High-Quality Life Cycle Assessment for Battery Industry

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AGENDA

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INTRODUCTION TO HIQ-LCA PROJECT

HiQ-LCA: High-Quality Life Cycle Assessment for Battery Industry

The HiQ-LCA project will enable a reliable battery-specific life cycle assessment (LCA) based on better data, by bringing together LCA experts and industrial companies along the battery value chain.

Objectives:

- Collect comprehensive, transparent and validated data on battery production, usage and recycling
- Develop tools, services and trainings for a reliable life cycle assessment of batteries
- Support the improvement of carbon footprints and resource efficiency

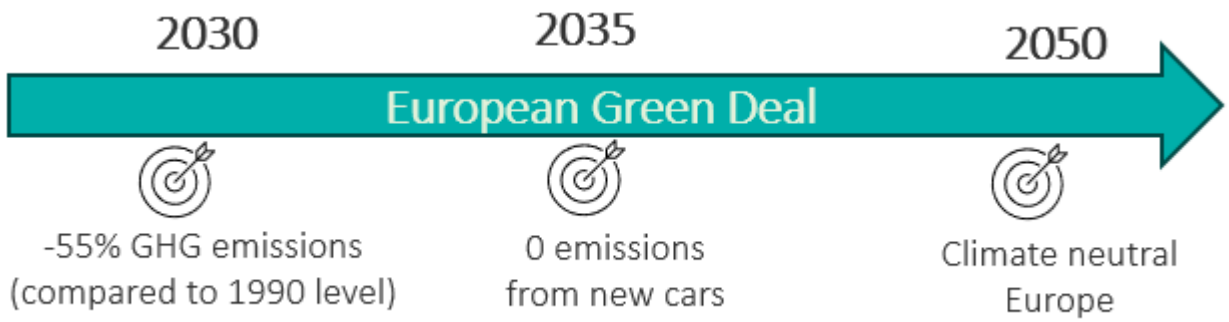
Duration: 1.2023 – 12.2025

Funded by EIT RawMaterials

PARTNERS

- 12 partners from materials production, cell manufacturing and recycling as well as life cycle assessment
- 7 countries involved: Belgium, France, Germany, Great Britain, Netherlands, Sweden, Switzerland
- All edges of the EIT knowledge triangle covered: industry, research and education

CONTEXT



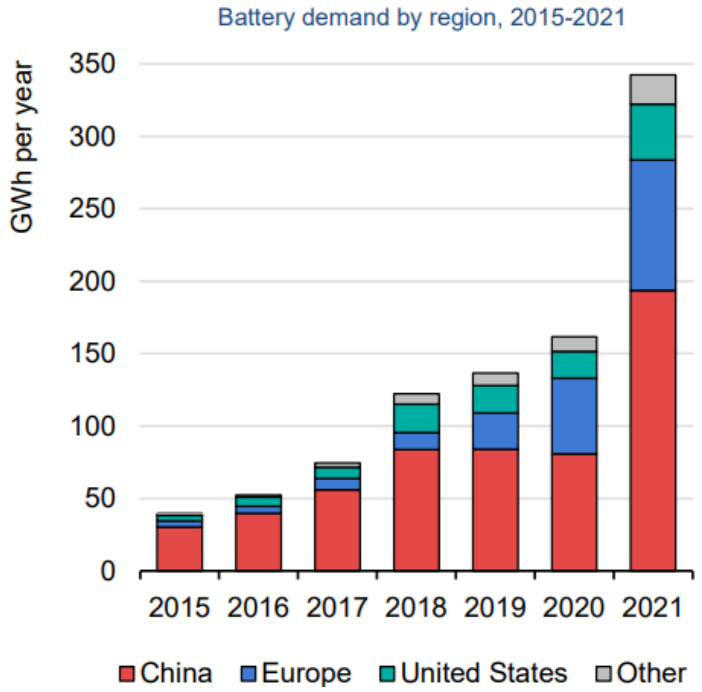
Circular Economy Action Plan: Announced initiatives along the life cycle of products

Green Claims Directive: Substantiating environmental claims against greenwashing

Environmental Footprint Methodology: Reference scheme for LCA in EU (PEF/PEFCR)

Ecodesign for Sustainable Products Regulation: Reducing life cycle impacts of products. DPP to trace compliance

EU Battery Regulation: Mandatory requirements to be met for rechargeable batteries to be placed in the EU market



Source, IEA 2022. *Global Supply Chains of EV Batteries*

KEY WORK PACKAGES

WP3 - Data Platform Implementation: creating a comprehensive semantic data platform

WP4 - Data Management: Guidance on data management; data generation; quality assessment

WP5 - Modelling of Future-Oriented Data Sets

WP6 - Products and Services

THE FOCUS: NEED FOR HIGH QUALITY DATASETS

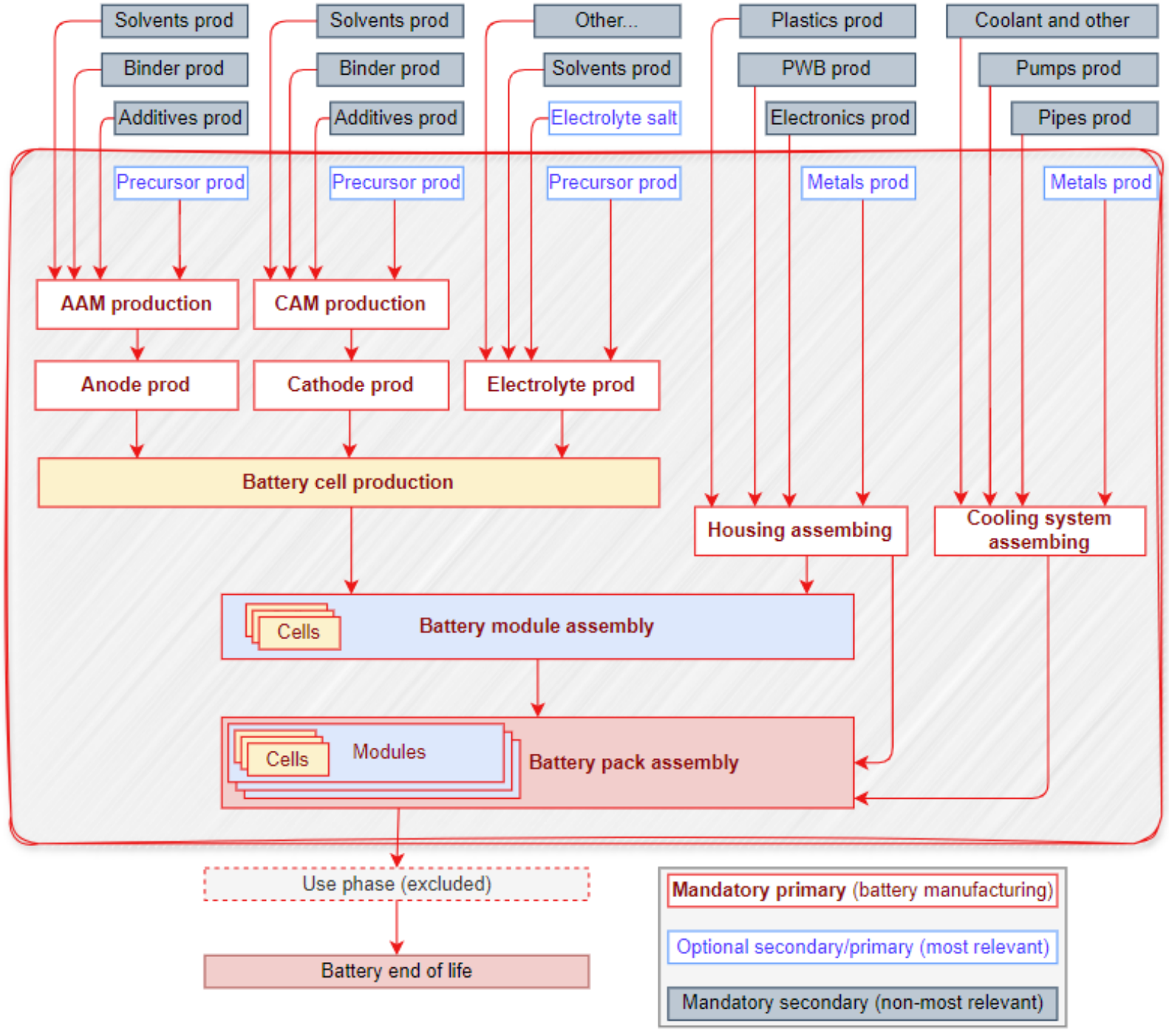
AAM precursors
Graphite:
- hard carbon
- lithium
- silicon
- titanium

Metals
Production of **copper**
(e.g., in current collectors; busbars and cables)
Production of **steel**
(e.g., in current housing)
Production of **aluminium**
(e.g., in current collectors; busbars, housing, and cables)

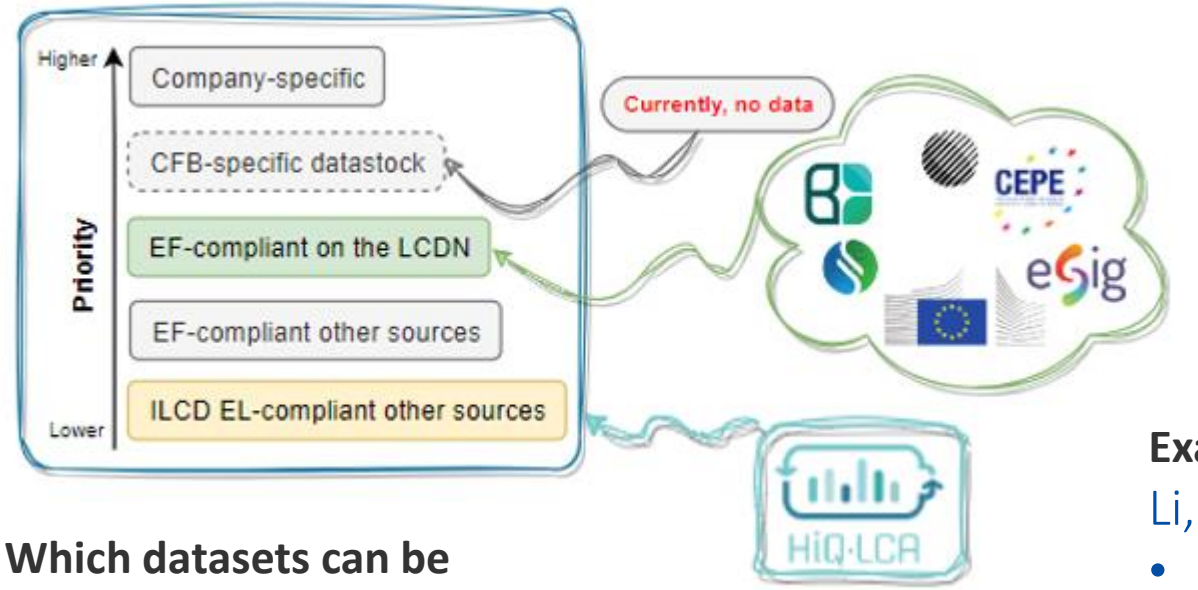
CAM precursors
(whether salts or metallic):
- cobalt
- nickel
- iron
- lithium
- vanadium
- titanum

Electrolyte salts and precursors:
LiPF6 and lithium salts

EoL
Pyrometallurgical treatment
Hydrometallurgical treatment



WP4 – DATA GENERATION



Which datasets can be utilized?

HiQ-LCA for:

- Data gaps filling (ILCD-EL)
- Comparisons
- Support selection/exclusion of proxies

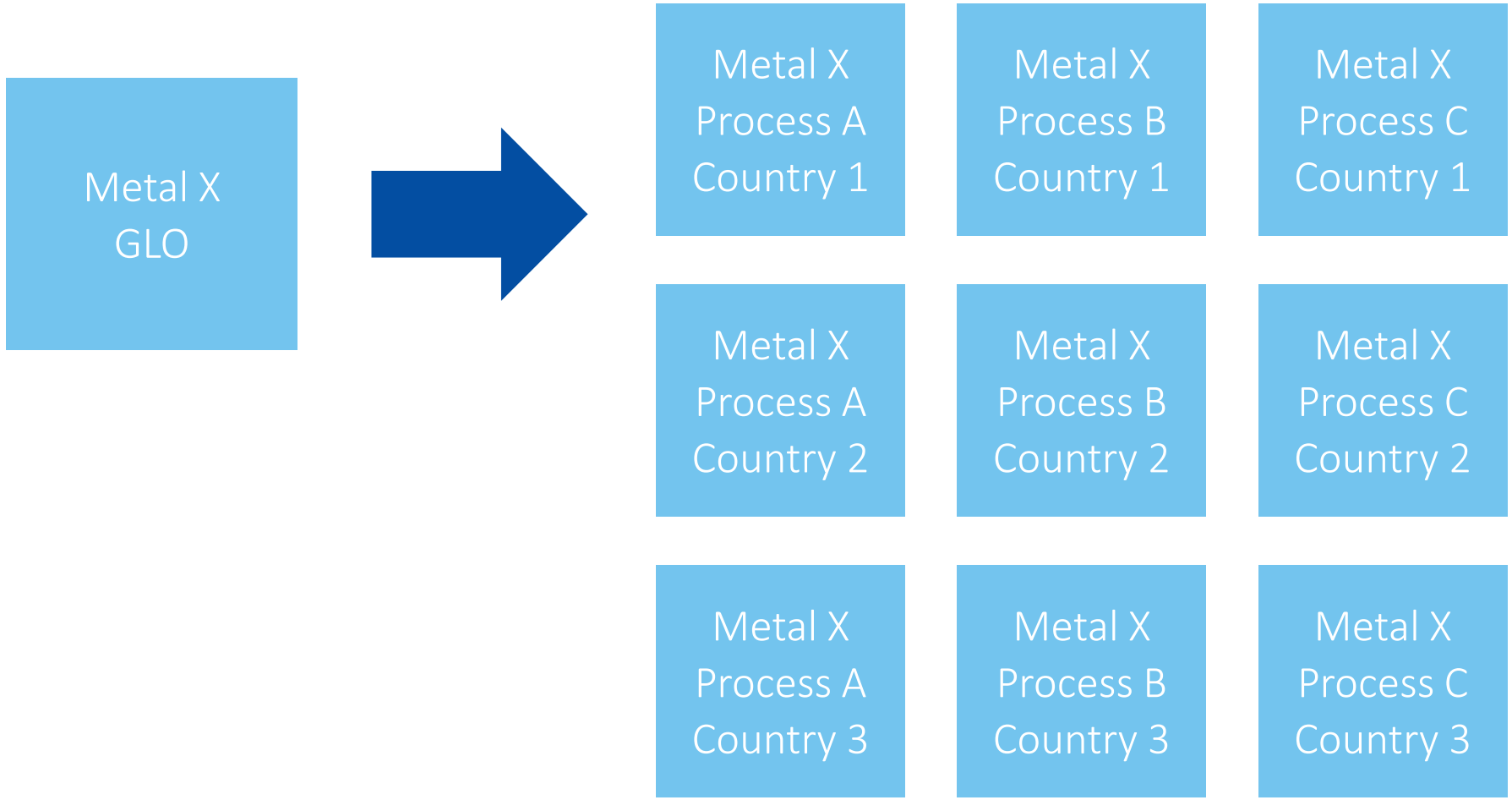
Example of gaps identified in the LCDN:

Li, Al, Ni, Graphite, Co and suphates

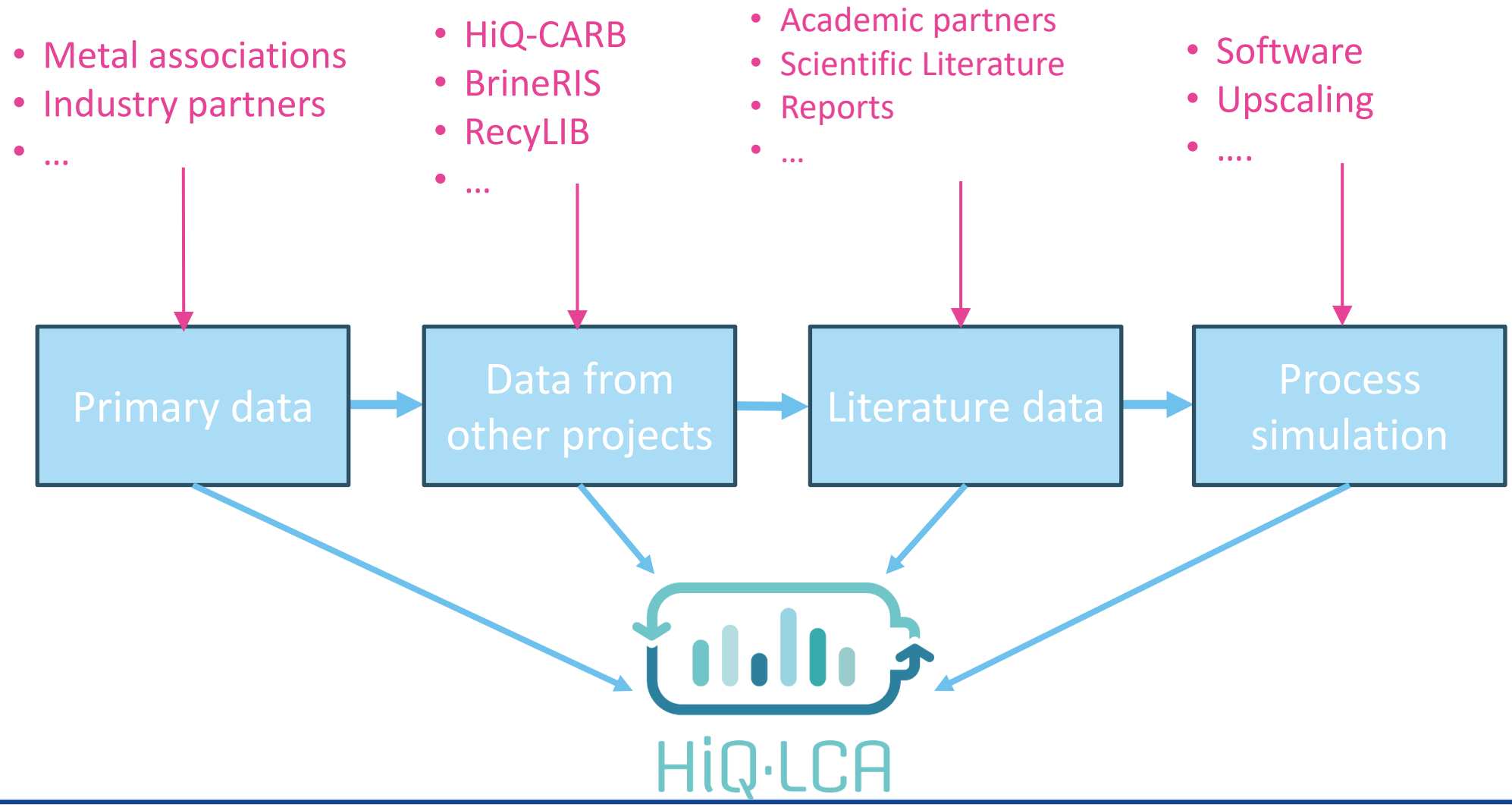
- from differente geographies (many data are representative of Europe only)
- and from different production pathways

***Depending on the development of right of use EF and CFB core-data, HiQ-LCA might target EF-compliance**

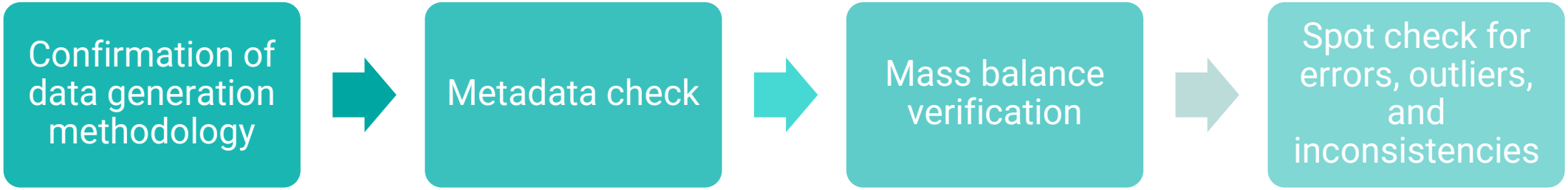
NEED: HIGHER RESOLUTION OF SECONDARY DATA



DATA GENERATION: DIFFERENT SOURCES



DATA CONSISTENCY AND COMPLETENESS

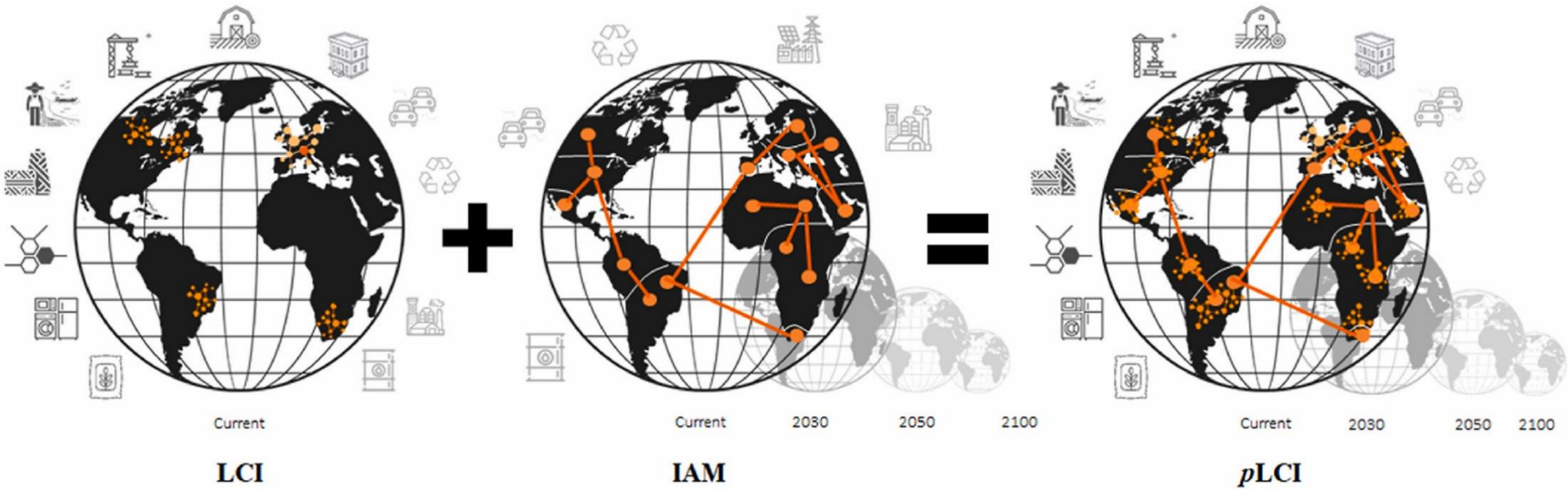


- Confirm that the data collection methods are appropriate, checking the reliability of the sources
- Checking sources, dates and other relevant information, identifying potential biases or limitations
- Ensure that there are no discrepancies or losses in the system being studied
- Identifying errors, outliers and inconsistencies in the data

INNOVATIVE METHODOLOGICAL GUIDANCE FOR CONSISTENT COMPILATION OF LCI DATASETS

- Thorough analysis of existing guidelines as performed in the Horizon Europe TranSensus LCA project
- HiQ-LCA datasets shall primarily be compliant with the ecoinvent methodology, provided in both Spold2 format & ILCD format
- Compliance systems to be targeted (EF-compliance, Batteries-Regulation and/or Catena-X-compliant) depending on their development
- Harmonizing diverse LCA guidelines to create a unified methodology
- Innovative methodological guidance for consistent compilation of LCI datasets was developed
- Transparent data aggregation needed while addressing industry-specific confidentiality requirements
- Challenges remain in achieving full regulatory alignment due to evolving legislative frameworks
- Work is in progress on refining methodologies, addressing data confidentiality concerns, and expanding industry adoption of best practices
- Validating dataset compliance, finalizing the framework for addressing data confidentiality and aggregation within HiQ-LCA for broader implementation is in progress

WP5 - MODELLING OF FUTURE-ORIENTED DATA SETS



Renewable and Sustainable Energy Reviews ***2022***, 160, 112311

DECARBONIZATION PATHWAYS SERVICE

Based on high quality LCI data developed within the HiQ-LCA project

Start-up expertise in battery manufacturing processes and battery supply chain

Integrating advanced modelling approaches in scenario analysis with future-oriented LCI datasets developed in the HiQ-LCA project

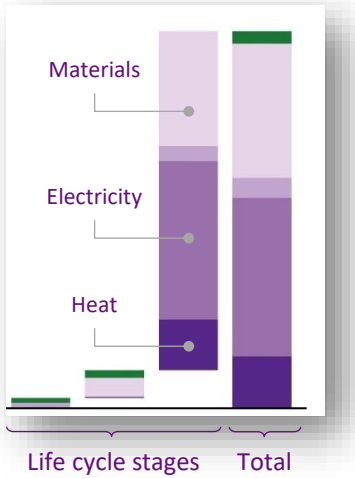
GHG emissions hotspot analysis

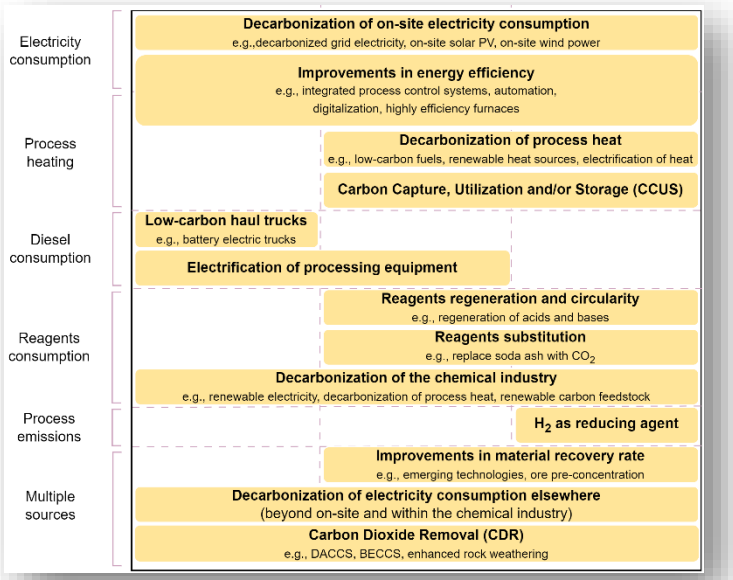
Scope 1, 2, 3

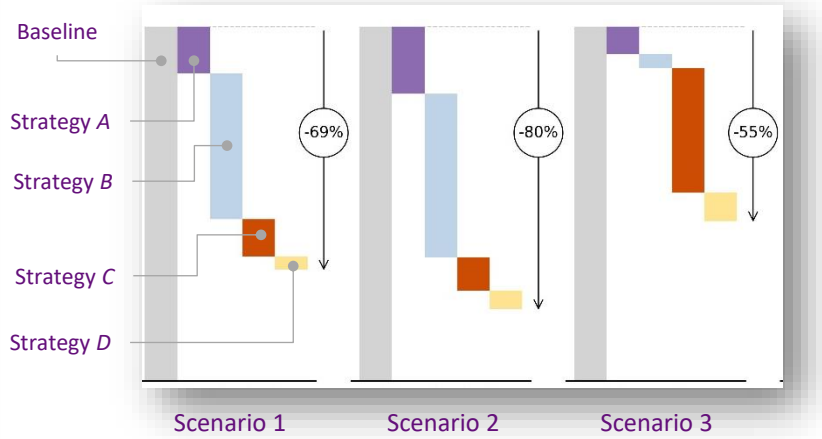
Customized blueprint of available decarbonization strategies

Quantify mitigation potential with scenario analysis and prospective LCA

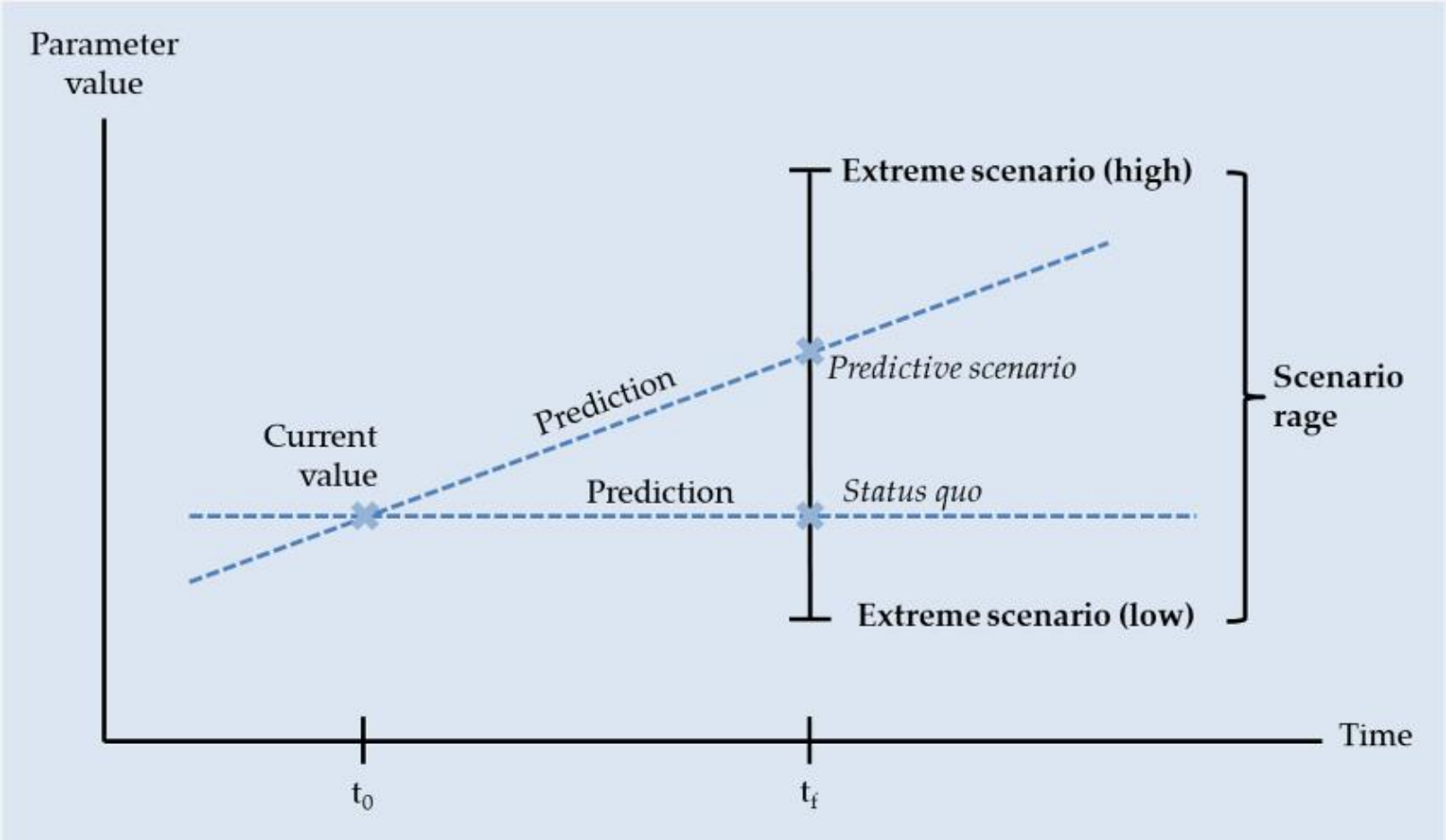
Decarbonization pathways







INVENTORY MODELLING IN PROSPECTIVE LCA

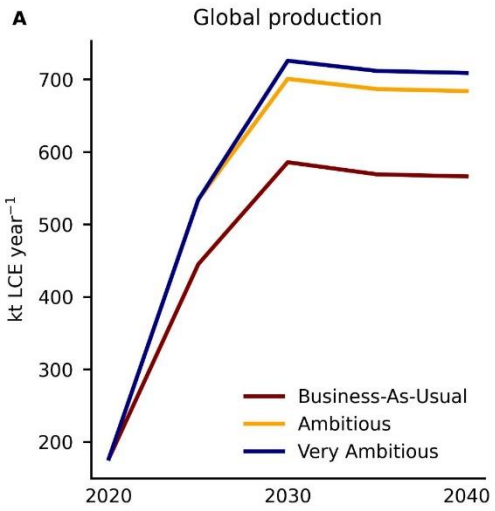


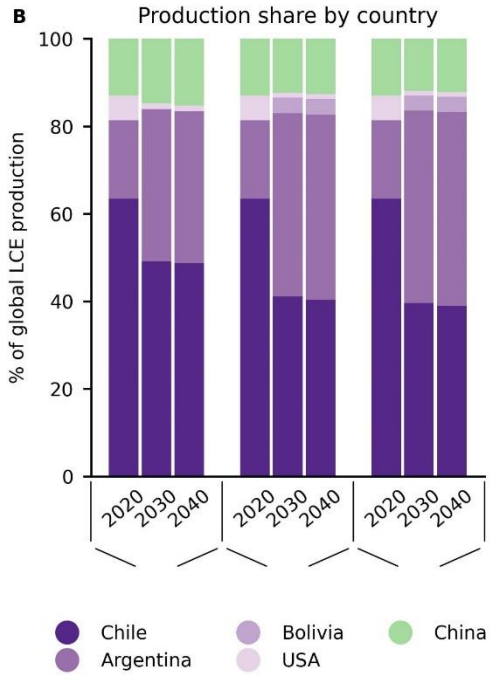
Sustainability ***2020***, 12, 1192

BOTTOM-UP GENERATION OF SUPPLY SCENARIOS

Example of results for brine-based lithium carbonate supply*

Models for graphite mining are in progress





Market activity for brine-based lithium carbonate supply in 2040 in the Very Ambitious scenario

*Preliminary results

WP6 - PRODUCTS AND SERVICES

Training on Carbon Footprinting of products and organisations conducted at the University of Bordeaux, 06 May 2025 as part of WP6

TARGET MARKET FOR HIQ LCA

Primary market

- Automative manufacturers
- Other OEM industries
- Electronics

- Big Battery manufacturers
- Megafactories
- Small & Medium Battery manufacturers

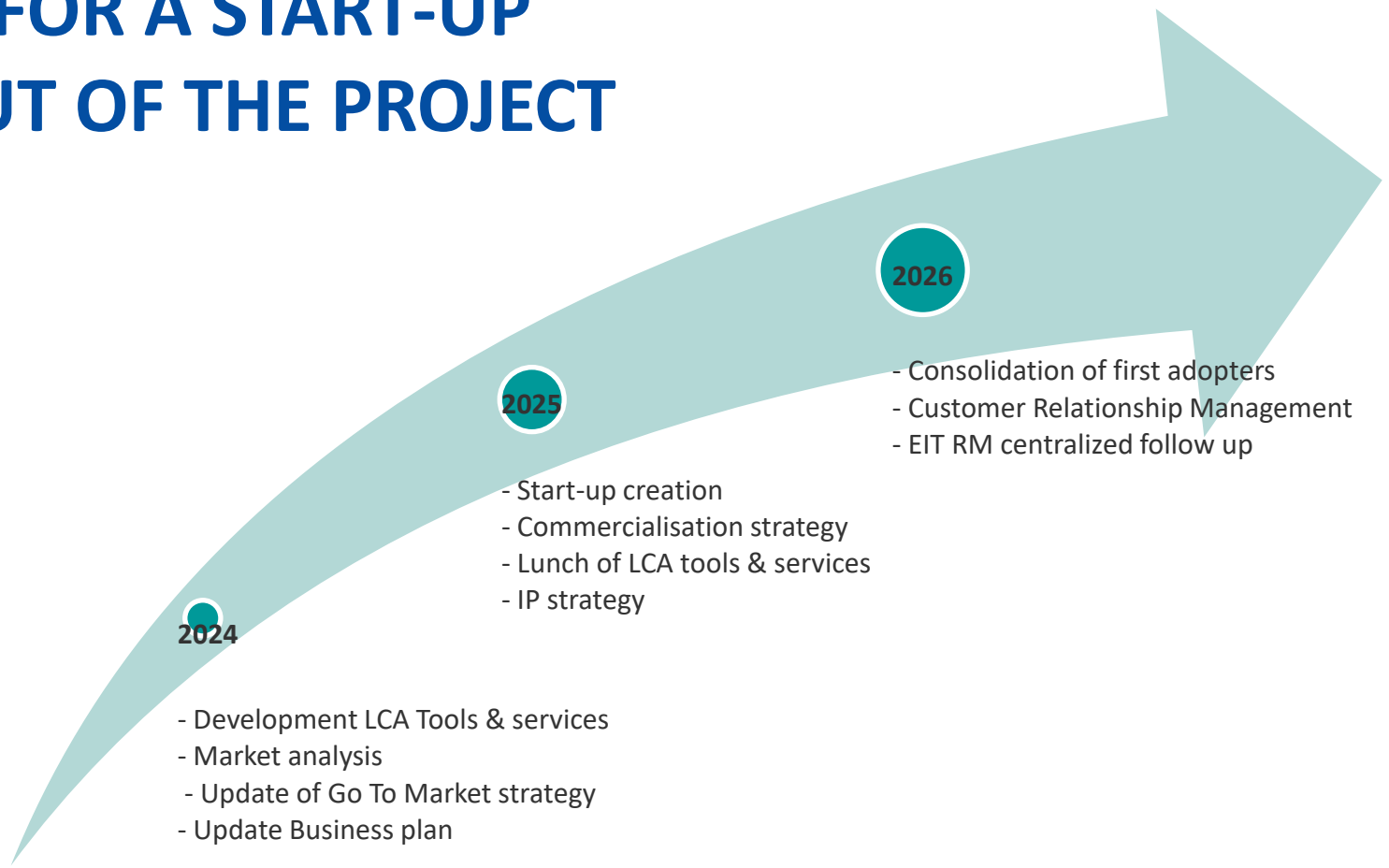
- Key components suppliers
- Other components suppliers

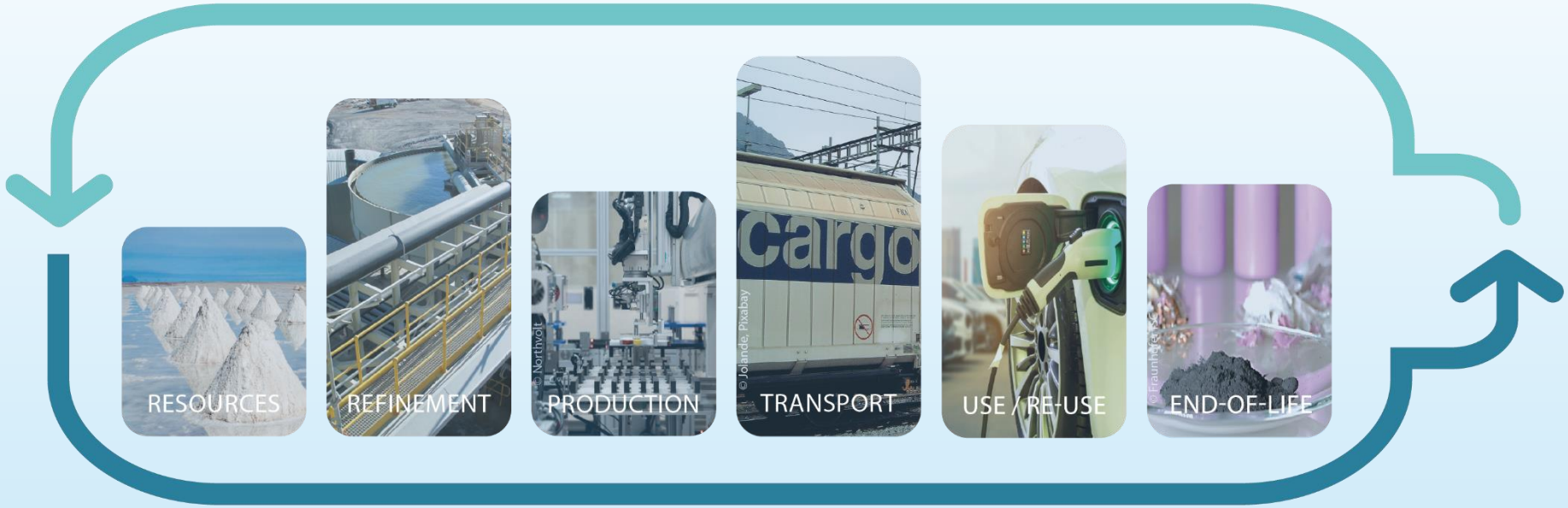
Secondary market

- Investment institutions
- Consultants for the primary market

Legend

TIMESCALE FOR A START-UP COMING OUT OF THE PROJECT





HiQ-LCA – High Quality Life Cycle Assessment – Data, Tools, Services

Thank you for your attention