BRINGING BATTERIES PRODUCTION TO EUROPE - IN A GREEN AND RESPONSIBLE WAY

HOW THE EU CAN DEVELOP A WORLD CLASS BATTERY INDUSTRY IN AN ENVIRONMENTALLY RESPONSIBLE WAY.

SUMMARY DOCUMENT

EXECUTIVE SUMMARY

Until 2030, battery demand for transportation is projected to continue to grow exponentially, both globally and in the European Union (EU). Battery production relies on so-called energy-mobility transition materials (transition materials) such as lithium, nickel, cobalt, manganese and graphite, and demand for these is equally projected to increase over the next years. In response to these forecasted developments, the EU has elaborated on the Critical Raw Materials Act (CRMA) and the Net-Zero Industry Act (NZIA), of which are expected to come into force in early 2024. While the proposals lay out environmental and sustainability goals, their primary objectives are related to industrial strategy and aim at securing a supply of critical raw materials and domestic manufacturing of net-zero technologies in order to achieve the green and digital transformations –thus remaining competitive in a decarbonising global economy.

This analysis was conducted to examine the environmental and climate implications of achieving the benchmarks stipulated by the CRMA and NZIA, specifically of two elements: first the aim to refine 40% of the raw minerals within the EU, and second, to increase battery manufacturing in Europe. Relocating parts of the battery supply chain, apart from supporting strategic autonomy goals, offers the **EU the possibility to control production parameters – including social and environmental – within its borders and to apply its ambitious environmental and climate policies to set the highest global standards for sustainable battery production**, compatible with the Paris Agreement and also with the Global Biodiversity Framework.

The analysis shows the following results for the processing and battery manufacturing sector in Europe:

- Shift from NMC and NCA batteries to LFP battery chemistries – with a less pronounced demand of cobalt and nickel.
- Necessity to relocate refining and processing capacities to Europe - only 180 kt of battery materials refining and processing could be reached by 2030 – a shortfall of 380 kt to fulfil the CRMA benchmark of 40%.
- 9.5 million tonnes CO2 eq per year from ICE vehicles could be displaced by securing the production of 6.7 million passenger BEVs.
- Depending on the origin of raw materials, GHG emissions from lithium and nickel refinery in the EU can vary by a factor of 5.
- Environmental impacts of refining key minerals need to be mitigated by EU regulations – cobalt and nickel implicate the greatest potential of local environmental impact.
- Shifts in the mix of battery chemistries will have a limited effect on overall emissions by 2030.

The EU, pushing forward with the implementation of the Green Deal, has proposed and is bringing into force an increasing number of legal instruments designed to ensure the sustainability of products and supply chains. From an environmental and global sustainable development perspective, to support the EU's aim to install capacity for refining at least 40% of its transition materials in an environmentally responsible way, WWF recommends the following:

- Battery regulation: WWF recommends defining the maximum carbon threshold categories of the performance classes as low as possible to push battery producers and stakeholders in the battery value chain in Europe towards the use of green electricity.
- Critical Raw Materials Act: Instead of prescribing blanket benchmarks for relocating production processes to the EU, WWF recommends for policymaker to consider fact-based assessments of the potential environmental implications of the types of ore imported for further processing.
- WWF recommends that technological advances need to go hand in hand with demand reduction for transition materials. Resource reduction targets needs to be implemented in EU Green Deal policies and needs to foster innovation encouraging the designs that require fewer resources to provide similar services.
- WWF recommends that key Eu environmental policies are strong, stringent and are kept updated and aligned with the requirements of the CRMA and that the CRMA does not provide any leeway for overriding environmental legislation, or for sidestepping environmental and social corporate due diligence obligations, such as environmental impact assessments.

THE INCREASED USE OF RENEWABLE ENERGY FOR BATTERY PRODUCTION MUST BE SUPPORTED BY INCENTIVES FOR GREEN POWER PURCHASE AGREEMENTS AND THE FURTHER DECARBONISATION OF THE EU ELECTRICITY GRID.

The comparison of GHG emissions from battery production across EU countries, as a result of their respective energy mix, shows a potential 30-50% reduction in GHG emissions by using renewable energy in battery production.

Share of GHG emissions from manufacturing energy (electricity and heat) in battery cell production (%) and impacts from emissivity of energy input (kg CO2 eq per kWh)

Potential technical levers for reducing the CO2 footprint of battery production are the use of more secondary transition materials and enhanced recycling technologies and advanced technologies like dry coating.

Another potential lever for reducing specific GHG emissions from battery manufacturing are green Power Purchase Agreements (green PPAs). Green PPAs are – direct medium to long-term (5-20 year) contracts between companies and renewable electricity suppliers. They can be used to finance new investments in renewable energy plants by guaranteeing price stability for electricity over a period of more than 10 years without the need for additional subsidies. Green PPAs are expected to become a major driver for market-based expansion of renewable energies in the EU in the coming years.

The new Battery Regulation will be a starting point to reduce the CO2 footprint of battery production. It will gradually introduce carbon footprint performance classes, declaration requirements and limits on the carbon footprint of batteries for electric vehicles, light means of transport (such as e-bikes and scooters) and rechargeable industrial batteries, starting from 2025.

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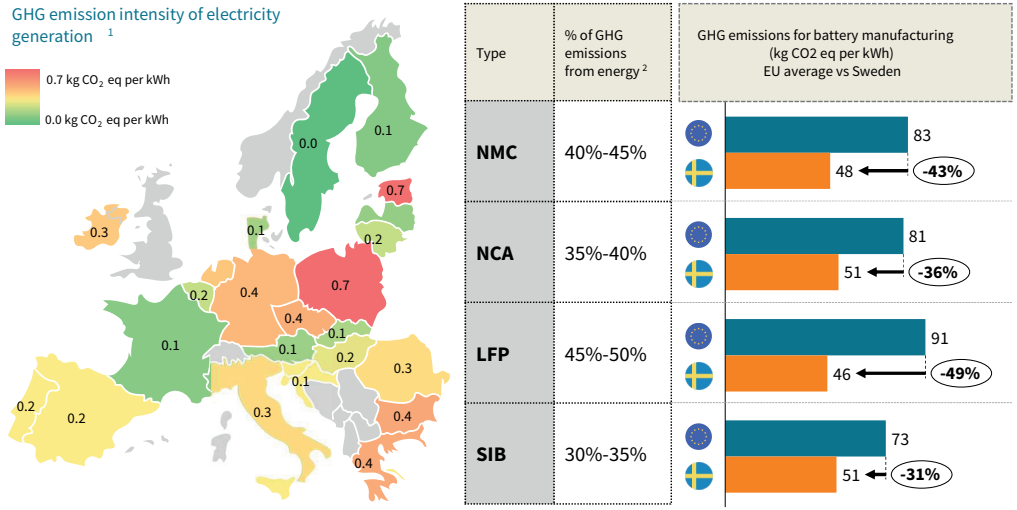


Type	% of GHG emissions from energy [2]	GHG emissions for battery manufacturing (kg CO2 eq per kWh) EU average vs Sweden
NMC	40%-45%	83 / 48 (-43%)
NCA	35%-40%	81 / 51 (-36%)
LFP	45%-50%	91 / 46 (-49%)
SIB	30%-35%	73 / 51 (-31%)

9.5 MILLION

MILLION TONNES CO2 EQ PER YEAR FROM ICE VEHICLES COULD BE DISPLACED BY SECURING THE PRODUCTION OF 6.7 MILLION PASSENGER BEVS.

AIMING FOR THE 40% DOMESTIC REFINING THRESHOLD OF THE CRMA IS NOT NECESSARILY PRACTICAL FOR ALL ETM.

Contrary to popular belief, cobalt and nickel demand for battery production will rise less markedly than the current market situation suggests. In the short term (by 2030), cobalt and nickel-free battery chemistries – particularly lithium iron phosphate (LFP) and derivatives and, later, sodium ion batteries (SIB) – will be on the rise and replacing NMC and NCA batteries as market leader, thus contributing to a relatively reduced demand for these minerals. Together with new technology, circular economy models and recycling, the demand for transition materials can be reduced to levels that can be met without necessitating such highly contentious developments as the mining of the deep seabed.

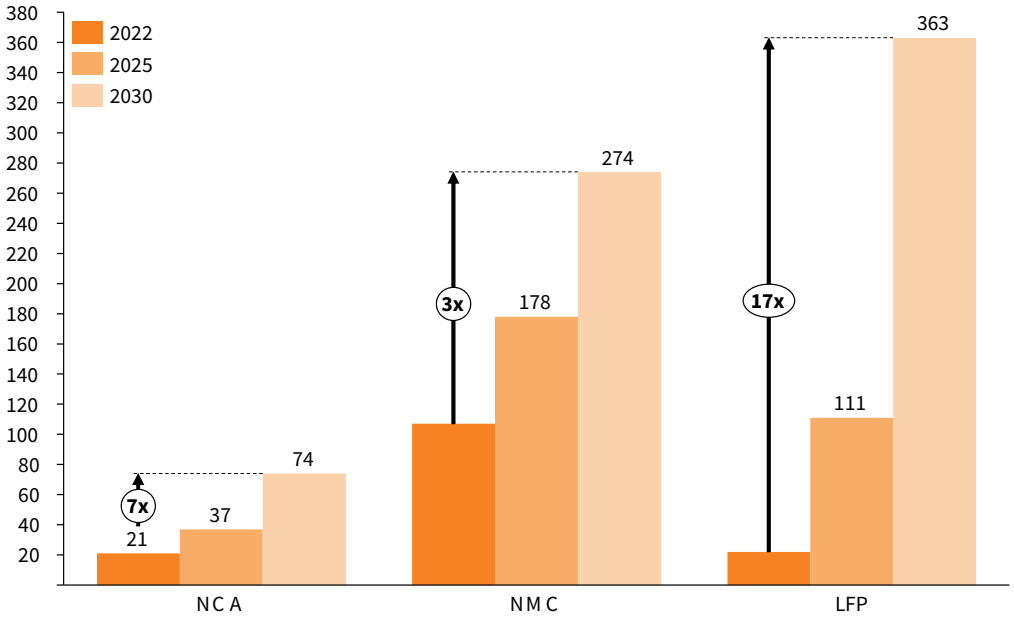
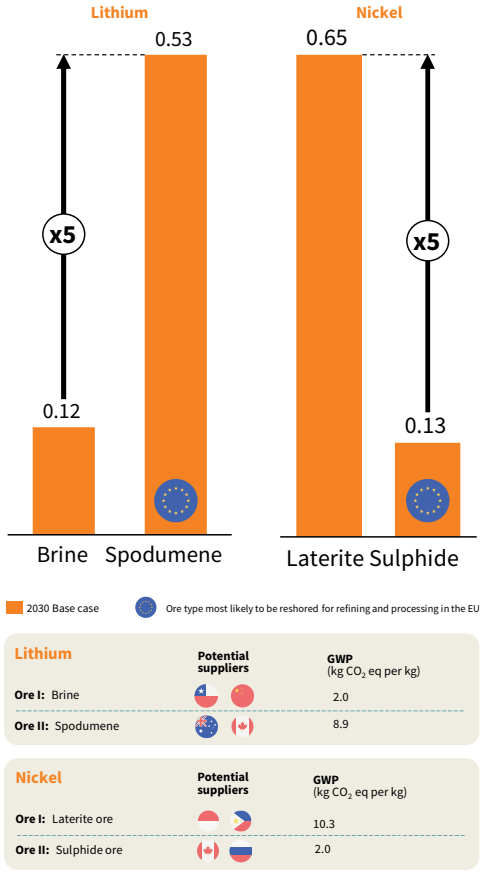


Figure 2: Annual demand for LIB cathode chemistries (GWh)

Additionally, relocating the refining of some materials may not result in environmental benefits depending on the ore type imported. The example of relocating midstream lithium processing to the EU illustrates this: the processing of lithium sulphate from brine is up to five times less emissions intensive than refining from spodumene. As brine processing is vertically integrated in its countries of origin, it is unlikely to be relocated to Europe. Without environmental considerations, the EU may opt for importing spodumene to reach the 40% benchmark, thereby increasing carbon emissions and undermining the objective of the Battery Regulation to reduce the GHG emissions of batteries. **Instead of prescribing blanket benchmarks for reshoring production processes to the EU, WWF recommends for policymaking to consider fact-based assessments of the potential environmental implications of the types of ore imported for further processing.**



AN IMPORTANT POINT FOR THE EU TO REALISE THE POTENTIAL FOR RESPONSIBLE BATTERIES IS TO ENSURE THAT EU LEGISLATION IS STRONG, STRINGENT AND ALIGNED WITH THE REQUIREMENTS OF THE CRMA.

Battery production is resource intensive, particularly regarding some transition materials such as nickel, cobalt, manganese, lithium, and graphite. Of these, especially the mining of cobalt and nickel have been raising ethical and environmental concerns, and processing these minerals is energy intensive.

At the same time, it is **important to consider that the environmental impacts of extracting the transition materials required for a clean energy-mobility transition are far lower than those imposed by the extraction and use of fossil fuels**. Shifting from an energy system based on combusting fossil fuels which must be continuously extracted, to the use of durable metals which can be reused and recycled, is inherently more sustainable. **This development supports the push for decarbonising the global economy, seeing that by now it has been sufficiently demonstrated that over their entire life cycle, battery electric vehicles (BEV) are less carbon emissions intensive than internal combustion engine (ICE) vehicles**.

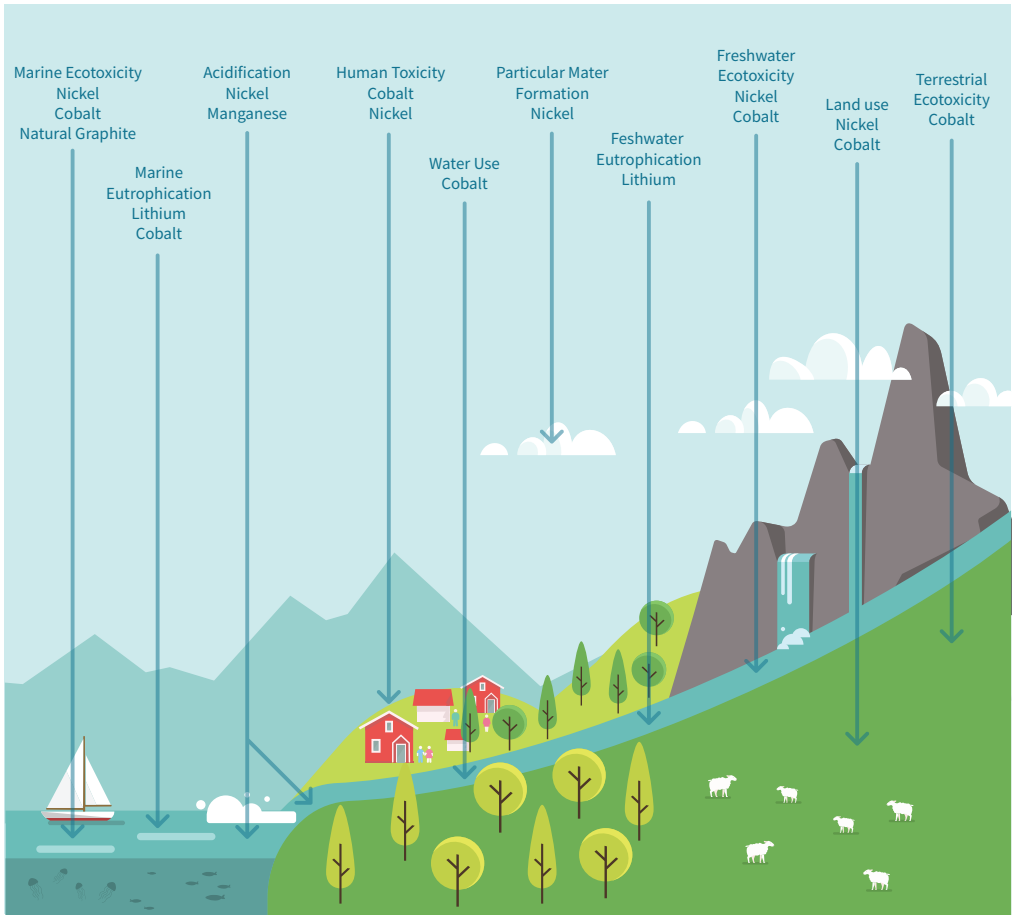


Figure 4: Unmitigated environmental impact of midstream production of battery material and respective legislation that regulates these impacts.

Proportionally to the growth of the battery market, however, both the demand for cumulative transition materials and greenhouse gas (GHG) emissions associated with battery production will increase in the near future, highlighting the need for stringent environmental regulations to minimise negative environmental and climate effects of the green energy transition on a local and global level. With comparatively ambitious environmental and climate policies in place, the EU has strong foundations to develop a best-in-class battery value chain, compatible with the Paris Agreement and with the Global Biodiversity Framework. **WWF recommends that they are kept updated and aligned with the requirements of the CRMA and that the CRMA does not provide any leeway for overriding environmental legislation, or for sidestepping environmental and social corporate due diligence obligations, such as environmental impact assessments**.

RAW MATERIAL DEMAND REDUCTION AND CIRCULAR ECONOMY SOLUTIONS NEED TO BE INCENTIVISED IN EU REGULATIONS AND SHOULD BE DISCUSSED WITH INDUSTRY

From an environmental point of view, the CRMA has also been challenged for disregarding demand reduction scenarios, placing its strategic objectives of expanding mining and refining above other complementary options like reducing required materials, environmental concerns of the new industrial processes and for prioritising industry over citizen communities. Technical solutions alone will not suffice to stabilise GHG emissions of the refining sector. **WWF recommends that technological advances need to go hand in hand with demand reduction for transition materials. Policies needs to foster innovation by encouraging the design of components and goods that require fewer resources to provide similar services.**

Consumers can use their power to modulate demand for the goods our global economy revolves around. A change in consumer behaviour towards an increased use of public transport and car sharing, and away from the use of private cars, has the greatest savings potential in terms of carbon emissions and resource utilisation. In addition to choosing durable, reusable, and recyclable product design (circular design), opting for smaller cars and keeping them in use for a longer time contribute to reducing the industry's resource intensity.