BRIEFING - September 2024

What Strategic Projects to select

T&E recommendations on the implementation of the EU Critical Raw Materials Act

Summary

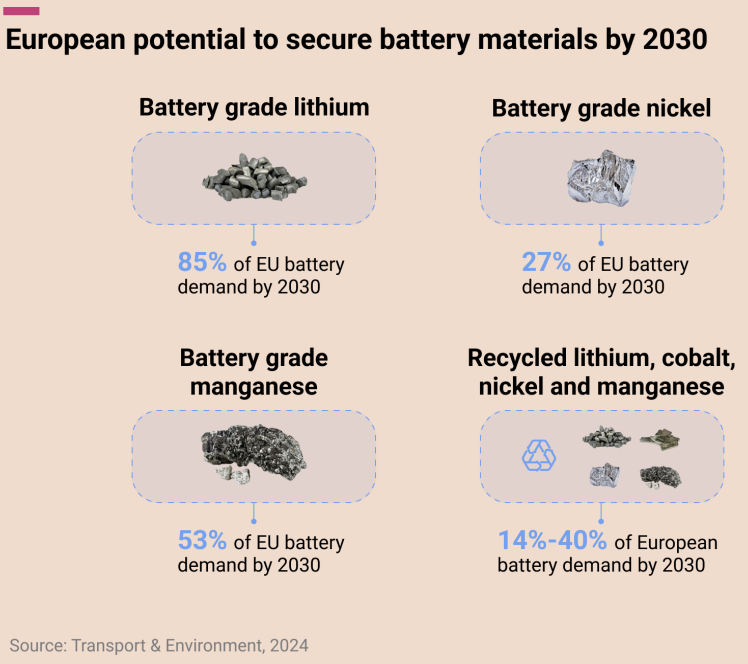
T&E's analysis of the European project pipeline for the implementation of the EU Critical Raw Materials Act

Summary

As China, Europe and the US race to secure the supply of critical raw materials for the energy transition, the EU's answer has been the passage of the EU Critical Raw Materials Act (CRMA). It aims to boost the supply quickly and responsibly by selecting Strategic Projects across mining, refining, processing and recycling value chain. But does the project pipeline across Europe match the objectives set in law by 2030? And how should the projects be selected? Focusing on the four battery materials - cobalt, lithium, manganese and nickel - this paper outlines T&E's analysis.

Overall, the project pipeline to date shows substantial potential, with the EU able to meet most of its mining and processing needs for lithium locally, as well as substantial amounts of nickel and manganese. In addition, up to a fifth of all battery materials can come from recycling by 2030:

- 19 mining projects are planned in the four battery metals analysis, with 12 focusing on lithium alone. If all of these were to go ahead, T&E estimates that 60% of the EU lithium demand from electric vehicles and energy storage can be met by 2030.
- An additional 19 facilities to process lithium, nickel, manganese and cobalt are planned by 2030. Over 80% of the EU's lithium demand can be met if these were to go ahead. While the potential for nickel is less than a third, a globally innovative fossil free process is being pioneered in Finland.
- On recycling, the recovered lithium, nickel, cobalt and manganese could cover up to 40% of the demand by 2030 if all batteries are collected and production scrap included, rising to more than two-thirds by 2040, depending on the metal.



While substantial potential exists, a lot of the projects are in early stages of development with no definitive investment decisions taken or permits secured. That means sharp focus (on best in class sustainable projects), strong political support and clear industrial strategy are necessary to realise that potential.

How should Strategic Projects be selected? Here are T&E's recommended criteria:

- Prioritise in line with CRMA's benchmarks: 40% processing, 25% recycling and 10% mining. Metals processing and material recovery (recycling) bring the biggest value added where political focus should be.
- Strict sustainability criteria in terms of CO2 emissions, impact on land, water and broader ecosystems & meaningful engagement with local communities cannot be compromised.
- Globally, the selected projects should respect the Free, Prior and Informed Consent framework, bring at least 10% of additional value locally and commit to undergo the certification by the Initiative on Responsible Mining Assurance.

1. Introduction

Earlier in 2024 the EU agreed the Critical Raw Materials Act (CRMA), designed to boost local extraction, refining and recycling of critical materials. This is the EU's chief framework to secure critical materials needed for the green transition both at home and abroad in a sustainable and responsible manner. Its core provisions include:

- Setting objectives (or "benchmarks") for the EU to secure: at least 10% of EU's critical minerals demand, 40% of the refining and processing demand, and 25% recycling share of the overall

minerals demand by 2030, alongside a diversification goal of no moe that 65% of any critical mineral originating from any single third country.

- The 2030 objectives will be secured via Strategic Projects, selected across Europe or globally, that will have to meet a set of sustainability criteria and will benefit from faster permitting and other (likely financial) support.
- Speeding up the operational and administrative side of permitting while upholding all of the key environmental safeguards around water, waste and biodiversity, alongside robust public consultation requirements. A number of new circularity provisions, e.g. for extracting minerals from the existing mining waste sites across the EU, have also been put in place.

This is a good critical minerals framework but its success will depend on how quickly and effectively it will be implemented. At the centre of it is the selection process of the Strategic Projects across the mining, refining and recycling sectors. How to select and prioritise the project list? How to assure the due diligence of local and global projects? What is that good balance between EU's needs and the Global South value add?

This paper by Transport & Environment outlines the potential to meet the EU's 2030 benchmarks with a focus on battery metals (cobalt, lithium, manganese and nickel), and presents the recommendations for the implementation of Strategic Projects under the CRMA.

2. European potential vs CRMA 2030 benchmarks

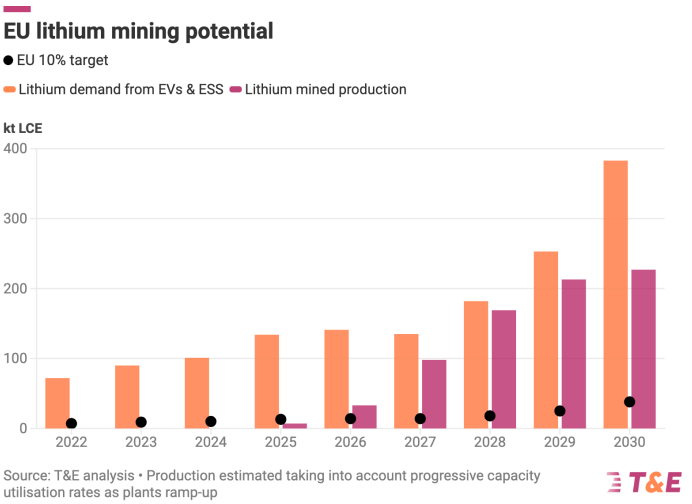
2.1 2030 mining benchmark of 10%: lithium, nickel, cobalt & manganese

Currently, the EU has limited mining activities in battery metals, having presence mainly in nickel and cobalt. However, the growing demand for critical minerals from the growing local market for lithium-ion batteries, wind turbines and other green technologies has spurred business interest. The currently announced project pipeline indicates potential increases in mining capacities over the coming years.

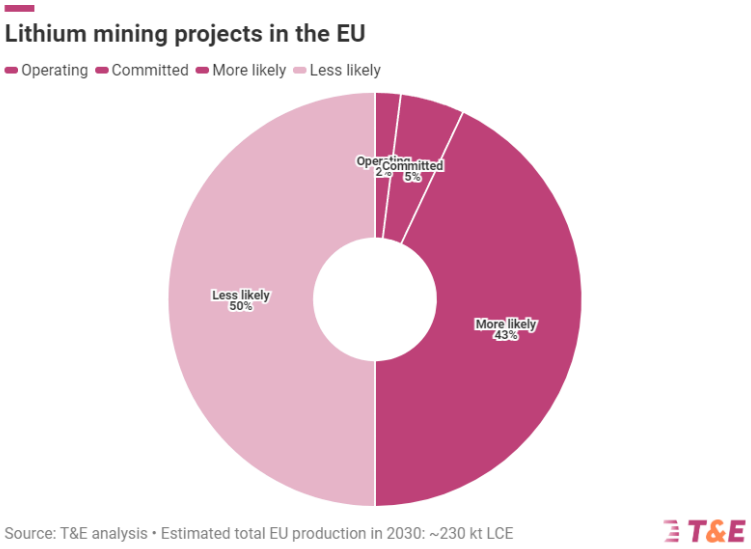
Overall, 19 mining projects are planned by 2030 in the four battery metals analysed by T&E, of which 12 focus on lithium alone. But most of them are in very early stages of development and, with no definitive investment decision taken or final permits secured.

Lithium

Today, Europe mines small amounts of lithium for the ceramics industry and imports the lithium required by the battery industry. The announced lithium mining capacities are expected to reduce this gap, potentially producing 230 kt LCE by 2030, or around 60% of the EU demand for electric vehicles (EV) and energy storage (ESS) batteries, which is significantly above the CRMA's 10% benchmark. The projects will be located in various countries, including France, Spain and Germany, and will involve both hard rock mining as well as direct lithium extraction.



Though outside the EU, Rio Tinto's lithium project in Serbia has already caught the attention of major carmakers like Mercedes-Benz and Stellantis. The project may become Europe's biggest lithium mine, potentially boosting capacity by 58 kt LCE and supplying around 43 kt LCE by 2030, which is around 11% of the EU's lithium demand in 2030.



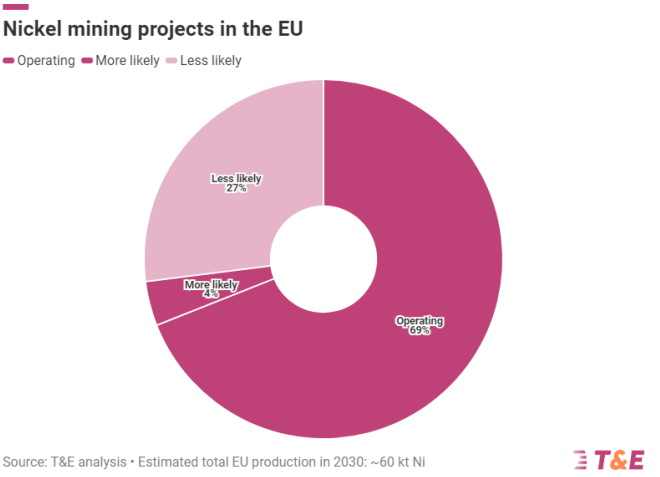
While the overall lithium potential in Europe is significant, only half of the announced projects are either already operating, committed (with the final investment decision taken) or are more likely to go ahead. Many face various acceptance, financial or other uncertainties, underlining the importance of strong industrial strategy to support them while assuming highest environmental and social stewardship. If Rio Tinto's Jadar project goes ahead, the share of more likely projects increases from 43% to 53%.

Nickel

The main European nickel mining operations today are located in Finland, with the output being used in various industries, such as steel and alloys.[1] In addition, 6 new projects are being planned in Sweden, Finland and Spain, aiming to mine nickel (often alongside cobalt) in response to the expected demand growth driven by the battery industry. By 2030, the existing mining operations and the announced projects could produce around 60 kt Ni, or 23% of the EU demand for EV and ESS batteries.

However, one uncertainty surrounding the nickel demand is how much the battery chemistry mix will shift towards nickel (and cobalt) free varieties such as lithium-iron-phosphate (LFP) or even sodium-ion batteries (which would also replace lithium). LFP batteries are already in close to half of all electric cars sold across the world. If the EV market shifts to LFP even faster, the EU will need less battery grade nickel than is currently assumed.

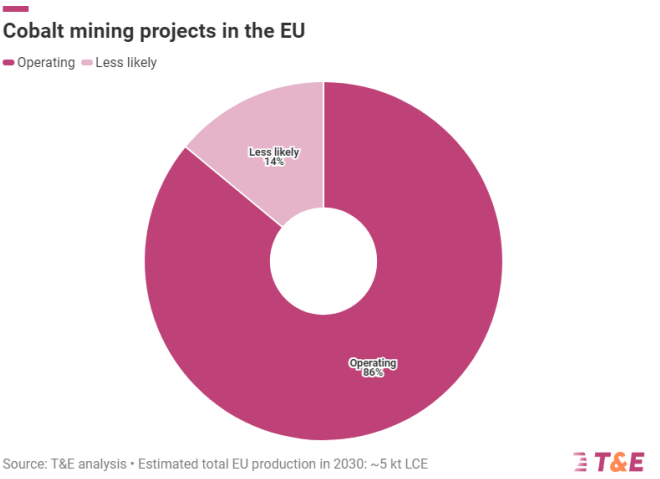
[1] Some extraction has been taking place in countries such as Greece, Macedonia and Albania (although currently halted), but the output is in the form of ferronickel which is used in the stainless steel sector. This analysis does not include these operations.



On the other hand, it is important to note that unlike lithium, which will primarily be used in batteries, nickel will continue to be utilised in a wide range of applications such as stainless steel, alloys, etc. The actual overall European demand for nickel is therefore higher than shown here, reducing the percentage share of supply compared to the total demand.

Cobalt

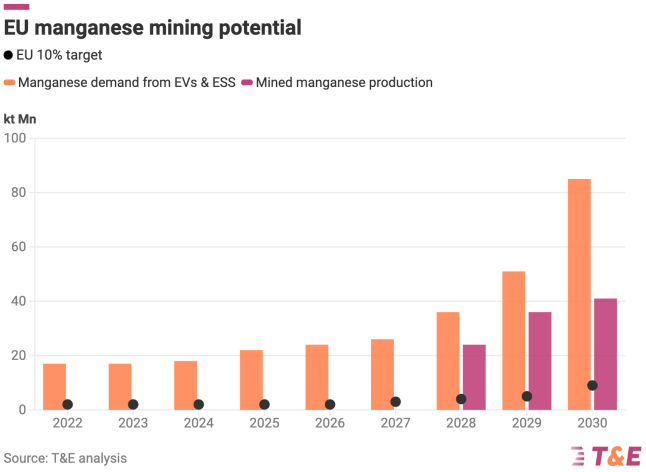
Finland is also the main mining country for cobalt in Europe. Around 3 new projects have been announced in Finland and Sweden, which plan to mine it alongside nickel. Altogether the total cobalt mining production could reach around 5 kt Co by 2030, meeting 20% of EU demand for EV and ESS batteries.

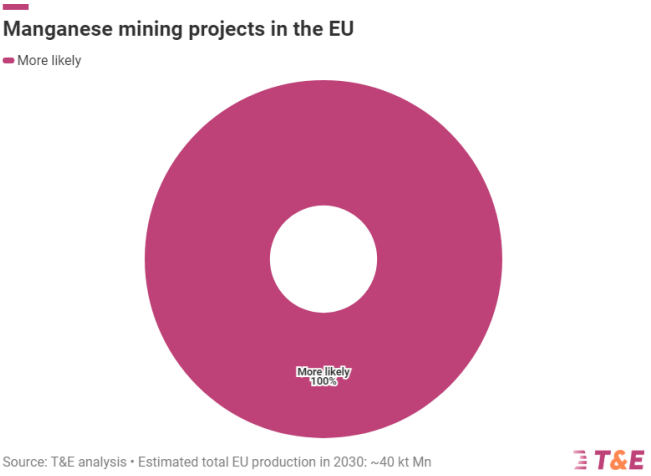


As with nickel, cobalt has many other applications apart from batteries (alloys, powder metallurgy, etc.), therefore, the overall EU demand is higher than shown above.

Manganese

The only major manganese project for batteries in the EU is located in the Czech Republic, expected to start production in 2028. The project aims to reprocess old manganese deposits in waste from a decommissioned mine, being essentially a “re-mining” project. By 2030, it could supply around 40 kt Mn, accounting for 48% of the EU demand for EV and ESS batteries.





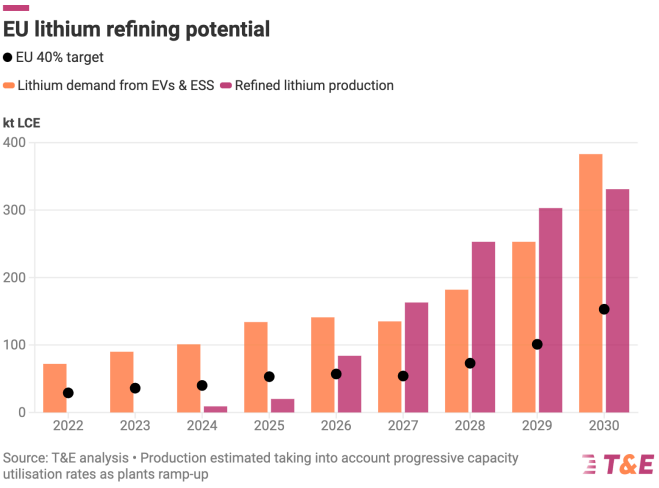
2.2 2030 refining & processing benchmark of 40%: lithium hydroxide, nickel sulphate and cobalt sulphate

The EU holds a considerable potential for refining and processing of raw materials, as evidenced by the announced project pipeline. While raw materials depend on geology with better resources located outside of Europe, processing facilities depend on favourable policies (e.g. clean and affordable energy availability) and technological expertise that can be developed. Processing materials also represent a lot more value added compared to extraction.

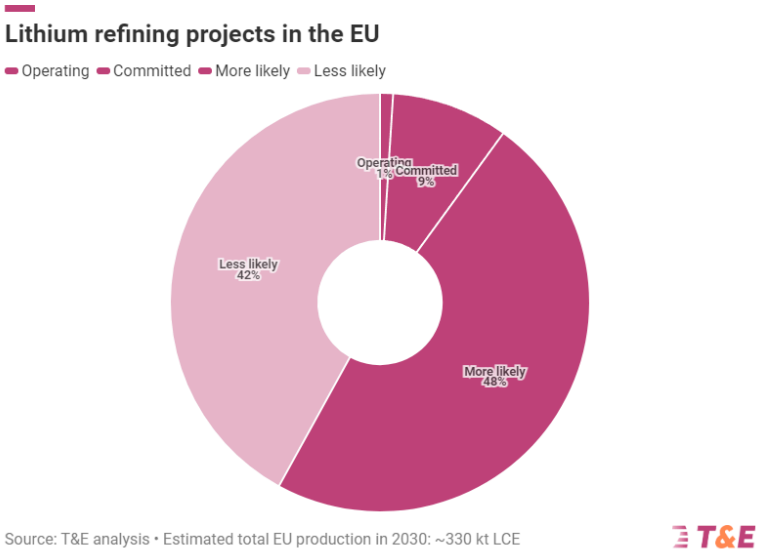
By 2030, 19 new processing facilities are planned in the battery materials analysed by T&E. However, as with mining projects, many of these plants are still in early development stages and their future remains uncertain, necessitating an urgent and robust industrial strategy to make them go ahead.

Lithium

In the case of lithium, the EU's 40% processing benchmark can be met by 2030. Over the past few years, 17 new lithium refining projects have been announced, some as standalone refineries (or converters) and others integrated with mining operations. The leading countries hosting these projects include Germany, France and Portugal, among others. With a combined potential production of over 330 kt LCE, these projects could meet 85% of the EU's demand for EV and ESS batteries by 2030.

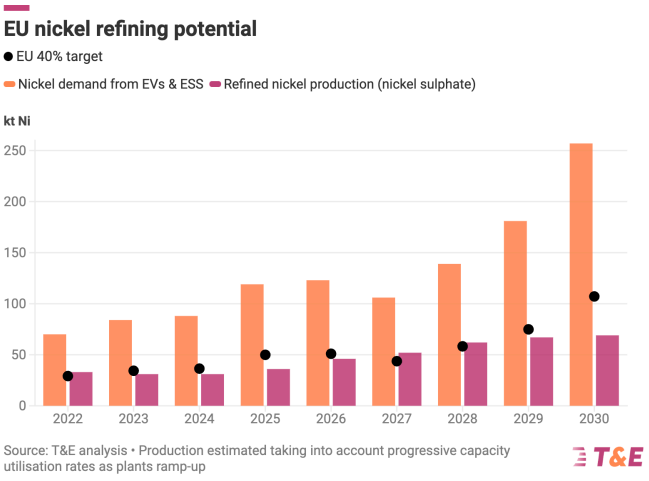


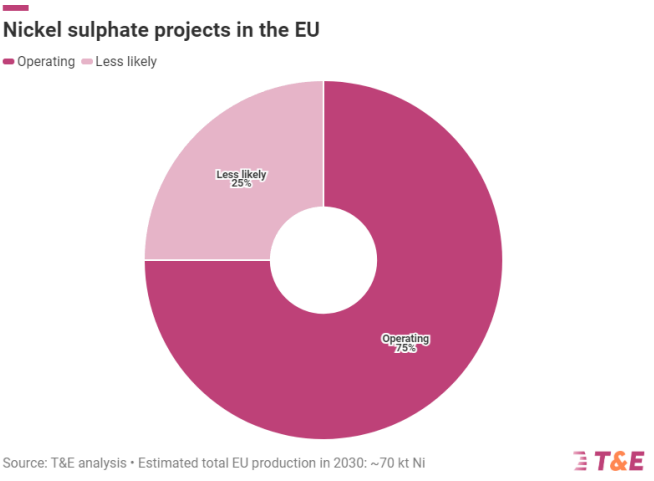
As mentioned in the previous section, the Jadar project led by Rio Tinto in Serbia could potentially account for 11% of the EU's demand in 2030.



Nickel & cobalt

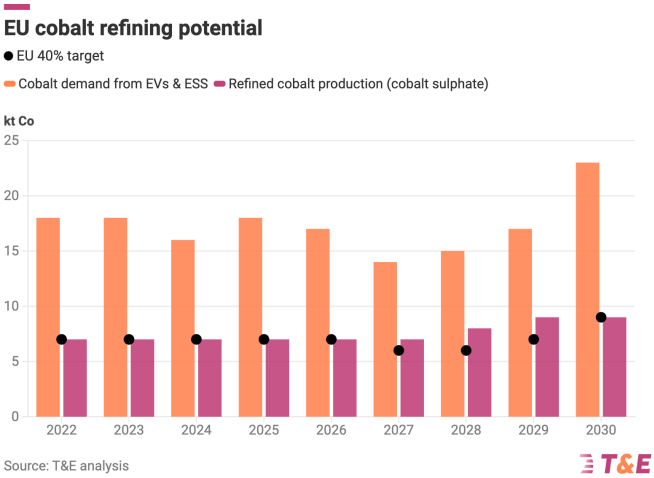
Currently, nickel sulphate and cobalt sulphate - the products used in lithium-ion batteries - are processed in Finland and Cyprus. Terrafame in Finland, with a planned 38 kt Ni capacity, has developed a cleaner nickel production method using bioleaching. Another nickel and cobalt refinery planned in France, announced in May 2024 and set to start in 2028, will add 20 kt Ni and 1.5 kt Co to the EU's pipeline.

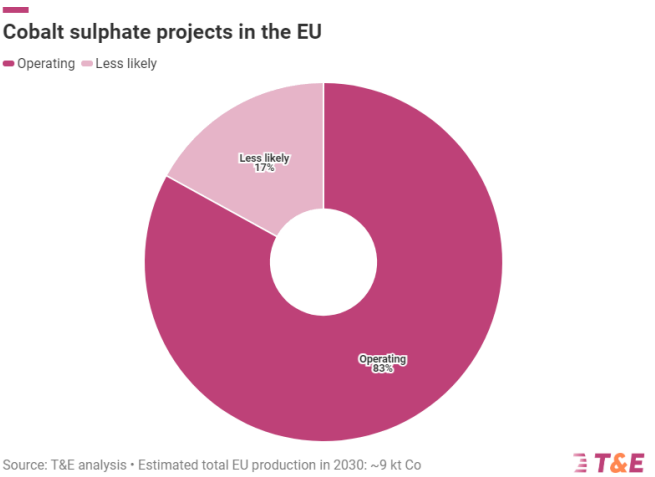




If these plans are realised, nickel sulphate production could meet 27% of EU's demand for EV and ESS batteries by 2030, while cobalt sulphate capacities would be sufficient to meet 37% of the demand.[2]

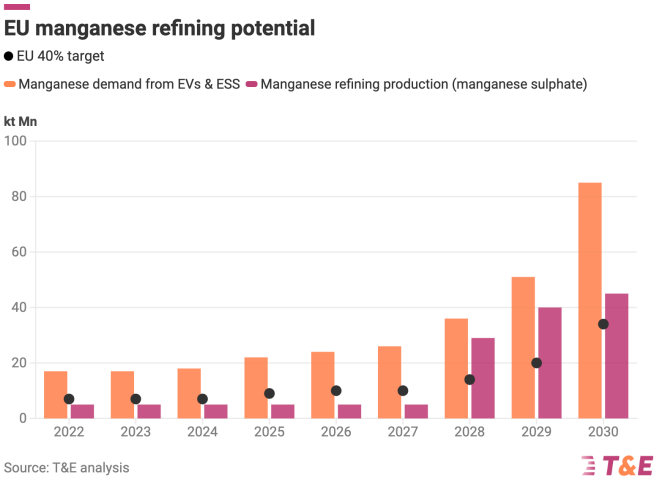
[2] In addition to nickel and cobalt sulphate, the EU produces nickel and cobalt metal and chemicals in Finland and France for use in various industries (e.g. nickel for stainless steel, alloys and electroplating; cobalt for superalloys, hard metals and catalysts). The volumes were excluded from the present analysis.

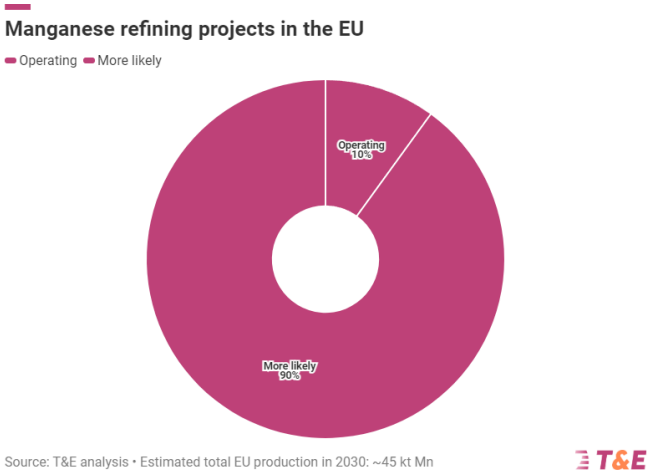




Manganese

Currently, only Belgium has a producer of battery-grade manganese sulphate, while the new "re-mining" project in the Czechia will also process manganese (and is expected to significantly boost the EU's supply in the long term). By 2030, these two plants are projected to produce around 45 kt Mn, meeting 53% of EU's demand for EV and ESS batteries.





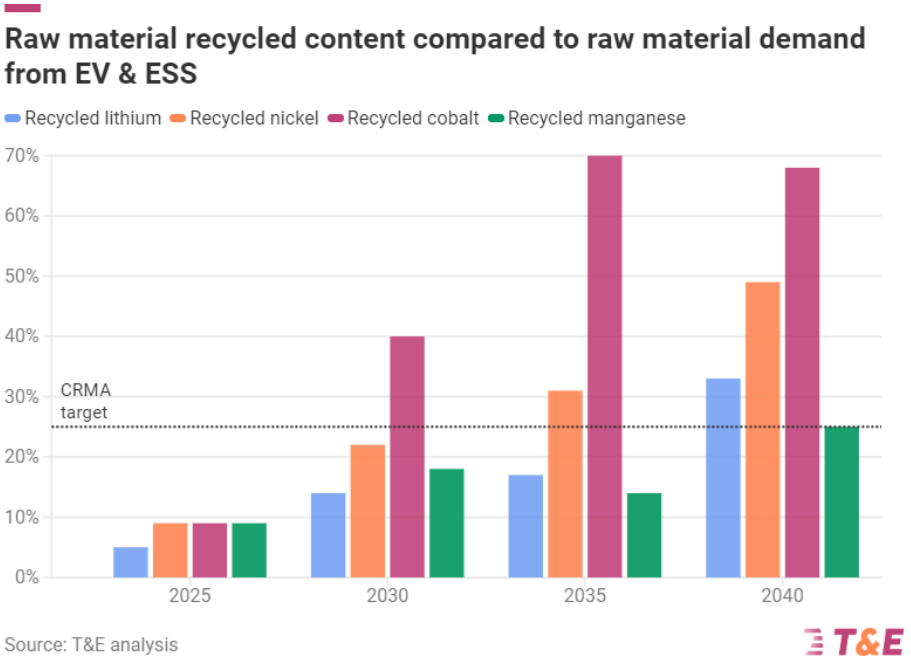
2.3 2030 recycling benchmark of 25%: battery demand

With battery gigafactories ramping up production across Europe along with EV and ESS batteries increasingly reaching end of life, Europe is expected to have nearly 120 GWh of feedstock available for recycling by 2030, and four times that by 2040.[3] Once recycled, the recovered lithium, nickel, cobalt and manganese is estimated to cover between 14% and 40% of the demand from electric vehicles (EV) and energy storage (ESS) by 2030, rising to 24%-68%, or up to two-thirds, by 2040, depending on the metal (see graph below).

As a critical element in all lithium-ion battery chemistries (whether NMC, LFP or other), lithium will be needed in batteries for a long time. T&E estimates its recovery from spent batteries and production scrap to cover around 14 % of the demand throughout the 2030s, rising to 33% by 2040 as more

[3] Assuming 100% collection rate, EV batteries lasting up to 12 years in first life application with most reaching retirement between years 8 and 12 and some reused in 2nd life applications for an additional 5 years; assuming ESS battery lasting 10 years; and assuming recovery rates of 80% for lithium and 95% for nickel, cobalt and manganese.

batteries reach their end of life. This is below the 25% benchmark set out in the Critical Raw Materials Act by 2030 (but above the minimum recycled content targets in the EU Battery Regulation). Nonetheless, there is further considerable upside potential if recovery rates go beyond the 80% level set in the Battery Regulation, which is feasible with advancements in technology. T&E believes a minimum of 90% of lithium should be recovered from factory scrap and end of life batteries.

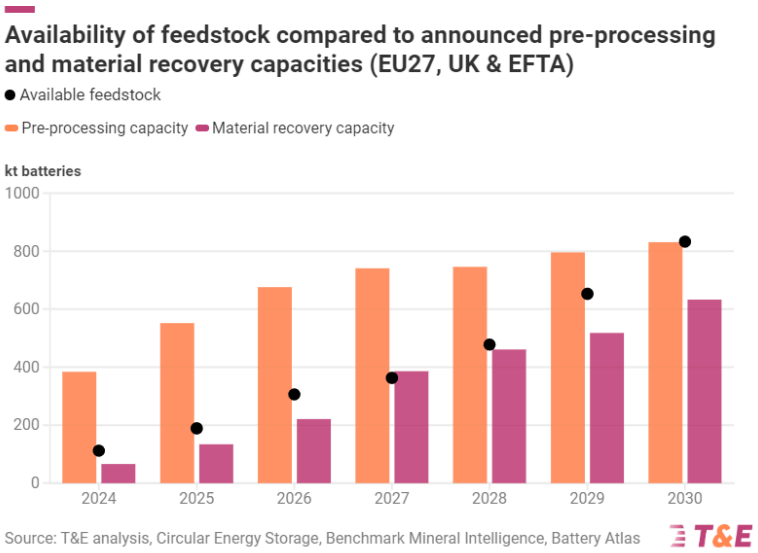


Nickel-containing chemistries will continue to be used in batteries due to their longer driving ranges and energy density, but their share will likely gradually decrease in favour of alternatives like LFP and LMFP. Nickel recovered from EV and ESS batteries is expected to account for 22 % of the demand in 2030, and more than double to 49% by 2040. This is in line with the CRMA benchmarks (and well above the minimum levels set in the EU Battery Regulation).

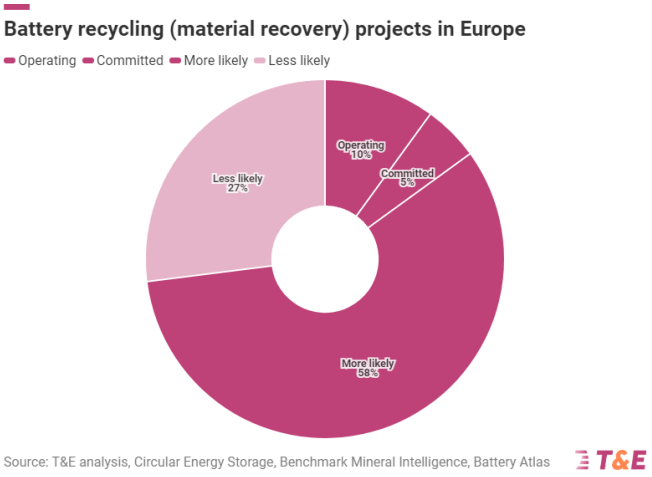
Cobalt has been gradually substituted in some chemistries due to past price volatility and environmental and social concerns associated with its mining in the DRC (though these concerns are not singular to cobalt, with copper and other metals facing similar problems). Its demand from EV and ESS batteries is expected to plateau around 2035, while at the same time batteries with legacy chemistries higher in cobalt content will reach their end of life, resulting in a higher share of recycled cobalt relative to the demand. T&E estimates recycled cobalt to account for 40% of demand in 2030 and 68% in 2040, which makes cobalt recycling to have the potential to be significantly above the CRMA 2030 benchmark.

Manganese is becoming a partial substitute for cobalt and nickel in new battery chemistries due to its lower cost and high energy density. As these emerging chemistries grow, recycled manganese content is expected to reach 18% of demand by 2030 and 25% by 2040, with fluctuations during this period reflecting the evolving market.

While the significant potential to supply battery demand from secondary sources exists, this will not happen on its own without more political and industrial support. To realise this potential, Europe will require extensive expansion of recycling capacities. Some 75 battery recycling facilities, covering pre-processing and material recovery, are planned by 2030 across Europe, including the UK, Norway and Switzerland. Prioritising their delivery is critical to Europe's circularity ambitions.



An additional difficulty is that today, installed pre-treatment capacities - whereby batteries are discharged, dismantled and shredded - still exceed material recovery capacities - whereby the metals themselves are extracted to be used in new battery manufacturing. This leads to the export of intermediate materials (or "black mass", which contains valuable metals like nickel, cobalt and lithium) overseas, stripping Europe of its valuable materials. Material recovery is also where the largest value add is, and is similar in technology to the metals processing industry. 33 material recovery projects have been announced across Europe, but more than a quarter of those remain uncertain necessitating political and industrial prioritisation.



3. Key criteria to select Strategic Projects: T&E recommendations

T&E analysis of the current project pipeline counts 19 new mining projects in lithium, nickel, cobalt and manganese, an additional 19 new projects in the processing stage of those minerals, and a total of 77 battery recycling facilities (both pre-processing and material recovery) by 2030. However, while potential is there, close to 50% of those are in initial stages of development with no definitive investment decisions taken.

To realise this potential - and do so responsibly - strong political, policy and financial support will be required. This is where the Strategic Projects selection comes in.

While mining operations take longer to come online and depend on local community support, the EU should prioritise developing local resilience and knowhow in minerals processing and recycling up to 2030. These have similar technological expertise that need developing and represent a no regrets strategy. That means that up to half of the projects selected should be in the processing stages, with a further quarter selected for recycling.

Estimates show that up to two-thirds of the Union's critical minerals extraction needs will continue to be sourced globally. That is why the EU has signed an array of Strategic Partnerships with resource-rich countries[4] and why strategic projects across the value chain from global players should be considered. There does not have to be a conflict between Europe's objectives to onshore some processing and the ambition of the Global South countries to go further down the value chain. While up to 40% of minerals should be processed locally, this leaves a significant 60% (from a vastly growing market) to come from elsewhere. The main consideration should be to ensure diverse supply with no one country dominating.

Given all this, how should the projects be selected? Below are the criteria that T&E recommends following when selecting the first batch of Strategic Projects list by the end of 2024:

1. **Follow 2030 benchmarks**: Prioritise the selection in line with the CRMA benchmarks: up to half of projects should be in the mineral refining or processing stages (can be integrated with mining), and at least a quarter should be in the recycling sector. When it comes to mining, projects reprocessing critical minerals from tailings should be prioritised. As regards recycling, the focus should be on integrated recyclers that include material recovery.

2. **Low CO2 emissions**: Projects, especially in the processing stages, that use innovative fossil- and emission-free technologies and processes, e.g. electric calcination in the case of lithium conversion or bioheap leaching/pressure oxidation in the case of nickel sulphate, should be prioritised.
    a. For nickel sulphate, T&E recommends using a threshold of 10 kg CO2 per kg of nickel content.
    b. For lithium, T&E recommends using a threshold of 10 kg CO2 per kg of lithium hydroxide.

3. **Sustainability**: best practice technology and processes as regards broader environmental stewardship should be required. This includes:
    a. Waste management: filtered tailings (dry stacking or backfilling) should be required in the case of any new mine accepted as the Strategic Project. Given that the EU's Extractive Waste Framework Directive is outdated and requires a revision, the global Safety First guidelines[5] should be used in the interim to assure best practice.
    b. Water management: water saving and re-using technologies, including direct lithium extraction (DLE), advanced filtration techniques and closed loop recycling, should be prioritised and/or required.
    c. Robust biodiversity plans that commit to at least no net biodiversity loss by 2030 should be required from any strategic project.
    d. Using toxic-free non-hazardous chemicals and ensuring no hazardous pollutant discharge on land or water. Priority should be given to environmentally friendly reagents and substitutes to the use of sodium sulphates.
    e. Any strategic project should show that sufficient financial guarantees are set aside for safety, closure and reclamation.

4. **Human rights**: highest social standards should be required, including implementation of the OECD/UNGP human rights due diligence guidelines, the relevant ILO labour conventions and strong policies on fair wages, corruption and gender & minority rights.

[4] T&E (2023): EU Strategic Partnerships for a resilient and sustainable supply of raw materials
[5] https://earthworks.org/resources/safety-first/

5. **Communities and Indigenous Peoples**: we recommend prioritising mining projects in Europe or globally that commit to the principles of the UN declaration on Free, Prior and Informed Consent. The overall goal should be to not only consult, but govern and engage on the projects prior, during and after their life.

6. **Innovation**: as battery and EV technology is developing rapidly, it is important to prioritise innovation into more affordable and resource-light chemistries. T&E recommends ensuring a balance between current and future technology, and selecting projects that offer materials for e.g. LFP or sodium-ion cathodes or wider supply chain.

7. **Global schemes**: when relying on global certification schemes to attest the compliance of strategic projects to the CRMA requirements, only those with multi-stakeholder governance alongside independent third-party audits and transparent disclosure should be considered. Multi-stakeholder governance should be defined as equal representation (50%) and shared decision-making with all rights holders, including workers, local communities and Indigenous Peoples. Overall, projects that have undergone or are undergoing an audit by the Initiative for Responsible Mining Assurance (IRMA) should be prioritised.

8. **Local value addition**: when it comes to global projects, it is important to ensure that additional value - beyond raw material extraction - occurs in resource-rich countries. What that value is will depend on the location: in some places going up and midstream in the selected material, e.g. by building refining and processing facilities (e.g. precursors) in the country would be the best strategy. In others, supporting other green industry sectors or simply improving the energy, grid or transport infrastructure would work better. However, a common definition for what constitutes sufficient added value is necessary. T&E recommends requiring that at least 10% of additional value is added on top of the project itself. E.g. in Chile the government requires an added value of USD 2,000 per each tonne of lithium carbonate sold at preferential rates to stimulate local investment. It is also important to focus on RDI activities in the country to ensure knowledge and expertise stay in the country.

4. Conclusions

The EU Critical Raw Materials Act is a comprehensive and promising framework, but its success will depend on its implementation. Central to this will be the selection process of Strategic Projects, designed to secure critical materials across the value chain in a sustainable and responsible manner.

Substantial local potential exists, with the EU able to meet most of its mining and processing needs for lithium locally, as well as substantial amounts of nickel and manganese. In addition, up to a fifth of all battery materials can come from recycling by 2030. But sharp focus, strong political support and clear industrial strategy are necessary to realise that potential.

When selecting Strategic Projects T&E believes that projects alongside the processing and recycling value chains should be prioritised, with strict sustainability criteria required in terms of CO2 emissions, impact on land, water and broader ecosystems as well as meaningful engagement with local communities. Globally, the selected projects should respect the FPIC framework, bring at least 10% of additional value and commit to undergo IRMA certification.

Further information

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