Exchange & Capacity-Building Group on Battery Materials (ECaBaM)

4th Workshop

Brussels, 27-28 January 2026

Final Report

The fourth workshop of the Exchange & Capacity-building Group on Battery Materials (ECaBaM) was held in person on 27-28 January 2026 in the European Metals premises in Brussels. This workshop report covers the two days of discussions and should be read together with the slides provided for both days, since they provide more detailed information.

The workshop was structured in two sections to foster expert discussion and capacity building. To ensure a balanced exchange of knowledge and perspectives, participants were divided into two breakout groups that lasted over the two days of workshop. Group 1 focused on "Prioritizations and restriction of substances in batteries: what is needed to support informed decisions (excluding SEA)", while Group 2 addressed "Assessment frame and proportionality of restriction options: control of risks and impact assessment (on wide scale) with focus on SEA". These targeted discussions enabled a thorough exploration of the specific challenges and opportunities in each area.

James Watson (DG European Metals) welcomed the participants and opened the session by briefly presenting European Metals and reiterating the central role of batteries in Europe's industrial and strategic landscape. He noted that, despite existing challenges, there are positive signs that EU institutions increasingly recognise the importance of the battery value chain.

He highlighted three concrete developments:

- Batteries Booster Strategy *(published on 16/12/2025)*
  This initiative focuses on scaling up EU cell manufacturing and demonstrates a clear commitment of public funding to support industrial ramp-up and innovation in the battery sector.
- **Industrial Accelerator Act (IAA)**
  The leaked draft indicates that batteries remain a top strategic priority, including the introduction of local content requirements for battery production. James stressed that failing to advance such measures would be politically counterproductive given the strong policy signals already sent.
- **Resource EU initiative**
  He referenced the RESourceEU initiative as another indicator of the increasing attention given to securing critical inputs for the battery and broader clean-tech industries.

He then wished a successful workshop to the participants and a good field trip on Wednesday and expressed thanks to the ECHA team for their collaboration and engagement.

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Day 1

Study report on SoC in batteries: Development of Phase 2

Veneta Nieminen (ECHA) introduced the first part of the presentation on the study on substances of concern (SoC) in batteries specifying that the Phase 2 will start in July and will finish in December 2026. Phase 2's objectives include identifying substances that hamper recycling, confirming SoC in batteries, identifying EU wide exposure and emissions from SoC and providing input to the European Commission's prioritisation exercise for potential regulatory action.

WSP reported that the late 2025 call for evidence generated only 30 responses, around 20% of what had been expected, which means that the current evidence base is still insufficient. Additional engagement took place in 2025 with industry bodies and waste and recycling operators, and WSP remains open to conducting further interviews to address remaining information gaps.

An interim report will be issued in April 2026 and key data will be shared with stakeholders[1]; This interim report it will contain the list of SoC identified in batteries to date (shorter list), information on alternatives and market overview together with exposure and emission mapping across the battery life cycle and initial recommendations

[1] The exact content and the stakeholders to be contacted still need to be defined.

for future regulatory action. A draft final report is scheduled for July, the final report for September, and submission to the European Commission is expected in Q4 2026.

Current analytical work focuses on exposure and emissions of SoC across the life cycle, as well as identifying substances that hinder recycling. The next stage involves developing prioritisation criteria for regulatory proposals, assessing hazard characteristics, exposure and emission potential, geographical relevance, available alternatives, and how substances are currently managed, to determine where restrictions or containment measures may be most appropriate.

Information available to date includes the list of substances used in batteries, the locations of EU manufacturing and recycling facilities, and stakeholder suggestions regarding substances that create obstacles for recycling. However, major data gaps remain, particularly concerning market information on production, imports and exports, collection and recycling by battery chemistry, concentration levels of key substances, and emissions and exposure data. Additional stakeholder input is therefore needed, especially on market data, SoC production volumes and concentrations, known reports that could be shared, substances that impede recycling, and any available emissions or exposure information. Without better information, risk management (e.g. restriction) decisions may be based on conservative (realistic worst case) assumptions.

In parallel to this study, ECHA is also working on the restriction processes set up, including policies, procedures, guidance, training, communication tools and IT systems.

Overview of the regulatory process

Augusto Di Bastiano (ECHA) provided a consolidated overview of the EU restriction process, explaining that restrictions are last-resort measures applied when risks cannot or have not been addressed by means of other REACH processes or Community actions. Restrictions under the Batteries Regulation are listed in Annex I of the Batteries Regulation, and REACH restrictions in Annex XVII of REACH. The scope of a restriction can either address specific use(s) concluded to pose a risk (e.g. use in batteries, mercury in thermometers) or be a 'comprehensive' / blanket ban (manufacture/use) of a substance. Uses can be derogated where risks are adequately controlled and where society overall would not benefit from a measure. Such derogations require **robust justifications on impacts/risks**. The precautionary principle is guiding decisions when scientific data are insufficient to permit a complete evaluation of the risk. However, opinions from RAC and SEAC shall inform Commission on what information would be needed to address the identified uncertainties, the timeline for generating such information (if possible), an overview of the potential consequences of inaction.

Pedro Carvalho (ECHA) showed the steps of a socio-economic analysis (SEA), using the following simplified visual of the SEA:

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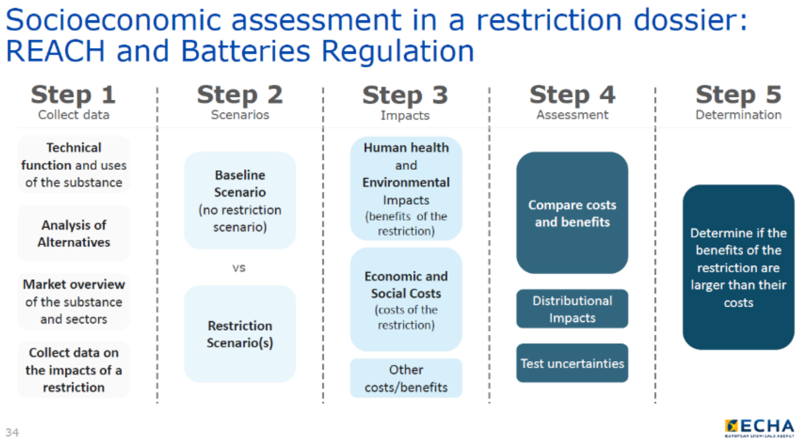

He stressed that proportionality cannot be reduced to simple arithmetic and that cost-effectiveness is often used. The process -from step 1 to 3- is data hungry and requires quite some granularity (i.e., a clear definition of which metal, which battery type, and which risk-management approach is relevant, as well as how risks and benefits differ across use patterns and release levels). He referred to the broader regulatory context, noting that restriction is one of the possible risk management options (RMOs) of the (REACH) RMOAs discussed in RIME+. This is different from what happens in the context of the ELV for example, where only restriction is available. He also explained that if we want to define the potential benefits of recycling, we need to make differences between high-quality recycling, down-cycling and destruction. There is a need to have robust and flexible recycling processes able to handle impurities, and there may be differences between sectors (e.g. in the metal sector, there is more attention to the incoming materials as determining the efficiency and the standards that need to be met by the recycled product ; some facilities will rely on technology while others may restrict certain inputs ("we refuse this metal to be treated"). The ongoing challenges such as NMC vs LFP processing were mentioned as well as the limitations of the 3Rs system was noted as theoretical but useful for identifying potential for recycling and recovery, alongside the need to distinguish proven industrial technologies from lab-scale ones. We should also realise that some future batteries might fall into hazard-free categories (Group 1) and therefore would not be prioritised for restriction, while others may still require information through an Analysis of Alternatives. EPR schemes may be more effective for some sectors than others. It was finally noted that market dynamics prioritise cost and performance rather than recyclability or end-of-life risk reduction. All this was considered as food for thought for breakout 2, expected to reflect on the socioeconomic assessment framework for a restriction and the **additional elements to be considered (l**ife cycle perspective, circular economy aspects, availability of critical raw materials, market structure of the batteries value chain, …)

Augusto concluded the presentation by explaining that the process for adding substances to Annex XVII can take seven years or more, requiring evidence of EU-wide risk and demonstrating that restriction is the most appropriate, enforceable and monitorable measure. Potential candidates for restriction are identified based on known or suspected hazardous properties. ECHA investigates properties, uses, potential exposures/releases and adequacy of existing regulatory risk management and prepares investigation reports, which are used by Commission and Member States to decide on further steps. Good quality information (stakeholders support) is crucial in decision-making process as it may lead authorities to discard the restriction of a substance (if safe use is sufficiently demonstrated). SEA under both REACH and the Batteries Regulation consider impacts on health, environment, competitiveness, innovation, employment, and the battery value chain, acknowledging that some benefits cannot be monetised.

In the follow-up discussion, the question was raised on how SEA should treat scenarios with 0.01% vs 99% release; whether geographical comparisons may be used when developing restrictions (e.g., ECHA consulted the

US in the formaldehyde restriction). It was also clarified that intermediates used in manufacturing but absent in final imported batteries cannot be restricted. It was also asked how proportionality is assessed considering cases where industry costs were 12 times higher than the benefits, highlighting the importance of cost-effectiveness.

Substances of Concern in the Batteries Regulation: what is needed to identify candidates for future restrictions and best handle these?

Augusto di Bastiano recalled that under Article 6 of the Batteries Regulation, the Commission, supported by ECHA, must prepare a report on substances that adversely affect human health or the environment or that hamper recycling into safe and high-quality secondary raw materials present in batteries or used in their manufacture. This broad definition covers both hazard-driven concerns and recycling-related disturbances. The hazard-based criteria include SVHCs under REACH, and harmonised classification (see endpoints listed on slide 50) and inclusion in the POPs list, and substances that negatively affect reuse or recycling. On the latter, JRC is still finalising the methodology but in a nutshell, SoCs may be grouped as process-disturbing (disrupting recycling operations, increasing costs, energy use and environmental impacts, reducing process efficiency and capacity, requiring additional treatments or controls) or quality-disturbing (lowering quality, limiting market uptake, requiring virgin material, reducing the product performance and value).

To identify the potential candidates for restriction, hazard data must be combined with release and exposure information to assess risks across the EU battery value chain. This requires background data on facilities, processes to have a good picture of the EU battery sector, but also chemical -specific data on quantities and releases. This data should allow to reply to the following key questions: are risks adequately controlled and are the risks EU-wide? In addition, socio-economic considerations will be considered in the broader assessment. Augusto described how the Commission can identify the need for restrictions, task ECHA with investigations and Annex XV reports, and adopt restrictions via Delegated Acts. ECHA has a supporting role: from the identification of substances for further risk management, the preparation of investigation/restriction reports, the preparation of the RAC/SEAC opinions up to the implementation of restrictions.

He stressed the crucial role of batteries stakeholders to provide insights (data and technical expertise), participate in consultations and expert groups, and coordinate across the entire value chain manufacturers, recyclers and raw-material suppliers because joint positions carry far more weight than fragmented contributions. Stakeholders can give early warning **signals**, such as supply shortages, implementing bottlenecks improving impact and enabling adaptive regulation.

He insisted again on the need to have appropriate information as all decisions are made based on **available information**; where information is lacking, worst-case scenarios are assumed. Hence data quality directly affects regulatory quality: **better data leads to more robust regulatory process.** It is always possible to submit business confidential information.

In the discussion, concerns were raised that recycling-market disturbance might not always be hazard-driven and may also have geopolitical relevance, suggesting that the SoC concept could/should evolve beyond traditional hazard- and recycling-based criteria. The Commission acknowledged that brainstorming on this broader interpretation is ongoing.

Group 1: Prioritizations and restriction of substances in batteries: what is needed to support informed decisions (excluding SEA)?

1. Background

Breakout 1 - Background Paper - ECaBaM 4

Please see the attached background paper.

Main aims of this breakout were:

- to identify the type, level of detail and representativeness of the information to be provided in the different stages of the restriction processes to support informed decisions
- to identify possible strategies that can be applied by stakeholders to generate the necessary information and/or coordinate the collection and the submission of information to ECHA

The following questions were used to direct the discussions:

1. Based on Annex XV report template: for which type of information on substances in batteries can stakeholders provide added value?
2. What type of information do you think should be further developed by stakeholders and/or institutions?
3. What strategy can stakeholders adopt to collect and submit information to ECHA in the different phases of the restriction processes?
4. What are the main issues that stakeholders face with current methods of information gathering (e.g. Call for Evidence, Consultations) and what should be improved to allow better collaboration?

To note also: Ivan Vera Concha from TNO provided a (too short) presentation on Metals in the Twin Transition: Regional Emissions in EU metal-technology pathways. The questions driving the study were: What are the additional water metal emissions from the increase in demand for key metals driven by the Twin Transition and CRM Act by 2030? And how relevant (magnitude) are such water emissions in the regional EU context? They used a multi-step approach to estimate additional emissions linked to the twin transition, focusing on strategic supply chains (including EV and batteries), with 6 metals in scope. They started from the understanding of the additional demand, the definition of life cycle emissions to fresh water per stage (assumptions made), the regional emissions, the estimation of the relative change, and finally the assessment of the relevance of additional emissions. They concluded that the increase in metal emissions driven by the additional metal demand for EVs, wind turbines, databases and servers, PV and electricity networks is low for copper, nickel and zinc when compared to the overall annual metal emissions from the industrial activities related to the metals in scope. Lithium emissions are expected to increase as there are currently no industrial lithium-related activities in the EU + 8. The increase in regional concentrations driven by the value chains in scope is low for copper, nickel and zinc. The added risk from the predicted environmental concentration is lower than 0.01 for all metals, suggesting a limited risk increase to the environment under the assessed conditions.

It was clarified that information was provided by metal type.

Possible Action: propose follow-up call with ECHA?

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2. Conclusions of Group 1

Generic conclusions:

- The high variability across technologies and operational conditions but also the need to cover the different lifecycle steps will make it hard to define only approach to gather representative data
- The type/relevance/urgency of information will also depend on whether the objective is to feed into the preparation of the phase 2 report, or the actual restriction process. It was proposed to first to focus on the information that should be included in the report to support a correct identification and prioritization of the SoCs.
- There is a significant variability in data availability (for metals for example, one can distinguish data-rich/data-poorer substances) and data generation requires time -hence it needs to be anticipated.

Regarding occupational exposure:

The discussion highlighted that companies have a good understanding of occupational exposure during production, and worker-monitoring data already exist for several steps of the manufacturing process and those could be aggregated to support regulatory assessments. This may be easier to achieve for metals than organics, but modelling tools could be used to generate some estimates.

Regarding environmental exposures/volumes:

Ideally, stakeholders should be able to clarify where releases to the environment originate throughout the battery lifecycle within different battery chemistries, production routes, and waste-treatment/recycling operations where data is the most limited. Qualitative figures (high-medium-low) with an agreed definition of what is high-medium-low could help to start with but at some point, quantitative figures or proxies would be needed to check that these ‘qualitative categories’ are meaningful. The group made several considerations, including e.g. that the tendency to control releases could be directly related to the value of the strategic battery material. The group agreed that covering all lifecycle steps would be difficult, both regarding emissions and volumes. The import of articles will also need to be considered, when it comes to e.g. recycling.

It was suggested to check some BREF documents, which may provide some generic datasets and some figures on some steps of the process (e.g., Surface Treatment and Coatings BREF (2020), Waste Treatment BREFs) that may be ‘read-across’ to batteries-related operations. Release Factors could be ranked (e.g. from high to low in %) but then info on the quantities is needed to make sense as e.g. a substance may have a high RF but only a small quantity is used.

In the absence of (specific) data, ECHA uses the Environmental Release Categories, which are a set of default (initial) release factors associated to each category (see ECHA Guidance R12, R16). Those release factors are assumed to be conservative default values, assuming no specific risk management measures are in place.

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Code	Name
LCS: Manufacture	
ERC1	Manufacture of the substance
LCS: Formulation or re-packing	
ERC2	Formulation into mixture
ERC3	Formulation into solid matrix
LCS: Use at industrial sites	
ERC4	Use of non-reactive processing aid at industrial site (no inclusion into or onto article)
ERC6b	Use of reactive processing aid at industrial site (no inclusion into or onto article)
ERC6a	Use of intermediate
ERC6c	Use of monomer in polymerisation processes at industrial site (inclusion or not into/onto article)
ERC6d	Use of reactive process regulators in polymerisation processes at industrial site (inclusion or not into/onto article)
ERC5	Use at industrial site leading to inclusion into/onto article
ERC7	Use of functional fluid at industrial site
LCS: Widespread use by professional workers & LCS: Consumer use	
ERC8a	Widespread use of non-reactive processing aid (no inclusion into or onto article, indoor)
ERC8d	Widespread use of non-reactive processing aid (no inclusion into or onto article, outdoor)
ERC8b	Widespread use of reactive processing aid (no inclusion into or onto article, indoor)
ERC8e	Widespread use of reactive processing aid (no inclusion into or onto article, outdoor)
ERC8c	Widespread use leading to inclusion into/onto article (indoor)
ERC8f	Widespread use leading to inclusion into/onto article (outdoor)
ERC9a	Widespread use of functional fluid (indoor)
ERC9b	Widespread use of functional fluid (outdoor)
LCS: Service life	
ERC10a	Widespread use of articles with low release (outdoor)
ERC11a	Widespread use of articles with low release (indoor)
ERC10b	Widespread use of articles with high or intended release (outdoor)
ERC11b	Widespread use of articles with high or intended release (indoor)
ERC12a	Processing of articles at industrial sites with low release
ERC12b	Processing of articles at industrial sites with high release
ERC12c	Use of articles at industrial sites with low release

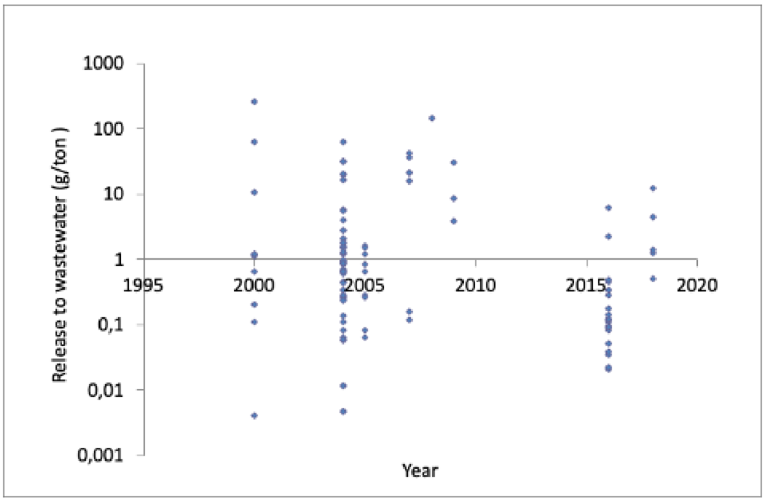
Specific Environmental Release Categories (SpERCs) have been developed by industry groups to refine the emission estimates obtained by using the ERCs' release factors and correspond to sets of information describing specific good practice conditions of use and the corresponding release estimates (to water, air, soil and waste). They take into account specific operational conditions and RMMs applied for the use in the sector. Several SpERCs have been developed by ARCHE Consulting for metals operations, including for industrial use of metal compounds (Eurometaux SPERC 5.2.v2) and batteries service life (Eurometaux SPERC 11A.2.v1). The group discussed the following options to further refine the existing SpERCs:

Option	Modalities	Workload/Limitations
Refine the existing batteries metal SpERCs + have organic SpERCs by collecting data from the battery sector(s) for inorganics and organics	Survey Coordination by e.g. Recharge Data needs: air and water emission, RMMs and type of batteries for metals and organic substances	+++ Different SpERCs for organics/inorganics
Use expert judgment to define categories and assess needs for refinement afterwards	Bring together experts from the batteries supply chain companies to identify semi-quantitatively when you can expect high or low emissions (according e.g. type of battery or type of process, wet/dry process, type of material etc.). The work on the Batteries BREF that starts may also provide a good frame for this.	++

Use existing SpERCs as "screening" for the scoping study and refine in a later step if need so	Use of the short list of substances (see below)	+

ARCHE Consulting indicated that they could share with ECHA/WSP:

- The relevant existing SpERCs fact sheets (including a SpERCs for metal recycling)
- To note: the SpERCs have been defined for registration purposes and hence most data go back to 2010 and before. Based on the below trend, one can expect and see lower emissions over time, however ARCHE does not have enough data from different metals to generate updated SPERCs. A possibility could be to go back to some of the metals producers to collect more recent data.



- An existing peer reviewed publication discussing the metals SpERCs (Verdonck et al. 2014) explains why one can use the median emission factor rather than the realistic worst-case (90th percentiles).

<u>Regarding human exposure via the environment</u>:

ARCHE will share the EUSES TEG deliverable showing shortcomings for metals for human exposure via the environment

<u>On how to improve data collection</u>, the group asked for:

- Precise definitions and transparent criteria for determining and refining the list of SoCs
- More focused data collections: it is proposed to start from the 'Short list' of SoC batteries defined in phase 1 and that will be confirmed by April. Having a shorter list will encourage data collection/submission.
- Unclear or ambiguous questions often lead to inconsistent or incomplete submissions. There was a call for clearer guidance, better-structured questions, and more realistic deadlines
- Stakeholders perceive a lack of transparency on how their information is used, noting that contributions often disappear into a regulatory "black box" without feedback or visibility of their impact. Greater transparency and dialogue would help maintain trust and encourage continued engagement
- Duplicate or overlapping information requests, which increase the administrative burden on companies and associations double information requirements should be avoided

- Competition issues should be kept in mind as those limit the ability of companies to share data, especially for substances not classified as SVHCs but still listed as SoCs
- Communication gaps along complex battery supply chains also complicate data collection, especially for non-SVHC SoCs where information flows are limited. Improved guidance and more structured communication channels would significantly strengthen collaboration.
- Finally, ECHA asks stakeholders to ensure traceability and transparency, clearly documenting the source, scope, methodology, and limitations of the information they provide. Such documentation helps ECHA evaluate the robustness of datasets and reduces the risk of misinterpretation.

Group 2: Assessment frame and proportionality of restriction options: control of Risks and Impact assessment (on wide scale) – Focus on SEA

1. Background

Please the see attached background paper.

PDF
Breakout 2 - Background Paper - ECaBaM 4

Main aims of this breakout were:

- Definition of potential frames for the proportionality and SEA considerations as well as their boundaries
- Identify parameters to be considered and related data needs

The following questions were used to direct the discussions:

1. Which considerations should be part of a discussion on proportionality? Can it be applied consistently in the Better Regulation context?
2. Which socio-economic considerations are most relevant for the batteries value chain in the context of a regulatory process, given its specific structure and dynamics?
3. How do battery value chain-specific characteristics, such high capital intensity, long investment cycles, rapid technological change and availability of raw materials shape short and long run economic effects?
4. To what extent could restricting a substance "hampering recycling for safe and high quality secondary raw materials" generate trade, economic and environmental benefits/risks through enhanced circularity?

The session opened with two presentations: one by Pedro Carvalho (ECHA) outlining the socio-economic assessment (SEA) framework under the Batteries Regulation (BR), and one by Hugo Waeterschoot (European Metals) providing the industry context for proportionality and SEA challenges. Pedro explained that socio-economic considerations under the Batteries Regulation operate on two levels: first, at the study-report stage, where information needs are limited and mostly qualitative, and second, at the restriction dossier stage, where SEA becomes intensive and must include a detailed analysis of alternatives, cost–benefit assessments, distributional impacts, baseline vs restriction scenarios, and monetised benefits where possible. He emphasised that under Article 86(3) of the Batteries Regulation, the restriction dossier must *"include a socioeconomic assessment, including an analysis of alternatives"*. He also highlighted that the Batteries Regulation introduces additional assessment dimensions, circularity, climate impact, EU strategic autonomy, recycling performance, making proportionality more complex than under classical REACH restrictions. Hugo's presentation instead focused on proportionality as applied within the BR framework, and the difficulty of applying it consistently in complex regulatory environments where multiple EU objectives co-exist (climate goals, chemicals safety, circularity, critical raw materials). He presented techniques for proportionality demonstrations, breakpoint assessments, benchmark assessments (e.g. euro per kg exposure reduced), willingness-to-pay approaches, and proposed the need for a comparative assessment frame to evaluate substances along dimensions such as technological performance, recyclability, exposure reduction potential, climate benefit, cost of alternatives, and societal impact. This was presented as a practical tool to support prioritisation.

2. Conclusions on Group 2

Generic conclusions:

- Proportionality must integrate multiple EU objectives, as decisions on battery substances require balancing climate goals, circularity, chemicals management and critical raw-material security, making simple cost–benefit assessments insufficient.
- Reliable evidence on actual emissions and release contributions is crucial, since proportionality assessments depend on a clear understanding of whether the battery value chain meaningfully contributes to overall risks.
- Socio-economic analysis must reflect the real structure of the battery value chain, accounting for high capital intensity, long investment cycles, rapid technological change and the interdependencies between materials and recycling pathways.
- Restrictions on substances affecting recycling must consider both benefits and potential unintended impacts, ensuring that gains in circularity and material quality do not undermine recovery rates, competitiveness or strategic autonomy.

1. Which considerations should be part of a discussion on proportionality? Can it be applied consistently in the Better Regulation context?

Participants recognised that proportionality in the Batteries Regulation must encompass more than the traditional comparison of costs and benefits. Because the sector interlinks multiple EU objectives, climate action, circularity, chemicals management, and securing critical raw materials, stakeholders repeatedly noted that proportionality must take into account multiple assessment goals simultaneously. These include impacts related to exposure reduction, climate benefits, recycling technology, and material accessibility.

Stakeholders emphasised that the mapping of the actual emission contribution of the battery value chain is essential for proportionality. Several participants noted that the contribution may be “small, very small, or negligible,” and that proportionality must be informed by robust evidence of actual release levels, complemented by mapping of diffuse sources, otherwise the proportionality judgement cannot be credible. Participants also highlighted a recurring difficulty: core elements of proportionality, such as the causal link between measures and material availability, or the long-term costs of restricting substances used in recycling, are often poorly documented, creating asymmetry between quantifiable and unquantifiable components. As a result, alternative proportionality techniques (breakpoints, benchmarks, willingness-to-pay) may be needed more often than under REACH. This complexity also raises questions about whether proportionality can truly be applied consistently across the Better Regulation framework when so many competing EU goals are involved. Overall, participants agreed that proportionality assessments must explicitly consider market realities, material dependencies, recycling performance, strategic autonomy, and climate contributions, not only health and environmental benefits.

2. Which socio-economic considerations are most relevant for the batteries value chain in the context of a regulatory process?

Participants underlined the importance of socio-economic considerations linked to the structure and specificities of the battery value chain. First, several stressed that the sector is marked by strong interdependencies between materials, the so-called *"metal spiderweb"*: for example, lead recycling is necessary to recover antimony and other materials and restricting one substance may therefore indirectly affect the availability of several others, with economic and strategic consequences. Another key aspect is the criticality of raw materials and Europe's structural dependence on imports. Participants noted that upstream extraction and processing largely occur outside the EU, and substitution decisions for battery chemistries are driven globally by cost and performance, not by EU regulation. This means that regulatory changes may have limited influence on global substitution patterns and may instead shift EU competitiveness. The socio-economic assessments must also reflect the rapidly growing but immature nature of the market. Recycling data for many emerging chemistries will not exist for years, meaning that waiting for actual recycling outcomes is impossible; instead, importers and market projections must be used. Several participants warned against assuming a stable "substitution market," since the battery sector is not comparable to more mature cycles (e.g., tyres manufacture process). Participants also stressed that cost–efficiency is crucial: data on the cost-efficiency of exposure reduction measures, the costs associated with losing access to recycled materials, and the broader economic implications of shifting technologies must all be incorporated. They also raised the need for clarity on how SEA outcomes translate into prioritisation and risk-management decisions, especially when multiple objectives are in conflict.

3. How do battery value chain characteristics (capital intensity, investment cycles, technological change, raw material availability) shape short- and long-run economic effects?

Participants explained that the battery value chain is characterised by high capital intensity and long investment cycles, meaning that regulatory uncertainty or strict limitations on certain substances may have long-term impacts on investment decisions, especially for recycling facilities intended to operate for decades. For example, one participant noted that "if I produce now, I will recycle in 20 years, how can I provide data now on a process that will happen decades later?", pointing to the inherent uncertainty regulators must account for. The rapid pace of technological change further complicates assessments. Alternative chemistries may emerge but often remain niche and cannot be assumed to replace established technologies in the short run. Some battery designs may even be "over-engineered" for certain applications, raising the need for granularity in restriction scope to avoid excluding entire technologies unnecessarily. Raw material availability plays a central role: the EU's dependence on imported processed materials means that any regulatory measure affecting supply chain stability may have amplified economic effects, both upstream and downstream. Restrictions could increase production costs, shift investment outside the EU, or reduce the competitiveness of European battery manufacturing. Participants also stressed that, because recycling input volumes will remain low for many newer chemistries for years to come, early regulatory decisions may heavily influence the long-term structure and direction of the market.

Finally, several noted that economic effects must be evaluated in a life-cycle and long perspective, since recycling processes will continue even after restrictions (as happened with cadmium batteries, where facilities remained necessary despite bans).

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4. To what extent could restricting a substance "hampering recycling for safe and high-quality secondary raw materials" generate trade, economic and environmental benefits/risks?

One of the outcomes of the discussion was that the participants agreed that restricting a substance that hampers recycling can have both benefits and risks, and that proportionality must weigh these carefully. On the benefits side, improved recycling performance, removal of problematic substances, and higher quality secondary materials can strengthen EU circularity, support climate objectives, and improve competitiveness in the long run. Enhanced recycling can also reduce import dependence and improve material security, particularly for critical raw materials. However, participants stressed several major risks. Restricting substances used in recycling processes may hamper the recovery of key materials, particularly when those materials depend on complex co-recovery pathways (e.g., antimony recovered via lead phases). Disrupting such pathways can generate negative economic and strategic consequences and may even reduce the overall effectiveness of recycling systems. Another concern is that restrictions could affect the quality of collection and sorting, which participants identified as a much bigger barrier to recycling performance than process-related limitations. They also noted that if restrictions impose high costs on manufacturers, the pressure to substitute may push the market toward chemistries that are less recyclable or available only outside the EU, weakening the circular economy. Finally, several participants emphasised that the SEA must consider pyrometallurgical options for lithium and other metals, as these processes may behave differently under restrictions. Overall, participants concluded that restrictions affecting recycling must balance the potential for increased circularity with the risks of reduced material recovery, decreased competitiveness, and unintended strategic dependencies.

Day 2

Overview of trends

In her presentation on the outlook for the European battery industry, Ilka von Dalwigk provided a comprehensive overview of the technological, industrial and geopolitical landscape shaping Europe's path in the global battery race. She began by introducing RECHARGE, the industry association representing the full value chain of advanced rechargeable and lithium batteries in Europe. The presentation emphasised that the future is electric across all major mobility segments. Beyond electric cars, electrification is rapidly gaining traction in scooters, trains, heavy-duty trucks, drones and defence applications, while the transformation of the grid will rely heavily on affordable, performant batteries. Batteries are becoming a foundational technology not only for mobility but also for Europe's digital, industrial and defence capabilities. Ilka highlighted the growing global competition for manufacturing capacity. According to IEA data from April 2025, China continues to dominate existing and planned lithium-ion cell manufacturing capacity, with Europe lagging significantly behind both China and the United States by 2030. Europe's challenge is compounded by the evolving market share of global car brands, where new electric-only manufacturers from China and the US are steadily capturing a growing share of worldwide vehicle sales, reshaping demand for battery chemistries and supply chains. The presentation showed the rapid expansion, but also volatility, of Europe's cell manufacturing landscape. Maps from June 2024, November 2025 and January 2026 illustrate the shifting pipeline of planned battery factories, including cancellations, delays and reconfigurations, underscoring the uncertainty of industrial investments in the region. Announced production capacity for the EU-27 continues to grow but remains insufficient to close Europe's strategic gap. A major geopolitical turning point occurred on 9 October, when China imposed export licences on key battery products including high-energy-density cells, cathode and anode materials, and specialised manufacturing equipment, creating immediate supply disruptions and giving China increased leverage over global market dependencies. This was presented as a “strategic wake-up call” for Europe.

Cost competitiveness emerged as a critical barrier. European battery pack prices currently average ~130 €/kWh, far above the <100 €/kWh threshold needed for globally competitive EVs. Europe faces stiff cost pressure from China’s low-cost LFP leadership and Korea’s manufacturing maturity. Accelerated R&I is required in cell chemistry, materials, manufacturing processes, and pack/system integration, with digitalisation and circularity as cross-cutting enablers. The presentation also compared design-to-cost and design-to-performance chemistries. LFP, LFMP and Na-ion offer affordability, safety and reduced dependency on critical raw materials, making them ideal for mass-market vehicles, though with lower energy density and weaker cold-temperature performance. Conversely, high-nickel NMC and emerging solid-state batteries remain essential for long-range and premium applications but carry higher costs, raw-material risks and longer validation requirements. Ilka further examined manufacturing and integration as “hidden” competitiveness gaps: pack and system integration accounts for 25% of pack cost, and Europe must advance in areas like dry-coating, precision assembly, digital twins, and modular architectures. Form factors and cell formats strongly influence pack performance, cost and recyclability, while chemistry choice directly affects recycling profitability. On recycling, she noted Europe’s structural challenges. Mechanical pre-treatment has a low barrier to entry, but post-treatment of black mass requires high capital investment, advanced expertise, and scale (40 kt+) to be cost-competitive. Europe also faces limited access to end-of-life batteries over the next decade, raising the risk of material leakage to Asia unless black-mass processing capabilities are built domestically.

Ilka concluded with strategic recommendations: localise LFP/LFMP and Na-ion production, strengthen manufacturing excellence, accelerate pack and system innovation, and anchor the entire sector in digitalisation and circularity, including digital product passports, direct-recycling scale-up, and end-to-end material tracking. Europe's future in batteries depends on making the right strategic choices now to build resilient domestic capabilities

Circular Economy Act: what it implies for batteries

In her presentation on the Circular Economy Act, Laura Fazio Bellacchio (European Metals) outlined how the forthcoming Act is poised to reshape Europe’s waste, recycling and resource-efficiency framework, with direct consequences for the battery value chain. She explained that the core ambition of the CEA is to accelerate the transition towards a circular economy while strengthening the EU’s economic security, resilience, competitiveness and decarbonisation efforts. This includes establishing a genuine Single Market for waste and secondary raw materials, boosting the availability of high-quality recycled materials, and improving enforcement of waste-collection and shipment rules to ensure scale-up of critical raw material (CRM) recovery. She noted that political momentum for circularity is high, supported by the Draghi Report and the Letta Report, both calling for a stronger EU single market for secondary raw materials, better waste-shipment rules enforcement, and measures such as potential export fees on scrap to reduce leakage of strategic materials. The Actis likely to tackle broad measures: reforms and harmonisation of End-of-Waste criteria, harmonised collection and sorting obligations, recycled-content requirements for selected products, strengthened Extended Producer Responsibility (EPR), improved treatment standards, and targeted updates to the EU List of Waste. For metals, the aim is to increase circularity while ensuring consistent rules across Member States. A major point for the battery sector is that waste lithium-ion batteries and black mass will be classified as hazardous waste from September 2026, triggering a ban on exports to non-OECD countries and the possibility of further Commission measures to prevent circumvention. The Commission and Member States will also monitor prices, export flows and potential market disruptions, with protective measures under consideration if needed. This creates renewed pressure to build European post-treatment capacity and reduce the long-standing problem of black-mass leakage. Laura highlighted the growing intersection between circularity and SoCs across EU legislation. The Batteries Regulation, Ecodesign for Sustainable Products Regulation (ESPR), Packaging and Packaging Waste Directive and End-of-Life Vehicles Regulation all integrate SoCs linked to negative impacts on reuse and recycling. Industry associations have therefore urged the Commission to adopt a harmonised and workable SoC approach, stressing the importance of consistent definitions, practicability, impact-assessed requirements and avoidance of unnecessary administrative burden. She noted that the Commission recognises these concerns, pointing to flexibility mechanisms, exemptions, product-specific delegated acts, and Digital Product Passports as tools meant to keep requirements proportionate and technically feasible. She concluded with key messages: several CEA measures already exist in the Batteries Regulation (e.g. recycled-content obligations); debates on restricting black-mass exports predate recent scrap-export discussions; and the Batteries Regulation is among the first EU laws to explicitly link SoCs to their impact on recycling. At the same time, broader CEA measures, such as harmonised waste classification and easier waste transport, will have important implications for the battery sector and its ability to scale circularity efficiently.

Conclusions of the workshop

Across the two days of workshop, the clear lesson is that a single, one-size-fits-all approach to SoC in batteries is neither realistic nor desirable. Chemistry process and operational conditions are too heterogeneous, so decisions must be taken granular, with a life-cycle evidence approach, rather than with generic assumption. Building on Group 1 discussions, participants converged on a more pragmatic path: a near term approach, pair qualitative release bands (high/medium/low) with clear indications of where releases originate across manufacturing, use, and end-of-life, while progressively enriching those categories with quantities as data improve. Worker exposure monitoring data already exist for several production steps and can be aggregated, but environmental releases remain harder to characterise across the life cycle. Stakeholders stressed that data availability is uneven across Europe, that timelines for Call for Evidence are tight, and that ambiguous questions, duplication and competition laws constraints hinder robust submission. The group endorsed a tiered strategy that uses BREF data where appropriate, ranks release factors and quantities, and when needed, applies expert judgment, recognising that risk prioritization requires exposure and release information, not hazard alone. A notable contribution was TNO's multi-step scheme to estimate additional emissions from the "twin transition" (demand, stage-level emissions to fresh water, regionalisation, relative change, relevance), which offers a structured way to connect life-cycle releases to policy relevance. Regarding the SpERCs, ECHA expressed a preference for the second option, i.e. bringing together experts from the batteries supply chain companies to identify semi-quantitatively when you can expect high or low emissions (according e.g. type of battery or type of process, wet/dry process, type of material etc.), confirming that the starting Batteries BREF may indeed provide a frame for this.

On the other side, Group 2 concluded that proportionality under the Battery Regulation must go beyond the classical cost-benefit framing: SEA needs to integrate circularity, strategic autonomy, availability of critical raw materials, market structure and the real contribution of the battery value chain to the overall emissions (recognising high capital intensity, long investment cycle and the risk that restrictions affecting recycling inputs or co-recovery pathways can unintentionally weaken EU security and competitiveness).