

The hidden raw materials stock of the Netherlands



Inventory of critical raw materials in devices, based on the FutuRaM study and data from Stichting OPEN

April 2026

Europe faces a growing challenge: the availability of critical raw materials. Metals such as lithium, cobalt, neodymium and gallium are essential for the energy transition, digitalisation and defence technologies. At the same time, Europe is largely dependent on imports from a limited number of countries. In recent years, geopolitical tensions and disruptions in global supply chains have clearly exposed the vulnerability of this dependence.

What is often overlooked, however, is that a significant share of these raw materials is already present within Europe. Not in new mines, but in devices that are already part of our economy: in homes, offices and commercial buildings. Electrical and electronic equipment together form a so-called urban mine, a stock of valuable materials embedded in society.

Recent research shows that this stock in the Netherlands now exceeds 7 billion kilograms of electrical and electronic equipment, containing 764 million kilograms of critical raw materials. This makes the urban mine a substantial potential source of raw materials.

At the same time, this source is still only being used to a limited extent. Although the Netherlands has a well-organised

collection and recycling system, recovery mainly focuses on bulk metals such as iron, copper and aluminum. The critical raw materials that are economically and geopolitically strategic are often found in small components or complex materials, making them technically difficult and economically unattractive to recover.

The main conclusion of this inventory is therefore that raw material independence is not only a matter of new mining, but above all of organisation and policy. The Netherlands already has a large stock of devices, a nationwide collection network and strong knowledge institutions. What is still lacking is sufficient industrial capacity and policy certainty to actually recover critical raw materials from this urban stock.

This requires targeted choices: bundling material flows, investing in refining and processing capacity and innovation programmes that accelerate new recovery technologies. Only with a consistent long-term strategy can the urban mine evolve from a statistical stock into a strategic source of raw materials.

This inventory contributes to the ongoing discussion on how the Netherlands and Europe can seize this opportunity.



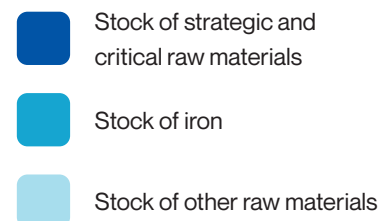
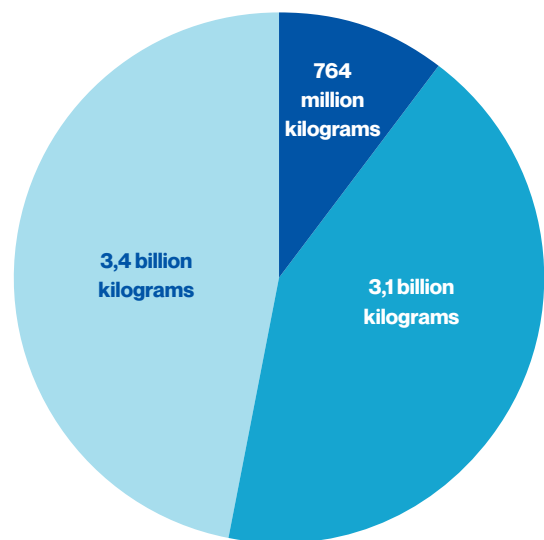
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For years, Europe has discussed raw material scarcity as if it were a problem for the future. In reality, we are already in the middle of it. The energy transition, digitalisation and the defence industry all depend on a small group of metals: cobalt, lithium, neodymium, gallium and several other so-called critical raw materials. They are found in batteries, chips, wind turbines, solar panels and virtually every electronic device. Without these materials, there are no electric vehicles, no data centres and no sustainable energy.

“We recycle large volumes of electronics, but in doing so we mainly recover mass, while hardly recovering any strategic raw materials.”

Europe imports the majority of these materials. Production and refining are concentrated in a limited number of countries. Yet geopolitical tensions, pandemics and trade restrictions have by now shown just how vulnerable that dependence is. This has led to initiatives such as the European Critical Raw Materials Act and national raw materials strategies. Even if Europe were to open new mines tomorrow, this would hardly solve the problem, because many of the raw materials we need simply do not occur here. The issue is not that these essential raw materials are rare in the Earth's crust, but that they appear scarce in our own region at the very moment we need them most. Refining capacity to turn ores into pure raw materials is also lacking. There is, however, another source and it is literally located in our homes, offices and commercial buildings.



Examples of volumes of critical raw materials in Dutch devices, collected by Stichting OPEN via 30,000 Wecycle collection points

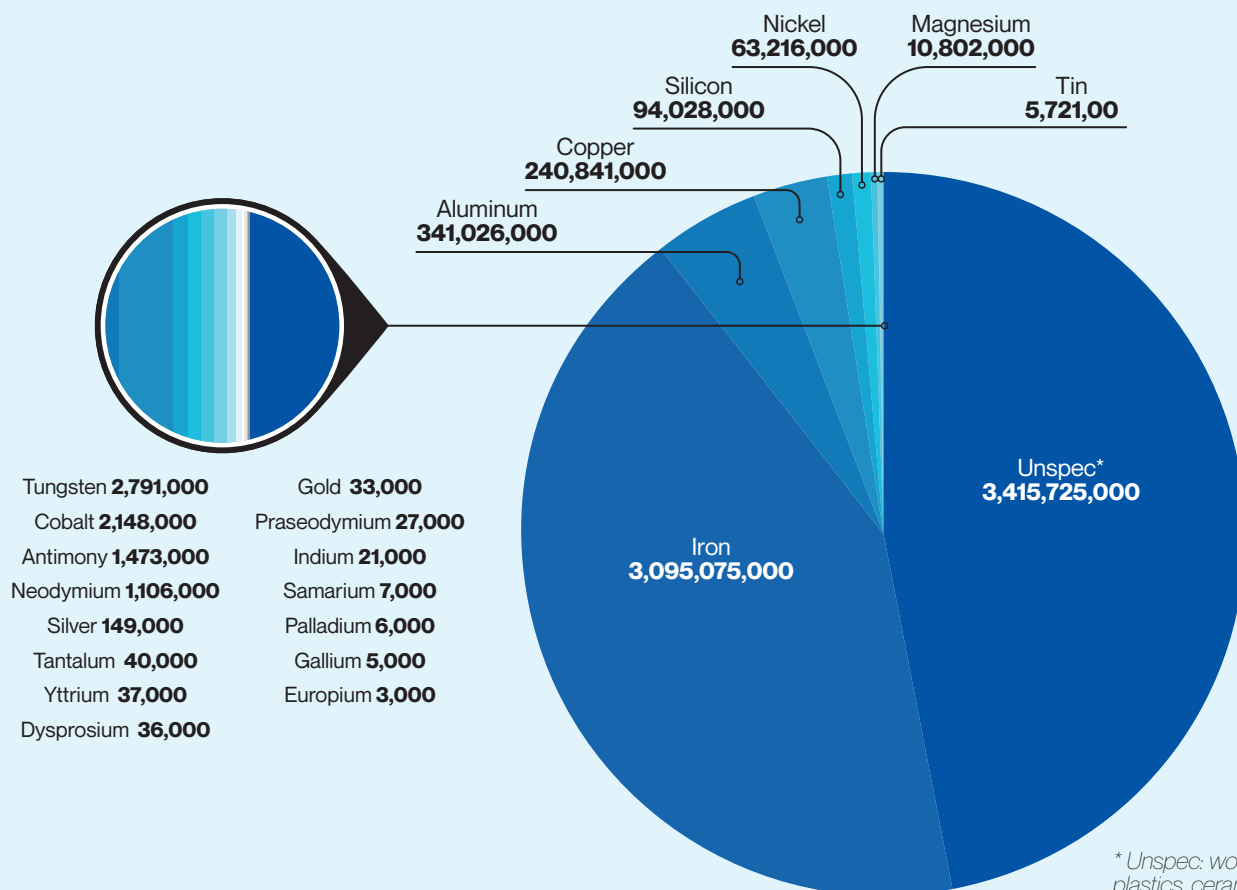
“There is another source and it is literally located in our homes, offices and commercial buildings.”

The urban mine: a mine without excavators

All devices together form what researchers call the urban mine: a stock of raw materials embedded in society. Every mobile phone, washing machine and solar panel contains small amounts of metals that are of great industrial value.

Recent European research data shows that in 2022, the Netherlands already had around 6.1 billion kilograms of electrical and electronic equipment in use. This hidden stock is growing rapidly, particularly due to solar panels, reaching as much as 7.2 billion kilograms in 2025 of which approximately 764 million kilograms consist of strategic and critical raw materials. This is comparable to roughly a thousand Eiffel Towers' worth of valuable materials.

This wealth of raw materials remains in use for a long time. Devices are often used for years, passed on, stored in attics or sold on second-hand markets. As a result, only about one seventeenth of these materials actually becomes available each year. The urban mine is growing faster than we can extract from it, yet it remains available within the Netherlands for many years.



Not all raw materials are equal

A key insight from the research: recycling is not a single activity. Metals such as iron, copper and aluminum are already relatively well recovered. They are present in large quantities in devices and are technically easy to separate. However, much work still needs to be done to recover critical and strategic raw materials that are difficult to extract.

The materials that geopolitics and industry depend on are embedded differently in products. These raw materials are dissolved in alloys, integrated into miniature components or applied as ultra-thin layers on chips. Some metals are found in parts smaller than a fingernail, others exist as atomic layers on a substrate. In this form, they are technically difficult to recover, even if all devices are perfectly collected. In other words, we recycle a lot of weight, but little strategic value.

An example: solar panels

Solar panels are being installed in large numbers, rapidly increasing the national stock of raw materials. However, they will only become available as waste on a large scale around 2035. They contain, among other things, silver and high-grade silicon. That silicon is particularly interesting: recovering it can save significant amounts of energy compared to producing new material.

The Netherlands is already extracting silicon from discarded panels and keeping it separate, but industrial-scale processing capacity is still largely lacking. In other words: the raw material is already there, the industry is not yet.



“We recycle a lot of weight,
but little strategic value.”

Insufficient recycling of **critical raw materials**

The research shows that the Netherlands performs well when it comes to collection. Also the recovery of conventional materials such as copper and iron is also well organised. However, even with perfect collection, many critical materials remain unusable because there are no industrial facilities capable of separating and refining them. Recovery only becomes meaningful at scale.

What is needed is specialised technology and sufficient volumes to provide long-term investment certainty. And that does not emerge on its own. The market price of many critical raw materials is lower than the cost of recovery. As a result, companies do not invest, even when it is socially desirable.

“Without policy choices, the urban mine remains a statistic. With policy, it becomes a source of raw materials.”

What this means for **policy**

The main conclusion from the data?

Raw material independence does not start with mining, but with organisation. The Netherlands already has a large stock of materials, a nationwide collection network for discarded electrical devices, lamps and batteries, and strong knowledge institutions. What is missing is supporting policy to enable the necessary investments. Without targeted choices, critical metals remain economically out of reach, materials are mainly recycled at low value, and valuable components leave Europe.

This situation will not change by itself. Recovering critical raw materials is more expensive than primary extraction and will therefore only develop if policy creates long-term certainty. This requires bundling and separating components with high material value, investment funds for refining capacity, and innovation programmes that scale up industrial recovery technologies.

The question is not whether the raw materials are present, but whether we are willing to treat them as a strategic resource. Without policy choices, the urban mine remains a statistic. With policy, it becomes a source of raw materials.

The Netherlands already has:

- ✓ a large stock of materials
- ✓ a nationwide collection network for electrical waste
- ✓ strong knowledge institutions

The Netherlands still lacks:

- ✗ specialised technology
- ✗ sufficient volumes and a viable business case

What is needed:

- bundling and separating material flows with high raw material value
- investment funds for refining capacity and guarantee schemes for building raw material reserves
- innovation programmes and guarantee schemes to scale up industrial recovery and establish raw material reserves

Conclusion

We still treat discarded devices as waste. In reality, they are future depots of raw materials. But a depot only becomes a resource when someone decides to exploit it. The policy choice is whether the Netherlands will actively utilise this stock of raw materials or remain dependent on imports.

Accountability

This document is based on recent European research data on secondary raw material flows. The analysis uses results from the EU-funded FutuRaM programme, in which universities, research institutes, industry and producer organisations collaborate to gain insight into materials becoming available from, among others, electrical and electronic equipment, batteries and vehicles.

For the Netherlands, these data have been combined with national information on device ownership in households, operational recycling data from processors, and lifetime models for equipment. The calculations show how much material is present in devices currently in use in the Netherlands, including small quantities of critical raw materials that are not automatically economically recoverable. Actual recovery depends on collection rates, available technology and industrial processing capacity. A portion of critical raw materials is currently only recoverable to a limited extent from a technical perspective.

Stichting OPEN (Organisation for Producer Responsibility for E-waste Netherlands) is the Dutch producer responsibility organisation that, on behalf of producers and importers, fulfils the legal responsibility for discarded electrical and electronic equipment, lamps and batteries. The organisation coordinates nationwide collection and processing, stimulates reuse, and ensures high-quality recycling and recovery of raw materials, in collaboration with amongst others; municipalities, retailers and recycling companies.

For more background and a more extensive version of the research:
<https://futuram.eu/2050-critical-raw-materials-outlook>



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Stichting OPEN

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