

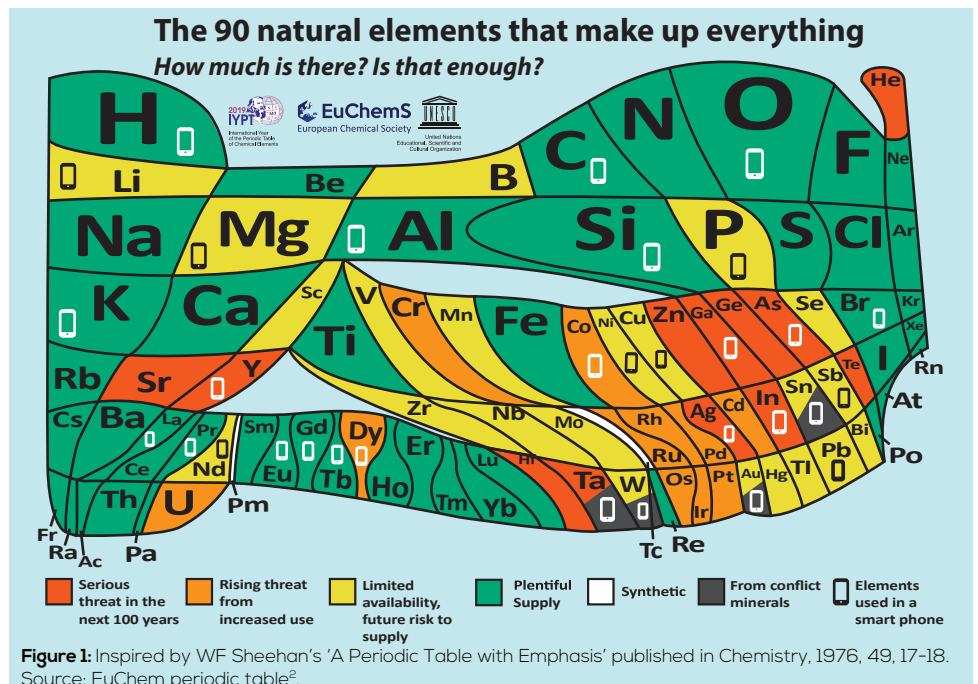
Critical Metals: Critically Important

What are critical metals?

As the saying goes, "if it's not grown it's mined." Everything today, from cars to mobile phones, are produced from resources that are found in the earth and need to be processed. Metals are vitally important to modern technologies and green energy, but many of these metals are either uncommon, difficult to extract or in unstable regions¹. These metals are called "critical metals". For example, metals such as the Rare Earth Elements (REE) are needed to build important devices such as wind turbines and smart phones. However, they are very difficult to process and come primarily from one place (China).

Critical resources identified by the European Commission:

- (He) Helium
- (Be) Beryllium
- (Mg) Magnesium
- (Si) Silicon
- (P) Phosphorous
- (Sc) Scandium
- (V) Vanadium
- (Co) Cobalt
- (Ga) Gallium
- (Ge) Germanium
- (Nb) Niobium
- (In) Indium
- (Hf) Hafnium
- (Ta) Tantalum
- (W) Tungsten
- (REE) Rare Earth Elements
- (PGE) Platinum Group Elements



Source: Eu Commission 2018 Report on Critical Raw Materials¹

Critical Metal Demand and Outlook

Demand for critical metals is expected to increase, driven by the development of renewable energy sources and green transport alternatives as well as increased consumption of electronics^{3,4}. To address the demand for these metals, which are essential for decarbonising, additional resources and shifts towards better recycling methods and policies will be needed⁵.

Figure 2: Demand for Co is expected to increase substantially.

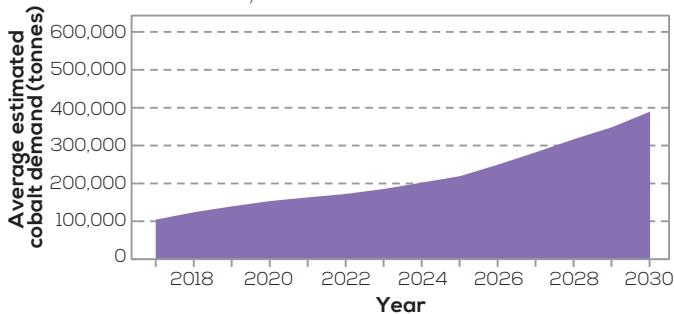
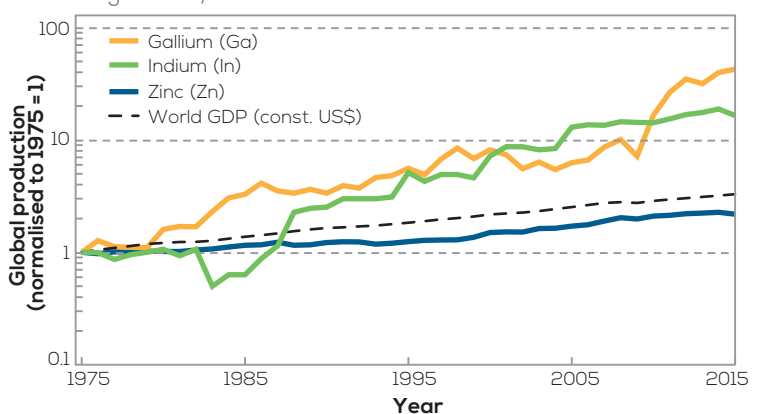
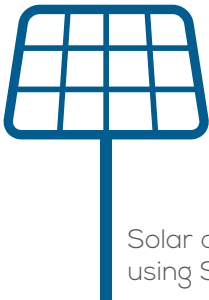


Figure 3: Production for other critical metals has been increasing significantly since 1975.



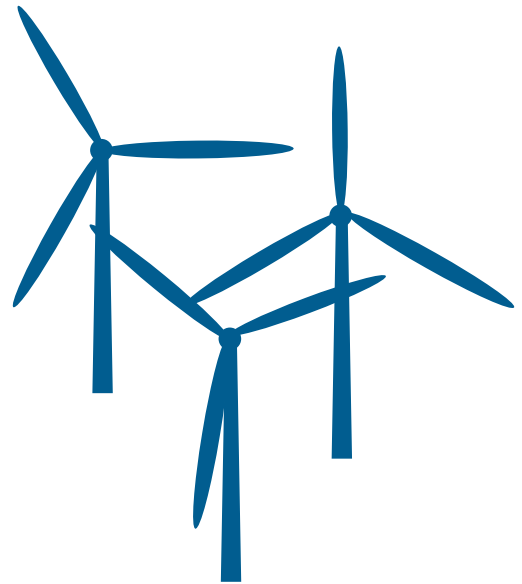
Uses

Renewable Energy: Wind and Solar



Solar cells are made using Si, P, In, and Ga¹⁰.

Wind turbines are mainly made of construction materials like fibreglass and steel⁹, the latter requiring metal additives such as Co, V, and Zn to improve strength and prevent rusting. The turbines generate electricity by rotating strong magnets –containing REE like Nd, Pr, and Dy– through a coil.



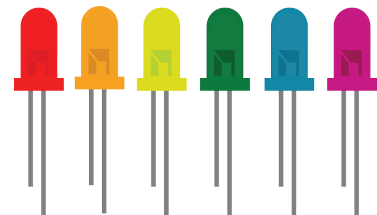
Transport: Electric Vehicles (EVs)

Car frames are often covered (galvanised) using Zn to prevent rusting. Hybrid/electric cars and electric bicycles utilise Co as well REE, such as Pr, Nd, Sm, and Dy for batteries and permanent magnets. Other car components, like touchscreens and dashboards, use additional critical metals. As part of the “Climate Action Plan 2019: to tackle climate breakdown”, there is a target to have 1,000,000 EVs in Ireland by 2030. To reach this target large amounts of metals (like the REE) will be required.



Electronics and Communications: Computers and Smart Metering

Digitisation and smart metering will be an essential part of the green transition. Phones, tablets, and computers are full of critical metals. For example, In and Ga are used in touch screens while REEs such as Ce are used to polish the screens. LCD screens and LEDs are made with a variety of metals such as La, Ce, Eu, Gd, Y, Ga, and P. Circuit boards, hard drives, and permanent magnets use metals such as Nd, Ta, Ga, and Ge whereas fibre optic internet cables require Eu¹¹.



Renewable energy, electric vehicles, and improved electronics are and will continue to play an essential role in addressing climate change and meeting the Sustainable Development Goals. However, these green technologies require additional materials, especially critical metals. Additional resources and improved recycling are needed to meet this increasing demand.



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