



Partnership Evaluation Report: **European Partnership for Batteries (BATT4EU)**

Horizon Europe and the Green Transition
Interim evaluation support study

Independent
Expert
Report



Research and
Innovation

Partnership Evaluation Report: European Partnership for Batteries (BATT4EU)

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Interim evaluation support study

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I. Key definitions, acronyms and glossary

Abbreviation	Definition
BATT4EU	European Partnership for Batteries
BEPA	Batteries European Partnership Association
CETP	Clean Energy Transition Partnership
CSA	Coordination and support action
H2020	Horizon 2020
HE	Horizon Europe
HES	Higher or Secondary Education Establishments
IA	Innovation Actions
IPCEI	Important Projects of Common European Interest
JRC	Joint Research Centre of the European Commission
KDT	Key Digital Technologies Partnership
KIP	Key Impact Pathway
LCA	Life-cycle assessment
MoU	Memorandum of Understanding
NRCG	National and Regional Coordination Group
OTH	Other
PRC	Private for-profit entities (excluding Higher or Secondary Education Establishments)
PSIP	Partnership-specific impact pathway

Abbreviation	Definition
PUB	Public bodies (excluding Research Organizations and Secondary or Higher Education Establishments)
REC	Research Organisations
RIA	Research and innovation actions
R&I	Research and Innovation
SRIA	Strategic Research and Innovation Agenda
TRL	Technology Readiness Level
2ZERO	Towards Zero-emission Road Transport

1. Introduction

This evaluation report is part of the interim evaluation of Horizon Europe's activities related to the Green Transition. The purpose of this evaluation report is to provide an assessment of the Co-programmed European Partnership for Batteries (BATT4EU) established under Horizon Europe against the given set of nine evaluation criteria, namely relevance, coherence, efficiency, effectiveness, EU-added value and additionality, directionality, international positioning and visibility, transparency and openness, as well as phasing out preparedness.

The data collection process for the partnership evaluation comprised one phase, incorporating information from Horizon Europe. The primary data collection was concluded by July 2023 and based on a CORDA extraction from March 2023. Supplementary data from the forthcoming Biannual Monitoring Report 2024 was incorporated in December 2023. Due to the short runtime of the Horizon Europe Partnerships, it is noteworthy to bear in mind that many of the partnerships' activities are still ongoing and have not yet been fully accomplished.

The evaluation of the BATT4EU partnership utilises a mixed-method approach, combining both quantitative and qualitative data analysis. The quantitative analysis involves examining funding data and project portfolio data. The qualitative analysis entails conducting desk research, analysing strategic documents, information material found on the Partnership's website and social media, as well as material pertaining to the monitoring progress of the Partnership. In addition, three expert interviews were conducted with five individuals who hold positions on the management board of the Partnership, with beneficiaries of the Partnership, and with representatives of the European Commission. These interviews served to gather insights and validate the findings from the analysis. The interviews were conducted using a semi-structured, exploratory approach guided by questions that reflected the evaluation dimensions of this report. A detailed account of the interview guidelines is presented in Annex 8.1.

2. Background to the Initiative

BATT4EU is a co-programmed partnership in Cluster 5 of Horizon Europe¹ (06/2021-12/2030) without a predecessor in H2020. The Partnership was officially launched on 23 June 2021 during the European Research and Innovation Days, when the European Commission and BEPA – the Batteries European Partnership Association – signed the Memorandum of Understanding (MoU).² It is a contractual public-private partnership gathering – on the public side – the European Commission, and – on the private side – BEPA, which regroups battery stakeholders from the European Research community.³

BATT4EU's vision is to foster a competitive, sustainable, and circular battery value chain and to drive the transition towards a carbon-neutral society. Through research and innovation (R&I), BATT4EU aims to contribute to bringing next-generation battery technologies to the commercial market by 2030. These technologies facilitate the widespread adoption of zero-emission transportation and renewable energy storage. Through a long-lasting effort involving industry, research and the public sector, the Partnership has the ambition to pool Europe's resources and knowledge and to increase predictability for EU battery value-chain stakeholders. Ultimately, the Partnership intends to create the world's leading innovation ecosystem in Europe by 2030 in battery energy storage technology and manufacturing. R&I efforts shall increase the material performance and push the limits in chemistry, enhance manufacturing processes, enable smart integration in various applications, and ensure affordable re-use, recycling, and sustainability across the entire battery value chain.⁴

A more detailed description of the governance, strategic and specific objectives, as well as the intervention logic of BATT4EU is given in Annex 8.1.

3. Implementation State of Play

3.1. Thematic Structure

The BATT4EU partnership mainly covers R&I activities dealing with the upstream segments of the battery value chain, from raw materials to battery cell manufacturing. R&I focus areas of the BATT4EU partnership comprise raw materials and recycling, advanced materials and manufacturing, battery end-uses and operations, and the two cross-cutting topics of safety and coordination. Although R&I activities cover the whole value chain, the key priorities of BATT4EU are advanced materials and battery cell design and manufacturing, as well as battery recycling and secondary raw materials (see Figure 6 in Annex 8.2).⁵ These parts of the value chain have been identified as requiring key R&I activities to reach the goal of a competitive EU battery industry.⁶

¹ Biennial Monitoring Report 2022 on Partnerships in Horizon Europe, pp.307-312.

<https://ec.europa.eu/research-and-innovation/en/knowledge-publications-tools-and-data/interactive-reports/performance-european-partnerships-2022>

² BEPA website. <https://bepassociation.eu/batt4eu-a-new-milestone-for-a-more-competitive-and-sustainable-eu-battery-value-chain/>

³ BEPA website. <https://bepassociation.eu/about/batt4eu-partnership/>

⁴ SRIA pp.29-31. <https://bepassociation.eu/our-work/sria/>

⁵ SRIA pp. 35-36 <https://bepassociation.eu/our-work/sria/>

⁶ Steen M., Lebedeva N., Di Persio F., Boon-Brett L., EU Competitiveness in Advanced Li-ion Batteries for E-Mobility and Stationary Storage Applications –Opportunities and Actions, European Commission, Petten, 2017, JRC108043.

3.2. Project Portfolio

The BATT4EU project portfolio within Horizon Europe comprises 24 projects at the date of preparation (Source: e-Corda, 1 May 2023). The present analysis of the portfolio - of 7 calls open in 2021 - with respect to its distribution across funding instruments, and sectors as well as countries of beneficiaries can be found in Annex 8.3.

3.3. Other Activities

The batteries sector currently faces rapid and heterogeneous developments both in the technological and in the business/industrial domain, mainly driven by e-mobility and pressing global competitiveness challenges. In this situation, we observe several R&I initiatives and industrial policy activities at the European level, which set up a complex institutional landscape and are of immediate relevance to BATT4EU.

Batteries Europe is the European Technology and Innovation Platform (ETIP) aiming at accelerating the establishment of a globally competitive battery industry in Europe. Thus, Batteries Europe has very similar ambitions to the BATT4EU Partnership. However, while Batteries Europe aims mainly at identifying all the R&I needs across the battery value-chain at every TRL level, the BATT4EU Partnership focuses on prioritising the most urgent R&I areas to be addressed within the Horizon Europe Work Programme with the aim to make the European battery industry more competitive and sustainable. Currently, BEPA and Batteries Europe are working in integrated working groups to develop together a common Strategic Research and Innovation Agenda. Along with this, BEPA and Batteries Europe also work together in Task Forces on transversal topics across the battery value chain. Finally, Batteries Europe also serves as an Advisory Committee in BEPA facilitating information exchange and coordination between the Horizon Europe Partnerships, Member States, relevant regions and other structures directly addressing different parts of the batteries value chain.⁷

Close synergies and collaborations of BATT4EU exist with those partnerships that see batteries as an enabler, namely Towards Zero-emission Road Transport (2ZERO), Zero-emission Waterborne Transport, Clean Aviation, and Europe's Rail JU. All these sectors are relying on batteries to limit their CO₂ emissions. And with all those partnerships close connections were indicated and realised through joint workshops and, for the Zero-emission Waterborne Transport partnership, also through shared personnel. BEPA and EGVIafor2Zero, the private-sector association within the 2ZERO Road Transport partnership, worked together and defined a joint call which focuses on developing a commonly accepted life-cycle assessment (LCA) for zero-emission vehicles and their batteries. The joint call was taken up in the 2021-22 Work Programme⁸. These collaborations are in line with BATT4EU's objective stated in the SRIA (p 94) to collaborate with partnerships that focus on battery end-users for different applications. Regarding initiatives for battery technologies, collaborations exist with the Key Digital Technologies Partnership (KDT) and the Clean Hydrogen for Europe Partnership.⁹

The BATT4EU Partnership has also established collaborations with the BATTERY 2030+ initiative, a Coordination and Support Action funded under the Horizon 2020 programme. Furthermore, a formal collaboration has been established between BATT4EU, the Joint

⁷ BEPA website. <https://bepassociation.eu/synergies-and-collaborations/the-etip-batteries-europe/>

⁸ [HORIZON-CL5-2021-D5-01-04](https://ec.europa.eu/research-and-innovation/en/knowledge-publications-tools-and-data/interactive-reports/performance-european-partnerships-2022)

⁹ Biennial Monitoring Report 2022 on Partnerships in Horizon Europe, pp.307-312.
<https://ec.europa.eu/research-and-innovation/en/knowledge-publications-tools-and-data/interactive-reports/performance-european-partnerships-2022>

Research Centre of the European Commission (JRC), and the 2ZERO Partnership, which shall again enable the sharing of information and the dissemination of project results. Through yearly meetings, synergies between key topics of JRC's work and R&I topics that are in the scope of the BATT4EU and 2ZERO Partnerships can be identified so that JRC can provide data and other relevant input that can inform the work of BEPA's Working Groups and vice versa. For setting priorities for the 2023-24 Work Programme for BATT4EU, BEPA collaborated closely with the ETIP Batteries Europe and the Battery 2030+ initiative in developing technology roadmaps. In this context, BEPA accounted for suggestions of the working groups of these initiatives, who presented their technology roadmaps as well as suggestions for areas of interest to the members of the BEPA working groups.

Furthermore, in collaboration with Batteries Europe and BATTERY2030+, and Partnership with the two IPCEI Batteries¹⁰ (European innovation and competitiveness initiatives with an exemption from the usual state aid rules), the Batteries European Partnership Association (BEPA) organises a conference called the Battery Innovation Days¹¹. In November 2023, it took place for the third time. The event stands out as an important forum which allows for networking opportunities with an industrial and research network which covers different parts of the battery value-chain.¹²

4. Results

4.1. Relevance

Batteries and energy storage in general are a key enabling technology and a relevant requirement for the green transition of both the energy and the transport sectors. Batteries enable the decarbonisation of various modes of transportation, including road, rail, air, and waterborne, which collectively contribute to 16% of global greenhouse gas emissions reductions¹³. Additionally, batteries enable the widespread utilisation of intermittent renewable energy sources and their integration into the grid, enhancing energy security and quality while also supporting electricity access in developing countries. Thereby, commercialising solutions for the electrification of the transport sector in Europe is seen as especially important, considering global challenges such as competitiveness and the necessity of lower dependence on countries outside of the EU.¹⁴

Interviewees underlined that from an R&D perspective, the BATT4EU partnership contributes to the Green Transition by contributing both to the electrification of the transport sector and the integration of intermittent renewables in the power grid. It plays an important role in creating and reinforcing the battery community and the whole battery value chain at the European level. As a success factor, the important role of BATT4EU in integrating R&D activities at different levels was highlighted and the ambition of the Partnership to serve as a future reference point for aligning R&D investments in the battery sector at the European,

¹⁰ IPCEI Batteries website. <https://www.ipcei-batteries.eu/>

¹¹ Battery Innovation Days 2021 website. <https://www.eba250.com/battery-innovation-days/>

¹² Biennial Monitoring Report 2022 on Partnerships in Horizon Europe, pp.307-312.
<https://ec.europa.eu/research-and-innovation/en/knowledge-publications-tools-and-data/interactive-reports/performance-european-partnerships-2022>

¹³ The World Economic Forum and the Global Battery Alliance - A Vision for a Sustainable Battery Value Chain in 2030: Unlocking the Full Potential to Power Sustainable Development and Climate Change Mitigation (Sept. 2019)

https://www3.weforum.org/docs/WEF_A_Vision_for_a_Sustainable_Battery_Value_Chain_in_2030_Report.pdf. P. 12

¹⁴ SRIA. <https://bepassociation.eu/our-work/sria/>

national, and regional level while also including the private sector was noted. In this line, the Partnership supports the goals of the European Green Deal and the Fit For 55 plan for a green transition and is also totally aligned with the ambition of the European Battery Alliance.

The drafting of BATT4EU's SRIA, finalised at the beginning of May 2021, was conducted by a group including organisations active in the field of raw materials and end-of-life, advanced materials, cells and batteries, mobility applications, stationary and other applications, as well as research organisations and supporting organisations. Furthermore, participation from stakeholders along the value chain was possible and a range of public and private organisations, along with European associations and technology platforms, were involved to ensure broad stakeholder engagement. Additionally, representatives from other partnerships were also invited to contribute.¹⁵

The BATT4EU partnership appears flexible in updating its strategic documents and activities. For example, the (hybrid) Battery Innovation Days 2022 addressed the policy priority of "Strategic autonomy for the EU battery value chain" explicitly as a separate topic on its agenda¹⁶. The topic has gotten more prominence in recent years, which is partially because of the setup of the Working Groups. In summer 2022, the work programme 2023-2024 was finalised, whereby BEPA experts lead the drafting and development process within different technical working groups and in collaboration with European Commission services¹⁷. Since its formal adoption in September 2021, the SRIA of the BATT4EU partnership has not been changed. Interviewees describe the SRIA as flexible and dynamic, so that a change of activities of the Partnership that is due to changing policy needs (the Russian invasion in Ukraine) can still be incorporated within the existing SRIA. In 2022, BEPA and the Batteries Europe ETIP merged their working groups. The first big iteration of the SRIA was indicated to be planned for September 2023 and is currently under development by these new joint working groups to align agendas within the battery R&I ecosystem and to avoid multiple similar documents. The updated SRIA is expected to take effect in the 2025 work programme. The process of updating the SRIA is implemented with the support of two different CSAs, supporting the aforementioned ETIP Batteries Europe and the Battery 2030+ initiative.

4.2. Coherence

Batteries have an enabling role as a horizontal technology that helps other sectors (e.g., rail or maritime) reach their zero-emission goals. Batt4EU sees itself as a coordinator within the complex and quickly evolving institutional landscape in European battery R&I and industrial policy, described in Section 3.3, Other. The Strategic Research and Innovation Agenda (SRIA) is the result of a comprehensive consultation process, starting top-down with a co-creation group inside the EC, complemented by a bottom-up process embracing the ETIP Batteries Europe and Battery 2030+, followed by a full inter-service consultation process and Member States consultation. The SRIA subsumes respective coordination activities under four groups of initiatives:

- **Collaborations to integrate batteries downstream** in their field of application, like waterborne, road transport and aviation (Figure 1 gives an overview of examples for how BATT4EU currently or later this year expands links to other partnerships and initiatives); for instance, in the 2021/22 Work Programme, Batt4EU and the 2ZERO

¹⁵ SRIA. <https://bepassociation.eu/our-work/sria/>

¹⁶ Agenda of Battery Innovation Days 2022: <https://www.accelevents.com/e/battery-innovation-days-2022#agenda>

¹⁷ BEPA Activity Report 2022. <https://bepassociation.eu/our-work/publications/> P. 12.

Partnership defined a call on LCA for zero-emission vehicles and their batteries, extending to other applications of the same types of battery cells.

- **Coordination with key enabling activities** for the development of battery technologies, like recycling, manufacturing robotisation and digitalisation (see Figure 1). Targeted partnerships in this respect are Clean Hydrogen for Europe, Key Digital Technologies (KDT), the Clean Energy Transition Partnership (CETP), the Made in Europe partnership fostering robotisation, automatISATION and dismantling, and Processes4Planet, focusing on recycling issues.
- **Collaboration with initiatives that target market uptake:** From Pillar III, three EIT-KICs are relevant: EIT InnoEnergy, accelerating sustainable energy innovations and implementing the European Battery Alliance (EBA), EIT Raw Materials, aiming at sustainable competitiveness of the European minerals, metals and materials sectors, and EIT Manufacturing, bringing European manufacturing actors together in innovation ecosystems to inspire the creation of globally competitive and sustainable manufacturing, to support the scale up and exploitation of battery related projects and the uptake of results from projects into products.¹⁸ Collaboration with InnoEnergy is strong, with InnoEnergy coordinating the secretariat of Batteries Europe and being one of the main drivers in BEPA's Task Force on Innovation Uptake, making use of InnoEnergy's network, the business orientation and InnoEnergy's extensive activities in the realm of industry implementation.¹⁹ Generally, energy storage technologies, especially batteries are targeted also by the EU Innovation Fund, fed by means from the EU Emissions Trading System, and by the European Investment Bank, stepping up the financing of all stages of the battery value chain. An increase of synergies with the Innovation Fund to ensure a better transition for BATT4EU Horizon Europe projects towards receiving funding from the Innovation Fund to upscale new innovations is planned.²⁰
- A series of **specific coordination initiatives** were launched. At the EU level, comprising the ETIP Batteries Europe and Battery 2030+, where Batt4EU integrated their priorities in its SRIA, organising the Battery Innovation Days. With the JRC, a joint declaration on battery technologies and testing collaboration was signed, including the 2Zero Partnership, an important complement of battery R&I are the two Important Projects of Common European Interest (IPCEIs) on batteries, leveraging EUR 3.2 billion and EUR 2.9 billion for industrial investments in the battery value chain in 7 and 12 Member States respectively. In the context of the Smart Specialisation Strategy (S3), the inter-regional platform on advanced materials for batteries for electro-mobility and stationary energy storage, an initiative launched in 2018 by the EC, is envisaged for collaboration. Last, but not least, the National and Regional Coordinators Group (NRCG) of Batteries Europe is expected to play an important role in linking up with national initiatives in the Member States and will serve as the States' Representative Group for the BATT4EU Partnership. For example, NRCG members and BATT4EU and Batteries Europe representatives meet regularly to share information on what is happening at EU/national/regional levels. Tools are also being put in place to make the sharing of information and data

¹⁸ <https://bepassociation.eu/synergies-and-collaborations/other-key-initiatives/>

¹⁹ <https://bepassociation.eu/our-work/task-forces/>

²⁰ Indicator no. 8.6, BMR-Survey Data 2023 received from EC.

more systematic. In particular, information is shared on the strategies concerning R&I activities, industrial uptake, education & skills, and policy frameworks.²¹

As a further complement of R&I and industry policy, the Marie Skłodowska-Curie Programme (Pillar I) contributes to human resource development in the batteries field: The PhD Programme Destiny, coordinated by CNRS (France), in line with the European context around energy storage, especially Battery 2030+, supports European industry and academia within the rapidly emerging green technology areas of e-mobility and large-scale energy storage.

Applications	2Zero Road Transport	Joint workshop with the JRC in autumn, including information exchange on the Battery Regulation
	Zero-Emission Waterborne Transport	Joint workshop with nominated experts to align research targets on June 7
	Europe's Rail JU (FP4 Rail4Earth)	Joint workshop with nominated experts to align research targets on May 30
	Clean Aviation	Close alignment about SRIA and roadmap via common stakeholders
Manufacturing	MadeInEurope	Joint workshop later in the year
	EIT Manufacturing	Preparation of Memorandum of Understanding for more cooperation

Figure 1. Example of measures of BATT4EU that aim at expanding links to other partnerships and initiatives

The interviewees described the importance of collaborating with partnerships outside the battery's landscape. The CETP (Clean Energy Transition Partnership) has been mentioned as one for which collaborations should be reinforced. As barriers to realising synergies, interviewees mentioned:

- The difficulty in identifying the scope of other partnerships, which may hamper the topical coordination/delineation of calls for projects by the different partnerships;
- Realising synergies was described as more difficult between clusters than within clusters. For example, potential synergies exist with the Made in Europe and the Processes4Planet partnerships, as well as the necessity to develop transversal technologies that can serve different industrial sectors rather than focusing only on one specific industry;
- Administrative hurdles were described as impeding joint calls with Joint Undertakings (JUs), e.g., Clean Aviation since JUs dispose of a different call management method.

In terms of external coherence, from an R&D perspective, an important contribution of the BATT4EU partnership is that it serves as a point of reference for aligning investments that are being made at the national level. The BATT4EU Partnership also has the ambition to extend synergies with the national and regional level through a National and Regional Coordination Group (NRCG) that aims to exchange with Member States and Regions, to provide them with a view on the planned activities of the Partnership. Other cooperations at national and regional level include the S3 Regional Platform on Advanced Materials (SRIA p 92, and Table 5 in Annex 8.4).

²¹ Indicator no. 10, BMR-Survey Data 2023 received from EC.

The new EU regulation on batteries was adopted by the European Parliament and the Council in July 2023 to strengthen sustainability rules for batteries, setting step-by-step increasing targets in the upcoming years until 2031, for re-use, re-collecting and recycling quotas, as well as recycling efficiency targets covering the entire life cycle of batteries²².

4.3. Efficiency

Regarding the process of project application and selection, no considerable room for improving cost-effectiveness for applicants could be identified. Through its calls, BATT4EU addresses battery technologies ranging from TRL 2 to TRL 7, whereby its activities aim to support implementation at an industrial scale. Interviewees who are involved in processes of project application and selection describe them as efficient and as assuring an alignment with expectations and developments needed by the industry.

The direct leverage factor is a core requirement of this evaluation study and represents the additional funds from third parties, public or private, that the EU project budget funds have mobilised. For Batt4EU, according to the latest BMR data, in-kind contributions amount to EUR 500 million, and EUR 925 million correspond to the contribution of the Commission, resulting in a direct leverage factor of 0.54²³.

Following Corda Data, different definitions and detailed data have been available (see Table 6 in Annex 8.4). In BATT4EU, the total eligible costs amounted to EUR 298.7 million. The EU funding rate for all action types was 95.6%. The direct leverage factor for all action types was 0.044 for all actions. The innovation actions exhibited the highest leverage (0.343), although they are less important in Batt4EU in terms of total eligible costs.

In contrast, RIA (0.017) and CSA (0.023) have significantly lower direct leverage. The leverage from the Business Enterprise Sector was 0.086 for all action types, thereby, doubling the size of all organisations. Innovation actions in the Business Enterprise Sector yielded a leverage factor of 0.716.

Compliance demands for reporting on additional investments and activities that BATT4EU is performing outside of the Partnership were mentioned as a potential administrative burden. While potentially demanding, reporting shall shed light on leverage that goes beyond the pure execution of the projects, i.e., on other activities that the Partnership triggers. For improvement of programme management and administration, interviewees referred to announcements made by the European Commission about forward-shifting deadlines. For simplifying the Partnership reporting processes and templates, representatives of the Partnership recommended keeping definitions and explanations clear and similar on all forms²⁴.

4.4. Effectiveness

Data on the performance of the Partnership in terms of KPIs are still scarce because the Partnership has only quite recently started (see Table 7 in Annex 8.4). Concerning the effectiveness of the Partnership, interviewees highlighted the existence of specific KPIs at the project level that aim to measure impacts including the effectiveness of the technology or its societal impact. Similarly, information regarding progress on Key Impact Pathways (KIPs)

²² Regulation of the European Parliament and of the Council 2020/053 (COD) PE-CONS 2/23
<https://data.consilium.europa.eu/doc/document/PE-2-2023-INIT/en/pdf>

²³ BMR-Survey Data 2023 received from EC.

²⁴ Additional Question 2, BMR-Survey Data 2023 received from EC.

is still hardly available at this stage of partnership implementation. In the BMR, the amount of co-investment (KIP9) committed by the BATT4EU partners until August 2023 is reported as EUR 500 million, while for the whole duration, in-kind contributions of EUR 925 million have been committed.

Due to the confidential treatment of potentially competitive information submitted by companies, a caveat was identified in establishing robust reporting of the investments made by the industry that are contributing to the objectives of the Partnership. The demonstration of investments made by members of the Partnership is not yet directed by clear guidelines. This could represent an administrative obstacle when trying to ensure to meet the objectives. The complex battery landscape represents another obstacle to the Partnership's activities and stakeholder engagement; accordingly, the necessity of streamlining activities within the broader battery landscape has been stressed.

As of fall 2023, a bibliometrics evaluation exercise of Horizon Europe journal-publication-mediated scientific outputs is too early, and the necessary data is not available. The pre-Horizon Europe track record of Batt4EU researchers on dimensions that are enabling factors for project effectiveness is presented in Annex 8.5.

Since BATT4EU operates as a catalyst for investments by private industry and member states, the budget provided for the Partnership does not assure full implementation of the SRIA and presupposes private investments. The partnership association BEPA itself relies only on the annual subscription fee of its members. For steering the activities in the ecosystem, for example, when initiating the Battery Innovation Days, all the partners were contributing to the costs.

Safeguarding a diverse representation of the battery value chain, including a gender balance, is a functional objective of the BATT4EU Partnership, as set out in the Memorandum of Understanding²⁵. The gender balance is accounted for when involving relevant stakeholders within BEPA. Among the stakeholders involved in the Working Group Core Teams²⁶, the gender balance is currently 6 women compared to 12 men. This is up from the start of the Partnership when this was 4 women and 11 men. Similar advances have been made in other Governing Bodies, such as the BEPA Executive Board (2 women out of 10, up from 1) and the BEPA Association Delegation (5 out of 25, up from 3 out of 24), but improvements could still be made in this regard. The average share of female participants across projects amounts to 25% and is within the observed range across partnerships (Figure 10).

4.5. EU Added Value & Additionality

The added value BATT4EU provides to its stakeholders is manifold. The Partnership provides stakeholders and partners involved with a better overview of activities and actors across the battery value chain. Furthermore, it fosters collaboration and joint development of technologies between research, academia, and other partners. Both provisions create a valuable basis for investment decisions regarding the development of new technologies and whether they could be implemented at an industrial scale. In that sense, the collaborations fostered by the Partnership and the information provided contribute to the development of new business models and informed decision-making. According to partnership

²⁵ Memorandum of Understanding: https://research-and-innovation.ec.europa.eu/document/download/e901825e-6029-495a-90f0-bfd94a1e6531_en?filename=ec_rtd_batt4eu-partnership-signed-mou.pdf

²⁶ "Working Group Core Team List" retrieved from: <https://bepassociation.eu/our-work/technical-working-groups-and-supporting-task-forces/> (downloaded in July 2023)

representatives, BATT4EU has also contributed to the expansion of investments of its Partners to build new plants and facilities to deepen their research and industrial capabilities. New technologies being developed within the BATT4EU projects will see direct application in these new facilities. For example, BMW, which is involved in two Horizon Europe projects and active within the Partnership, will double their investments in their EV production facility in Hungary, adding a battery assembly facility²⁷.

BATT4EU addresses batteries as an ‘enabling’ technology and, therefore, indirectly contributes to the EU Missions. For example, batteries enable cleaner vehicles on the road in cities or help build greener vessels. In this context, the Climate Neutral and Smart Cities Mission and the Oceans and Waters Mission stand out as examples that are particularly related to the activities of the Partnership.

Through the task force on “education and skills development”, an identification of the specific added value that BATT4EU can bring to the EU ecosystem and of relevant gaps in training and skills development in specific battery sectors was carried out. Roughly, the added value for EU Member States created by the BATT4EU partnership can be summarised through the contribution to five key advantages: ensuring seven years long-lasting industrial support and commitment to a common R&I vision in the field of batteries; identification and implementation of strategic R&I activities; aligning R&I policy with industrial, environmental and education and training policies; leveraging technical and financial resources from the public and private sectors; and through contributing to better coordination of research across the European battery value chain.²⁸

4.6. Directionality

The BATT4EU partnership delivers results for the EU and its citizens by addressing batteries as an ‘enabling’ technology. The Partnership focuses on prioritising the most urgent R&I areas to be addressed within the Horizon Europe Work Programme. Global challenges of competitiveness, sustainability, industrial upscaling and market uptake are explicitly recognised within its intervention logic. This also entails more autonomy across the value chain, from raw materials to end-of-life batteries²⁹. The Partnership goes beyond traditional calls through the fostering of collaborations and the provision of information, which contributes to the development of new business models and informed decision-making through the openness of the Partnership to new members as well as the inclusion of a balanced variety of stakeholders from industry and research in the definition of topics for calls. Many BATT4EU partnership topics explicitly refer to the results of previous projects or ask to establish links with other topics, thereby underlining the cumulative and synergistic nature of the programme.

4.7. International Positioning and Visibility

The level of international cooperation in BATT4EU can be measured in terms of participation and budgets by country groups (see Table 3 in Annex 8.3). Accordingly, the EU-14 countries account for the major shares; only 3.4% of participation goes to EU-13 countries (2.7% of the budget), and Associated Countries (UK excluded) account for 5.3% of the participation (6.1% of the budget). Third-country participations in BATT4EU projects amount to a share of 1.6%, lower than for all projects within Cluster 5 (3%) and Cluster 6 (7%). According to interviewees,

²⁷ Indicator no. 2, BMR-Survey Data 2023 received from EC. Source of example: <https://europe.autonews.com/automakers/bmw-will-add-battery-production-new-hungary-plant>

²⁸ SRIA. <https://bepassociation.eu/our-work/sria/>

²⁹ Additional Question 1, BMR-Survey Data 2023 received from EC.

the Partnership gains international visibility through participation in battery conferences abroad (by BATT4EU management, members, or stakeholders), which are occasions to promote the activities of the BATT4EU partnership. Furthermore, international visibility could be triggered through open calls in WP 2023-24 that encouraged collaboration with stakeholders abroad (such as from the US, Japan and South Korea). Sometimes, open calls initiated other collaboration activities and visibility. For example, representatives of the Partnership were invited to join the EU mission in New Delhi to present a call to Indian stakeholders. As a result, the board of the Partnership was also represented and spoke at the EU-India Trade and Technology Council summit. Since one of the objectives of BATT4EU is to create a European battery value chain that competes with other regions in the world, according to representatives of the Partnership, international cooperation is not the most significant investment of the Partnership³⁰.

4.8. Transparency & Openness

Several aspects suggest that the BATT4EU partnership is transparent and open in its activities. Membership in the BEPA AISBL (International non-profit making association) is open to any industrial stakeholder, research organisation, university, and public service entity that performs activities in the European Union or countries associated with the Horizon Europe Programme shares the goals and objectives of the Partnership, is willing to pay the membership fee, and is engaged in research and development, demonstration, industrialisation, production, or deployment of technologies and services aligned with the Partnership's scope.

Independently of its BATT4EU membership, any organisation that complies with EC rules for Horizon Europe is eligible to apply to the calls launched by the partnership Work Programmes and is eligible for funding.³¹ In the past, BATT4EU could successfully involve new participants and members in its community. The process of updating the current version of the Partnership's SRIA is open to new participants. It is carried out by different working groups, whereby membership and the payment of the membership fee is not a prerequisite.

With 209 members in May 2023³², BEPA could successfully attract a large number of members to its network. Interviewees perceived the Partnership as successful in creating a network and community around batteries, covering different parts of the value chain, incumbents, newcomers, and other companies adjacent to batteries, as well as research institutions. Within the Partnership, the BEPA has the task of bringing stakeholders together and disseminating information about the state of play of battery research in Europe. For example, through events such as the Battery Innovation Days, which are co-organised by BEPA, the Partnership expands its network further and demonstrates the delivery of results and benefits created. For stakeholders involved, the Battery Innovation Days are an important occasion to gain insights on new technologies, start-ups etc. and for establishing new contacts and connections with other partners in Europe.

The participation patterns across countries reflect a strong underrepresentation of EU-13 countries (Figure 9 in Annex 8.4). The share of participation of EU-13 countries (3.4%) is significantly lower than the participation shares across all projects within Cluster 5 (9%) and Cluster 6 (13%) (Source: eCorda). This issue is planned to be addressed by an outreach plan and future activities and events that target EU-13 countries more specifically. Those include visits to these countries during important events (Horizon4Poland and others) and

³⁰ Indicator no. 4, BMR-Survey Data 2023 received from EC.

³¹ SRIA p.92. <https://bepassociation.eu/our-work/sria/>

³² <https://bepassociation.eu/>

participation on the advisory board of the Fit4NMP project aimed at getting newcomers from unrepresented regions into Horizon Europe³³. Furthermore, interviews with project participants suggested that information on the Partnership's synergies and activities conducted in connection to other partnerships could be improved.

4.9. Phasing Out Preparedness

The possibility of the phasing-out of the Partnership from the Framework Programme funding is addressed in the updated SRIA, which is currently under formulation. Interviewees suggested the possibility of a voluntary partnership which recommends topics for calls.

5. Conclusions

In defining R&D priorities, the Partnership was able to establish a process which assured an alignment with expectations and developments needed by the industry and a balanced participation of representatives from industry and academia. This contributed to making the BATT4EU Partnership successful in prioritising urgent R&I areas to be addressed within the Horizon Europe Work Programme. Key priorities of BATT4EU range from technological readiness level 2 to 7 and focus on advanced materials and battery cell design and manufacturing, as well as battery recycling and secondary raw materials. The Partnership contributed to aligning R&D activities within a complex battery landscape involving academia, research, industry, and other stakeholders. Through outreach activities, and in particular the Battery Innovation Days, BATT4EU could effectively expand its network to 209 members in May 2023 and provide a valuable opportunity for networking within the sector.

6. Lessons Learned & Recommendations

While being successful in supporting R&I topics of high priority ranging from TRL 2 to TRL 7, this evaluation highlights potential room for improvement amongst others regarding the very significant underrepresentation of EU-13 countries, as compared with all projects across Cluster 5 and Cluster 6. Based on an analysis of calls from 2021, the Partnership does not yet provide an opportunity to reduce the growing innovation divide across the Union. Furthermore, with its focus on research activities and TRL 2-7, BATT4EU differentiates itself from the InnoEnergy partnership. The collaboration between BATT4EU and InnoEnergy should be endorsed to facilitate the exploitation of research results of projects supported by BATT4EU. In addition to downstream battery application fields, similar synergies should be explored with EIT Raw Materials and EIT Manufacturing. In addition, regarding the exploitation of synergies, a difficult identification of scopes of the various partnerships, as well as administrative hurdles, also between clusters, were outlined as making collaboration efforts unnecessarily difficult. The reporting requirements for downstream investments made by its members should be more clearly communicated to remove obstacles for the Partnership in documenting the achievement of its targets. In the case of discontinuation of funding, the necessity of monitoring ongoing projects and to continue disseminating results should be addressed, as well as the key issue of geographical concentration of activities almost exclusively in the EU-15 Member States.

³³ Indicator no. 9, BMR-Survey Data 2023 received from EC.

7. Sources

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- Agenda of Battery Innovation Days 2021: <https://www.accelevents.com/e/the-battery-innovation-days#agenda>
- Agenda of Battery Innovation Days 2022: <https://www.accelevents.com/e/battery-innovation-days-2022#agenda>
- Battery Innovation Days 2021 website. <https://www.eba250.com/battery-innovation-days/>
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8. Annexes

8.1. Methodology and Evaluation Questions

The results section of this study is divided into sub-sections based on the evaluation questions presented below. These questions are drawn from the list of evaluation questions selected for the overall study and are prioritised based on their relevance to the BATT4EU partnership, its current phase, and the availability of data. This approach ensures a focused yet comprehensive evaluation.

To validate and complement the findings in alignment with the evaluation criteria, interviews are guided by the same evaluation questions, albeit tailored to the profile of interviewees. A semi-structured approach is utilised to ensure flexibility during the interviews, allowing for a detailed exploration of current discussion topics while still maintaining a focus on the evaluation questions (see below).

This study is limited in that the Partnership is new. Therefore, funded projects are still ongoing, and results are not yet fully visible. Furthermore, data on the performance of the Partnership in terms of KPIs has not yet been available, while the project portfolio of BATT4EU could only be assessed based on calls open in 2021.

Relevance

- How relevant has the Framework Programme been in this area given the stakeholders' needs and considering the scientific, technological and/or socio-economic problems and issues identified at the time of its design and over time?
- To what extent have the supported thematic areas considered the latest technological, scientific and/or socio-economic developments at the national, European and international level?
- Has the Framework Programme tackled the right issues given the positioning of the European Union in this area since the programme started and over time?
- To what extent has the Framework Programme in this area addressed the needs of groups targeted for application/participation in terms of tools and thematic areas covered? Are the activities as they exist today appropriate to address the needs?
- To what extent has the Framework Programme demonstrated to be flexible to cope with changing circumstances in Europe and in the world?
- To what extent have the objectives of the partnerships been, and are still relevant regarding the challenges and needs addressed in this area by the Framework Programme? How flexible have partnerships in this area proven to be in the course of their operation, in updating the Strategic Research Innovation Agendas, or equivalent strategic documents, adjusting objectives, activities and resources to changing market and/or policy needs?

Coherence

- How coherent has the Framework Programme been with respect to deliver impact in the Green Transition, in particular:
 - Between Framework Programme parts
 - With other EU programmes serving similar objectives

- With relevant national, regional, or international initiatives
- What is the positioning of the Framework Programme in this area within the overall European research and innovation landscape (incl. R&I funds at national, regional, and European level) and beyond (at international level)?
- What could be done to improve the coherence of the Framework Programme interventions in this area with other initiatives to better deliver on the European Union policy objectives?
- How is the level of coherence among partnerships, and between partnerships and the Framework Programme activities in this area?

Efficiency

- How efficient have the implementation processes of the Framework Programme in this area been in terms of:
 - administration & management
 - project application and selection processes
 - funding allocation
 - forms of implementation
- How did these processes cater for flexibility needs in implementation? What have been the barriers or drivers? How could they be improved or what else could be done to maximise the benefits of the Framework Programme implementation in this area?
- To what extent has the Framework Programme in this area been cost-effective? How cost-effective have partnerships been?

Effectiveness

- What are the main expected results and outcomes and impacts from the projects supported in this area? Is the delivery of the projects' results all together leading to the achievement of the programme's objective(s) in this area?
- Which internal or external factors have influenced progress or lack of progress of the Framework Programme interventions in this area towards their impact? What could be done to address these in the short and longer term?
- What further actions are needed to maximise the impact of the Framework Programme interventions in this area?
- To what extent has the Framework Programme in this area contributed to achieving the European Union policy priorities and the Sustainable Development Goals (SDGs)?
- To what extent have the partnerships achieved their objectives and the objectives of the Framework Programme in this area?

EU added value & additionality

- What is the EU added value of the Framework Programme in this area? What would have happened if the Framework Programme had not existed? Could the stakeholders have implemented their research and innovation in another way, including through other national or regional support?
- What is the value resulting from partnerships in this area that is additional to the value that could result from interventions carried out at regional or national level?

- How do partnerships facilitate the creation and expansion of R&I networks that bring together relevant and competent actors from across Europe and beyond?

Directionality

- What is the progress towards the strategic vision of the European Partnerships? Do partnerships clearly demonstrate progress in the delivery of results for the EU and its citizens, notably global challenges and competitiveness, which cannot be achieved by traditional calls alone?

International positioning & visibility

- To what extent are partnerships acting as global ambassador for the European R&I system/establish global relevance/ achieve scientific and technological reputation in the international context/ serve as hubs for international cooperation, where appropriate?
- What is the level of international cooperation at partnership and project level and how does this result in visibility for the European Partnership?

Transparency & openness

- How open are partnerships to new participants? Are there procedures / mechanisms in place to expand the Partnership to involve new members at Partnership and project level, as well as gradually engage a broader set of stakeholders across Europe? Are there open and transparent processes for consulting all relevant stakeholders and constituent entities in the identification of priorities? To what extent are partnerships (notably with industry participation) accessible for SMEs?

Phasing out preparedness

- What are the foreseen measures and conditions set for the orderly phasing-out of the Partnership from the Framework Programme funding? Are these measures appropriate regarding a possible phasing-out (or renewal) of the Partnership?

8.2. Supplementary Evidence: Background to the Initiative

8.2.1. Governance

In May 2023, BEPA, the private sector association connected to the Partnership, comprised 209 members from across Europe, bringing together important stakeholders from the entire battery value chain, covering industry, university, research, SMEs, and other stakeholders (see Figure 2). BEPA is made up of representatives from key industries connected to batteries (battery raw materials industry, battery advanced materials industry, battery manufacturing industry, battery manufacturing supply industry, automotive industry, another application industry, recycling industry, research members).



Figure 2. BEPA members per type of organisation.³⁴

Source: Biennial Monitoring Report 2022 on Partnerships in Horizon Europe, https://ec.europa.eu/research-and-innovation/sites/default/files/bmr-2022/ec_rtd_bmr-2022-chapter-4.pdf.

Three key governing bodies compose the governance of BEPA: the General Assembly (composed of all BEPA members), the Executive Board and the Association Delegation (Figure 3). The General Assembly is the supreme body of the association. The General Assembly approves the general policy of the association based on proposals of the Executive Board and gives recommendations to the Executive Board for its application. The association is managed by the Executive Board, composed of a minimum of 6 and a maximum of 10 members. The private-side association is represented in the partnership board by the Association Delegation, which is composed of a maximum of 25 full members. Furthermore, different expert groups were established to organise the work within the Batteries European Partnership Association (BEPA) and to achieve the objectives of the BATT4EU Partnership.³⁵

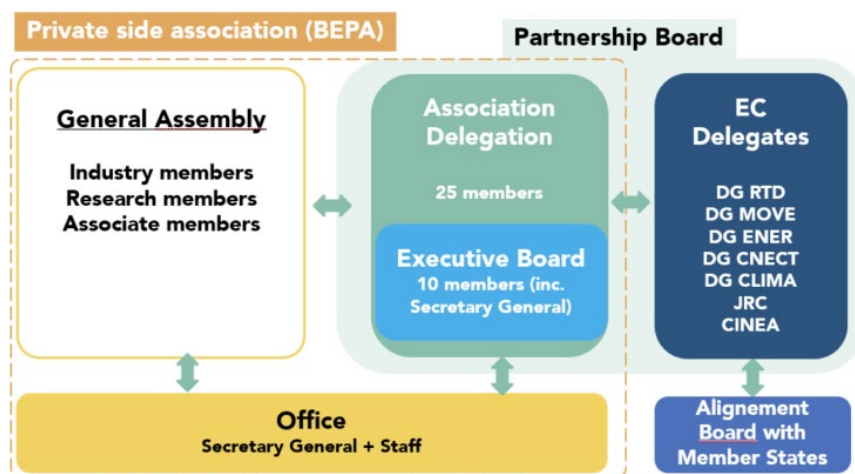


Figure 3. Governance bodies of BEPA.

Source: BEPA website. <https://bepassociation.eu/about/bepa-governance/>

³⁴ Source: Biennial Monitoring Report 2022 on Partnerships in Horizon Europe, pp.307-312, published in April 2022. Changes in the meantime in the distribution of members are possible. <https://ec.europa.eu/research-and-innovation/en/knowledge-publications-tools-and-data/interactive-reports/performance-european-partnerships-2022>

³⁵ SRIA pp.90-91. <https://bepassociation.eu/our-work/sria/>

8.2.2. Objectives and Intervention Logic

As described in the Partnership's SRIA, the intervention logic for the Partnership follows three specific objectives (Figure 4): (a) providing the European industry with differentiating technologies; (b) supporting the industrial upscaling and market uptake of battery solutions for clean mobility; (c) contributing to the cost-effective integration of renewable electricity.

Through contributing to achieving those specific objectives, four key challenges in mobility, energy storage, and industrial strategy shall be addressed by the BATT4EU partnership:

- competitiveness: competitiveness in the battery industry for Europe to prevent domination by the Asian market and capitalise on the expanding market
- sustainability: a reduction of the carbon intensity of industrial processes like refining and manufacturing, to enhance the depth and efficiency of recycling and contribute to implementing a circular economy for batteries
- industrial upscaling: future-proof, cost-effective and sustainable industrial processes exceeding the current state-of-the-art of Asian manufacturers
- market uptake: successful and fast market uptake of battery-related technologies.³⁶








Specific Objectives	Challenges			
	Competitiveness	Sustainability	Industrial upscaling	Uptake (market, regulatory, policy)
Provide the European industry with differentiating technologies		 Raw material processing technologies		
		Advanced materials		
		 Cell design		
		 Manufacturing processes		
		 Recycling technologies		
Battery solutions for clean mobility				Application specific, smart and safe battery solutions for all transport modes (road, air, water, rail)
Cost-effective integration of renewable electricity				Flexible, scalable, smart and affordable solutions for stationary applications

Figure 4. Scheme of the intervention logic for the BATT4EU Partnership³⁷

Source: SRIA. <https://bepassociation.eu/our-work/sria/>

Figure 5 depicts the impact pathways of the Partnership in more detail, providing the Partnership-specific impact pathway of BATT4EU (Source: SRIA).

³⁶ SRIA p.36 <https://bepassociation.eu/our-work/sria/>

³⁷ SRIA p.36. <https://bepassociation.eu/our-work/sria/>

PARTNERSHIP SPECIFIC IMPACT PATHWAY (PSIP)

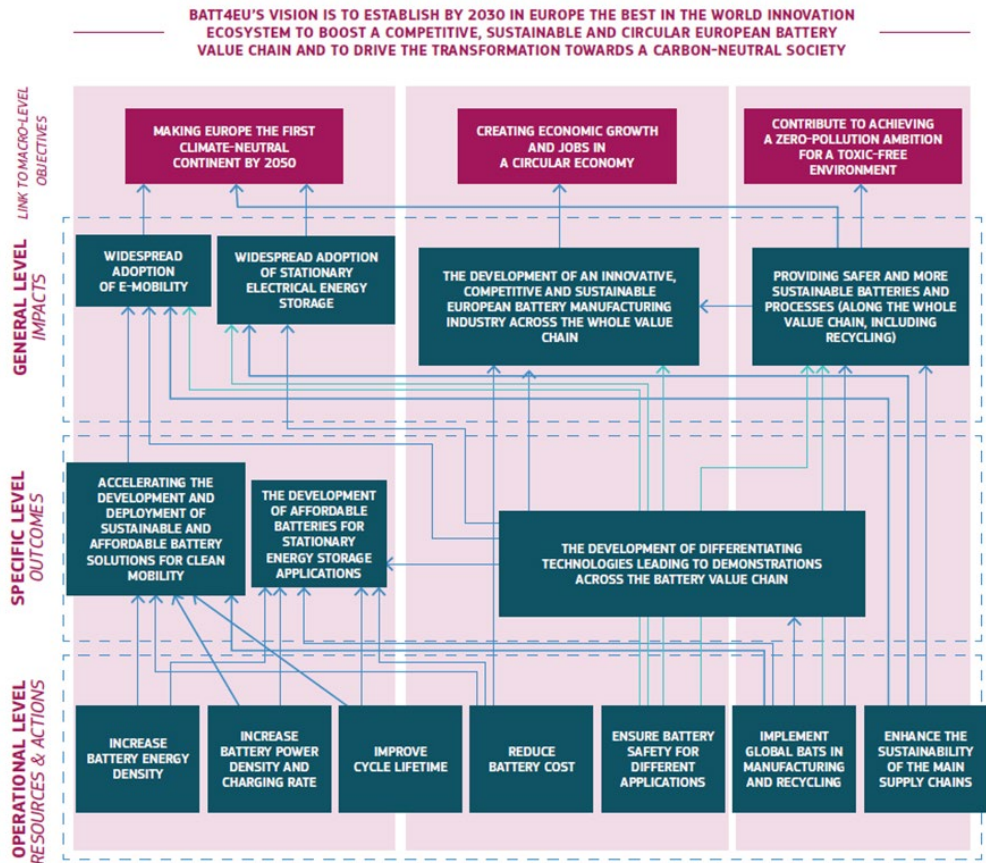


Figure 5. Scheme of the impact pathways of the BATT4EU Partnership

Source: Biennial Monitoring Report 2022 on Partnerships in Horizon Europe, https://ec.europa.eu/research-and-innovation/sites/default/files/bmr-2022/ec_rtd_bmr-2022-chapter-4.pdf.

Figure 6 depicts the focus of BATT4EU within the battery value chain, reflecting its orientation towards precompetitive research (2-7), and the support of a circular concept.

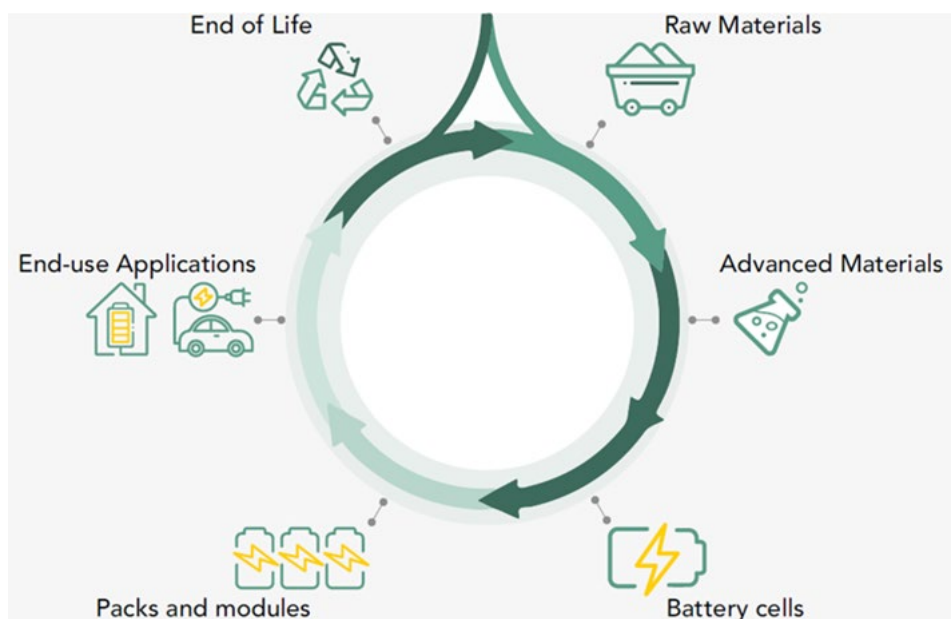


Figure 6. Technological scope of the BATT4EU partnership (darker green indicates stronger focus)

Source: SRIA. <https://bepassociation.eu/our-work/sria/>

8.3. Supplementary Evidence: Implementation State of Play

In the following, the project portfolio of BATT4EU of 7 calls open in 2021 is presented.

Table 1. Distribution of projects, participations and EC contributions across organisation types

Type of organisation	Number of projects	Participations		EC contribution		EC Contr. per part. (EUR 1000)
		Nb	Share (%)	EUR (1000)	Share (%)	
HES	23	73	19%	28.579	18%	391,5
OTH	4	15	4%	1.777	1%	118,5
PRC	24	182	48%	69.011	43%	379,2
PUB	0	0	0%	0	0%	N/A
REC	24	109	29%	62.417	39%	572,6
Total (All types)	24	379	100%	161.784	100%	426,9

HES: Higher or Secondary Education Establishments

PUB: Public bodies (excluding Research Organisations and Secondary or Higher Education Establishments)

REC: Research Organisations

PRC: Private for-profit entities (excluding Higher or Secondary Education Establishments)

OTH: Other

Source: eCorda. Own calculation.

Out of the total EC net contribution amounting to EUR million 162, private companies received 43% of the allocated funds; research organisations received 39%, and higher or secondary education institutions received 18%. This indicates a relatively balanced distribution of funding across private and public entities, while a smaller proportion is allocated to higher or secondary education institutions. The share of private for-profit entity

participation (48%) is similar to the participation share across all projects within Cluster 5 (44%) while being significantly higher than in Cluster 6 (24%).

Table 2. Participations and budgets by type of action/instruments for BATT4EU projects

Group of Action/instrument	Number of projects	Participations		EC contribution		EC Contr. per part. (EUR 1,000)
		Nb	Share (%)	EUR (1,000)	Share (%)	
IA	0	0	0,0%	0,0	0,0%	N/A
RIA	22	318	83,9%	155.109,3	95,9%	487,8
CSA	2	61	16,1%	6.675,1	4,1%	109,4
All types	24	379	100,0%	161.784,4	100,0%	426,9

Source: eCorda. Own calculation.

Within the project portfolio of BATT4EU (Table 2) of calls open in 2021, the lion's share of funding (95.9%) was allocated to Research and Innovation Actions (RIA). Only 4.1% of the funding was designated for Coordination and Support Actions (CSA). No funding was attributed to innovation actions (IA). Across all instruments, private companies are the most frequent recipients of funding (48% for RIA and 46% for CSA) (Figure 7).

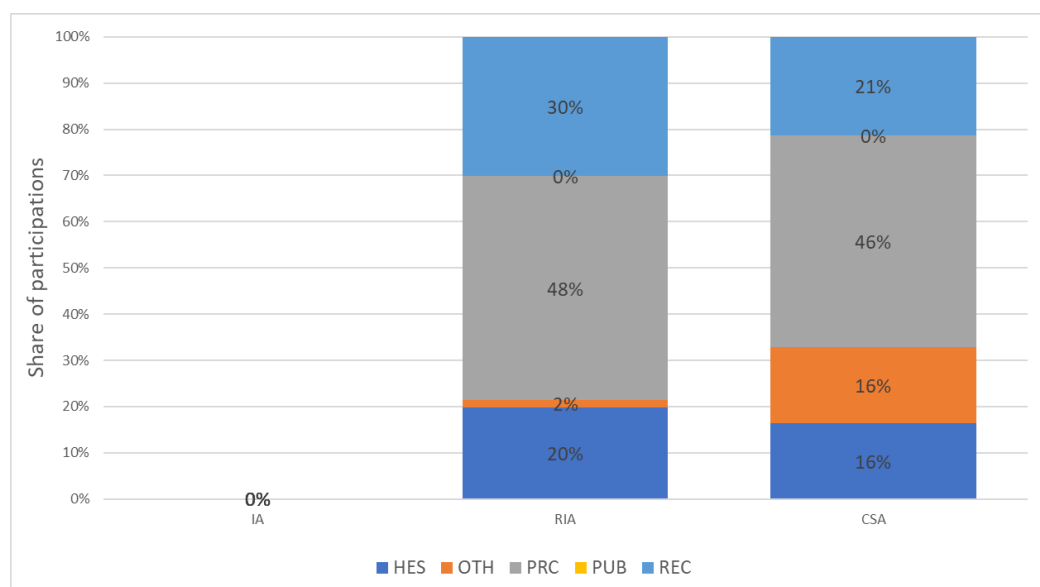


Figure 7. Share (%) of participations by type of action/instruments in BATT4EU projects

Source: eCorda. Own calculation.

Geographically, the e-Corda data show that associated countries and third countries are participating in projects as well (Table 3). Associated countries (excluding the UK) have taken part in 14 out of 24 projects, accounting for a funding share of 5.3%. Similarly, third countries and the UK have participated in 14 projects. EU-13 countries have participated in 13 projects, accounting for an EC contribution share of 2.7%. For EU-13 countries, the share of participation (3.4%) is significantly lower than the participation shares across all projects within Cluster 5 (9%) and Cluster 6 (13%).

Table 3. Participations and budgets by group of countries (of the participating organisations)

Group of country	Number of projects	Participations		EC contribution		EC Contr. per part. (EUR 1,000)	Number of countries
		Nb	Share (%)	EUR (1,000)	Share (%)		
EU-27	24	339	89,4%	151.944	93,9%	448,2	20
EU-14	24	326	86,0%	147.537	91,2%	452,6	14
EU-13	11	13	3,4%	4.407	2,7%	339,0	6
Associated (excl. UK)	14	20	5,3%	9.841	6,1%	492,0	3
United Kingdom	9	14	3,7%	0	0,0%	0,0	1
Third Countries	5	6	1,6%	0	0,0%	0,0	2
All-countries	24	379	100,0%	161.784	100,0%	426,9	26

Source: eCorda. Own calculation.

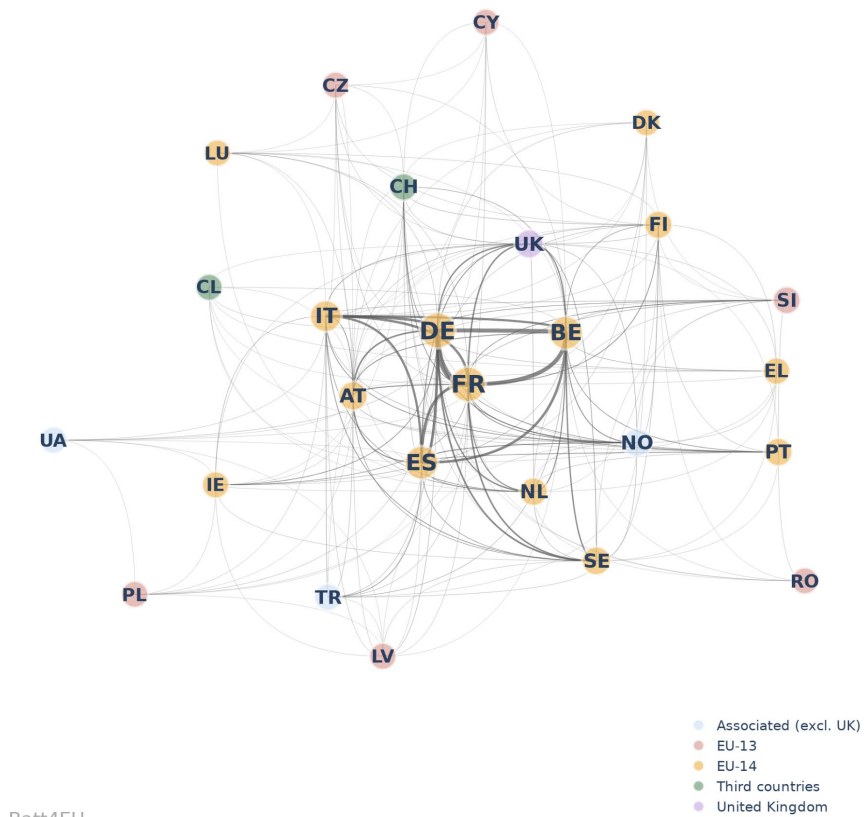
Table 4 shows the project participation patterns and budgets across countries (of the participating organisations). Accordingly, France has the highest share of EC contribution in total funding (18%), followed by Germany (17%), and Spain and Belgium (15%). Germany shows the highest number of project participants (22), followed by France (20), Spain (19) and Belgium (19).

Table 4. Top countries in BATT4EU (by number of participations and budgets of the participating organisations)

Top 15 country	Number of projects	Participations		EC contribution		EC Contr. per part. (EUR 1,000)
		Nb	Share (%)	EUR (1,000)	Share (%)	
Germany	22	65	17,2%	27.545	17%	423,8
France	20	61	16,1%	29.033	18%	475,9
Spain	19	48	12,7%	23.722	15%	494,2
Belgium	19	46	12,1%	23.748	15%	516,3
Italy	17	34	9,0%	9.372	6%	275,6
Austria	13	17	4,5%	9.754	6%	573,8
Norway	12	15	4,0%	8.934	6%	595,6
Netherlands	9	11	2,9%	3.308	2%	300,7
United Kingdom	9	14	3,7%	0	0%	0,0
Sweden	8	14	3,7%	5.788	4%	413,4
Portugal	6	10	2,6%	3.711	2%	371,1
Slovenia	6	6	1,6%	2.373	1%	395,5
Finland	5	9	2,4%	7.087	4%	787,4
Switzerland	4	5	1,3%	0	0%	0,0
Turkiye	3	4	1,1%	664	0%	166,1

Source: eCorda. Own calculation.

Based on the number of collaborations among organisations from the countries participating in projects included in this study, a network analysis has been conducted (Figure 8). The network analysis shows that the BATT4EU partnership could establish a high collaboration intensity among some core countries, predominantly EU-14 countries. The countries most funded form the strongest collaboration patterns.



Batt4EU

Figure 8. Network of participating countries in BATT4EU

Source: eCorda. Own calculation.

8.4. Supplementary evidence: Results

BATT4EU is dedicated to closely work with partnerships for alignment and to ensure relevant synergies with other related R&I initiatives at the EU, national and regional levels. These collaborations and synergies are crucial to disseminate activities of the Partnership, to coordinate R&I efforts on specific topics of common interests and to avoid any duplication of work (Table 5).

Table 5: Priority actions of BEPA in 2021-22

ACTIONS TO BE LAUNCHED IN 2021-2022	ACTIVITIES INTEGRATED IN MOU	Strategic & operational alignment	Battery R&I ecosystems at EU/national/regional or international level	Communication networking and outreach activities	Innovation uptake in the market	Scaling-up of technologies at higher TRL	Supporting regulations and standards activities	Complementary side/upstream projects not funded by the EU	Training and skills development
Launch of the Technical Working Groups (TWGs)		✓				✓			
Launch of the Enabling Task-Forces (Innovation uptake, Skills development)					✓	✓			✓
Coordination with other European Partnerships (respective responsibilities, joint calls,...), ETIP Batteries Europe (BE), Coordination with ETIP BE NRCG		✓	✓					✓	
Cooperation with other initiatives on specific topics (e.g. S3 Regional platform on advanced materials, Joint Research Centre, EIT Innoenergy, etc)			✓		✓		✓	✓	✓
Organisation of "Battery Innovation Days" (in coordination with BE and B2030+)			✓	✓					
Organisation of common workshops with other European Partnerships			✓	✓					
Organisation of at least one workshop/webinar on innovation uptake				✓	✓				
Creation of all the communication and dissemination tools				✓					
Dissemination activities focusing on battery projects' results (workshops, website, newsletter, annual report, etc)			✓	✓					
Publication "how to accelerate innovation uptake for battery technologies"				✓	✓				
Mapping of financing opportunities for battery technologies (inc. EIB funds)					✓				
Match-making activities (e.g. online event, match-making platform on Horizon Europe energy related topics)					✓				
Wide stakeholder consultation specifically on regulation / standardisation issues							✓		

Source: SRIA. <https://bepassociation.eu/our-work/sria/>

Table 6: Direct leverage factors of partnerships

Partnership	org_type_groups	Total Eligible Cost (EUR million)				Funding Rate (EU Contr/Total Cost)				Direct Leverage Factor* (1/Funding_Rate)-1			
		All action types	CSA	IA	RIA	All action types	CSA	IA	RIA	All action types	CSA	IA	RIA
2ZERO	any org type	231,3	3,8	131,2	96,4	0,817	0,973	0,701	0,968	0,224	0,027	0,426	0,033
	PRC only	153,0	1,4	96,2	55,4	0,725	0,971	0,592	0,948	0,380	0,030	0,689	0,054
Batt4EU	any org type	298,7	10,0	31,4	257,3	0,958	0,978	0,744	0,983	0,044	0,023	0,343	0,017
	PRC only	127,8	3,0	17,9	106,8	0,921	0,972	0,583	0,977	0,086	0,028	0,716	0,024
Built4People	any org type	57,3	1,2	56,1	0,0	0,757	0,854	0,755	N/A	0,321	0,171	0,325	N/A
	PRC only	31,3	0,3	31,0	0,0	0,588	1,000	0,583	N/A	0,701	0,000	0,714	N/A
CBE	any org type	148,4	2,9	98,6	47,0	0,783	1,000	0,698	0,949	0,277	0,000	0,433	0,053
	PRC only	89,6	1,4	68,5	19,7	0,658	1,000	0,582	0,899	0,520	0,000	0,719	0,113
CCAM	any org type	184,1	0,0	118,7	65,4	0,819	N/A	0,733	0,976	0,220	N/A	0,364	0,025
	PRC only	92,0	0,0	64,1	27,8	0,688	N/A	0,577	0,943	0,454	N/A	0,734	0,060
CLEAN-AVIATION	any org type	901,4	0,7	900,7	0,0	0,725	1,000	0,725	N/A	0,378	0,000	0,379	N/A
	PRC only	734,1	0,2	733,9	0,0	0,663	1,000	0,663	N/A	0,507	0,000	0,507	N/A
CLEANH2	any org type	423,2	2,1	270,8	150,4	0,641	0,993	0,469	0,945	0,561	0,007	1,133	0,058
	PRC only	334,3	0,4	250,5	83,4	0,548	1,000	0,427	0,908	0,825	0,000	1,340	0,101
ER (Shift2Rail successor)	any org type	315,9	0,0	315,9	0,0	0,736	N/A	0,736	N/A	0,359	N/A	0,359	N/A
	PRC only	278,1	0,0	278,1	0,0	0,700	N/A	0,700	N/A	0,429	N/A	0,429	N/A
SESAR 3	any org type	29,1	3,8	6,6	18,7	0,785	0,880	0,576	0,840	0,274	0,136	0,737	0,191
	PRC only	12,4	2,4	3,6	6,4	0,866	1,000	0,688	0,916	0,155	0,000	0,454	0,092
ZEWT	any org type	222,2	0,5	129,9	91,8	0,757	1,000	0,599	0,979	0,321	0,000	0,668	0,021
	PRC only	173,7	0,1	107,2	66,4	0,690	1,000	0,515	0,973	0,449	0,000	0,944	0,027
Source: CORDA (version from June/2023), except data on ER (Shift2Rail successor) which was obtained from the Horizon Dashboard (this data was incomplete on CORDA)													
NOTES:													
Data on EU contribution and Total Eligible Cost was extrated from CORDA (table participants)													
Direct Leverage (not displayed) corresponds to the difference between Total Eligible Costs and EU Contributions													
Funding Rate is the share of EU contributions on the Total Eligible Cost													
Direct Leverage Factor corresponds to (Direct Leverage)/(EU Contribution)													

The distribution of BATT4EU members across European countries is given in Figure 9, highlighting the dominant role in terms of the number of partners is with Germany, Belgium and France. EU-13 countries, on the other hand, are very strongly underrepresented as compared with total Cluster 5 and Cluster 6 activities.

GEOGRAPHICAL COVERAGE

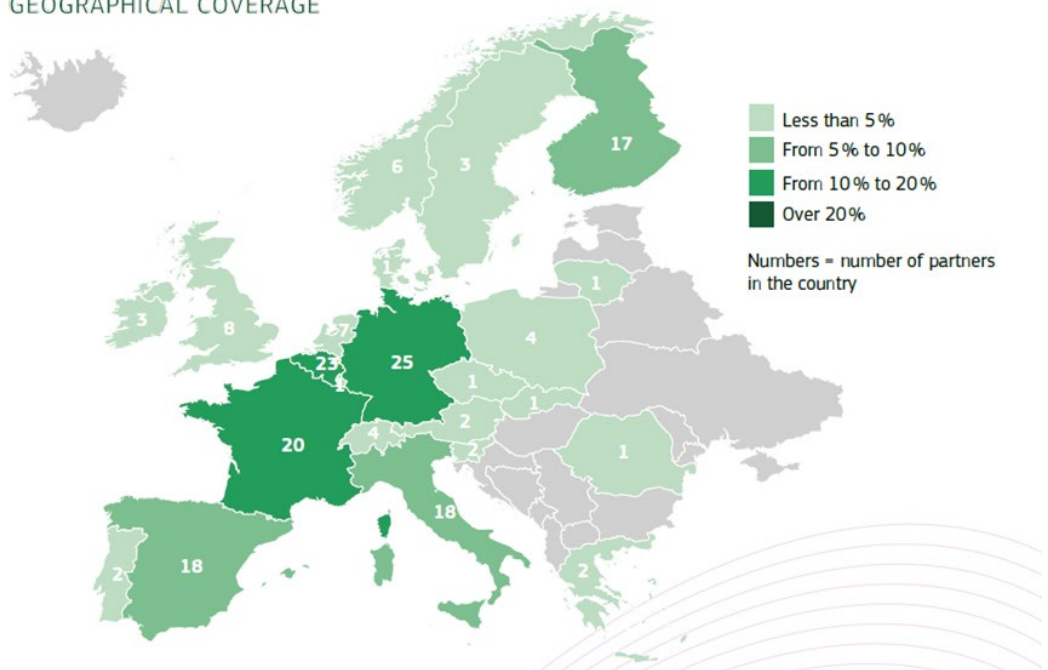


Figure 9. Members of BEPA across European countries³⁸

Source: Biennial Monitoring Report 2022 on Partnerships in Horizon Europe, https://ec.europa.eu/research-and-innovation/sites/default/files/bmr-2022/ec_rtd_bmr-2022-chapter-4.pdf.

Table 7 shows the key performance indicators of the BATT4EU partnership, grouped by inputs, outcomes and impact indicators, according to the PSIP.

³⁸ Source: Biennial Monitoring Report 2022 on Partnerships in Horizon Europe, pp.307-312, published in April 2022. Changes in the meantime in the distribution of members are possible. <https://ec.europa.eu/research-and-innovation/en/knowledge-publications-tools-and-data/interactive-reports/performance-european-partnerships-2022>

Table 7. BATT4EU Partnership Key Performance Indicators³⁹

KPI NAME	UNIT OF MEASUREMENT	BASELINE	TARGET 2023	TARGET 2025	TARGET 2027	AMBITION >2027
RESOURCES (INPUT), PROCESSES AND ACTIVITIES						
Joint demonstration projects with other Partnerships	# of design to cost (dtc) of design to energy (dte) of design to power (dtp)	0		2 dtc 2 dte 1 dtp		5 dtc 5 dte 3 dtp
Availability of updated/ new standard methodologies	#	TBD	N/A	N/A	N/A	TBD
Demonstration projects for stationary electricity storage	# of projects	0		3		8
New cell chemistries and archit	# of projects (TRL 4 or higher)	0		TBD		TBD
Development of innovative process technologies	# raw materials processing # recycling	0	N/A	3 3	N/A	6 6
OUTCOMES						
Battery performance	Gravimetric & volumetric energy densities at cell level	For BEV in 2019: 250 Wh/kg, 500 Wh/L	N/A	N/A	N/A	+60% compared to 2019 baseline
	Gravimetric & volumetric energy densities at cell level	Depends on application sector. For BEV in 2019: 750 W/kg, 1500 W/L	N/A	N/A	N/A	At least +30% compared to 2019 baseline

³⁹ Biennial Monitoring Report 2022 on Partnerships in Horizon Europe, pp.307-312.
<https://ec.europa.eu/research-and-innovation/en/knowledge-publications-tools-and-data/interactive-reports/performance-european-partnerships-2022>

	Cycle life at cell level	Depends on application sector. For BEV in 2019: 1000 cycles at 80% DoD	N/A	N/A	N/A	At least x2 compared to 2019 baseline
	Cost at cell level (€/ kWh)	Depends on application sector. For BEV in 2019: 125€/ kWh	N/A	N/A	N/A	- 60% compared to 2019 baseline
Supply Chain Sustainability	CO2 equivalent per manufactured kWh	TBD	N/A	N/A	N/A	TBD
Recycling efficiency	of Li-ion batteries in %	TBD	N/A	N/A	N/A	TBD

IMPACTS

Widespread adoption of e-mobility	Numbers of registrations in EU of personal vehicles (PV) and commercial vehicles (CV), both electrically chargeable vehicles (ECV).	Baseline (2019 figures): PV 3,0 % ECV share CV 1,2 % ECV share	N/A	<ul style="list-style-type: none"> ● PV 20 % ecv share ● CV 2 % ecv share (in total) 	N/A	PV: 50% ecv share CV: 20% ecv share
Widespread adoption of stationary electrical energy storage	Battery electricity stationary storage capacity Installed in Europe.	4GW/7GW h	N/A	15 GW / 30 GWh	N/A	40 GW / 100 GWh
EU Battery manufacturing capacity competitive with respect to the rest of the world	New battery cell manufacturing plants.	26 GWh		200 GWh/yr		400GWh (by 2028)
% of improvement of environmental impact in terms of CO2 and toxic material	Reduction of CO2 per kWh.	TBD		TBD		TBD

- 1) Measurement of the TRLs achieved at the end of EU-funded demonstration projects (for BtM and/or FtM applications), qualitative analysis of the work
- 2) Some objectives TBD in function of future regulations
- 3) Depends on application sector.

Batt4EU will monitor 19 KPIs in total over the course of Horizon Europe. In this table a selection is shown to show progress towards the general, specific and operational objectives. More information can be found in the SRIA. Although the battery value chain supports many end-uses, the KPIs are generally focused on one type of application (road transport, for example). This is for ease of measurement and follows the argument that progress in one application is indicative of progress across the board.

KPIs for the uptake of battery use are of course contingent on investments on related infrastructure (grid updates, charging infrastructure), which are beyond the scope of the Batt4EU partnership.

Sustainability KPIs are generally still to be defined, as we don't want to anticipate similar KPIs which will be put forward in the update of the Battery Regulation.

Source: Biennial Monitoring Report 2022 on Partnerships in Horizon Europe, https://ec.europa.eu/research-and-innovation/sites/default/files/bmr-2022/ec_rtd_bmr-2022-chapter-4.pdf.

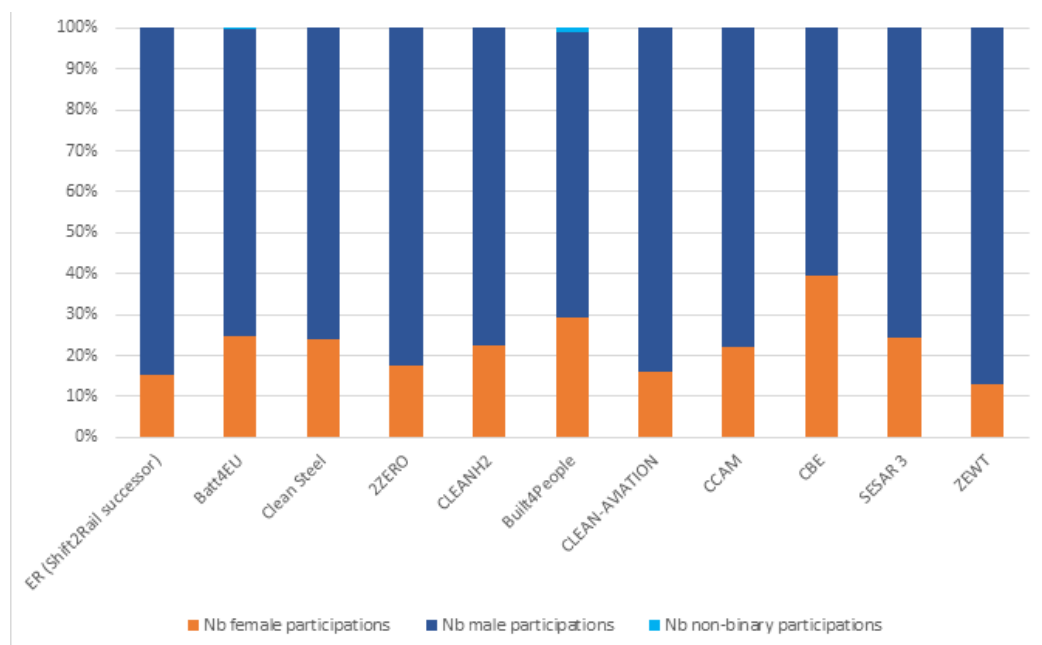


Figure 10. Gender data of researchers for partnerships

Source: eCorda. Own calculation.

8.5. Annex Bibliometric Analysis

8.5.1. Batt4EU researchers' track record on team diversity and societal readiness

- A share of 88% of Batt4EU researchers' 2017-2021 publications were thematically aligned with the SDGs. This was much above the benchmarking range (45%-51%).
- Another positive point in past research by Batt4EU investigators was the share of academic-private co-publications at 15%. This compared to 9% at LERU level and 7% at EU27+UK overall level.
- Batt4EU researchers' past research fell on par with the benchmarks for its share of highly multidisciplinary publications.
- The past publications by Batt4EU investigators tended to cite a relatively narrow scope of disciplines. The share of highly interdisciplinary publications was only 5%, below the three benchmarks.
- The average share of authors that were women in Batt4EU researchers' prior publications was much below the benchmarks at 25%, against 33% in the next closest benchmark (EU27+UK industry at 33%).

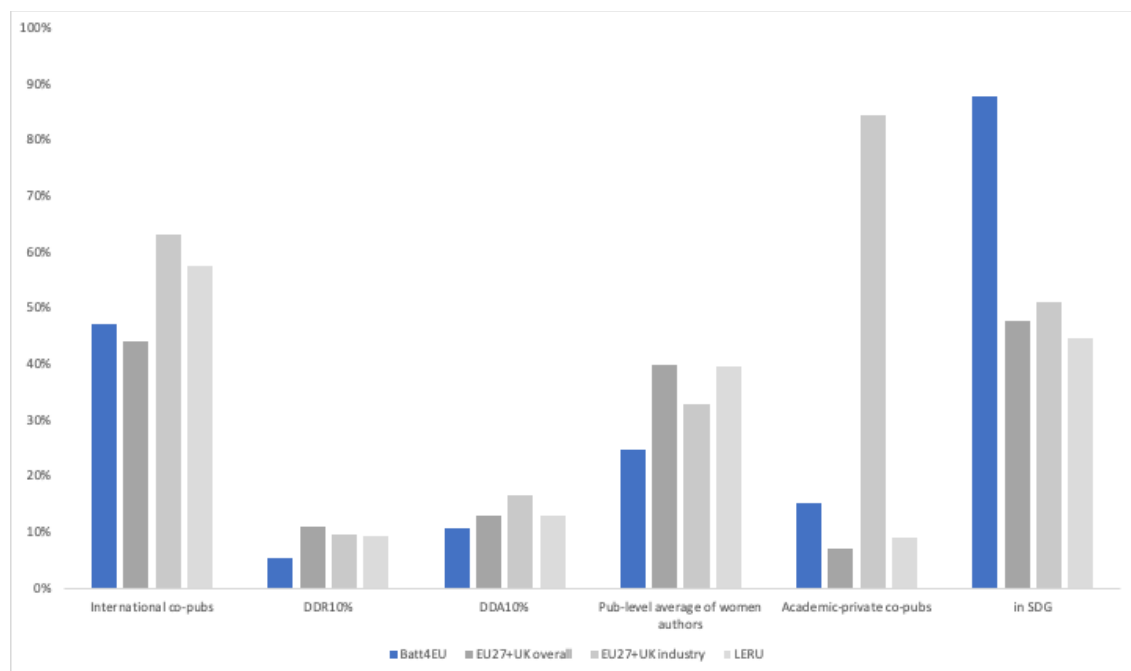


Figure 11: Pre-Horizon Europe track record of Batt4EU researchers on selected dimensions of diversity and societal readiness of research teams (2017-2021)

Note: DDR10%: share of publications amongst the top decile of publications with most disciplinary diversity in references (i.e., most interdisciplinary) in their subfield, year and document type. DDA10%: share of publications amongst the top decile of publications with most disciplinary diversity in authorships (i.e., most multidisciplinary) in their subfield, year and document type. Source: Scopus, NamSor and eCorda databases processed by Science-Metrix

8.5.2. Batt4EU researchers' track record on citation impact as proxy for scientific excellence and leadership

- Batt4EU researchers registered a very good track record of scientific excellence, particularly on the CDI indicator that is well-rounded and provides a balanced view of citation impact across the full set of publications. Their 2017-2021 CDI was of 20.9, well above the LERU level of 12.4.
- Past publications by Batt4EU investigators also achieved a higher share of highly cited publications (HCP10%) than the benchmarks, indexed at 2.2 (or a 22% share).
- Citation impact was comparable to the highest benchmarks on the other citation impact indicator, the ARC.

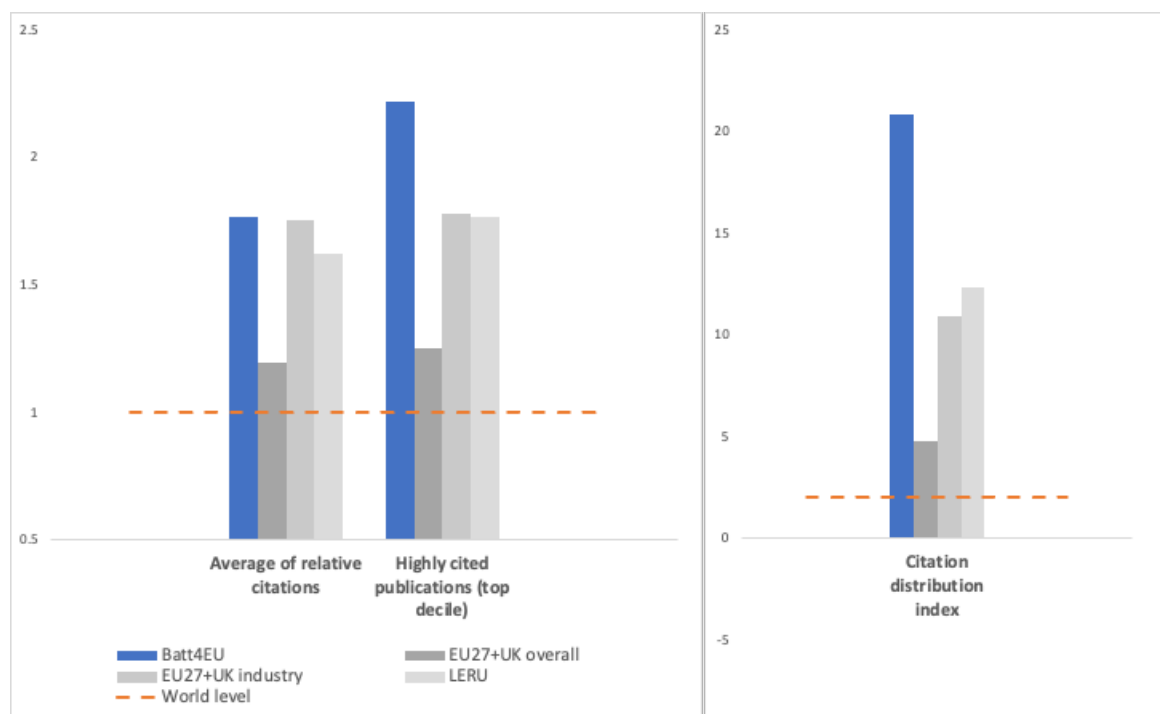


Figure 12: Pre-Horizon Europe track record of Batt4EU researchers on citation impact (2017-2021)

Source: Scopus and eCorda databases processed by Science-Metrix

8.5.3. Batt4EU researchers' track record on online dissemination capacity, including OA and online policy-related uptake

- Past research by Batt4EU investigators saw impressive uptake through Wikipedia mentions, 2.7 percentage points above an expected of 1.4% and above benchmarks' achievements.
- Batt4EU investigators' track record on online policy-related citations towards their publications was strong, 3.6 percentage points above the expected level of 2.7%, again above benchmark's achievements.
- Batt4EU researchers' track record on OA publishing fell below the benchmark range at 54%, compared to 65% at EU27+UK overall level.

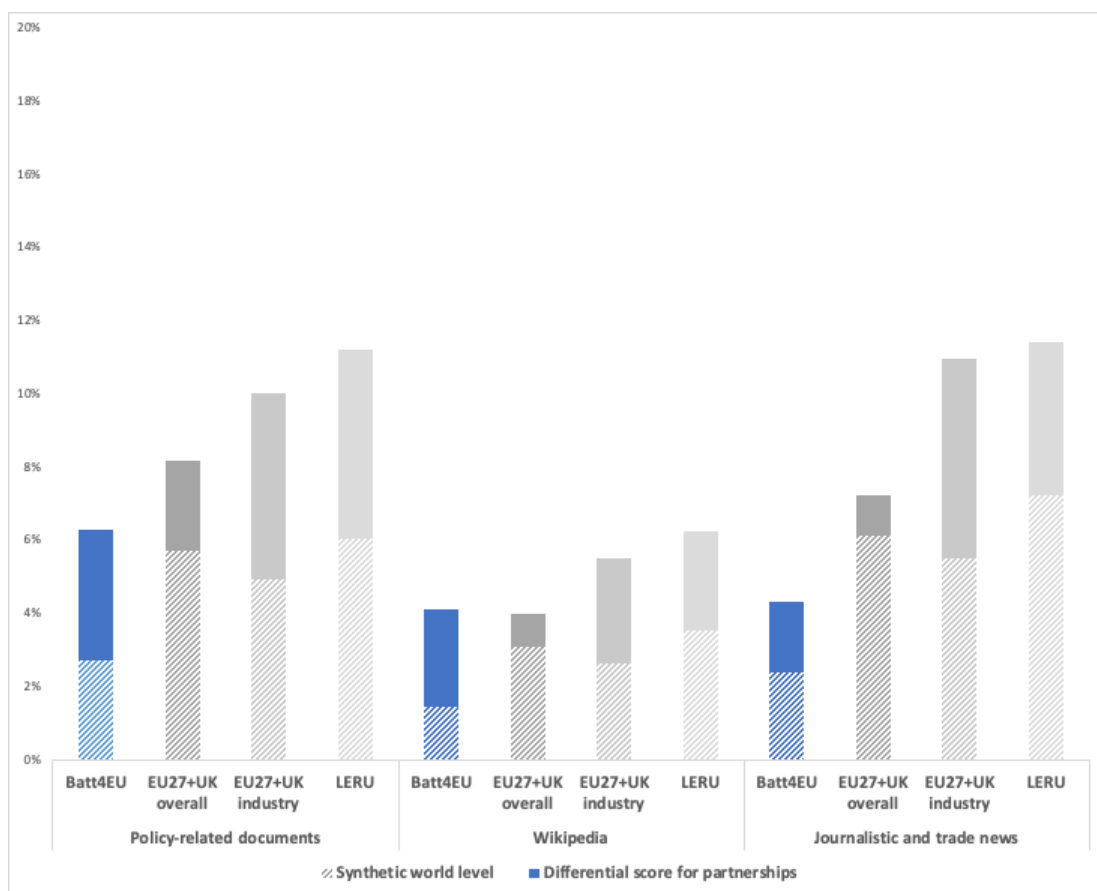


Figure 13: Pre-Horizon Europe track record of Batt4EU researchers on selected online dissemination dimensions (2017-2021).

Note: Synthetic world levels are the average level of publications with one or more altmetrics mentions in equivalent (in terms of disciplinary distribution) global reference sets. Comparisons with benchmarks should be made on the differential scores (represented by the full bar sections as opposed to the stripped sections representing the synthetic world level). Differential scores are presented in red where they are negative, that is, below the expected world level.

Source: Scopus, PlumX, Overton and eCorda databases processed by Science-Metrix

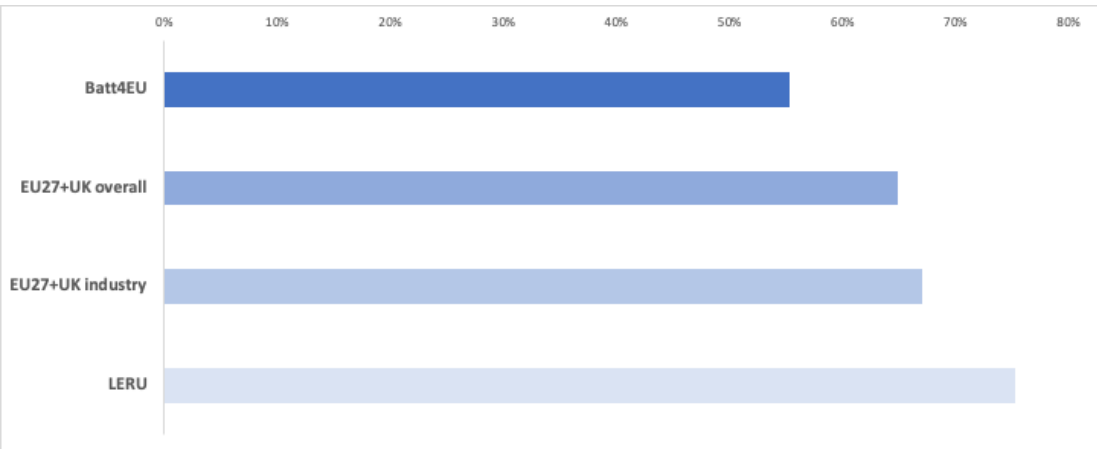


Figure 14: Pre- Horizon Europe track record of Batt4EU researchers on selected online dissemination dimensions (2017-2021)

Source: Scopus, Unpaywall and eCorda databases processed by Science-Metrix

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This evaluation report is part of the interim evaluation of Horizon Europe activities related to the Green Transition. It presents the assessment of the Co-Programmed European Partnership BATT4EU against the evaluation criteria of relevance, coherence, efficiency, effectiveness, EU added value, additionality, directionality, international positioning and visibility, transparency and openness as well as phasing out preparedness. The evaluation of the Partnership is based upon a mixed-method approach including quantitative and qualitative data analysis.

Studies and reports

