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Mineral Raw Materials for the energy transition

Corina Hebestreit

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"MATERIAS PRIMAS MINERALES NECESARIAS PARA LA TRANSICIÓN ENERGÉTICA"

The EU economic outlook as available/predictable today…

forecasts an increase in raw material needs for whichever scenario of a future society we choose!

Despite higher resource efficiency in production and use and higher circularity of value chains efforts in the predictable future will be offset by

- growth and partially aging of world population,
- aspired improved standard of living,
- higher environmental and climate protection requirements.

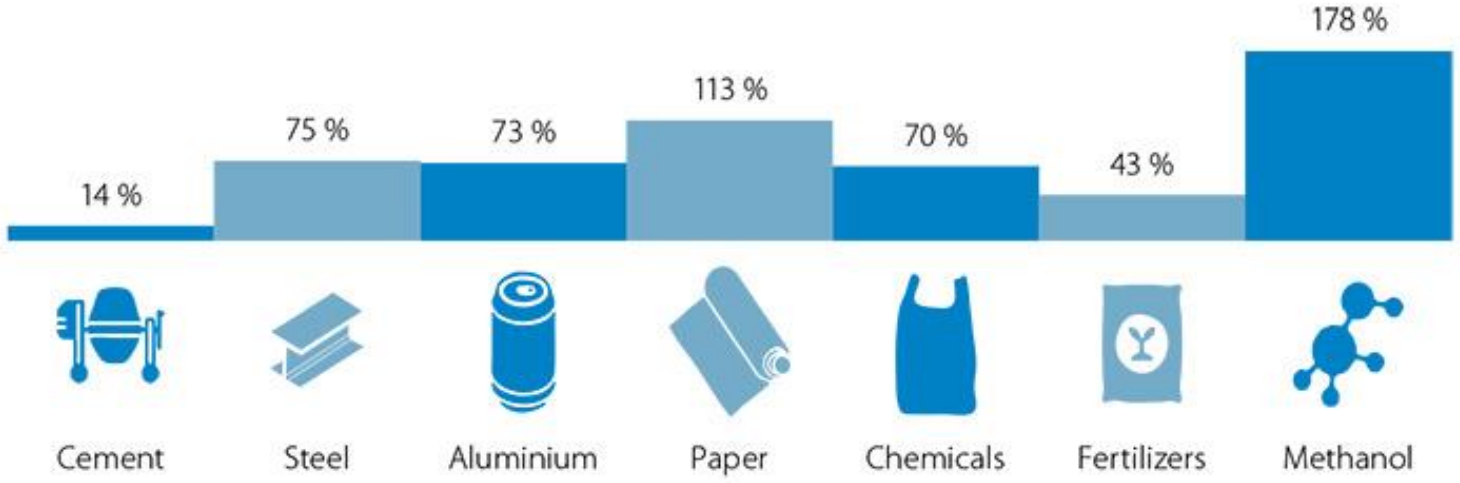

Figure 3. Expected demand development in the industry sector in our decarbonisation scenario

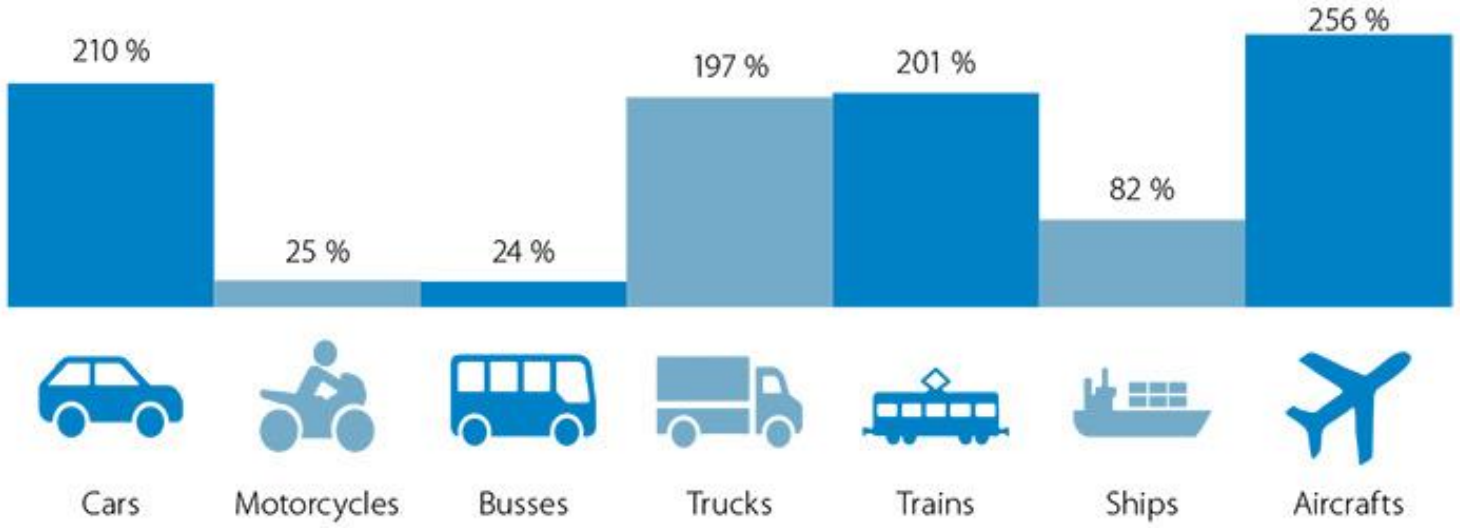

Figure 4. Expected demand development in the transport sector in our decarbonisation scenario

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Metal and mineral demand: Now and in the Future Current (2012) and projected (2030) annual demand of raw materials used for selected low-carbon energy technologies EC Scoreboard 2017

Source: ECOFYS, Energy Transition within 1.5C, A disruptive approach to 100% decarbonisation of the global energy system by 2050.

Industrial value chains and ecosystems require

1. attractive economic, administrative and social conditions,
2. planning security, reliability and consistency throughout the political framework, and
3. a clear strategic focus on maintaining value adding industrial production in Europe.

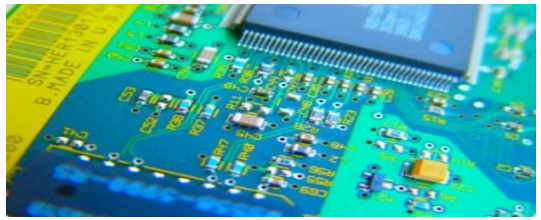
The metals and minerals value chain

- The European mineral raw material sector is facing critical challenges in terms of supporting the transition to a low-carbon, fossil-free sustainable Europe and the green economy.

- The metals mined are critical to build electric infrastructure as well as energy storage systems, renewable energy power plants and vehicles for both personal and commercial use.

- The sustainable supply of metals and minerals will also be critical to build a future sustainable society that will rely heavily on new transport infrastructure as well as new green buildings.

- The mining sector and the mineral processing sector are vital to securing the supply of metals extracted in a sustainable manner. The value chain spans from geological exploration, mining and processing to the recycling of metals. The aggregate sector is spread throughout Europe providing aggregates for the building and infrastructure industries. Embedded in the value chain is a strong environmental commitment both during operation, as well as for the reclamation of land used for mining.



The EU Raw Materials sectors will achieve and underpin greater…

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Sustainability

- by providing and improving the sustainable supply and use of primary, secondary and renewable RMs throughout the values chains.
- by developing and implementing improved and better adapted measurable scientifically based values/indicators/standards associated with sustainability through the whole value chain where needs have been identified using newly developed data management systems.

Economic resilience

- by increasinge the resilience of the EU economy by decreasing import dependencies and ensuring base load supply through diversification of primary, secondary and renewable raw materials.
- by developing new business models.

Technological leadership

- through the development of and adaptation of new technologies such as digitisation, automation, robotics and AI.
- by establishing new value chains. Current processes will change radically through big data management.
- by improving scientific and technical dialogue along and across business lines, exchange experiences, advance and leverage good practices.
- Through cross-disciplinary integration between academia and business for identification and development of new, cross-sectorial value chain opportunities.

Greening of:

The European mineral raw materials sector continuously reduces the emissions of its activities

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The mineral raw materials industry has radically progressed in productivity and energy efficiency and is still implementing new solutions aiming at further reducing the energy consumption/unit and improving carbon-intensive operations.

LKAB strives to reduce carbon emissions by at least 12% per tonne of finished product by 2021 compared with 2015. Photo © LKAB

Greening of:
The European mineral raw materials sector continuously reduces the emissions of its activities

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Measures to reduce the mining–related emissions:

- Investments in own alternative electricity generation or switch to 100% renewable energy
- Investments in electrification and remote
- Use of both conventional and technological innovations to improve recovery per unit of energy used
- Implementation of energy saving programs and Energy Management Systems,
- together with the downstream industry, the mining industry is investing in new and further research in developing raw material feeds that will allow reduction in carbon emissions in further processing.

Greening by:
Climate Change adapation -
Mineral Raw Materials as Key Enablers

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Renewable Energy

- **The new infrastructure for the alternative energy sector requires an increased use of metals and minerals, in particular steel for pipelines, mining equipment, copper and graphite for the electricity cables, generators and electric motors, and aluminium, primarily for the electricity cables, and a host of other metals and minerals including phosphorous, potassium and nitrogen for biomass production. Metals and minerals are essential for manufacturing and renewable "green" energy supply technologies. Low carbon technologies require significant amounts of steel, iron, copper, aluminium, zinc, nickel etc. as well as a vast array of speciality metals. In most cases, the annual demand for raw materials used in certain low-carbon technologies is projected to increase significantly by 2030.**

- **Example: Solar photovoltaic panels and thermal systems**

  These use a combination of up to **22 non-ferrous metals, silicon, chemicals (e.g. organic electrolytes) and a specific type of flat glass**. Innovation in light-weight flexible photovoltaic films is also enabled by the development of advanced polymers. Improvements on solar energy cells are shifting some of the materials needed, and now include gallium arsenide, gallium indium phosphide and germanium. Besides these elements, solar panels may also contain **molybdenum, zinc, cadmium, sulphur and aluminium**.

- **Example: Wind turbines**

  90% of a wind turbine's weight is comprised by metals components, and each wind turbine contains over **14 non-ferrous metals.** A 3-megawatt wind turbine requires **335 tonnes of steel, 4.7 tonnes of copper, 1,200 tonnes of concrete, 3 tonnes of aluminium, 2 tonnes of rare earth elements as well as zinc.** Additionally, smaller amounts of other materials are often used, such as **aluminium, cast iron, carbon steel and fibre glass.**

Energy Storage

Batteries

Different kinds of batteries use different metals and alloys: **nickel, cobalt, graphite.** They also include various chemical materials such as electrodes, electrolytes, and membrane separators and battery trays which are all either oil based or mineral based.

Infrastructure development, power lines and energy storage

For all of these infrastructure developments for our communities, metals and mineral based products are required, whether that is **steel, aluminium, copper,** or specialised materials for future batteries. The extensions of Europe's electricity network to secure and extend access to electricity will require more **aluminium and copper**.

2020:
17 Gigafactories – 234 GWh

Source: Benchmark Mineral Intelligence

E-Mobility

Electric Vehicles (EVs)

A new car today is 22% more efficient than in 2007, and metals as well as light-weight plastic materials help achieve this, together with high-performance lubricants and fuels. Lime helps produce high-strength steel for lighter cars, and ferro-alloys are essential to produce specialty steels.

EV technology is relevant for cars that average citizens may drive, as well as large vehicles in a variety of industries (mining included). Even public transport vehicles like city buses are becoming more eco-friendly. There's much debate over which materials are best for EV batteries, but future automobile manufacturing will certainly use at least some of the traditional raw materials used such as cobalt, lithium, graphite, nickel, zinc, magnesium, cadmium and manganese.

Public transportation

The number of train carriages and trams will have to be increased which will require many more metals, such as steel, aluminum, copper and nickel.

Infrastructure in public transportation and e-mobility

Charging stations will require concrete, steel, copper and other metal alloys. Specialised concrete highways reduce vehicles' fuel consumption by over 20%. As the number of Smart and self-driving vehicles on European roads increases, demand will also rise for high-tech materials.

Mining productivity will be important in satisfying the rapidly growing EV demand for cobalt, nickel and lithium – estimated to be 25 to 35 million vehicles per year

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For producing each electric vehicle, we need:

	Today[1]	Tomorrow[2]
	7.4 kilograms of lithium	8.4 kilograms of lithium
	36 kilograms of nickel	52 kilograms of nickel
	12 kilograms of cobalt	6.6 kilograms of cobalt

1 Considering an NMC622 cathode, 55 kWh battery pack
2 Considering an NMC811 cathode, 77 kWh battery pack

SOURCE: McKinsey 2017 Battery raw materials demand model 2018Q1

COMMUNICATION FROM THE EUROPEAN COMMISSION::

A New Industrial Strategy for Europe

(10.3.2020 COM(2020) 102 final)

- The new EU industrial strategy recognises the possibilities of the European raw materials sector to supply sustainable raw materials of critical and strategic raw materials for the identified industrial ecosystems, such a low-carbon steel, smart mobility, renewable energies, the digital economy, microelectronics, health care, defence and aerospace, etc.
- Using financial instruments and other instruments to strengthen the EU's raw materials supply and recognise the raw materials sector as a sector that qualifies under the criteria of the EU's sustainable finance regulation

Carbon-neutral Europe and competitiveness

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- Due to Europe's cost structure European industry has and will need to the advantage of globalisation wherever possible to maintain competitiveness and markets. The additional ambitions formulated in the EU's Climate Law will put additional burdens on industry.

- The further shift of industries to countries with lower environmental and social standards must be prevented. The lose-lose situation resulting from such delocalisation does not only harm Europe as a business location, but moreover will not help achieving the UN's sustainability goals.
- There are still considerable differences in ambition and realisation of the appropriate measures around the world which still have a negative impact on the global level playing field for Europe's industry.

  - All sectors will have to make a transformative change. Energy-intensive industries are indispensable to Europe's economy and are relied on by other sectors. Modernising and decarbonising energy-intensive industries must therefore be a priority, but not without safeguarding their global competitiveness.
  - The EU Emissions Trading System should be aimed at achieving one single Greenhouse Gas reduction target rather than multiple targets including efficiency and renewable supply.
  - Free allocation of emission allowances must continue wherever EU industrial sectors are exposed to carbon leakage. ETS revenues should be recycled into development of the full range of potential emissions reduction and/or sequestration technologies for the EU.
  - A proposal for a Carbon Border Adjustment Mechanism in 2021 to reduce the risk of further carbon leakage and/or loss of competitiveness would be welcome, but there are concerns that this proposal will only address certain steps of the value chain and continue the policy of relying on raw material inputs from around the world rather than fostering own supply as far as possible.

Supporting industry towards climate neutrality

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- The raw materials sector will play its role to provide carbon-neutral raw materials as far as possible to enable the various value chains to achieve their goals. The raw materials sector like other industries are complying with very high social, labour and environmental standards which come at additional costs.
- However, it should also be noted that European metal and mineral industry's leadership in global markets often depends on the fact that their products are high value-added products, and this is often linked to higher energy input and higher degree of processing.
  - The EU's raw materials sector is also key in providing a number of raw materials for the new technologies under development that will allow for a further transition and creation of affordable, clean technology solutions. The raw materials sector is already in a major transition to eliminate most diesel driven engines wherever possible, to switch to renewable energy sources where available, including into its own where possible.
  - In this context the raw materials sector therefore welcomes the renewed focus on industrial ecosystems and industrial ecology since it will be the most effective way of addressing several solutions for CO2 storage and utilisation in the future.
  - Support for investments in research, innovation, deployment and up-to-date infrastructure for low-carbon solutions will help develop new production processes and secure existing and new jobs.

What the raw materials industry needs from the EU's Sustainable Finance regime

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Making the goals of the industrial strategy and sustainable finance strategy compatible and workable:

- Keeping finances and investments available to all, both to those that are trailblazers and to those that are in need of finance to modernise and upgrade to achieve the targets, including large corporations and SMEs;
- Integrating the research, development and innovation potential in sustainability reporting;
- Maintaining the investment system's flexibility and dynamism according to the social, economic and environmental evolution;
- Fostering transparency and providing clarity to the markets through a common understanding of sustainable investments and their impacts;
- Keeping reporting duties to an efficient and functional minimum;
- Using relative and not absolute indicators or even qualitative ones as metrics of selection.
- Encouraging investments into generic new business developments such as sustainable exploration which would secure the supply of resources for the future.

Euromines

European Association of Mining Industries, Metal Ores & Industrial Minerals
Avenue de Tervueren, 168, box 15
1150 Brussels-Belgium

www.euromines.org

hebestreit@euromines.be

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