

## BRIEFING

# Europe's waste creates value elsewhere

How the Circular Economy Act can provide the tools to help scale Europe's recycling industry, in order to secure access to critical minerals.

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Lead author: Emily Ritchey, [emily.ritchey@transportenvironment.org](mailto:emily.ritchey@transportenvironment.org)

Lead analyst: Loïs Miraux, [lois.miraux@transportenvironment.org](mailto:lois.miraux@transportenvironment.org)

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## Summary

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Recovering materials from end-of-life products like cars and batteries is a key means to secure much needed critical minerals resiliently and sustainably. However, Europe's recycling industry is struggling to scale and compete globally. The Circular Economy Act can and must provide the tools to support the effective scaling of Europe's material recovery and recycling capacity.

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### Key data points

**Over 60%**

At least 60% of Europe's black mass is leaving the EU to be processed elsewhere.

**\$2.4 billion**

Scrap aluminium worth \$2.4 billion was exported from the EU in 2024.

**94%**

China holds 94% of global battery material recovery capacity.

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The rationale for recovering all important critical minerals from end of life vehicles and waste batteries is clear. With increased recycling, Europe can reduce imports of critical minerals (CRMs) such as nickel and cobalt, in turn reducing external dependencies. Increased recycling can also limit the need for primary extraction, providing a more sustainable source of CRMs.

However, Europe's recycling industry is struggling to scale. European battery and aluminum recyclers lack the needed feedstock, with huge amounts of end of life vehicles, waste batteries, black mass and scrap being exported outside of the EU, to be processed elsewhere. **At least 60% of Europe's black mass is leaving the EU, equal to around €150 million worth of material a year.** This is only the tip of the iceberg, with lots more black mass leaving the EU, hidden in different customs codes, and unable to be traced.

If nothing is done to limit black mass leakage, and we continue to export at least 60% of our black mass, this number will only grow. Based on [current estimates](#) of future black mass production in Europe, **we could expect at least 200kt of black mass to leave the EU in 2030, the recoverable battery material from roughly 1.7 mn cars.** Using today's black mass prices, this could be the equivalent of 1.1 bn EUR of material.

On top of this, without a battery value chain in Europe, there will be little demand for recycled materials in Europe. **To effectively scale its recycling industry, Europe will need to onshore the entire battery value chain.** This includes in particular the midstream industry, including cathode active materials and their precursors (pCAM). This part of the value chain is key as they will be the offtakers for EU recyclers.

Finally, European recyclers struggle to compete globally, facing higher energy costs and extended project timelines. Companies recycling in Europe need targeted financial, de-risking and industrial support to compete on the global scene.

**Fundamentally, we need to see the economic opportunity in our waste, instead of the environmental burden.** This briefing explores how the upcoming Circular Economy Act can achieve a shift in mindset, and deliver much needed tools to support Europe's recycling industry, securing effective material recovery capacity in Europe.

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## Key recommendations

- 01 **Limit material leakage outside the EU.** Black mass and scrap steel and aluminium should not be exported outside the EU unless it to be treated by EU facilities abroad or shown to benefit the EU battery value chain. Proper enforcement, clear definitions and export restrictions e.g. ban or fees are needed.
- 02 **Drive demand for locally recycled materials.** The CEA should set out a targeted amendment to article 8 of the EU Batteries Regulation (2023/1542) in order to introduce a union content requirement to recycled content targets for batteries. This would incentivise the scaling of recycling and refining capacity within Europe.
- 03 **Create a truly single EU market for waste.** The CEA should amend the Waste Shipment Regulation (WSR), to simplify intra-EU shipments of waste streams containing CRMs. These waste streams should be exempt from the procedure of prior written notification and consent, and subject to the simplified information procedure.
- 04 **Harmonised end-of-waste criteria.** The CEA should harmonise and ensure strict end-of-waste (EoW) criteria for CRM-containing waste, accompanied by implementing guidance for Member States.
- 05 **Local content rules under the IAA should be expanded, to include precursor cathode active material (pCAM)** in order to ensure robust European battery component manufacturing and a competitive recycling industry. Incentives for pCAM, as well as anode active material (AAM), critical raw materials (CRMs) should be added as third step from 2032.

# Europe's lost waste is creating value elsewhere

Recovering materials from end-of-life products like cars and batteries is a key means to secure much needed critical minerals resiliently and sustainably. However, these valuable waste and end of life products are currently leaving Europe, and are largely being shipped to Asia. Measures, such as export bans or levies will be key to limit this material leakage, and ensure Europe's recyclers have the needed feedstock to be able to scale.

## 1.1 Over two thirds of Europe's black mass is being shipped to Asia

As Europe's recyclers scale their operations, ensuring the availability of feedstock is key. However, the leakage of black mass to Asian countries such as South Korea remains a problem. Generally, Asian recyclers can pay a higher price for black mass, thanks to their large-scale recycling systems which operate at competitive costs.

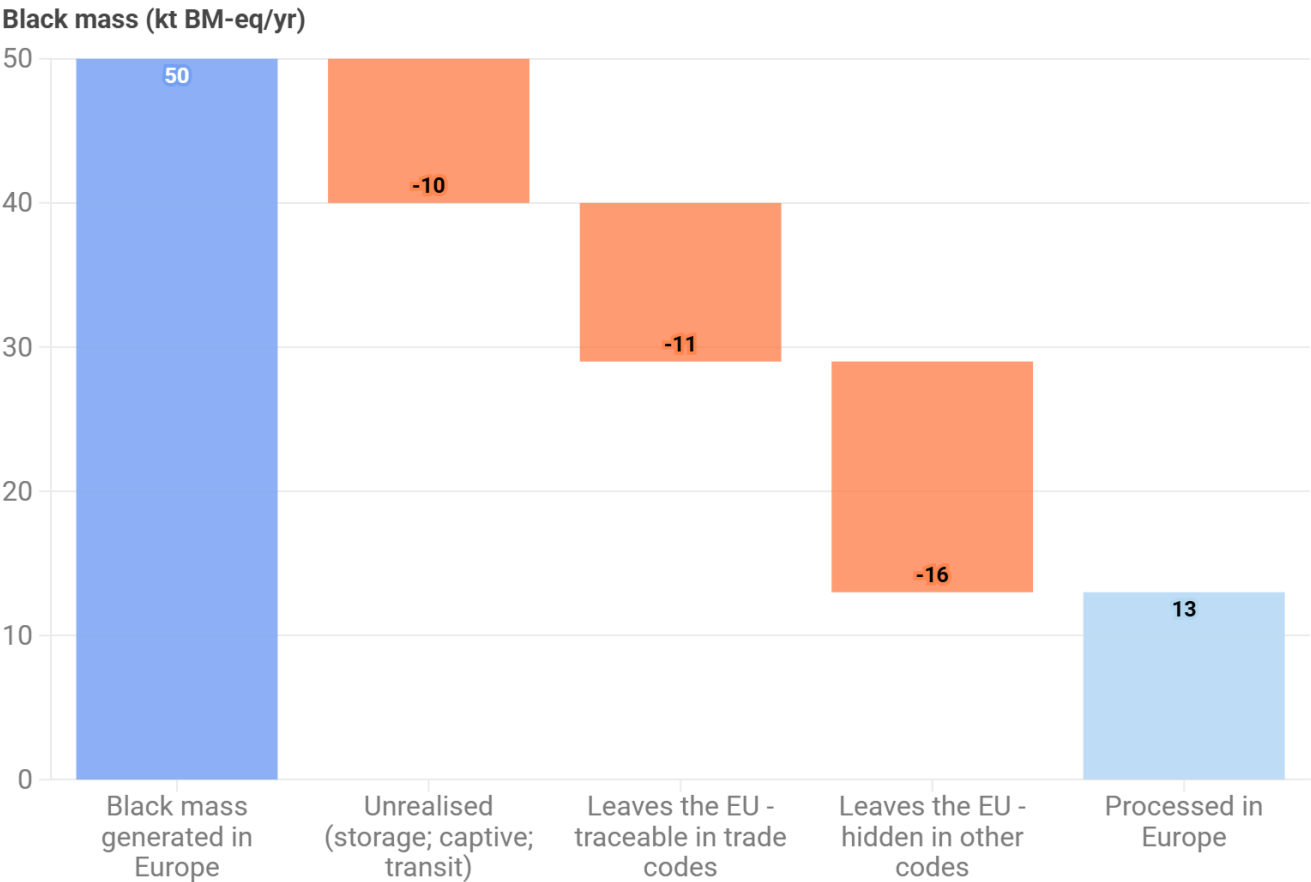
**Analysis commissioned by T&E shows that at least two thirds of European black mass is leaving the EU.** By tracking a number of waste codes and product customs (HS) codes, the analysis was able to trace around 10kt equivalent of black mass being exported from the EU. With around 40kt of black mass generated in Europe annually, and a declared capacity to process 13 kt of black mass domestically in Europe, we can assume that at least an additional 17kt is leaving the EU, hidden under other customs codes. This represents a total of at least 27kt of black mass leaving the EU annually, which represents the recoverable battery material from roughly 225 000 electric vehicles. This also equals material worth around €150 million leaving the EU every year.

However, black mass leakage is very difficult to trace due to the use of numerous different and incorrect waste and product codes, and often being hidden in larger chemical codes. The lack of a clear definition of black mass adds to this, with black mass often inadvertently classified as a product.

It is therefore likely this number is only the tip of the iceberg, with the reality of black mass leakage expected to be much higher. Other [estimations](#) claim as much as 80% of available black mass is leaving the EU.

**Of ~40 kt of tradeable black mass, only ~13 kt is processed in Europe and about ~27 kt leaves**

Europe generates the feedstock but lacks the buyer: two-thirds of realised black mass leaves the EU, and most of it is invisible in trade codes.



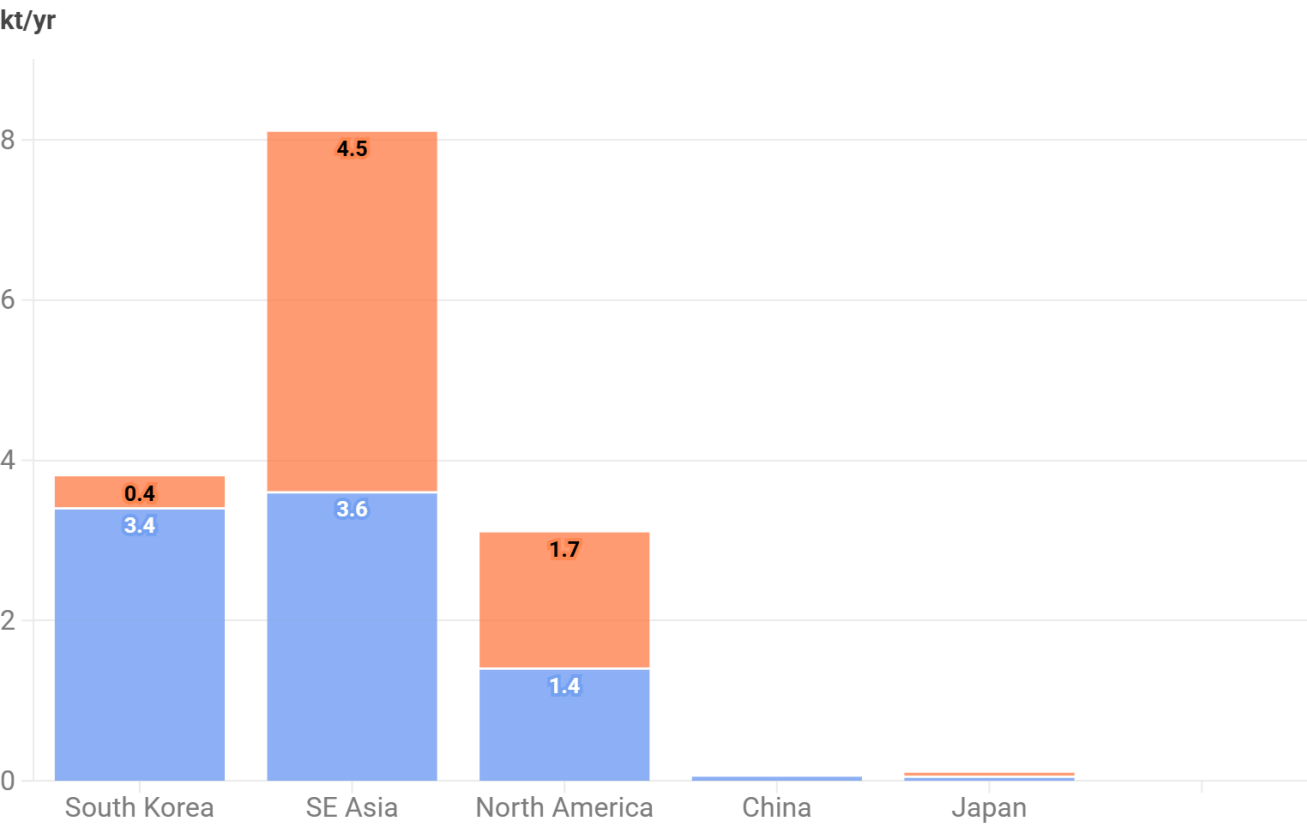
Source: Circular Energy Storage • Available ~50 kt → realised ~40 kt after captive scrap, storage option-value and transit. 'Processed in Europe' is declared intake capacity, not verified throughput, so ~27 kt leaving is a floor. No single code tracks all black mass, and some is untrackable because it is hidden in larger, more generic chemicals trade codes.



According to the analysis, the majority of this black mass, as well as waste batteries, are being shipped to South Korea and South East Asia.

## European black mass and batteries headed for South Korea and Southeast Asia

Black mass Whole waste batteries



Source: Circular Energy Storage. Screened trade, 2024-25 average.



## Europe must invest in hydrometallurgy

It is important to differentiate between the steps involved in battery recycling, from the collection and shredding of end of life batteries to the refining of black mass. In Europe, the low-value pre-treatment activities such as shredding are favoured over domestic hydrometallurgical refining. Without mastering this second step in Europe, we are unable to retain the much needed critical raw materials. **A clear definition of black mass can help to differentiate black mass production from other material recovery activities, as well as helping to limit black mass leakage.**

T&E [analysis](#) found that when looking at Asian players' investments in recycling in Europe, their presence is more prevalent in the pre-processing stage of recycling. This suggests that Asian companies overseas may prefer to process batteries into black mass and export it back home for further material recovery, rather than investing in capital- and opex-intensive material recovery plants in Europe.

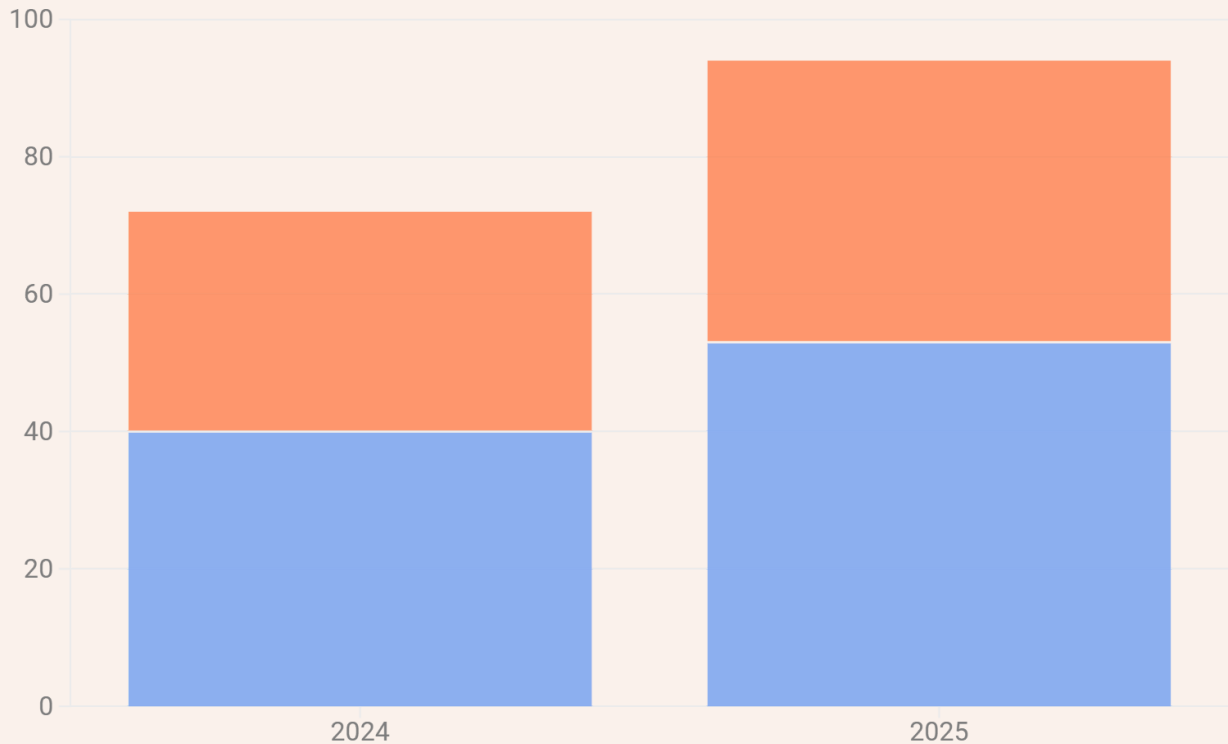
In parallel, analysis shows that South Korean recycling capacity is currently running at a 56% utilisation rate. In addition, the majority of the black mass is imported, rather than generated in South Korea. This suggests we can expect South Korean players to seek to capture available black mass globally, such as in the EU, to then process domestically.

## Korean recycling capacity runs at ~56% utilization rate, with ~40 kt being idle

This prompts Korean actors to bid aggressively for black mass, pulling it out of Europe

Throughput Idle

kt black mass equivalent/yr



Source: Circular Energy Storage. Throughput = imports (~48 kt, 2025) + ~5 kt domestic.



### 1.2 Measures to keep black mass and end of life batteries in Europe are needed

We need to ensure our valuable waste, including end-of-life batteries and black mass, stays in Europe. Despite the European Commission having taken some steps, notably by classifying black mass as hazardous, limiting its exports to OECD countries, circumvention persists. **Black mass should only be exported outside of the EU if it is to be treated by EU facilities abroad or shown to benefit the EU battery value chain.**

Firstly, proper enforcement at EU level of the ban on exports of black mass to non OECD countries is required to ensure compliance and collect the necessary data on waste stream flows. If there is proof that black mass is exported to a non-OECD country shortly after its export to an OECD country, a wider ban should be considered.

In order to limit exports of black mass, the Circular Economy Act should:



- **Adopt a clear definition of black mass to ensure it is not inadvertently classified as a product.** Currently, diverging national interpretations allow some operators to prematurely label black mass as a “product” after minimal processing, bypassing waste shipment controls and safety standards. A uniform EU approach should clarify that black mass and its derivatives remain waste until refined into recoverable metals. This would make exports outside the EU more administratively burdensome and expensive and would improve traceability. This would also help to differentiate the production of black mass from other material recovery processes.
- **Ban exports of black mass outside the EU or introduce export fees, for example in the form of a tax levied on non-EU buyers,** which could then be reinvested in EU recycling capacity.

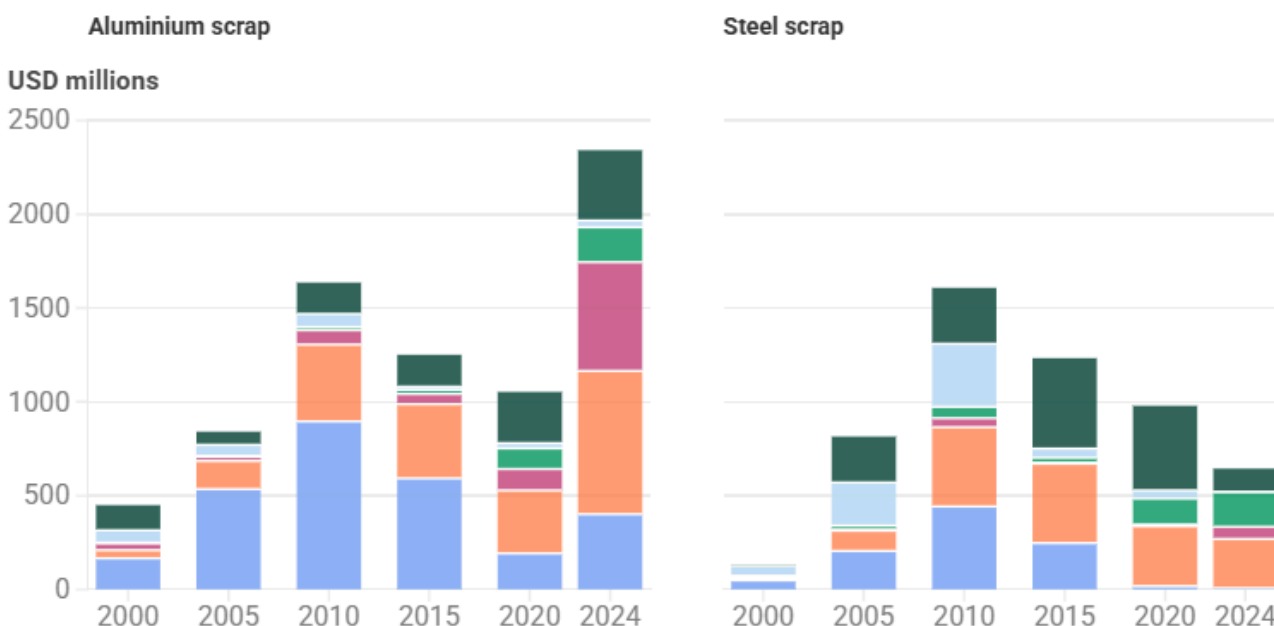
### 1.3 Valuable scrap steel and aluminium are leaving Europe

Every year, around [3.5 million vehicles go missing](#): they are either deregistered, dismantled or exported illegally. On top of the environmental and safety implications, this also means that a tremendous quantity of high quality and valuable materials are lost. Huge amounts of scrap steel and aluminium are also exported from the EU. As a result, the CEA should ensure that scrap and end-of-life steel and aluminium products, including EoL-vehicles, are kept in Europe. The revised End-of-Life Vehicles Regulation (ELVR) has taken a step in the right direction by limiting exports to only used vehicles with a roadworthiness certificate. However, the CEA should go further to introduce a Euro 4 limit on vehicles exported to third countries from 2028 onwards, moving to a 5 year vehicle age limit from 2035 onwards. This will further reduce the flow of old, polluting vehicles to third countries while ensuring enough supply of scrap to the European recycling industry.

Recyclers in Europe lack the needed scrap aluminium. Despite this need for feedstock in Europe to help scale recycling facilities, the European Union exports large amounts of scrap aluminium today. This trend has increased dramatically, rising from \$0.4 billion in 2000 to over \$2.4 billion in 2024. Approximately 84% of aluminium scrap value was exported to Asia in 2024.

## EU's lost waste creates value elsewhere

■ Eastern Asia ■ South Asia ■ South-eastern Asia ■ Western Asia ■ Rest of Asia ■ Rest of World



Source: T&E analysis based on UN comtrade • South Asia includes China



There has been a vicious cycle where limited investment in recycling infrastructure, especially in innovative sorting, has continually reduced the supply of appropriately treated EU scrap. This coupled with the commercial advantage of Asia (lower energy and labour costs) have resulted in the exodus of scrap leaving the EU today.

**The EU must prevent material leakage from end-of-life products and all waste products, including scrap, relating to aluminium.** This should be achieved via export bans, or levied export fees, which would make exporting to third countries more expensive and burdensome.

There is currently a lack of harmonised end-of-waste criteria for aluminium across EU member states, creating administrative burden and contributing to material leakage as scrap is often exported under less stringent regulatory conditions, through misuse of EoW status. Streamlined and harmonised application of existing EoW criteria is therefore needed, accompanied by implementing guidance.

# Scaling recycling in Europe is key to reducing dependencies

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Europe will need to significantly scale up its recycling capabilities and the CEA provides a key lever to create the regulatory space to drive this.

## 2.1 Europe can reduce its strategic dependencies by boosting recycling

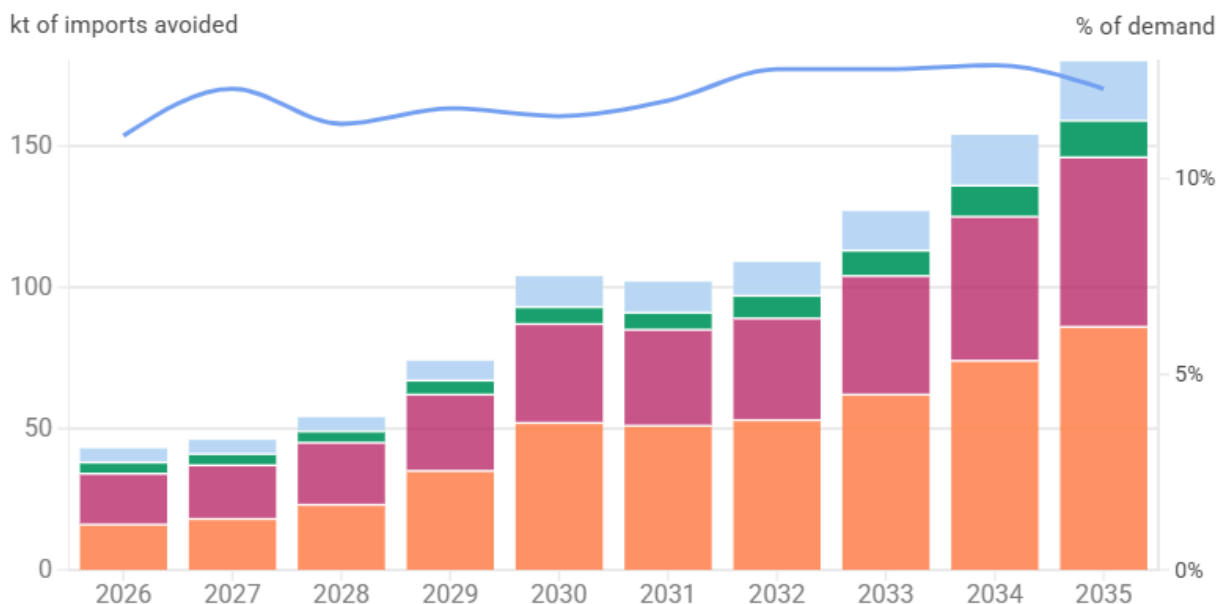
It's clear that clean power and electrification are the way to wean Europe off its dependency on fossil fuel imports. Luckily, the minerals we need for the batteries and clean technologies at the heart of this transition are not like oil. In large part because they can be recycled and reused endlessly.

In the long term, recycling is therefore one of Europe's tools to reduce dependencies, and secure its energy security. Currently, however the EU is heavily dependent on imports for many of these critical minerals. At the same time, end-of-life batteries and scrap in Europe contain lots of the materials we need.

There is therefore huge potential in Europe to recover these raw materials. By scaling recycling capacity in Europe, we can avoid importing over 80kt of lithium by 2035, enough to power around 2.5 million EVs.

## Recycling could prevent further increases in Europe's dependency on imported raw materials by 2035

■ % demand ■ Lithium (LCE) ■ Nickel ■ Cobalt ■ Manganese



Source: T&E analysis • Recycling rates based on targets set out by Battery Regulation



### 2.2 Europe's recycling capacity is at risk

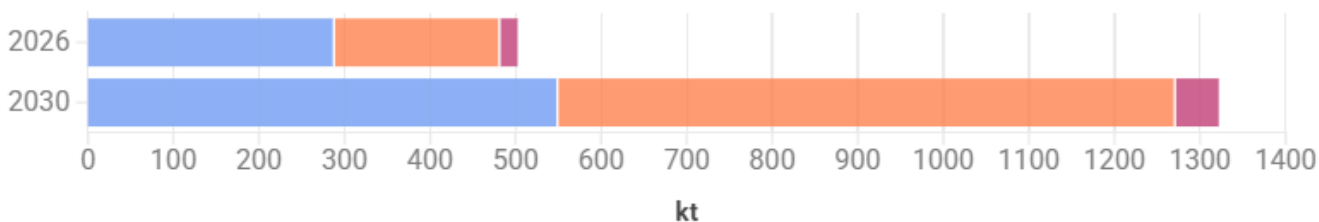
Whilst the arguments in favour of recycling in Europe are clear, over half of Europe's battery recycling capacity is currently at risk. Despite the huge potential, Europe is not yet ready to capture this opportunity. Fully seizing this opportunity requires rapid investment across the recycling value chain - from pre-processing capacity (including shredding, sorting and sieving) to, crucially, advanced downstream recovery facilities using hydrometallurgical or pyrometallurgical processes to convert waste streams into battery-grade inputs.

When looking at the pipeline of projects across the recycling value chain, T&E [research](#) tracked a total of 93 projects, of which 39 are already operational. If all projects come online, we will be able to process around 1,320 kt of battery materials in 2030. However over half of this capacity is currently at risk.

## Over 50% of recycling capacity in the EU is at risk

Expected battery recycling capacity

Low risk Medium risk High risk



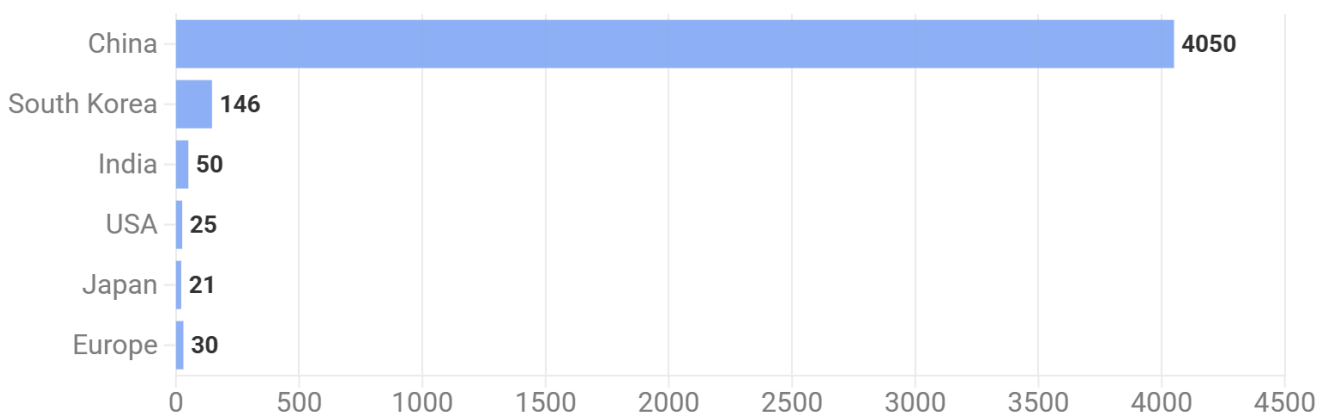
Source: T&E analysis



On top of this, current material recovery capacity is far behind other countries, notably China. China currently leads material recovery capacity globally, holding 94% of total capacity.

## Material-recovery capacity is ~94% Chinese, while Europe is a rounding error

kt/yr



Source: Circular Energy Storage. Material-recovery (refining) capacity, not black-mass intake. Europe  $\approx 30$  kt =  $\sim 13$  kt of operational black-mass intake (Umicore, Veolia, Mercedes) +  $\sim 17$  kt at Glencore Nikkelverk (Norway), which recovers metals from matte pre-processed outside the EU.



Recyclers in Europe are facing a number of challenges. Firstly, as explained, there is a lack of feedstock as almost all our valuable black mass is leaving Europe to be processed and create value elsewhere.

Secondly, there is currently little demand for recycled materials in Europe. To efficiently scale its recycling industry, Europe will need to onshore the entire battery value chain. This includes in

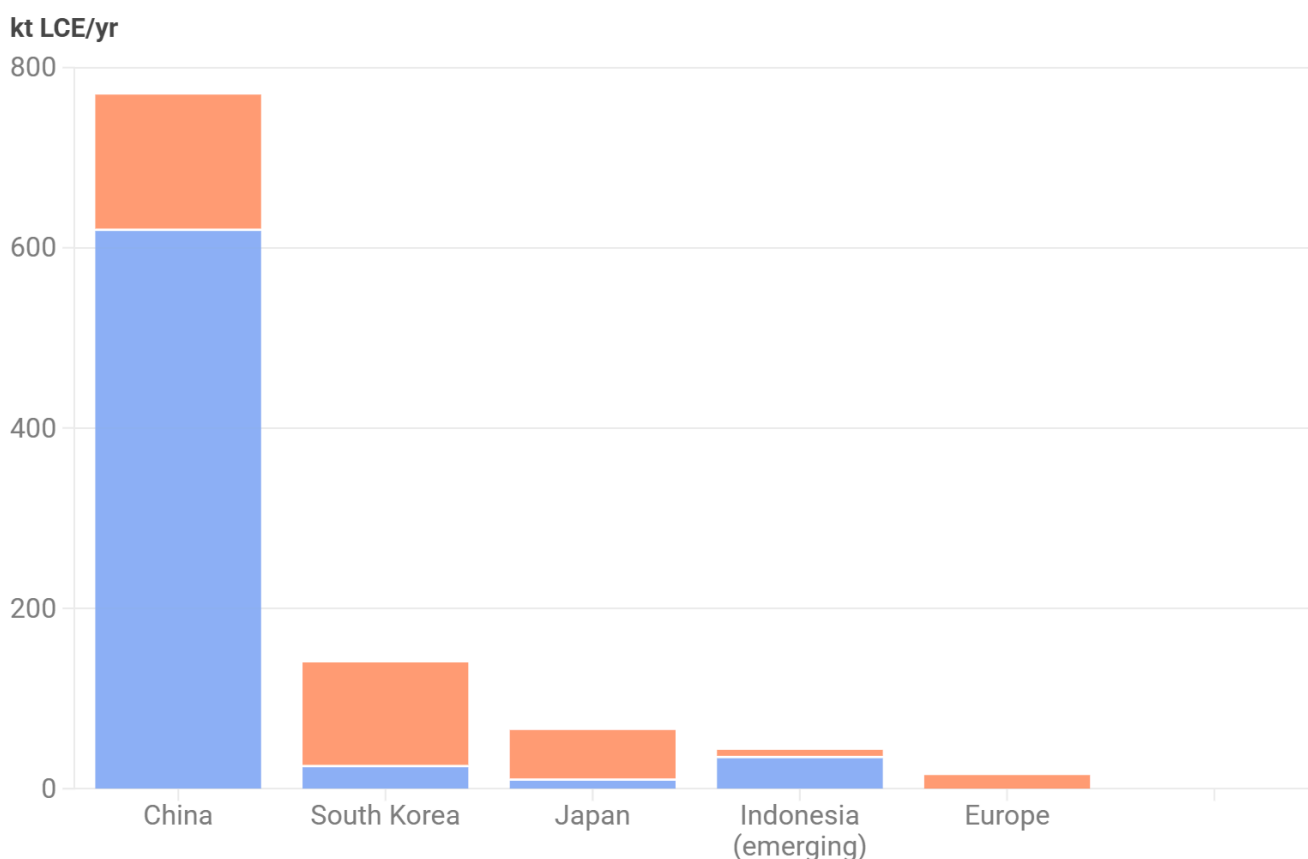
particular the midstream industry, including Cathode active materials and their precursors (pCAM). This part of the value chain is key as they will be the offtakers for EU recyclers.

When looking at demand for battery grade materials, there is currently a very small demand for lithium hydroxide and no demand for battery grade lithium carbonate in Europe.

## There is currently very little demand for battery grade lithium in Europe

Recovered lithium has almost no European outlet: Europe buys a little hydroxide for NMC cathode and no battery-grade carbonate.

■ Lithium carbonate ■ Lithium hydroxide



Source: Circular Energy Storage

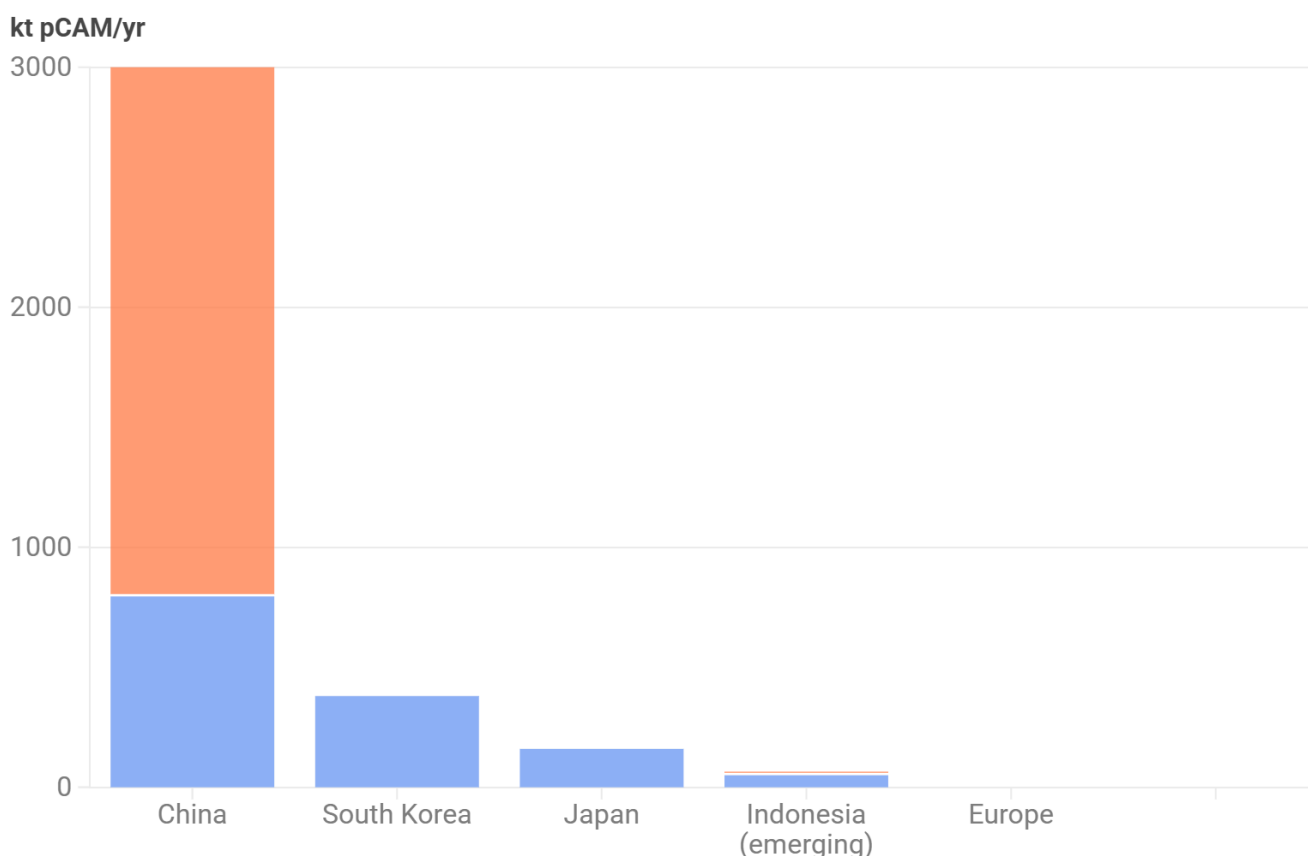


Similarly, there is currently no domestic buyer in Europe for the nickel and cobalt sulphates recovered from recycling. As a result, measures to onshore the entire battery value chain will be key and the Industrial Accelerator Act, currently being negotiated, can and must play an important role. The IAA marks a step in the right direction towards scaling a European battery supply chain with the introduction of component based local content rules for batteries. However, precursor cathode active material (pCAM) must be included to both ensure a robust battery component manufacturing and a competitive recycling industry. Incentives for pCAM, as well as anode active material (AAM), critical raw materials (CRMs) should be added as third step from 2032.

## Precursor (pCAM) production – the demand for recovered sulphates – sits in Asia, not Europe

In Europe, there is no domestic buyer for the nickel and cobalt sulphates that recycling recovers

■ NMC/NCA (drives sulphate demand) ■ LFP (no sulphate)



Source: Circular Energy Storage. NMC/NCA chemistries drive sulphate demand; LFP needs none.

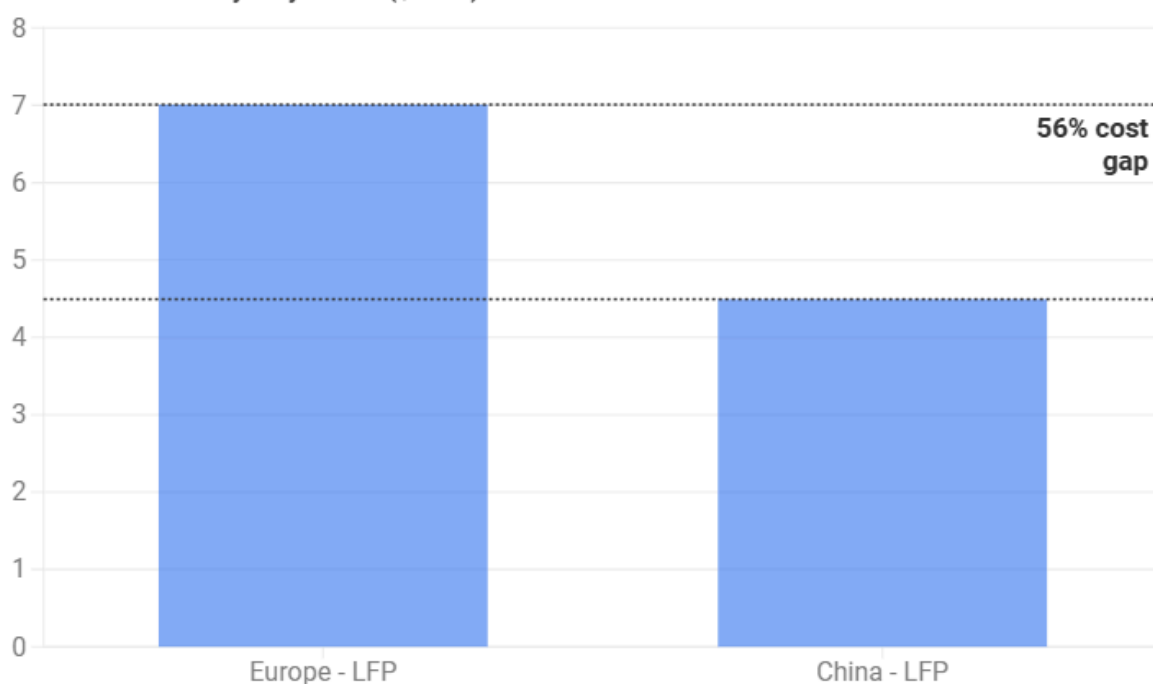


## Battery recycling in Europe struggles to compete with China

European recyclers incur 60% higher electricity costs than their Chinese counterparts, 35% higher labour costs, while utility costs can be 5 times more expensive. Looking at NMC battery recycling, this translates into a 25% cost gap in OPEX between Europe vs China (considering disassembly and hydrometallurgical recycling).

### Recycling Opex in Europe remains significantly higher than in China

Opex - LFP disassembly & hydromet (\$/kWh)



Source: T&E analysis based on BloombergNEF LiRyc model • Note: Opex comparison for prismatic LFP cell packs at facilities with automated disassembly and hydrometallurgy



Companies recycling in Europe need targeted financial, de-risking and industrial support to compete with their Chinese counterparts on the global scene. While the CRMA has selected strategic projects in recycling, more can be done to ensure recyclers can scale efficiently, faced with this significant competition. The EU Innovation Fund, the European Investment Bank (EIB), the future European Competitiveness Fund and national state aid should provide similar Capex and Opex support to recycling and circularity projects as cleantech, focusing on commercialisation and technology gaps, prioritising hydrometallurgical recovery of CRMs.



## 2.3 How can the Circular Economy Act scale battery recycling in Europe?

Fundamentally, we need to see the economic opportunity in our waste, instead of the environmental burden. Whilst there is no single magic solution, the upcoming Circular Economy Act must set out the right policy measures to help scale recycling facilities in Europe and secure access to the raw materials we need, before it's too late.

### 2.3.1 Recycled content targets must drive local recycling

Faced with financial pressures and higher energy costs, European recyclers need strong political and demand signals in Europe.

The EU Batteries Regulation sets ambitious collection and recycling targets for end-of-life EV batteries, alongside mandatory minimum levels of recycled content in new cells placed on the EU market. Together, these measures - if coupled with local content rules for recycled content - will significantly expand Europe's secondary materials base over the coming decade.

Currently, these recycled content targets can be met with materials that have been recycled anywhere in the world. However, T&E [analysis](#) shows that these targets can be met locally.

As a result, the Circular Economy Act should amend the EU Batteries Regulation recycled content targets to include a union content requirement in order to incentivise the scaling of recycling and refining capacity within Europe and avoid external reliance. The CEA should set out an amendment, targeting the delegated act on recycled content targets under the EU Batteries Regulation (2023/1542) in order to introduce a union content requirement to recycled content targets for batteries.

### 2.3.2 Simplified rules for intra-EU waste shipments

We need a truly European single market for waste. Currently, the process for shipping waste between EU member states is complex and burdensome. Different countries apply different requirements, even coming down to the colour of the pen needed for filling out forms. This makes the process of moving waste costly and time consuming.

The updated Waste Shipment Regulation (WSR) has led to real improvements, including fast-track procedures for 'pre-consented' recovery facilities and the introduction of tacit consent to facilitate shipments. However, these measures do not go far enough to tackle high costs and delayed shipments.

**As a result, the European Commission should commit to amend the Waste Shipment Regulation (WSR) to simplify intra-EU shipments of waste streams containing CRMs.** These waste streams, as listed in Commission Implementing Act (EU) 2026/1116 under the Critical Raw Materials Act, should be exempt from the procedure of prior written notification and consent, and subject to the simplified information procedure, when destined for a EU pre-consented facility. This should - and actually can - be done without increasing safety risks.

## Recommendations

- 01 **Black mass should only be exported outside of the EU if it is to be treated by EU facilities abroad or shown to benefit the EU battery value chain.** Proper enforcement, clear definitions and export restrictions e.g. ban or fees are needed.
- 02 **The EU must prevent aluminum material leakage from waste products, including scrap,** via export bans or fees.
- 03 **The CEA should ensure EoL-vehicles are kept in Europe,** by introducing a Euro 4 limit on vehicles exported to third countries from 2028 onwards, moving to a 5 year vehicle age limit from 2035 onwards.
- 04 **The CEA should create a truly single EU market for waste** by amending the WSR, to simplify intra-EU shipments of waste streams containing CRMs. These waste streams should be subject to the simplified information procedure.
- 05 **Harmonised end-of-waste criteria.** The CEA should harmonise and ensure strict end-of-waste (EoW) criteria for CRM-containing waste, supported by guidance.
- 06 **Drive demand for locally recycled materials.** The CEA should set out a targeted amendment to article 8 of the EU Batteries Regulation in order to introduce a union content requirement to recycled content targets for batteries.
- 07 **Local content rules under the IAA should be expanded to include precursor cathode active material (pCAM),** to ensure a competitive recycling industry.
- 08 **The EU Innovation Fund, the European Investment Bank, the future European Competitiveness Fund and national state aid should provide Capex and Opex support to recycling projects,** prioritising hydrometallurgical recovery of CRMs.

## Further information

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### Further information

Emily Ritchey

Policy Manager, Supply Chains

[emily.ritchey@transportenvironment.org](mailto:emily.ritchey@transportenvironment.org)

Mobile: +32(0) 492 43 21 12

[www.transportenvironment.org](http://www.transportenvironment.org) | [BlueSky](#) | [LinkedIn](#)

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