Plan on Critical Raw Materials)
- **New Industrial policy to be published soon...**

EU assessment 2020 identifies 30 critical raw materials

2020 Critical Raw Materials (new as compared to 2017 in bold)		
Antimony	Hafnium	Phosphorus
Baryte	Heavy Rare Earth Elements	Scandium
Beryllium	Light Rare Earth Elements	Silicon metal
Bismuth	Indium	Tantalum
Borate	Magnesium	Tungsten
Cobalt	Natural Graphite	Vanadium
Coking Coal	Natural Rubber	Bauxite
Fluorspar	Niobium	Lithium
Gallium	Platinum Group Metals	Titanium
Germanium	Phosphate rock	Strontium

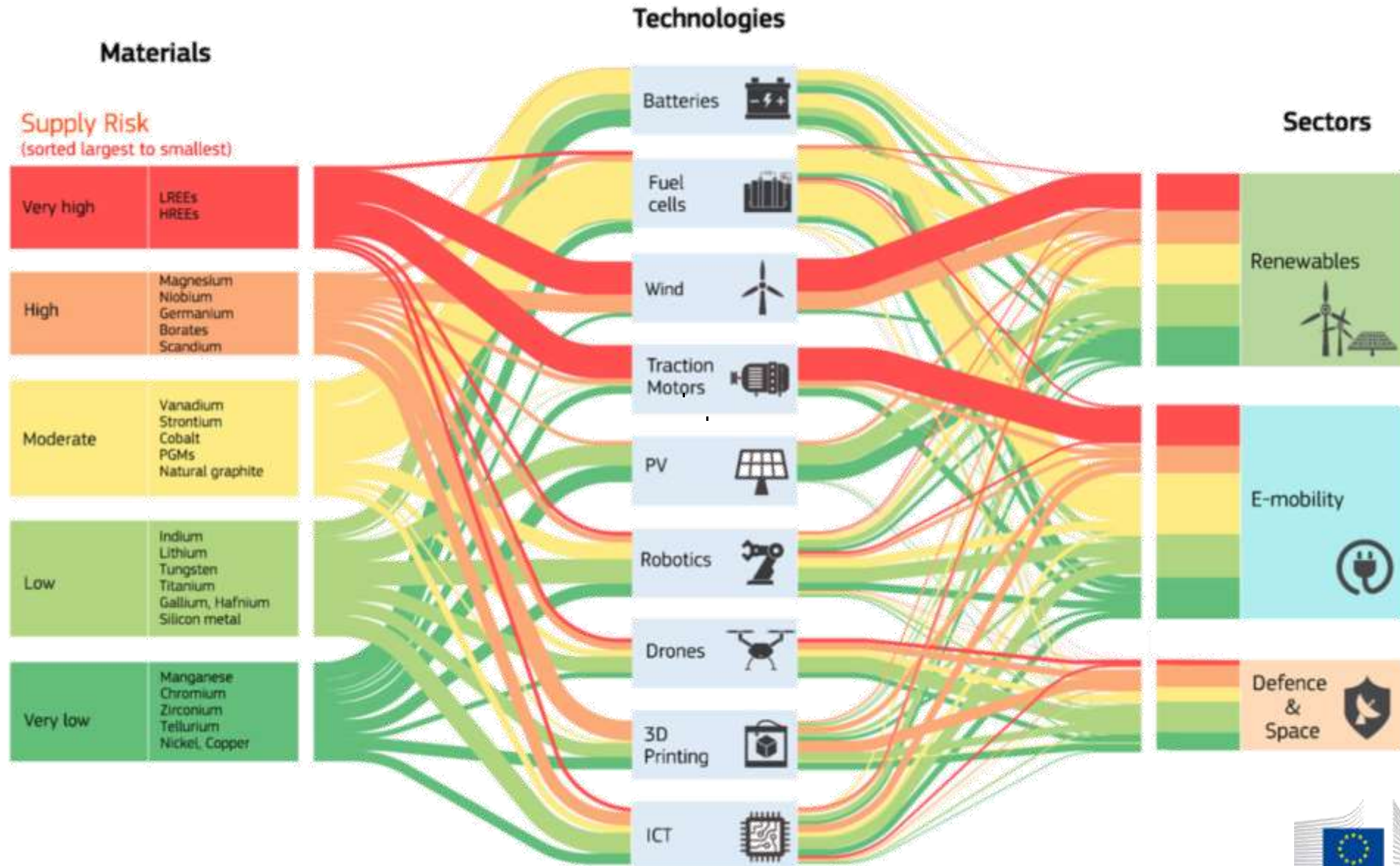


Main CRM suppliers of the EU



Source: "European Commission, Study on the EU's list of Critical Raw Materials – Final Report (2020)"

Which materials do we use for green technologies?



Wind turbines

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

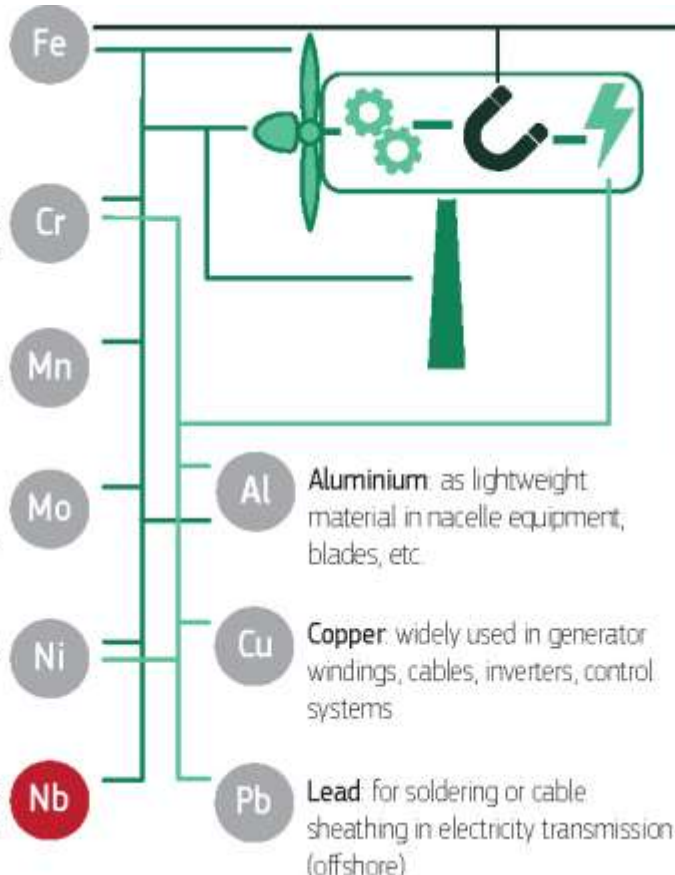
Chromium: essential for stainless steel and other alloys in rotor and blades

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

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

Nickel: in alloys and stainless steel for different components of the turbine

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



B: Boron: in composition of neodymium-iron-boron (NdFeB) magnets or as lubricant

Dy: Dysprosium: important additive of neodymium-iron-boron (NdFeB) permanent magnets

Nd: Neodymium: in NdFeB permanent magnets for electricity generation

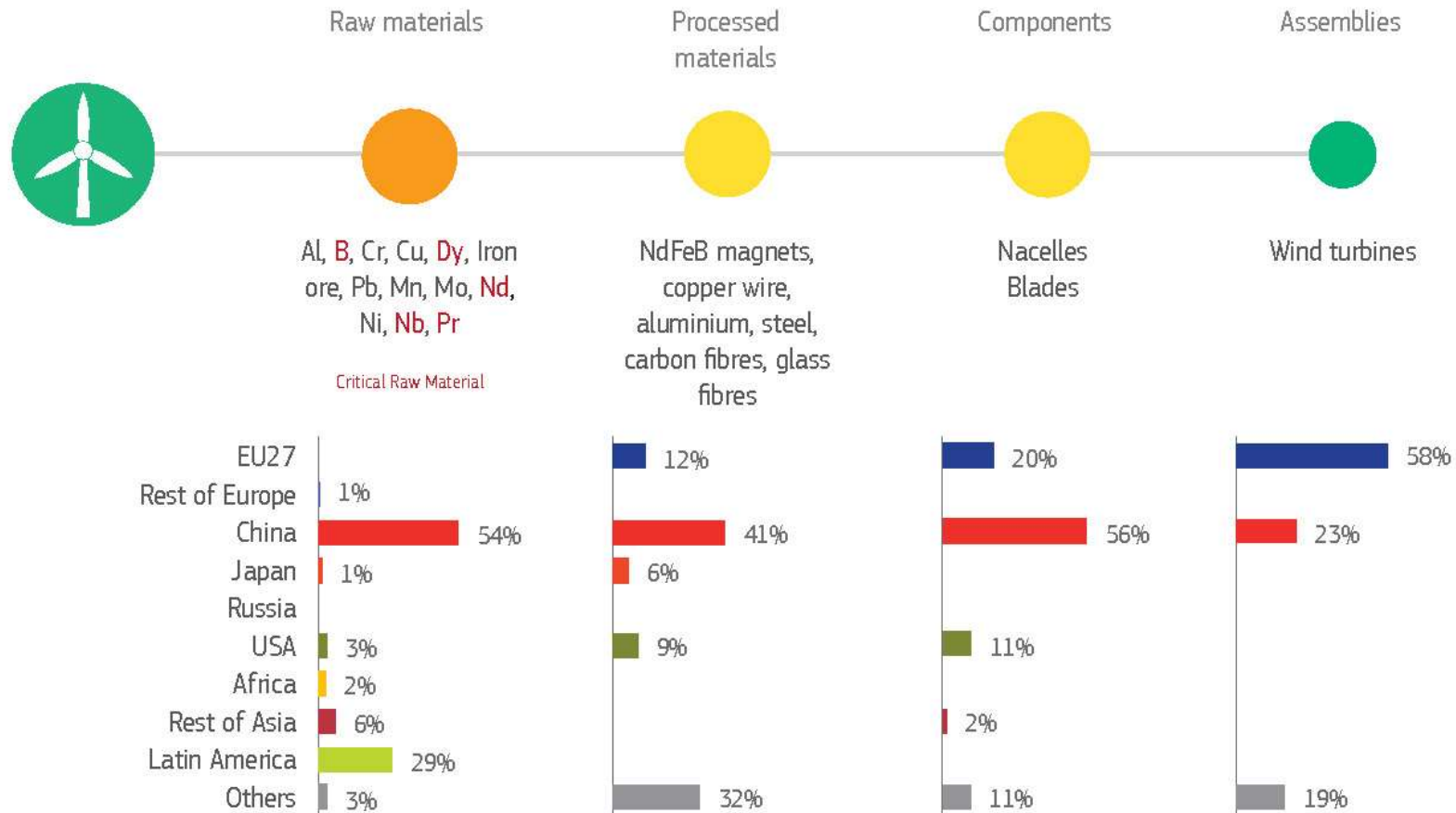
Pr: Praseodymium: together with neodymium in permanent magnets

● Critical Raw Material

Structural materials are needed in large quantities – concrete, steel, copper, aluminium, wood, composite materials.

Magnets are very large.

Wind turbines



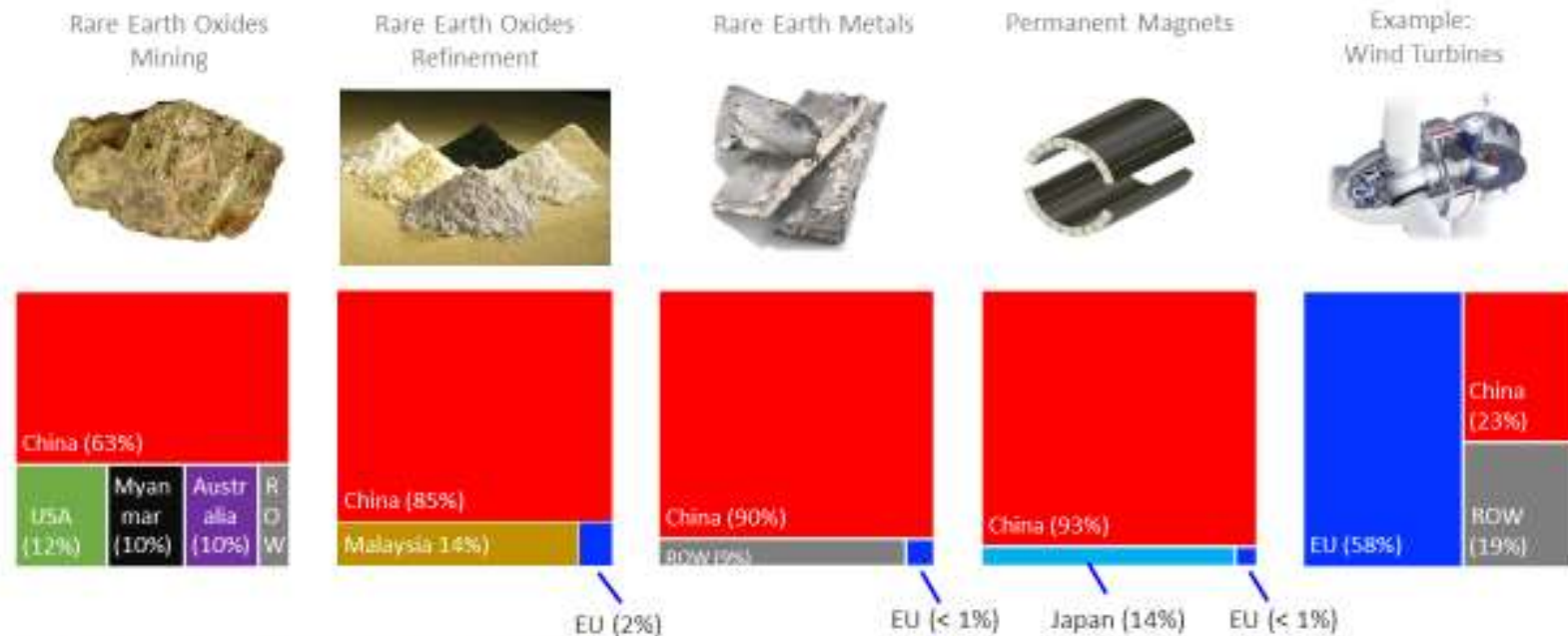
The EU only provides 1% of the raw materials for wind generators.

Major issue is a supply of rare earths and permanent magnets.

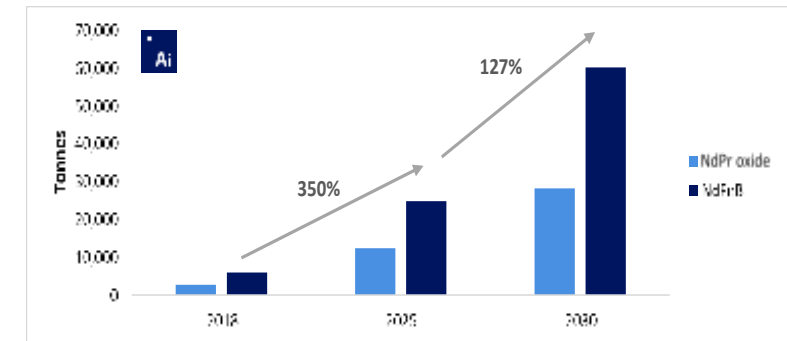
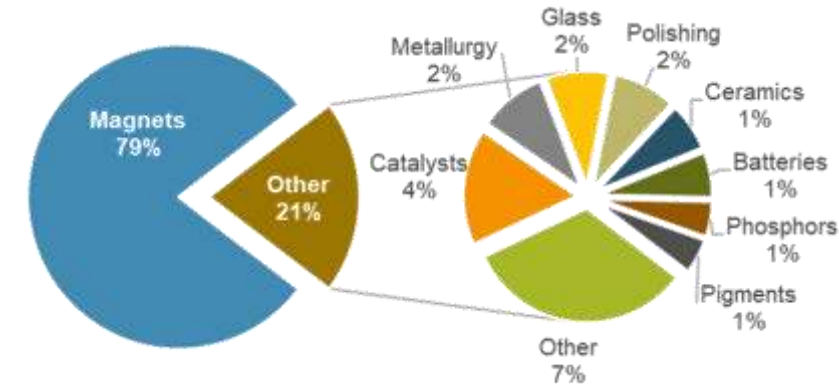
There is no EU producer of perm. magnets for wind turbines

Rare earths based magnets

PRODUCTION IN THE RARE EARTH VALUE CHAIN IS HIGHLY CONCENTRATED IN ONE COUNTRY WHICH RESULTS IN A HIGH SUPPLY RISK AND SPECULATION (2019 DATA)



Sources: USDA; USGS; JRC 2017; JRC 2020; Adamas Intel 2019



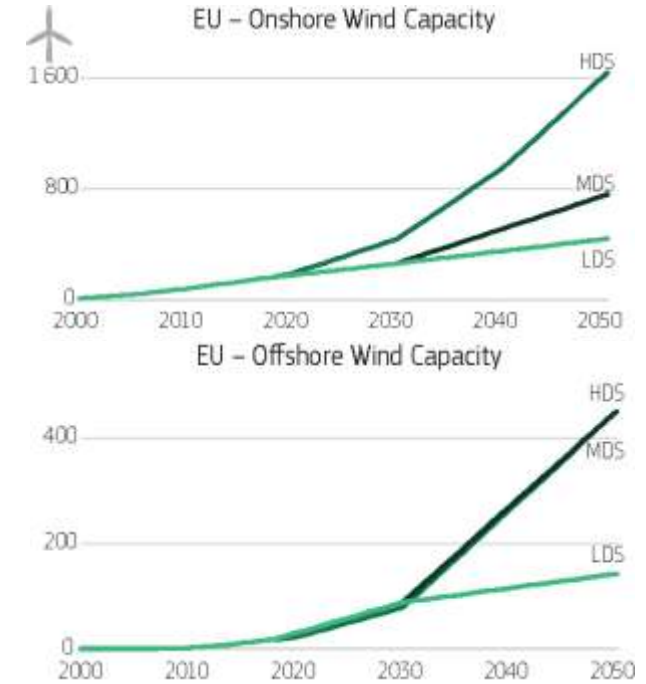
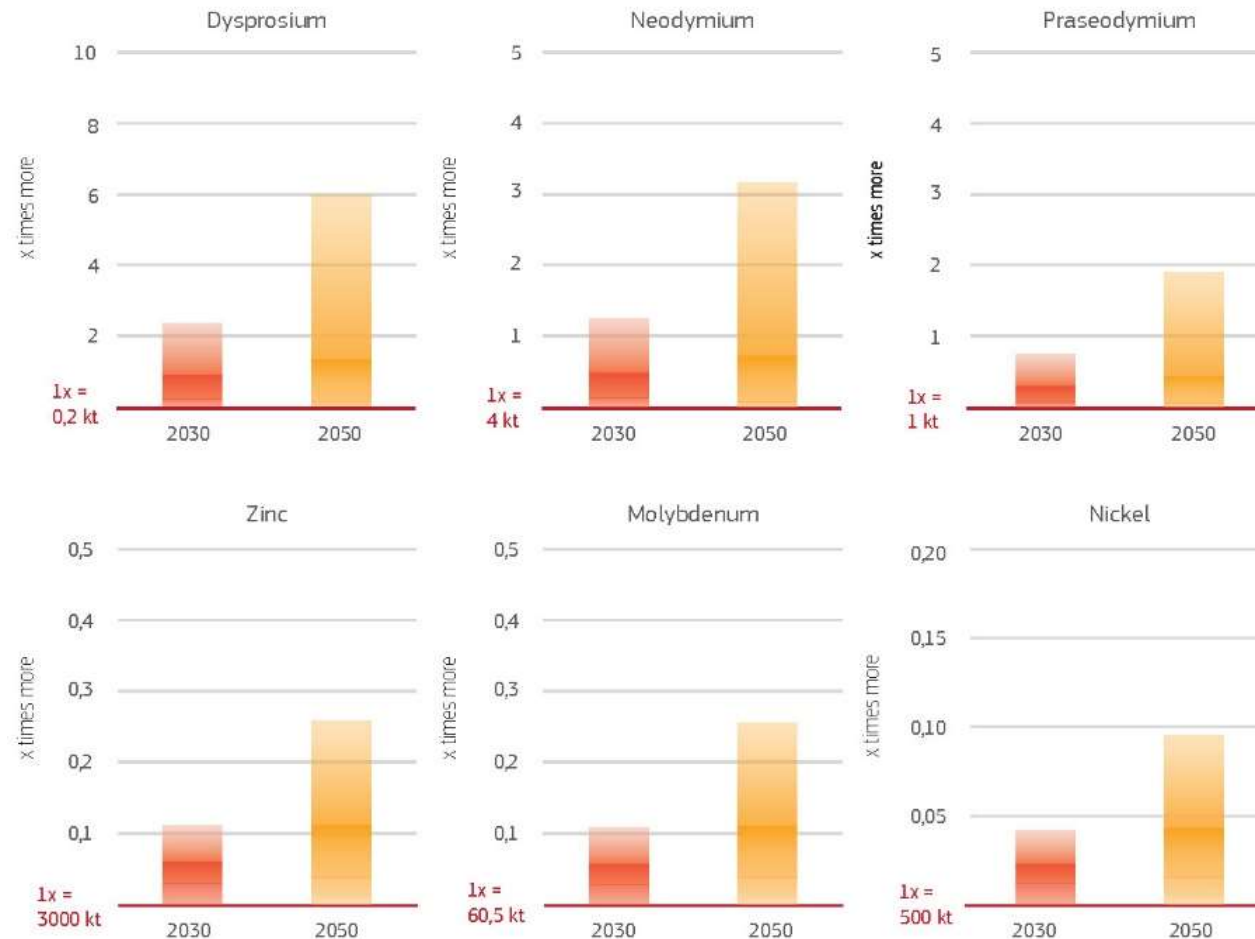
Source: Adamas Intelligence

Sources: Adamas, Roskill in EU CRM factsheets 2020

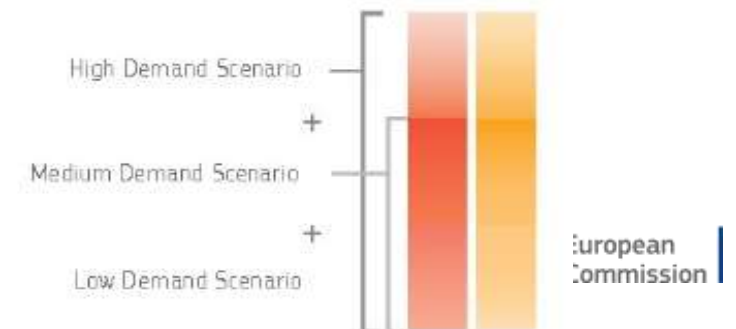
Wind turbines – Future raw materials needs



Additional material consumption for wind turbine in **renewables only** in 2030/2050 compared to current EU consumption* of the material in **all applications**



* See the methodological notes in Annex 1 and all data in Annex 2



Action Plan on Critical Raw Materials

10 actions to ensure Europe's access to raw materials

1. **European Raw Materials Alliance**
2. Develop sustainable financing criteria for mining
3. **Research and innovation on waste processing, advanced materials and substitution**
4. **Map the potential supply of secondary CRM from EU stocks and wastes**
5. Investment needs for mining projects that can be operational in 2025
6. Develop expertise and skills in mining
7. Deploy Earth observation programmes for exploration, operation and post-closure environmental management
8. **Develop research and innovation projects on exploitation and processing of CRMs**
9. Develop strategic international partnerships to secure CRMs supply
10. Promote responsible mining practices for CRMs

1. European Raw Materials Alliance

- Workstreams:
 1. **Consultations** with a wide range of stakeholders
 2. Raw materials **investment** platform
- Join the Alliance at www.erma.eu
- Cluster 1: Strengthening capacity in the **rare earths and magnets** value chain
 - mining, recycling and magnets making investment projects with a potential to increase rare earths magnets production capacity from 500t to 7,000t per year.
- Cluster 2: **Energy storage and conversion**
- **Downstream industry is welcome!**



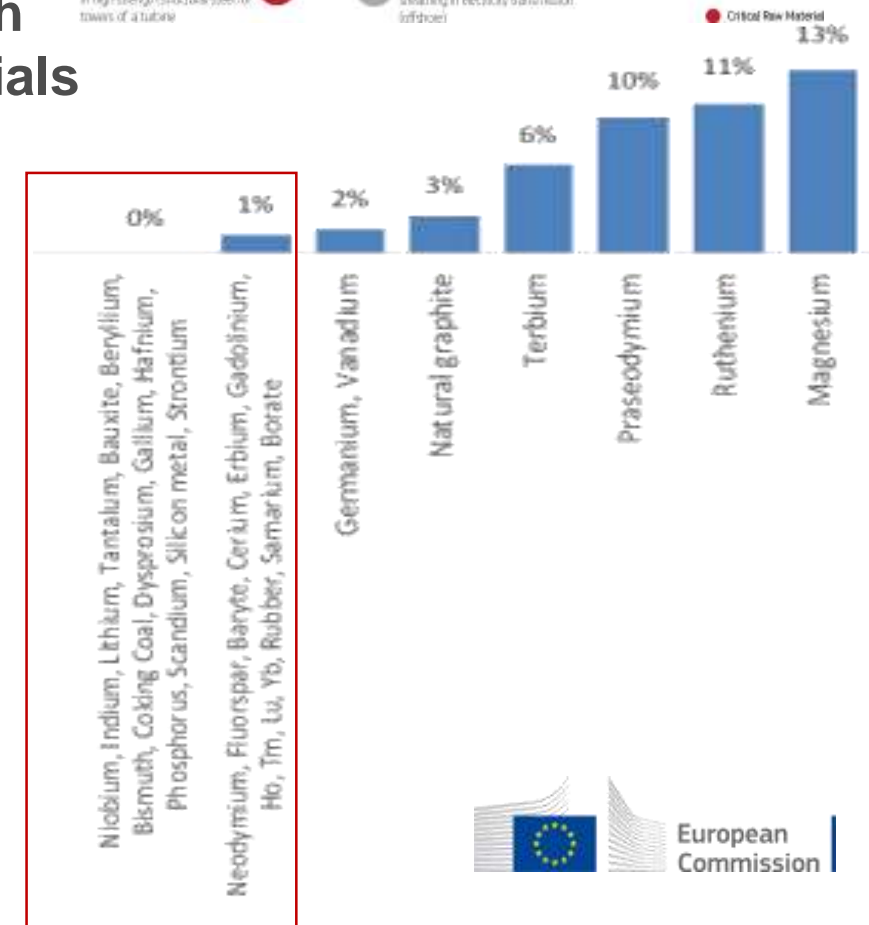
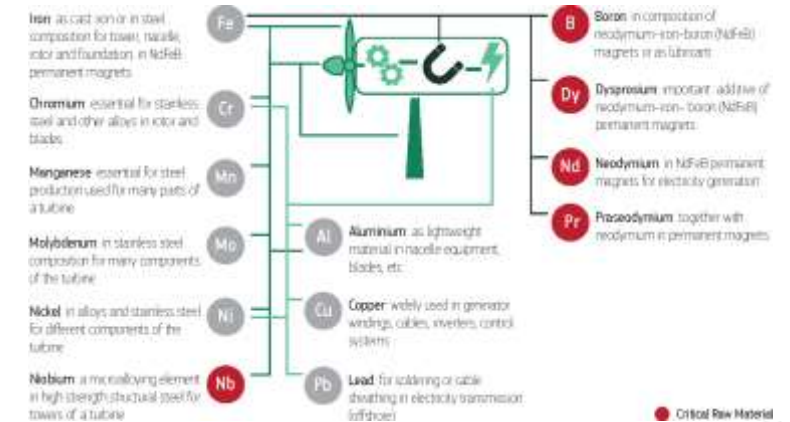
Circular use of resources, sustainable products and innovation

3. R&I on waste and materials

- Horizon 2021-2022 calls on critical raw materials **research and innovation on waste processing, advanced materials and substitution**

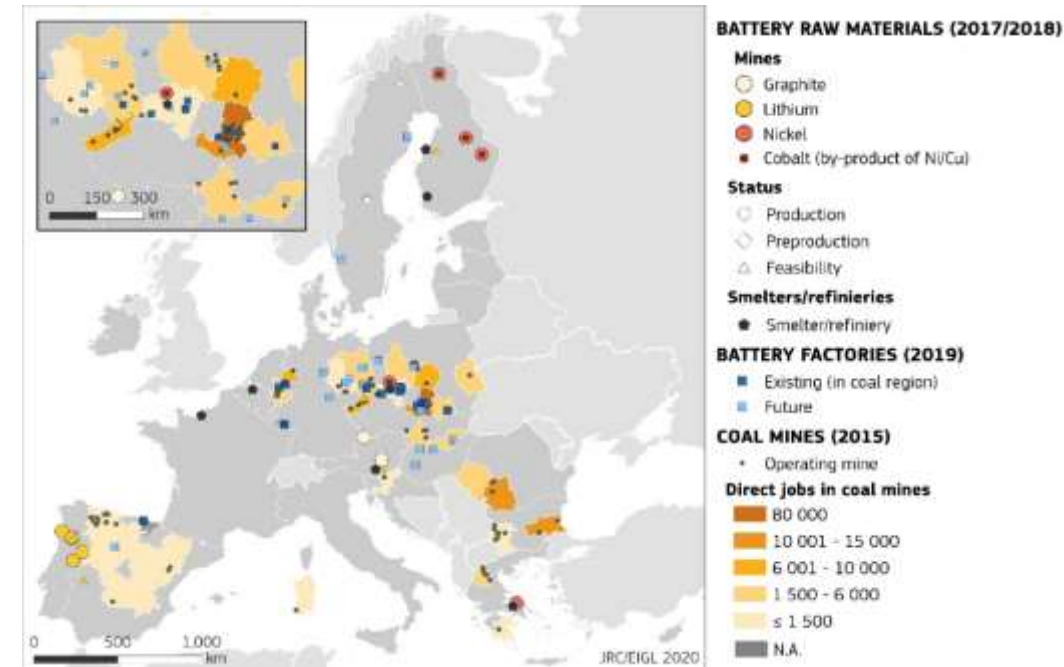
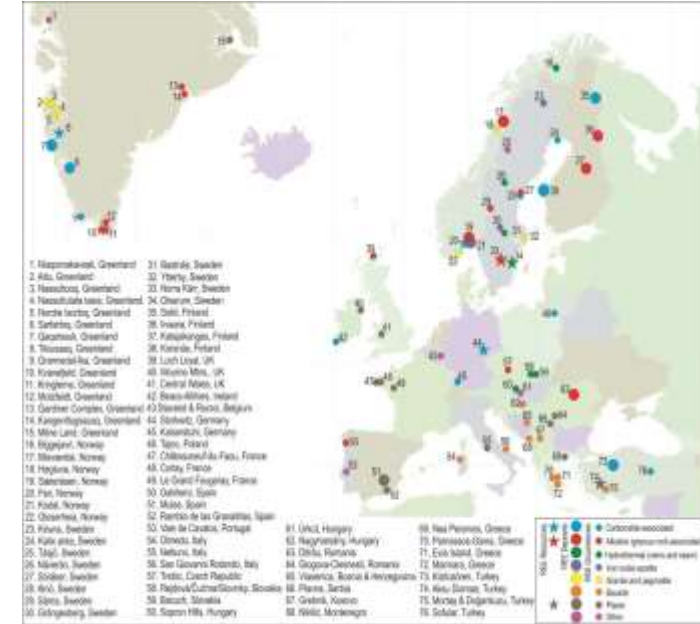
4. Secondary RM mapping

- **Map the potential supply of secondary critical raw materials from EU stocks and waste and identify viable recovery projects**
 - Secondary production of most of the CRMs (rare earths, niobium or borates) makes only a marginal contribution.
 - Wind turbines have a recyclability rate of 85% to 90%. 178 MW decommissioned in 2019 in Europe. **But what and where is recycled?**



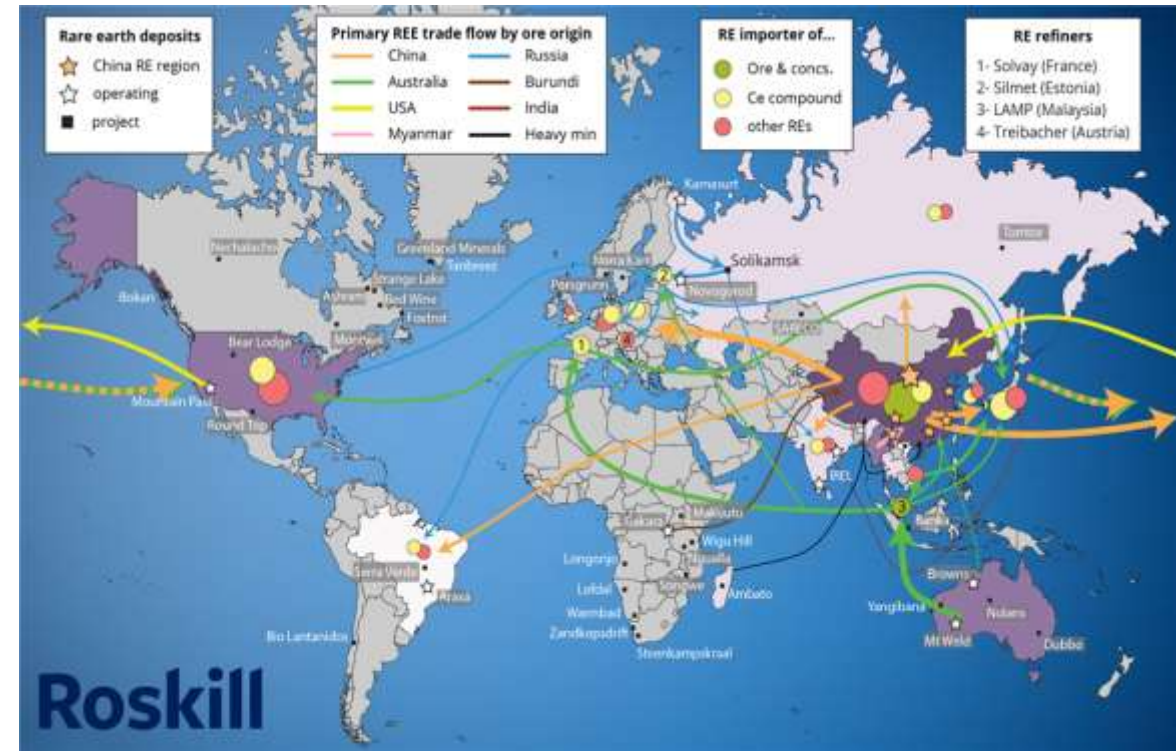
Sourcing from the European Union

5. Identify mining and processing projects that can be operational by 2025
6. Develop expertise and skills in mining, extraction and processing technologies - **regions in transition**
7. Deploy **Earth-observation** programmes and remote sensing for resource exploration and production monitoring
8. Develop **Horizon Europe** R&I projects on exploitation and processing of CRMs to reduce environmental impacts



Diversified sourcing from third countries

9. Develop strategic **international partnerships** and associated funding to secure a diversified supply of sustainable critical raw materials, including through undistorted trade and investment conditions
10. Promote **responsible mining practices** for critical raw materials through the EU regulatory framework and relevant international cooperation



Thank you!