

Global battery demand will exceed

 **2,900 GWh**

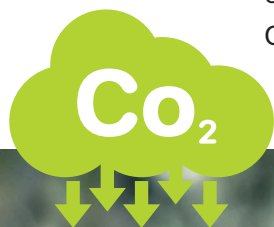
by 2030, with Europe accounting for ~1/3 of this demand



Metal production contributes 3% of global greenhouse gases and

80%

of a Lithium-Ion battery's CO₂ emissions.



Replacing primary metals with recycled ones cuts CO₂ emissions by

38-96%



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The future of battery recycling

OUR GOAL Recycling rates of 89% or more

REVITALISE is set to redefine the future of battery recycling, emphasizing sustainability, cost-effectiveness, and minimal environmental impact.

OUR PARTNERS

To find out more about their roles in this project go to our website.



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Challenges

Increased EU Lithium-Ion Battery (LiB) production is resulting in increasing end-of-life streams that contain valuable raw materials such as Cobalt (Co), Lithium (Li) and Phosphorus (P).



LiBs recycling is being implemented in European organizations, with a focus on recovery of valuable materials. Low-value parts such as Aluminium, (steel) casing, plastic separators and the other cathode metals are currently uneconomic to recover.



Pyrometallurgical processes result in net emissions, high energy consumption and loss of Li in the slag, while hydrometallurgical processes use harmful chemicals, produce waste streams affecting the environment and human health.

Current recycling processes are becoming commercially impractical due to fast evolving LiB chemistries. **Future LiB recycling must be efficient, environmentally-friendly, designed to process various battery chemistries (including waste streams), enabling low-value materials recovery, and ultimately producing battery materials applicable for battery production. These must be competitive to the battery materials produced from existing supply chains.**

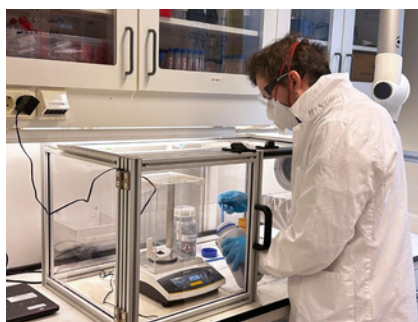
Objectives

REVITALISE will develop novel pre-treatment technologies to give cost-effective approaches and to achieve at least 40% high purity active materials which can be reconditioned using green, low temperature, direct recycling by re-lithiation and re-sodiation.

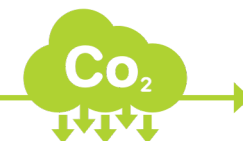
The remaining 60% of materials with low purity will be recycled using hydrometallurgy to achieve battery grade materials and intermediate high-value compounds.

This will result in cost-effective and environmentally-friendly simplified flow sheets, with minimised energy usage, and that are resilient against mixed chemistries and cross-contamination.

Design and implementation of this closed-loop process and water remediation will guarantee sustainability, minimum CO₂ footprint, reduced chemicals usage and emissions, and mitigate environmental threats.



Impact



The global battery demand forecast is set to exceed 2,900 GWh by 2030 and Europe is expected to account ~1/3 of this demand.

Significant waste from LiBs and other battery technologies will exert substantial negative environmental impact and accelerate the depletion of mineral reserves. REVITALISE will develop an efficient and cost-effective process that will lead to commercial recycling of critical materials as well as low-value materials that cannot be currently recycled economically, ultimately driving a fully-circular approach, which will reduce strategic dependencies for critical raw materials by promoting a circular economy. NMC and LFP batteries will constitute about 80% battery market share by 2025, while Na-Ion is expected to achieve ~2.5% market share.

REVITALISE addresses recycling of the majority of chemistries that are expected to reach EoL by 2035 and majority of EOL batteries in 2050s. As battery technologies move towards using lower-cost materials and to keep all battery materials in a circular economy, more efficient and economically viable recycling processes are needed to retain the values.

Overall processing and supply costs need to be collectively cheaper than buying virgin materials.

At a global level, metal production currently contributes to 3% of the world's greenhouse gas emissions and around 80% of CO₂ is emitted over the life cycle of a LiB. REVITALISE process will create a closed-loop, fully circular battery value chain and will reduce the CO₂ burden of primary material production and transport to Europe.

Replacing the primary-source metal with a secondary-source metal allows for CO₂ cuts of 38-96%, saving natural resources and avoiding the environmental impacts associated with primary metal extraction.

