Global race for critical raw materials and cleantech. Europe between China and the US

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Global economy has become a different place
Rapid climate change

Yearly surface temperature compared to the 20th-century average from 1880–2022. Blue bars indicate cooler-than-average years; red bars show warmer-than-average years. NOAA Climate.gov graph, based on data from the National Centers for Environmental Information.
The share of the EU in the global economy continues to decline

Shares of World Gross Domestic Product (1991-2023)

Source: International Monetary Fund – WEO.
Lack of investments in the West for 20 years

According to the IEA, if G7 countries would restore their previous investment levels, this would cover half of the globally needed annual $4 tn CleanTech investments. G7 annual GDP approximately $45tn

Source: World Bank via Martin Sandbu, FT
Rise of China in manufacturing & exports

Source: ERT (2022).
Dominant supplier impact: China

World fertilizer prices have continued to skyrocket after China curbed exports

Fertilizer prices and exports January 2017–March 2022 (index: January 2019 = 100)

- July 2021: China orders companies to stop exporting
- October 2021: China demands new inspections, further limiting fertilizer exports
- February 2022: Russia invades Ukraine

Notes: Export data are 12-month trailing sum.
EU critical raw materials dependences

- 63% of the world's cobalt, used in batteries, is extracted in the Democratic Republic of Congo, while 60% is refined in China.
- 97% of EU's magnesium supply is sourced from China.
- 100% of the rare earths used for permanent magnets globally are refined in China.
- South Africa provides 71% of the EU's needs for platinum group metals.
- Türkiye provides 98% of the EU's supply of borate.
Supply risks of critical raw materials
Geopolitical risks – Russia

Evolution of gas prices (€/MWh) in EU and third partners

Critical and Significant Raw Materials imported from Russia

Source: “Decoupling from Russia”, DG GROW Single Market Economy Papers (2022)
The global race is on for green, digital and resilient
The previous Big Transition

5th AVE NYC
1900

Where is the car?

5th AVE NYC
1913

Where is the horse?

Source: internet, Tony Seba & A Learning a Day
As of the end of Q3 2022, Europe leads with $238 billion announced, followed by the United States and Asia Ex-China each with $210 billion, $199 billion in China, and $10 billion outside of these regions (including Mexico, Canada, and Australia).

The US Infrastructure Investment and Jobs Act (IIJA) and the Inflation Reduction Act (IRA) provide more than 30 times more support than had previously been made available for electric vehicles by the federal government.

At the end of 2020, U.S. investments were lagging both Asia and Europe.
• Global lithium-ion battery production capacity projected to **increase 8 fold by 2027**. 6 of the top 10 countries expected to be **European**.

• **China** is home to six of the world’s 10 **biggest battery makers**. Behind China’s battery dominance is its vertical integration across the rest of the EV supply chain, from mining the metals to producing the electric vehicles. It’s also the **largest EV market**, accounting for 52% of global sales in 2021.

  - Based on Bloomberg NEF, elements.visualcapitalist.com
Value chain exposures in CleanTech

Over the past years, China developed a dominant position in the entire supply chain of green tech sectors:

- **Raw materials**;
- **Intermediate products**;
- **Final manufacturing**.
Energy transition: solar production and installation

Forecasts for annual solar PV market installations (until 2024, in GW in Europe)

Source: Solar Power Europe

Production of PVs in the world (2010-2020)

Source: Jäger-Waldau (JRC)
Global race for CleanTech and CRM

Expanding its monopoly:
- controls 70% of Congo’s cobalt;
- acquires stakes in AUS or USA companies

Increasing its consumption:
- consumes 50-60% of world’s metals
- plans additional 750 GW of wind and solar PV installed capacity by 2025

Developing refining capacity:
- controls 73% of global lithium cell manufacturing

Restraining supply:
- All rare earths covered by 2022 export control list;
- 65 000 tonnes of rare earths exported in 2005;
- 35 500 tonnes in 2020;

JOGMEC:
- monitoring
- stockpiling
- investing (Lynas rare earths refinery)
- supply contracts

National Defence Stockpile

Defence Production Act
- 120 million USD to build rare earths refinery by Lynas

Critical minerals-related funding
- (Infrastructure Investment and Jobs Act)

Inflation Reduction Act

Economic Security Promotion Act
- Ensuring Stable Supply of critical items

Section 232 investigations
- neodymium magnets, vanadium, titanium

National Defence Stockpile
European Green Deal: both a Deal and Green
The Fit-for-55, i.e. reduction of GHG by 55% by 2030 compared to 1990 became law in May 2021.

Creating business opportunities in fast growing green/clean markets

#EUGreenDeal
Net-Zero Industry Act: "the why"

1. Dependencies

2. Investment needs

- USD 1.2 trillion required in clean energy technology supply chains for global 2030 targets.
- Fit for 55 objectives require annual investments of EUR 487 billion in the energy system in next 2 years
- NZIA needs assessment establishes EUR 92 billion investments in 2023-2030 in EU manufacturing capacity required for five key technologies

3. Barriers

- Global supply chain and price constraints: volatility in international material prices, more expensive transportation and financing, and continued supply chain bottleneck
- Long Lead times slowing down production: e.g. up to 5 years for EV batteries production
- Lack of skilled workforce: 180,000 skilled workers in the hydrogen sector and 66,000 for solar PV by 2030

Global market for key mass-manufactured net-zero technologies to triple by 2030 with an annual worth of around EUR 600 billion

Once in a generation opportunity to pave the way with speed and ambition to secure the EU’s industrial lead in the fast-growing net-zero technologies sector with the Net-Zero Industry Act
# Net-Zero Industry Act: "the what"

<table>
<thead>
<tr>
<th>Permitting</th>
<th>Investment</th>
<th>Markets</th>
<th>Skills</th>
<th>Innovation</th>
<th>Governance</th>
<th>International Partnerships</th>
</tr>
</thead>
<tbody>
<tr>
<td>Streamlined permitting deadlines and procedures</td>
<td>Crowding-in private investments in net-zero strategic projects by Commission and MS</td>
<td>Sustainability &amp; resilience criteria in auctions</td>
<td>Skills for quality jobs through Net-Zero Industry Academies</td>
<td>Regulatory Sandboxes to promote innovation and to test innovative net-zero technologies in a controlled environment for a limited amount of time</td>
<td>Net-Zero Europe Platform as a reference body for the Commission to coordinate actions jointly with Member States</td>
<td>Adopting net-zero technologies globally and to support the role of EU industrial capabilities in paving the way for the global clean energy transition</td>
</tr>
<tr>
<td>One-stop shops</td>
<td>Net-Zero Industry Europe Platform to advise on financing of projects</td>
<td>Sustainability &amp; resilience criteria in public procurement</td>
<td>Sustainability &amp; resilience criteria in public support measures</td>
<td>Credentials for skills transparency, transferability &amp; cross-border mobility</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Twofold scope:**
(1) net-zero technologies & (2) net-zero strategic technologies

**Benchmark:**
Manufacturing capacity of strategic net-zero technologies to reach at least 40% of EU's annual deployment needs by 2030

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Critical Raw Material Act: "the why"

1. Dependencies

2. Growing demand

- 89-fold increase in global demand for lithium used to manufacture batteries for mobility and storage (21-fold for EU demand);
- 18-fold increase in global demand for cobalt, used for electrification;
- 10-fold increase in EU demand for copper used for electrification;
- 6-fold increase in EU demand for aluminium;
- 6 to 7-fold increase in EU demand for rare earth elements (Nd and Dy).

3. Investments needs – the battery example

- Investment needs to ensure some ratio of domestic sources for extraction, processing and recycling of the European demand are enormous.
- Investment needs to ensure the processing of 40% and recycling of 15% of the European demand for the five main raw materials for batteries (lithium, cobalt, nickel, manganese and natural graphite) from domestic sources amount to EUR 8.5 billion by 2030 and 14.9 billion by 2040.
- The investment needs to ensure the supply of 25% of European demand of the same raw materials for batteries from domestic sources amount to EUR 7 billion by 2030 and 13.2 billion by 2040.
- Assuming a share of public spending to realise these projects comparable to the American Battery Materials Initiative, public support of EUR 2.7 billion by 2030 and 4.7 billion by 2040 would be required.

In 2030, global demand is likely to outstrip supply for Net-Zero Industry technologies – like cobalt, lithium, nickel and manganese, as well as for rare earth elements.

Driven by the twin transition and defence needs, significant growth in CRM demand, with risk of global supply/demand imbalance.
**Critical Raw Materials Act: "the what"**

**Scope:**
EU access to a secure and sustainable supply of critical raw materials by (a) improving EU capacity, (b) recycling CRM content and (c) diversifying supply

**Benchmark for domestic capacities of the EU's annual consumption:** at least 10% for extraction, at least 40% for processing, at least 15% for recycling. Not more than 65% dependency from a single third country.

### Permitting
- Clear information and digital processes
- Clear deadlines and fast tracks
- National Geological Exploration Programmes
- One-stop-shop for CRM projects
- Strategic Projects labelling

### Investments & Partnerships
- International Strategic Partnerships
- Public/Private financing (w/ blending)
- Trade and Investment Agreements
- Creation of the CRM "Club"

### Markets
- Secondary Raw Materials markets
- Focus on Permanent Magnets
- Certification schemes
- Benchmarks on domestic value chain
- Benchmark on international dependency from single country

### Governance
- CRM Board (EC+MSs)
- Stress-tests for CRM supply chains
- Mitigation of risks (by audits, stocks and joint purchasing)
- Monitoring and coordination

### Sustainability
- Environmental Footprint information on CRM
- Promote CRM circular economy
- Development of Standards for CRM value chain operations

### Skills
- Development of sectoral skills (geologists, metallurgists, mechanical engineers, mine workers, etc)
- Skilling, up-skilling and re-skilling programmes through the CRM Academy

### Scope:
EU access to a secure and sustainable supply of critical raw materials by (a) improving EU capacity, (b) recycling CRM content and (c) diversifying supply

**Benchmark for domestic capacities of the EU's annual consumption:** at least 10% for extraction, at least 40% for processing, at least 15% for recycling. Not more than 65% dependency from a single third country.
There are meaningful deposits of relevant raw materials.

E.g.: potential EU projects for lithium could satisfy 38% of annual EU demand for EV battery production in 2030 (15% by 2050).

Just transition: CRM production can offer opportunities for regional development and a new application for existing skills.
Rare earth elements occurrences in the EU
Raw materials partnerships and diplomacy

- Canada
- Namibia: Supply diversification
- South Africa: Security of supply and geopolitical interest
- Senegal: Supply diversification and political interest
- Uganda: Supply diversification
- Rwanda: Geopolitical interest
- Great Lakes Strategy
- DRC: Security of supply and geopolitical interest
- Serbia: Supply diversification and geopolitical interest
- Ukraine: Supply diversification
- Indonesia: Security of supply and EU investment
- Kazakhstan: Geopolitical interest
- Australia: Supply diversification
- Chile: Security of supply
- Brazil: Supply diversification
- Argentina: Supply diversification
- Peru: Supply diversification
- Greenland: Supply diversification and geopolitical interest
- Norway: Supply diversification
- Morocco: Security of supply
- Senegal: Supply diversification and geopolitical interest
- Malaysia: Geopolitical interest
- Zimbabwe: Supply diversification
- USA: TTC
- DG GROW 07/10/2022
New State aid tools to support the green transition and the Net-Zero Industry Act (NZIA)

<table>
<thead>
<tr>
<th>Setting up new tools</th>
<th>Adapting existing tools</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temporary Crisis and Transition Framework</strong></td>
<td><strong>General block exemption Regulation</strong></td>
</tr>
<tr>
<td>Valid until end 2025</td>
<td>Valid until review in end 2026</td>
</tr>
<tr>
<td>- New section 2.8 to support NZIA</td>
<td>- New tool: “Mini-IPCEI”</td>
</tr>
<tr>
<td>- <strong>Scope</strong>: key value chains (including critical raw materials) for the transition</td>
<td>- <strong>New category of aid</strong> for “industrial research and experimental development” projects</td>
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<td>- <strong>Support through schemes</strong></td>
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<td>- <strong>Aid amount</strong> up to EUR 150 million (350 in assisted regions)</td>
<td>- Aid intensity up to 80%</td>
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<td>- <strong>Aid intensity</strong> up to 15% with bonuses for tax advantages (5%), SMEs (20%) and assisted regions</td>
<td>- Schemes for R&amp;D projects</td>
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<td>- <strong>Support through individual matching aid</strong> for key projects located in assisted regions, aligning aid amount with subsidy offered outside the EEA</td>
<td>- Selected following an open call to form part of a project jointly designed by at least three Member States</td>
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<td>- <strong>Aid for deployment of renewables</strong>: larger scope, aid intensities, investment and operating aid</td>
<td>- Involving effective collaboration between undertakings</td>
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<td>- <strong>Aid for decarbonation</strong>: renewable H2 fuels covered</td>
<td>- <strong>Simplification of operational rules for investEU schemes</strong></td>
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<td>- <strong>Increase of thresholds for renewable deployment aid</strong></td>
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</tbody>
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Climate and energy security investment needs in the EU

Average annual needs over 2021-30, public and private; EUR billions in 2022 prices. Sources: ECB calculations based on Commission estimates of Fit-for-55 and REPowerEU investment needs. * “Demand side excl. transport” includes industrial, residential and tertiary-related investments. ** Supply side includes power grid, power plants, boilers and new fuels production and distribution.