Map of key stakeholders

Deliverable D1.2

Version N°0.3

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<tr>
<th>Grant Agreement</th>
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<td>CTA</td>
<td>Call-to-Action</td>
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<tr>
<td>CDE</td>
<td>Communication, Dissemination and Exploitation</td>
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<tr>
<td>H</td>
<td>Heading</td>
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<tr>
<td>OEM</td>
<td>Original Equipment Manufacturer</td>
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<td>SAB</td>
<td>Stakeholder Advisory Board</td>
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<td>WP</td>
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1. Introduction

For many years, rechargeable batteries have primarily been utilised in portable devices and managed at their end-of-life by well-established national battery collection schemes. However, batteries installed in electric vehicles (EVs) require a different set of reverse logistics processes due to their significantly larger size, higher energy capacity, and safety concerns. Consequently, a new set of stakeholders is required, ranging from EV repair workshops and refurbishers to specialised logistics operators, safety packaging OEMs, repurposers, recyclers, and data management platforms.

While the demand for new EV batteries has already grown exponentially, the number of used car batteries remains relatively small, and an established end-of-life value chain for EV batteries is yet to be developed. One of the key goals of BatteReverse is to connect reverse logistics stakeholders. As the first step towards achieving this goal, we have mapped companies that play an instrumental role in the management of EV batteries in Europe. Divided into 14 stakeholder types, this interactive map explains their specific roles and allows users to explore the locations and websites of over 140 companies. The map is available for everyone on the BatteReverse project website: https://www.batterreverse.eu/insights.

2. Objectives and methodology

The main goal of the D1.2 is to identify key industrial and policy-related stakeholders involved or having an impact on the reverse logistics process for Li-ion batteries. This deliverable will support the creation of the "AS-IS" model (D1.4) and help build the community of stakeholders as part of the Task 7.3 by exchanging sought-after information about key companies on the reverse logistics market.

The methodology followed to acquire the information presented in this deliverable is based on a desk research and interviews conducted by BAX with the support of L-PIT, EIT-UM, and validated with external stakeholders. First, a list of 14 key stakeholder types was identified and their roles were described, including some key parameters characterising them. The stakeholder types information was based on available literature (e.g. study on reverse...
logistics conducted at Lund University) as well as interviews with at least one representative of each stakeholder type, performed by BAX.

Then, a list of 10 key stakeholders in each stakeholder type was created, based on identified KPIs (e.g., the annual recycling capacity for pretreatment plants), as well as the following formal requirements:

- The company actively offers battery products or services, or has obligations related to the reverse logistics of li-ion batteries;
- The company offers their products or services in Europe and has an office in one of the European countries;

These requirements were verified by scanning the companies’ websites and through independent sources (such as market reports, research publications and interviews). In order to ensure validity of the map throughout the project, any company that has not been included on the map has the possibility to submit a request through BatteReverse website and it will be added as long as it meets the formal requirements explained above.

3. Stakeholder types

14 stakeholder types have been identified to cover the whole scope of reverse logistics processes of EV batteries. These types are presented in Table 1 and explained in the following subchapters.

<table>
<thead>
<tr>
<th>Stakeholder types</th>
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<tr>
<td>Battery OEM</td>
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<td>EV OEM</td>
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<td>Refurbisher</td>
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<td>Third-party logistics operator</td>
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<td>Online marketplace</td>
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<td>Pretreatment plant</td>
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<td>Material refinery</td>
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<td>Data management platform</td>
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<tr>
<td>Research &amp; innovation</td>
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<tr>
<td>Battery marketplace</td>
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3.1. Battery OEM

These companies produce battery cells according to the requirements of their application (e.g. electric vehicles). Each cell is made of cathodes, anodes, a separator, and electrolyte, and they can have various shapes: cylindrical, pouch, and prismatic. Cells are typically transported to another facility where they are integrated into modules and battery packs, ready to be installed in electric vehicles. Production scrap from the cell manufacturing process is collected and transported to a recycling facility.

3.2. EV OEM

EV OEMs play a crucial role in the reverse logistics of batteries since they introduce EVs to the market and thus hold the Extended Producer Responsibility, which means they are responsible for the treatment of batteries coming from the production process and from end-of-life EVs. EV OEMs also train their authorised workshops on how to repair and extract batteries from EVs.

3.3. Refurbisher

Refurbishers are typically independent car workshops specialised in the repairs of electric vehicles. They perform an assessment of batteries and replace damaged/degraded batteries to restore their original condition or upgrade them. Refurbishers are often experts in reverse engineering - holding know-how on communications with the battery management system of various EV brands.

3.4. Car dismantling network

Car dismantlers (Authorised Treatment Facilities or ATFs) are car recycling companies which hold a permit to dismantle and depollute scrap cars according to the End-of-Life Vehicle Directive. ATFs are the only organisations that can issue car owners with a Certificate of Destruction - a document to prove responsibility for the vehicle has ceased. Car dismantlers become the owners of parts from vehicles, including EV batteries, which can be sold to repurposers or sent to recyclers.
3.5. Packaging OEM

These companies produce packaging for the safe transportation and storage of batteries which are used by logistic operators. There are several types of packaging which depend on the state of safety (SoS) of the battery, which is defined by the battery owner (EV OEM, car dealership, dismantler): green (new and undamaged), yellow (prototypes, used, and non-critically damaged), and red (critically damaged).

3.6. Battery collection scheme

Battery collectors (or National Collection Schemes for Batteries) usually offer a wide range of services for EV battery disposal, e.g. they organise the collection of li-ion batteries from dealers and dismantlers, as well as the transport to the recycler or re-user in accordance with the preferences of the car producer. They also fulfil the reporting obligations.

3.7. Third-party logistics operator

3PL operators are responsible for the transportation of the battery packs and modules, ensuring compliance with environmental regulations and safety standards. These companies may work with recyclers or other companies that specialise in the processing of end-of-life batteries. 3LP for black mass is responsible for safely and securely transporting the black mass from the pretreatment plant to the metal refineries.

3.8. Repurposer

Repurposers give a new life to batteries that are no longer suitable for electric vehicles but have a sufficient state of health for less demanding applications. This stakeholder may use the whole battery pack or dismantle it into modules or cells to develop a new product. The two main applications for repurposed EV batteries are behind-the-meter (e.g. residential) and front-of-the-meter (grid scale) stationary energy storage systems.

3.9. Pretreatment plant

The pretreatment process involves discharge, dismantling, mechanical shredding, and sorting. The outcome of these steps is a black mass, which is a mix of the battery’s active materials (such as cobalt, nickel, manganese and lithium). These companies receive end-of-life batteries from different stakeholders (e.g. EV OEMs) and they send the black mass to metal refineries.

3.10. Material refinery

The material refinement companies collect black mass that comes from the pretreatment plant and refine it to get secondary raw materials such as nickel sulphate, cobalt sulphate, manganese carbonate, and lithium carbonate. Modern facilities most commonly use a highly efficient hydrometallurgical process which involves steps such as leaching, solid-liquid
separation, purification, and precipitation. The resulting materials are sold to producers or cathode active materials.

### 3.11. Circular management

Companies that use a mix of software platforms and consultancy services to facilitate the full end-of-life management of EV batteries, including collection, logistics, testing, document generation, transfer of ownership, and data analysis of batteries.

### 3.12. Data management platform

These platforms offer various data management services throughout the full life cycle of the battery, such as traceability, regulatory compliance, carbon footprint analysis, state-of-health characterisation, and safety monitoring. Most platforms are related to the regulation on battery passports, which establishes principles of data sharing between battery stakeholders.

### 3.13. Battery marketplace

2nd life marketplaces help to connect the supply and demand of batteries from EVs. Customers (individuals or businesses) can use these platforms to sell or buy batteries in the form of packs, modules, or cells, while the marketplace operator usually handles the logistics, data exchange, and transactions.

### 3.14. Research & innovation

Research institutes and innovation actors help improve the reverse logistics of batteries by advancing research on technologies and developing new business solutions. CEA, Inegi, Centria, and UPV are the coordinators of Horizon Europe projects under the call HORIZON-CL5-2022-D2-01-10, which aims to develop streamlined collection and reversed logistics, fully automated, safe, and cost-efficient sorting, dismantling, and second use before recycling.

### 4. Map functionality

The stakeholder map is showcased on the BatteReverse project website within the insights window: [https://www.battereReverse.eu/insights](https://www.battereReverse.eu/insights). For user's convenience, seamless navigation through the stakeholders will be facilitated by an interactive mapping tool Mapbox. On the left-hand side of the interface, a list of company information is made available, aiming to ease users' search and gathering of data.

As one of the key features of the BatteReverse project website, the stakeholder map is designed to provide valuable information and foster a better understanding of the EV battery ecosystem. Its interactivity and the information from companies are set to serve as valuable resources and collaboration between stakeholders.

For a visual reference, a screenshot of the map is presented in the Figure 1 below.
Due to the high number of icons on the map, two distinct filtering mechanisms have been implemented to enhance navigability and overall user experience. The primary filtering mechanism sorts between the stakeholder types, allowing for clear visualisation of the distinct players operating within each sector. Simultaneously, the secondary filtering feature adopts a country-centric approach, enabling the viewer to study the different stakeholders within each country, which may lead to valuable networking opportunities. Examples of these two sorting methods are shown in the Figure 2 and Figure 3.
D7.2 BatteReverse Community Platform
Version 0.3

Figure 2 Stakeholder type filter

Figure 3 Country filter

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Each icon featured on the map corresponds to a distinct company, and upon the user's click on any given icon, a pop-up banner is triggered, presenting key details of the respective company (company's logo, geographical location, and website).

Furthermore, the pop-up display will also indicate whether the company is on the BatteReverse community platform. The inclusion of this information is aimed at encouraging user engagement and incentivising sign-ups to the platform.

By offering users a glimpse into the basic attributes of each company we aim to increase the interest in signing up on the community platform. The map will be gradually complemented with more detailed information on stakeholders, which will be available for the signed-up users. An example of the attributes and the banner is displayed in Figure 4 below.

![Company information banner](image-url)

*Figure 4 Company information banner*