Zero Emission electric Vehicles enabled by haRmonised circularity

Deliverable 6.7

Exploitation plan (second version)

31.12.2025

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ZEvRA
Zero Emission electric Vehicles enabled by haRmonised circulArity

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19.12.2025	V0.1	Results compilation, structure and writing of the report – polished after review
31.12.2025	V1	Final-/Submission version

ZEvRA project abstract

ZEvRA's main objective is to improve the circularity of light-duty EVs throughout their entire value chain, from materials supply and manufacturing to end-of-life (EoL) processes, which aligns with the European Union's goal of achieving zero CO2e emissions by 2035, particularly in the EV value chain. To do so, ZEvRA will develop a Design for Circularity (DfC) methodology and a holistic circularity assessment aimed at improving the production of electric vehicles (EVs) based on the 9Rs. This methodology will be validated by developing zero emission solutions for the most important automotive materials, covering > 84% material mix: steel, three versions of aluminium (wrought, casting, and foam), thermoplastics composites (long and continuous fibre-reinforced), unfiled/short fibre plastics, glass, tyres and Rare Earth Elements (REE). These solutions will be supported by a set of digital tools to support the manufacturing of the use cases, the assessment of circularity, traceability, and the virtual integration of components into a full replicable vehicle.

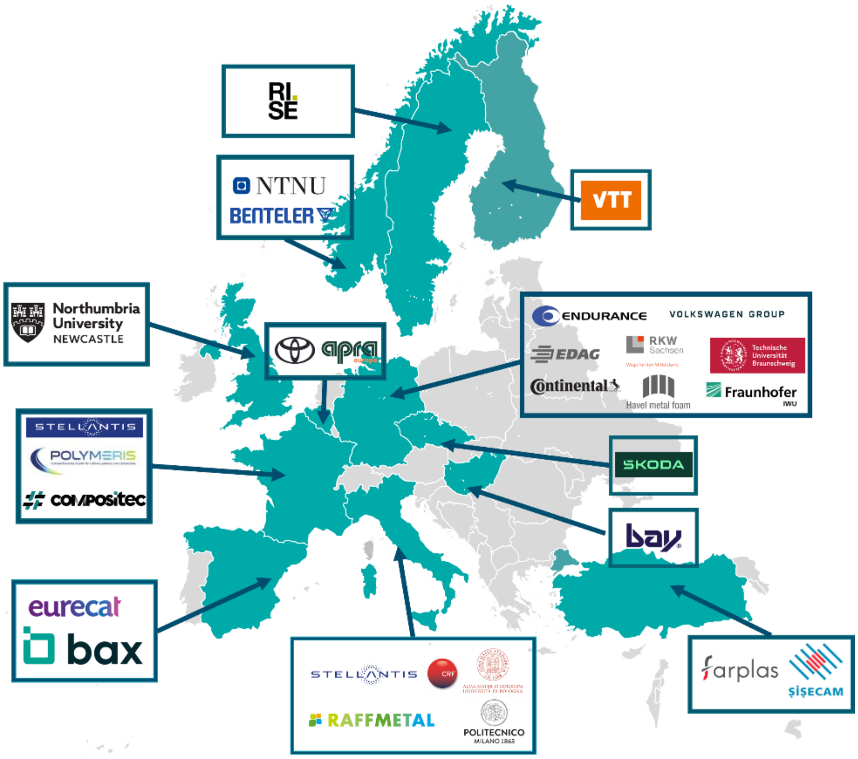

Figure 1: *ZEvRA Consortium*

To maximise the outreach of our methodology and zero emission solutions, ZEvRA will develop a dedicated training & upskilling programme for the automotive workforce and academia, together with activities aimed at increasing awareness & acceptability of the proposed zero emission solutions. Lastly, circular business models targeting EoL and logistics aimed at improving the economic feasibility of circularity in EVs are advanced. ZEvRA's innovations aim to improve zero emission approaches in the life cycle and value chain of at least 59% of European EVs by 2035 through the 5 OEMs and Tier 1's that are part of the consortium (Figure 1), which includes industry and academia covering the entire automotive value chain.

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Abbrevations and Acronyms

Table 1: *Abbrevations and Acronyms*

Abbr.	Full name
DfC	Design for Circularity
DPP	Digital Product Passport
EoL	End of Life
ERP	Enterprise Resource Planning
EV	Electric Vehicles
GMT	Glass Mat Thermoplastic
GUI	Graphical User Interface
HIC	Head Injury Criterion
HRB	Horizon Europe Results Booster Initiative
IB	Innovation Board
KER	Key Exploitable Results
LCA	Life Cycle Assessment
LCC	Life-Cycle Costing
OEM	Original Equipment Manufacturer
P-KER	Prioritised/Selected Key Exploitable Results
PCR	Post-Consumer Recycled
SLCA	Social Life Cycle Assessment

Executive summary

ZEvRA aims to enhance vehicle material circularity, enabling zero-emission vehicles. It will achieve this through four stages: identifying design use cases, guiding technology development, translating requirements into design strategies, integrating technology to TRL5 with zero virgin materials, and transitioning to circular manufacturing. Collaboration with stakeholders is essential to address regulatory and logistical challenges in the vehicle manufacturing sector. Task 6.2, "Exploitation of Innovations and Circular Business Models," focuses on creating a viable exploitation strategy, guiding the consortium toward maximizing the project's most promising Key Exploitable Results (KERs). This deliverable identifies ZEvRA's exploitable results and presents the methodology that will be followed for strategizing the KERs and aligning project outcomes with broader societal and economic impacts.

Three deliverables will be elaborated to report the results of T6.2 (D6.6- presented in M12, D6.7, D6.8). The present document (D6.7) at Year 2 describes the process that has been followed to make progress with the exploitation plan that was set out in D6.6. So far, the results are based on the EXPLOITT® methodology developed for H2020 and validated by the European Commission, and the Horizon Results Booster (HRB), recommended by the European Commission. EXPLOITT® is a methodology for industrial exploitation and take-up developed by IK4-IDEKO in the FOCUS EU-Project. The methodology is based on four phases: A) technology assessment, B) business plan, C) competitive intelligence activities, and D) clustering activities.

Phase A on technology assessment is integrated into two parts. The first one addresses the technology identification, where the partners complement the KERs identified at the proposal stage, and add any further KERs identified within the first 18 months of ZEvRA. These KERs were then characterised in more detail and prioritised for further technology evaluation. The technology evaluation focuses on the selected most important/most highly exploitable KERs. The processes are performed using specific templates that were shared with the ZEvRA partners. After the characterisation, all partners participated in a workshop in which a prioritisation exercise was performed based on the innovativeness of the result, the exploitability level, and the impact on industry. The 3 most important KERs are then fully evaluated combining both the EXPLOITT® methodology and the HRB to understand the individual KERs into more detail and essentially obtain all knowledge required to prepare them for commercialisation/route to market planning. As ZEvRA project has over 30 results, several of them were identified during the PR1 review meeting in Brussels (September 2025) as highly impactful, this led to a select few additional KERs also following just the EXPLOITT® methodology, as the HRB can only focus on 3 KERs. After this evaluation, dedicated business plans will be developed. Anything that has not been achieved/performed up until this D6.7 (M24) will be achieved by D6.8 (M26).

1 Introduction

By 2030, EVs are projected to make up 75% of new car registrations in Europe due to ICE phase-out regulations. However, EV manufacturing currently produces 80% more CO_2 emissions than ICE vehicles, with production being the most emissions-intensive yet most impactful phase for emissions reduction. To address this, DfC strategies and technologies are emerging across the EV value chain to lessen environmental impacts.

Challenges remain, including inconsistent LCA results across diverse EV designs and the lack of a unified DfC methodology, which complicates identifying effective solutions. Additionally, IPR conflicts between OEMs and suppliers hinder technology and knowledge sharing.

ZEvRA aims to resolve these issues by fostering collaboration among five major OEMs, European universities, and stakeholders in the EV value chain. The project will create a harmonized circularity methodology, supported by digital tools, enabling technology interchangeability and scalability in Europe. This methodology will validate zero-emission solutions for key materials (covering 84% of the material mix) with the Skoda Enyaq as a development baseline.

ZEvRA's main goal is to enhance circularity in light-duty EVs from material supply through end-of-life, supporting the EU's 2035 net-zero CO_2 target. A comprehensive DfC methodology and circularity assessment, based on the 9Rs and focusing on key materials like steel, aluminum, thermoplastics, glass, tyres, and REEs, will be developed.

The project will leverage digital tools for manufacturing efficiency, circularity assessment, traceability, and virtual integration into a replicable vehicle. By 2035, ZEvRA aims to improve zero-emission practices in the lifecycle of at least 59% of European EVs, supported by OEMs, Tier 1 suppliers, and academic and industry partners across the automotive value chain.

ZEvRA's approach consists of four phases:

- Phase 1: Requirements are defined from three perspectives: (1) life cycle thinking from academia and research, (2) specific needs of the use cases from design teams (including OEMs, suppliers, and material producers), and (3) the full SUV prototype vehicle perspective. These requirements will guide the strategic development of all project technologies.
- Phase 2: Requirements are translated into design strategies for both use cases and the full vehicle prototype, with an iterative process between design teams and academia, heavily supported by digital tools.
- Phase 3: All technological developments are integrated into a TRL5 test bench-ready vehicle concept and a virtual twin, emphasizing collaboration and feedback across stakeholders. This phase includes feedback loops to optimize use case technologies for the final prototype, aiming for maximum circularity and zero virgin material use.
- Phase 4: Focuses on expanding the impact of validated measures in ZEvRA to transform the EU's EV production landscape toward circular manufacturing. This involves training future

designers, promoting circularity acceptance among stakeholders, and addressing regulatory and logistical challenges.

Therefore, the main results of ZEvRA are those coming from the DfC strategy, use cases, digital tools, and training packages. Due to the combination of different types of automotive materials and their manufacturing technologies, a multiplying effect of results is taking place during the implementation of the project.

2 Aim of the deliverable

Task 6.2, titled "Exploitation of Innovations and Circular Business Models", creates an exploitation plan for the most promising KERs to support the ZEvRA consortium's exploitation strategy. D6.7 follows on directly from D6.6´s plan, beginning with a comprehensive analysis of KERs identified during the proposal phase, aiming to assess their commercial or social potential as independent products, methods, tools, or services. This analysis follows the EXPLOITT® methodology, in combination with the Horizon Results Booster (HRB). Following this, each KER undergoes a detailed characterisation, including identifying key owners and partners, further describing the KER, specifying the innovation content, detailing any legal and normative requirements, and justifying the exploitability of the KER. To close out A1 (As defined in D6.6), the prioritisation will occur. The characterised KERs will then be filtered and prioritised during a workshop held with all members of the consortium.

At this stage, the HRB really comes into play during the A2 technology evaluation phase and beyond (B1- Business plan). Combining this with the EXPLOITT ® methodology steps to cover ground identification, contribution-benefits matrix, patents analysis, competitors' analysis, market research, exploitation claims, standardisation process, and exploitation roadmaps and pathways. Specific protection measures will be outlined, and a comprehensive risk assessment will be conducted for each pKER, covering technological, financial, and legal aspects. Throughout the project, an IPR management strategy will be developed and regularly updated by the IB, chaired by Bax, incorporating inputs from all consortium members involved in KER development.

Task 6.2 is led by Bax, with contributions from all partners, and runs from month 12 (M12) to the end of the project (M36). Three key exploitation deliverables will be submitted during this time. Deliverable completed:

- Deliverable 6.6- Exploitation plan- first version (M12)
    - Initial exploitation report outlining the methodology for the commercial strategy and integration with Task 7.5's innovation activities.

Current deliverable:

- Deliverable 6.7- Exploitation plan- second version (M24)
    - Characterization of KERs and prioritization results based on initial identification and analysis.

Final deliverable:

- Deliverable 6.8- Exploitation plan- third version (M36)
    - Final report with business models for selected KERs, refining the exploitation strategy, and preparing for post-project commercialization.

The annual reports will provide an overview of the project's exploitable outputs and results, including associated business models, to support market readiness beyond the project's end (>2027). The first report (D6.6), due in month 12, covered the background and context of Task 6.2, explaining the methodology for crafting a commercial exploitation strategy for the project's key outcomes. It also covered the integration with Task 7.5's innovation support and management, circular business models, and the role of the External Advisory Board (EAB) in ensuring industrial relevance of the KERs.

The second (and current) report (D6.7), due in month 24, details phase A1; the identification, characterisation, and prioritisation of the KERs based on the established methodology, and phase A2; technology evaluation up to a certain extent.

The final report (D6.8), due in month 36, will present business models for the prioritised KERs selected by partners, enabling validation and expansion of the initial exploitation strategy outlined in the proposal and supporting Task 7.5's innovation support and management. Business models will become circular by integrating inputs from S6.2.2.

3 Methodology

For readability purposes, the methodology strategy presented in D6.6 will also be presented here in D6.7. The Exploitation strategy of ZEvRA's KERs follows the EXPLOITT® methodology. The principal goal is to create a preliminary business plan and facilitate the take-up process. The methodology encompasses four key phases: technology assessment, business planning, competitive intelligence activities, and clustering [1]. In Figure 2, the EXPLOITT® methodology for Industrial exploitation is mapped out. The methodology will be complemented by partner contributions, which are crucial in assessing, characterising, and prioritising the exploitable results. The timeline is from the 12th Month of the project- which as the project started in January 2024, the 12th month is December 2024- and runs through to M36, December 2026.

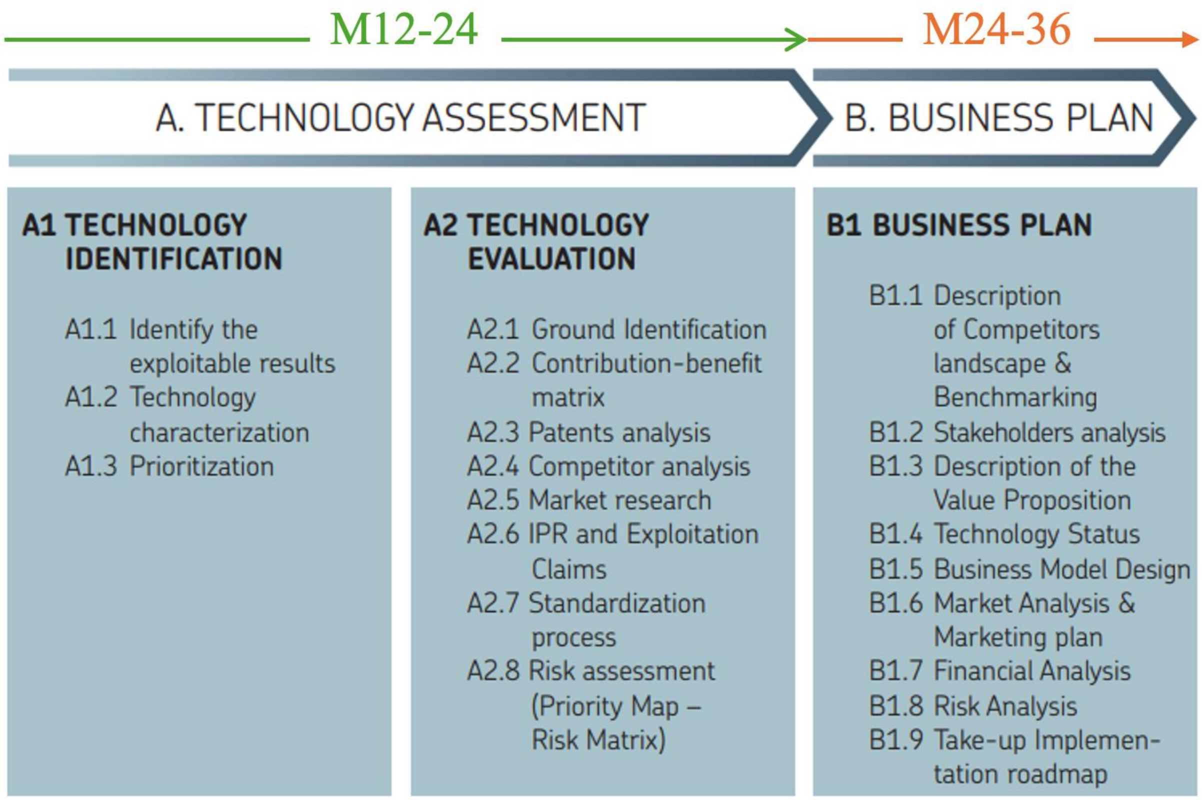

Figure 2: *Methodology for industrial exploitation and take-up [1]*

To accompany this, the HRB is utilised as an attachment to the exploitation process. The HRB nicely complements the EXPLOITT® methodology, and Bax identifies synergies between the two. Bax recognised that there are certain crossovers and similarities between the two, and so analysis of the entire processes allowed us to ensure that we obtained the maximum potential of the combination of the two. For good measure, the HRB offered the following Go-To-Market (G2M) support over 6 months:

- Module A: Kick off
- Module B: Unique Value Proposition (UVP) and Key exploitable results (KERs)
- Module C: Exploitation Strategy

- Module D: Business Plan
- Module E: Access to other funding & entrepreneurship support
- Module F: Reporting

The add on package from the HRB greatly completes the EXPLOITT ® methodology, adding further detail in value proposition, exploitation strategy, business plan, in the sense that they include active workshops between the exploitation manager (Bax), the KER owner, and an HRB consultant who guides the process and provides several additional, detailed templates. The combination of the EXPLOITT ® and HRB ensures KERs advance towards market readiness, supporting the development of an exploitation strategy/business plan and identifying opportunities for further exploitation or use of results.

4 Results

The results section considers the methodologies described above: the EXPLOITT® and the HRB. Each methodology will be explicitly mentioned to ensure clarity of which methodology benefited each step along the process.

4.1 Technology identification

The technology identification process follows phase A1 of the EXPLOITT® methodology. As can be seen in Figure 2, this is made up of A1.1- Identify the exploitable results; A1.2- Technology characterisation, A1.3- Prioritisation.

4.1.1 Identification of the KERs

At the proposal stage, 15 KERs were identified. Project partner Bax then shared this original list of 15 KERs with all 28 ZEvRA partners, including a template for the partners to fill out (which can be seen below in Table 2), and they provided their updates based on progress and new ideas that had been formed since the project development/Grant Agreement (GA) phase. The purpose of the identification was to identify all potentially exploitable project KERs during implementation. This resulted in 30 KERs, highlighted in Table 2.

Table 2: *Key Exploitable Results (KERs) identified by all partners. Green-High exploitability, Blue- Moderate, Amber- Low, Note: The partner highlighted in bold is the KER owner.*

#	Project results title	WP	Partners involved	Exploitability level
1	Demonstrator with new design and material (KER3). Casting of the parts	WP4	END, CRF, UBO, SKO	Moderately exploitable
2	AI HIC tool (KER10)	WP2	EDAG	Highly exploitable
3	Vehicle Design for Circularity	WP3	EDAG, all OEMs	Moderately exploitable
4	Special connection for circular joining	WP3	EDAG, SKO	Weakly exploitable
5	(use case 2.1): 100% recycled wrought aluminium for extruded profiles	WP4	RAF - FRA - BEN - UBO- VW- SKO	Highly exploitable
6	(use case 2.2): 100% recycled casting aluminium for HPDC	WP4	RAF - UBO - END - CRF- VW- SKO	Highly exploitable
7	(Use case 3.1): Low CO2 and lightweight top cover of battery pack molded by thermocompression from recycled PET and glass fibers	WP4	FAU and STL, SKO	Highly exploitable
8	(Use case 3.2): Charging lid of battery pack molded by thermocompression from recycled	WP4	FAU and STL, SKO	Moderately exploitable

	PET and glass fibers (recycled or not)			
9	(Use case 3.1): thermoplastic composite semi-products (organo sheets) made of recycled (PCR) PET and glass fabrics	WP4	FAU, SKO	Highly exploitable
10	(Use case 3.1): thermoplastic composite semi-products (GMT) made of recycled (PCR) PET and glass mats (recycled or not)	WP4	FAU	Highly exploitable
11	(Use case 3.2): recycled plastics (up to 70% PCR) for interior parts	WP4	FPL, VTT, TME, RISE, SKO	Highly exploitable
12	(Use case 4): Glass- 0% water use and coolant on cutting process. 25% reduction of paint in digital printing. Integration of photovoltaic cells into a panoramic laminated sunroof	WP4	SIS, VTT	Moderately exploitable
13	(Use case 5): Tyres- up to 20% of recycled materials, through pyrolysis and retreating process of C1 and C2 tyres	WP4	CON, VTT	Moderately exploitable
14	Harmonised circularity methodology, including holistic LCT methodology, LCA, LCC, and SLCA on the use cases	WP1	EUT, BEN, RISE, NTNU	Moderately exploitable
15	Automated systemisation of LCT assessment of R9 strategies	WP1	EUT, All OEMs and Tier1	Moderately exploitable
16	Developing a numerical model to simulate rPET-gF fibre composite	WP2	UNN	Moderately exploitable
17	Prediction of Response Behavior and Failure Criteria for Foamed Aluminum Components Under Various Loading Conditions	WP4	UNN	Moderately exploitable
18	Comprehensive Characterization of Recycled Thermoplastics (PP for Non-Structural Applications and PA/PET for Structural Components)	WP4	FAU, UNN, SKO	Moderately exploitable
19	Analytical Modeling and Visualization of Microstructure and Mechanical/Crash Properties for Cast and Extruded Aluminum Profile	WP2	FRA, UBO, UNN	Moderately exploitable
20	Automated systemisation of LCT assessment of R9 strategies/ Circular Designer	WP2	BRA, FRA, EUT	
21	Traceability of components through digital product passport (DPP)	WP2	PLM	Highly exploitable
22	Information exchange to support human or machine decision making or specification for how to correctly execute processes throughout value networks, as carried by digital product passport (DPP)	WP2	RISE	Highly exploitable

23	Beyond-Compliance Circularity and Sustainability Metrics for Automotive Aluminium	WP4	BEN	Highly exploitable
24	Advanced Heat Treatment Strategies for HyperAl and Future Aluminium Alloys	WP4	BEN	Highly exploitable
25	Breakthrough Compensation Design Approach for Crash Management Systems (CMS)	WP4	BEN	Moderately exploitable
26	Predictive Simulation Models for Aluminium Wrought Alloys and Castings	WP2	NTNU, BEN, UBO, UNN	Highly exploitable
27	Digital twin for aluminium components in circular design	WP2	NTNU, BEN, UBO, UNN	Highly exploitable
28	Automated system to evaluate design for circularity	WP2	NTNU, BEN, UBO, UNN	Moderately exploitable
29	Circular design optimisation of crash management system	WP4	NTNU, BEN, UBO, FRA	Highly exploitable
30	Car Demonstrator. Use-case feasibility check through showcasing possible usage of use-cases from WP4 on physical demonstrator.	WP3	SKODA, all Tier 1, all WP4	Moderately exploitable

4.1.2 Characterisation of the KERs

Following the technology identification stage, phase A1.2 consisted of another template, presented in Table 3, created and provided by Bax, in line with the EXPLOITT ® methodology, which allowed the partners to describe their KER in more detail. The following Table 3 details the characterisation criteria for an example KER- KER 6, Recycled plastics with up to 70% post-consumer recycled (PCR) material.

Table 3: *Characterisation template, including an example, used for characterisation of highly and moderately exploitable KERs after the identification stage*

KER	(KER1/10) AI Head Impact Criterion tool for steel repurposing
Partners involved	EDAG
Exploitability Level	Highly exploitable
Brief Description	AI tool capable of predicting HIC with 90% accuracy for the steel component designed in T4.1.
Unique Selling Point (innovativeness)	Reduced designing time by 99% (1 hour vs 6 weeks). Contributes to the feasibility and efficiency of reusing steel. 100% reuse of steel for component manufacturing
Legal/Normative/ethical requirements (need for authorisations, compliance to standards)	Possibility to achieve the validation of the HIC not via testing the hood design, but by an approved fast and reliable simulation process utilizing AI. Possibly by verification using few random samples.
Which partner contributes to what (main contributions in terms of know-how, patents, etc)	HIC is calculated (EDAG) by simulating the shooting of an accelerating head from 150 positions (Euro NCAP) towards the meshed (discretizing a complex component into elements) steel component. To reduce the simulation time for HIC

	predictions to 0.5 sec, machine learning algorithms are used to analyse the geometry of the component, based on earlier generated results. This analysis helps identify weak spots in the component, and the results are directed back to T4.1 for design optimization (FRA, SKO). The final step is to perform a check on the optimized component to achieve a HIC of 750 (general threshold NCAP) with 95% accuracy of HIC prediction.
Justification of exploitability level (e.g. market opportunity, industry impact)	The simulation of the HIC is a service EDAG is performing for numerous customers. The simulation must be repeated once a new design is implemented. This can happen multiple times per vehicle development. The AI tool would be able to shorten the time and improve the understanding, since more points can be evaluated than in the former regulated pattern.

4.1.3 Priorisation of the KERs (pKERs)

The third stage of phase A1- Technology identification- consists of the prioritization of KERs (pKERs). As stated by the EXPLOITT ® methodology, the importance of narrowing down to 3-5 pKERs is crucial, to allow performing technology evaluation and business planning on a reduced number of results, this is to ensure optimised use of resources, a recommendation of both the EXPLOITT ® and the HRB, ensuring full focus on those KERs with the highest chances to be commercialised. The HRB also only offers its service to 3 KERs to ensure efficient use of resources. First, a filtration was performed, which consisted of discussions between the exploitation manager (BAX) and the project coordinators (FRA) about the status of each KER, to move forward those KERs with the highest chances of impact (and commercialisation). This resulted in 14 remaining KERs being taken to the prioritizations workshop in M18, which are in Table 4 below.

Table 4: *KERs forwarded to the prioritisation workshop*

KER	Project Result
1	AI Head Impact Criterion tool for Steel repurposing
2	Steel Repurposing
3	100% recycled cast Aluminium processed into foam
4	100% Recycled Wrought Aluminium for extruded profiles
5	100% Recycled Casting Aluminium for HPDC
6	Thermoplastic Composite semi-products (Organo sheets and/or GMT) made of Recycled (PCR) PET and Glass Fabrics
7	Recycled Plastics (up to 70% PCR) for interior parts
8	Traceability of components through Digital Product Passport (DPP)
9	Predictive Simulation Models for Aluminium Wrought Alloys and Castings
10	Digital twin for aluminium components in circular design
11	Tyres- up to 20% of recycled materials, through pyrolysis and retreating process of C1 and C2 tyresoncepts
12	Harmonised circularity methodology, including holistic LCT methodology, LCA, LCC, and SLCA on the use cases
13	Glass- 0% water use and coolant on cutting process. 25% reduction of paint in digital printing. Integration of photovoltaic cells into a panoramic laminated sunroof
14	Prediction of Response Behavior and Failure Criteria for Foamed Aluminum Components Under Various Loading Conditions

The workshop took place during the 3rd consortium meeting in June 30th in Budapest (M18), and roughly 40 people were present (below, some images are displayed of the successful session), representing the 28 project partners organisations. 10 teams of 4 were made and they followed the templates provided by the EXPLOITT ® methodology (see Table 5) to prioritise the KERs in Table 4. The following templates were used for measuring the innovativeness of the KERs. As you can see in Table 5, the scoring was up to 5 (Where 1 is very low, and 5 is very high) for each KER for each team, with a weighting of 30% A, 30% B, and 40% C. Where A, B, and C are detailed in Table 6.

Table 5: *Criteria and weighting for KERs, template provided to each group during the prioritisation workshop*

	Criteria and Weights			
Weight (0-1):	0.3	0.3	0.4	Score: 5 max
Project Result	Innovation (A)	Exploitability (B)	Impact in Industry (C)	Total (0.3A+0.3B+0.4C)
KER X	(1-5)	(1-5)	(1-5)	

Table 6: *Definitions of the criteria A, B, and C, for the KER weighting*

Innovation (A)	Refers to exploitable result's degree of innovation.
Exploitability (B)	Refers to the condition of being exploitable, which means, profit can be made from this exploitable result.

The total results led to a summation of each of the groups' scoring for each KER. The KERs with the highest scores can be seen in Table 7.

Table 7: *3 pKERs from the session that were provisionally taken forward.*

Nº	Project Result	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	Total (max: 5*12=60)
1	KER 4- 100% Recycled Wrought Aluminium for extruded profiles	4.3	4	3.4	4	3.8	3	1.6	3.8	4.1	3.7	35.7
2	KER 7- Recycled Plastics (up to 70% PCR) for interior parts	3.9	3.4	3.7	3	3	4.1	2.7	3.8	4.1	4.1	35.8
3	KER 8- Traceability of components through Digital Product Passport (DPP)	3.9	4.1	3.8	0	2	4.7	4.1	4.1	2.7	4	33.4

The following photos were taken from the Prioritisation workshop, Figure 3.

Figure 3: *ZEvRA KER prioritisation workshop, Budapest, July 1st, 2025*

In addition to the 3 pKERs, after discussion with the PO and expert reviewer, it has been decided that the KERs ¨AI head impact criterion tool for steel repurposing¨ and ¨Thermoplastic composite semi-products (organo sheets and/or GMT) made of recycled (PCR) PET and glass fabrics¨ will be prioritized too, leaving the following KERs to be prioritised (the first 3 following both HRB and EXPLOITT ® due to HRBs limit of 3, the final 2 following just EXPLOITT ®) in Table 8.

Table 8: *pKER selected*

pKER Number	KER name	KER owner	KER contributor	Exploitation process
1	100% Recycled Wrought Aluminium for extruded profiles	RAF	FRA, BEN, UBO, VW	EXPLOITT ® and HRB
2	Recycled Plastics (up to 70% PCR) for interior parts	FPL	VTT, TME, RISE, SKO	EXPLOITT ® and HRB
3	Traceability of components through Digital Product Passport (DPP)	PLM	RISE	EXPLOITT ® and HRB
4	AI head impact criterion tool for steel repurposing	EDAG	FRA, SKO	EXPLOITT
5	Thermoplastic composite semi-products (organo sheets and/or GMT) made of recycled (PCR) PET and glass fabrics	FAU	RISE	EXPLOITT

4.2 Technology Evaluation

The technology evaluation process follows phase A2 of the EXPLOITT® methodology. The technology evaluation phase in the EXPLOITT methodology serves to identify and assess the project results that have real potential for exploitation. Since not all outcomes of a project are suitable for commercialization or practical application right after the implementation of ZEvRA, this phase focuses on a maximum of three KERs, as recommended by the EXPLOITT® methodology. Each selected KER undergoes an in-depth analysis to evaluate its technical feasibility, innovative value, and potential impact. This structured assessment ensures that only the most promising results are considered for further development, helping the project team focusing on results that are likely to succeed in the market or broader application by the time ZEvRA completes its implementation.

As can be seen in Figure 2, this is made up of A2.1- Ground identification, all the way through to A2.8- Risk assessment. The individual steps that make up A2 will be explained in the following text. Due to this process being very detailed, this process will be applied to the prioritised KERs (pKERs), which were the 3 that include the HRB (pKER 1, 2, and 3), and the additional KERs that will just follow the EXPLOITT®, due to HRB only having the capacity to perform the booster's services on 3 pKERs.

4.2.1 Unique Value proposition and Market definition

The Unique Value Proposition Canvases were carried out for pKERs 1–3 from the HRB, independently of the EXPLOITT ® methodology, through a collaborative workshop between the HRB consultant, the Bax exploitation manager, and the respective pKER owners. The purpose of this exercise was to clearly identify the intent of each KER and articulate the unique and outstanding value each one offers.

The Market Definition Canvas was used to systematically clarify the target market for each pKER by examining several core elements essential to positioning the result for future exploitation. The process begins by defining the product, service, technology, or data being innovated, followed by identifying the job executors, the individuals or groups who will use the result to accomplish a specific task. These users are then consolidated into an abstracted job executor, a unifying term that captures all categories of people performing the job. The canvas also outlines the product's primary function, the alternative products or solutions currently used for the same purpose, and an abstracted job statement that distills the essential outcome the user seeks to achieve. This structured approach is critical for the result owner, as it enables a clear definition of the most relevant and valuable target markets for the intended outcome. Moreover, the market definition serves as a foundational input for subsequent templates and analyses, including the processes followed under 4.2.2- 4.2.10 risk assessment and other steps within the exploitation methodology, making its accurate completion a vital component of the overall process.

The information included in the following canvases will be placed into a final report for the support given by the HRB expert. In the report, the expert will include an assessment and recommendations to deep in into the exploitation activities with the analysed KERs. Such a report will be provided between M24-M35.

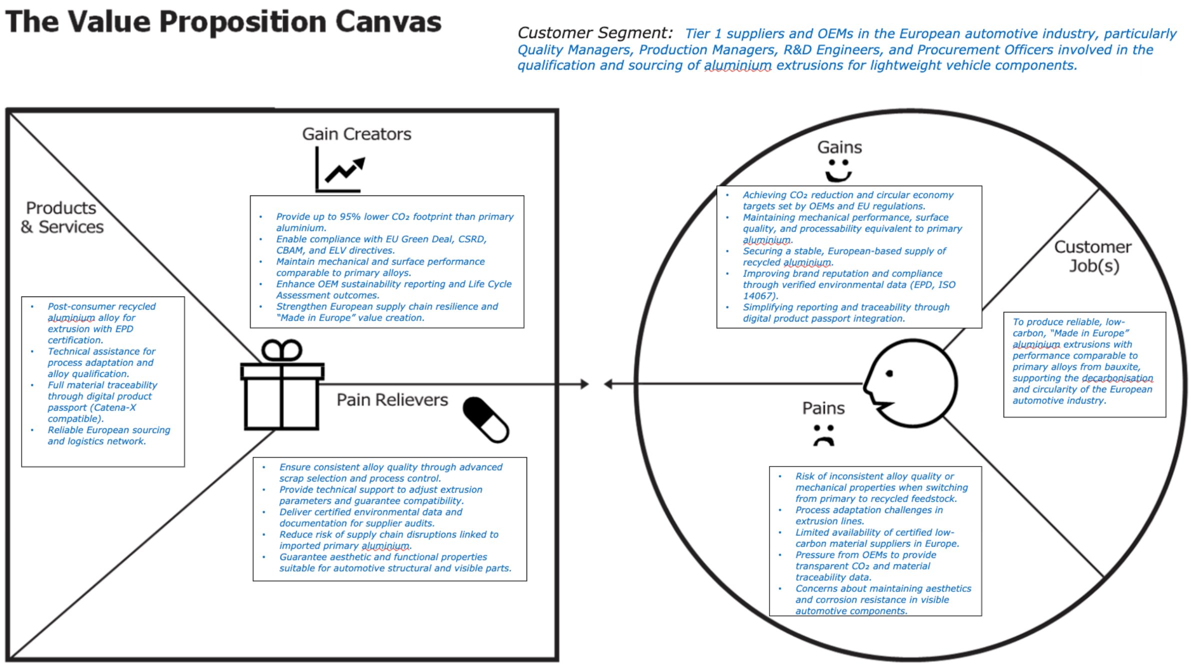

Figure 4: *RAF Market definition canvas*

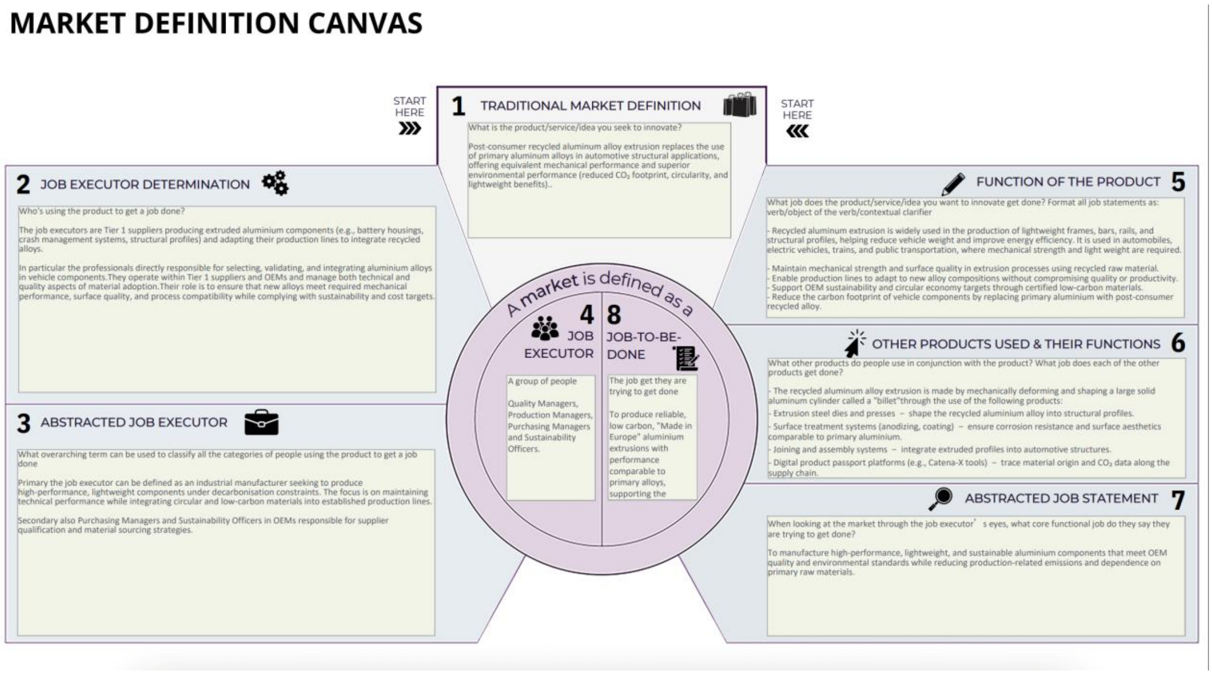

Figure 5: *FPL G2M value proposition canvas*

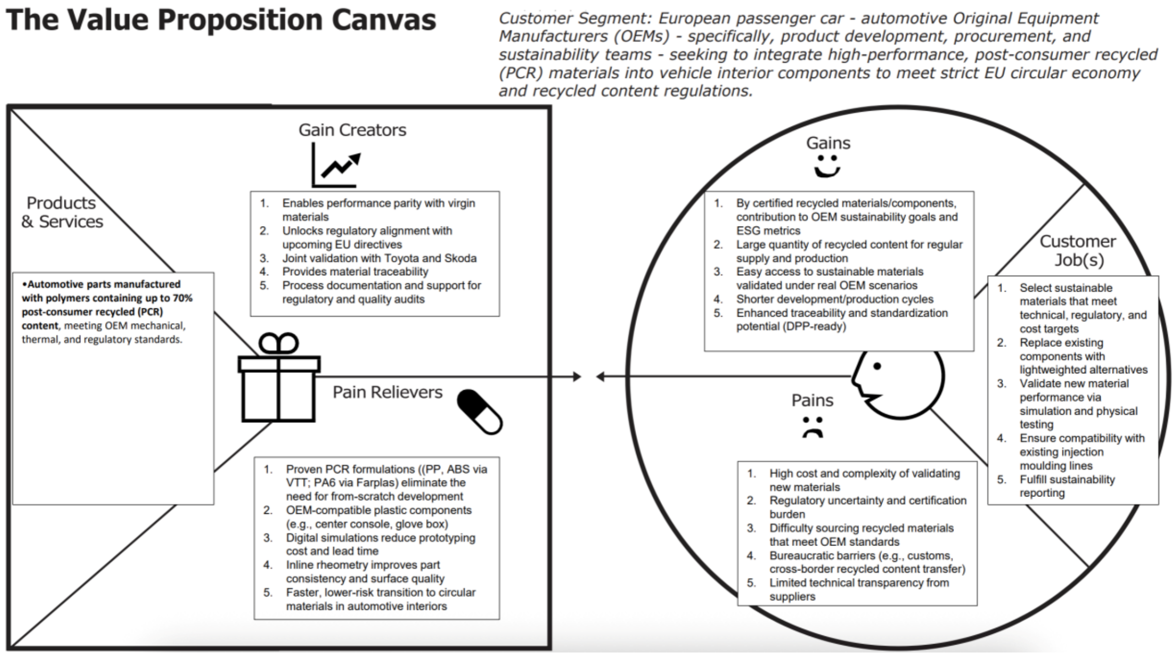

Figure 6: *FPL Market definition canvas*

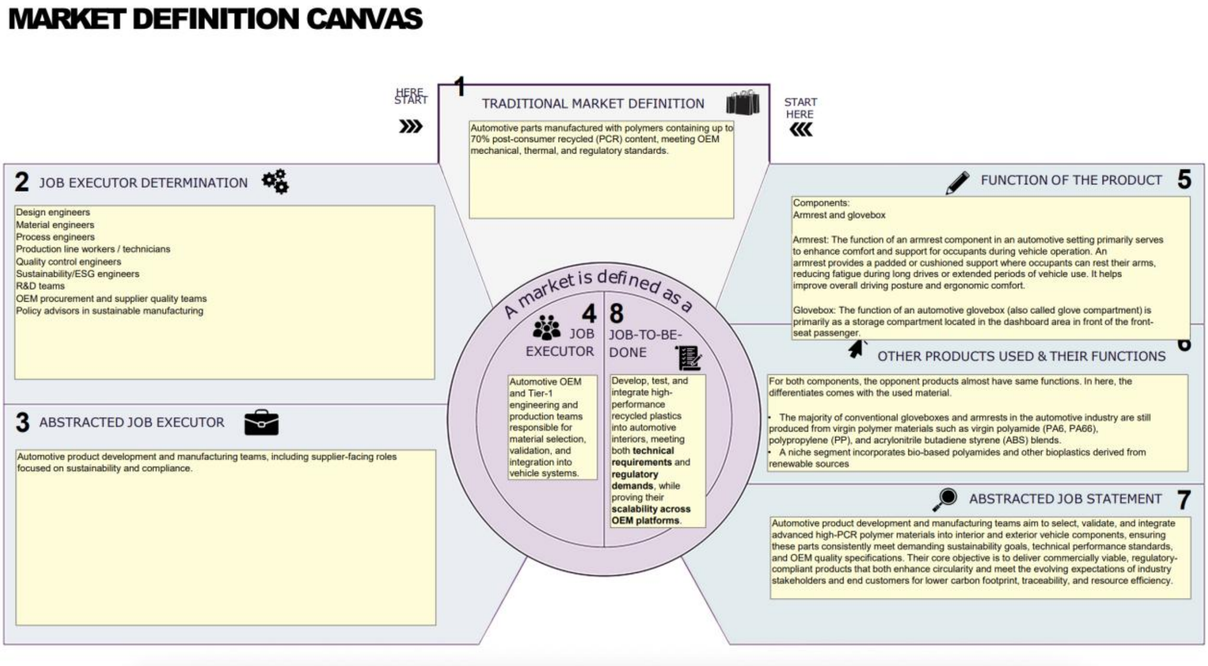

Figure 7: *PLM G2M value proposition canvas*

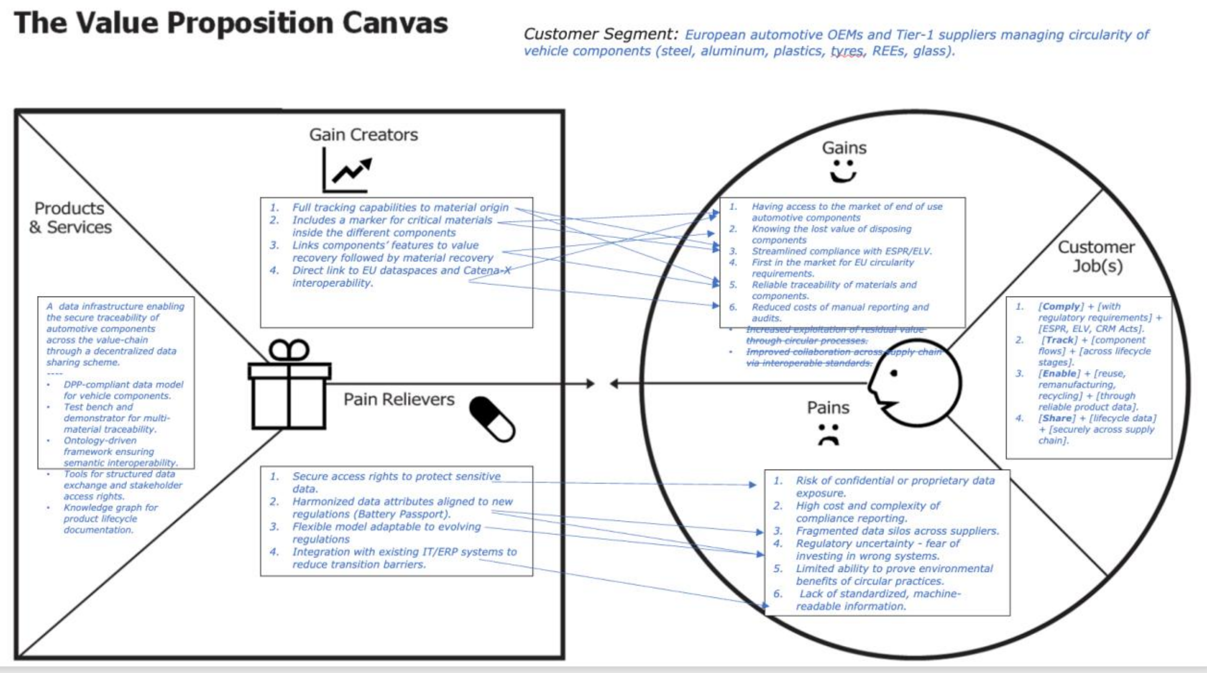

Figure 8: *PLM Market definition canvas*

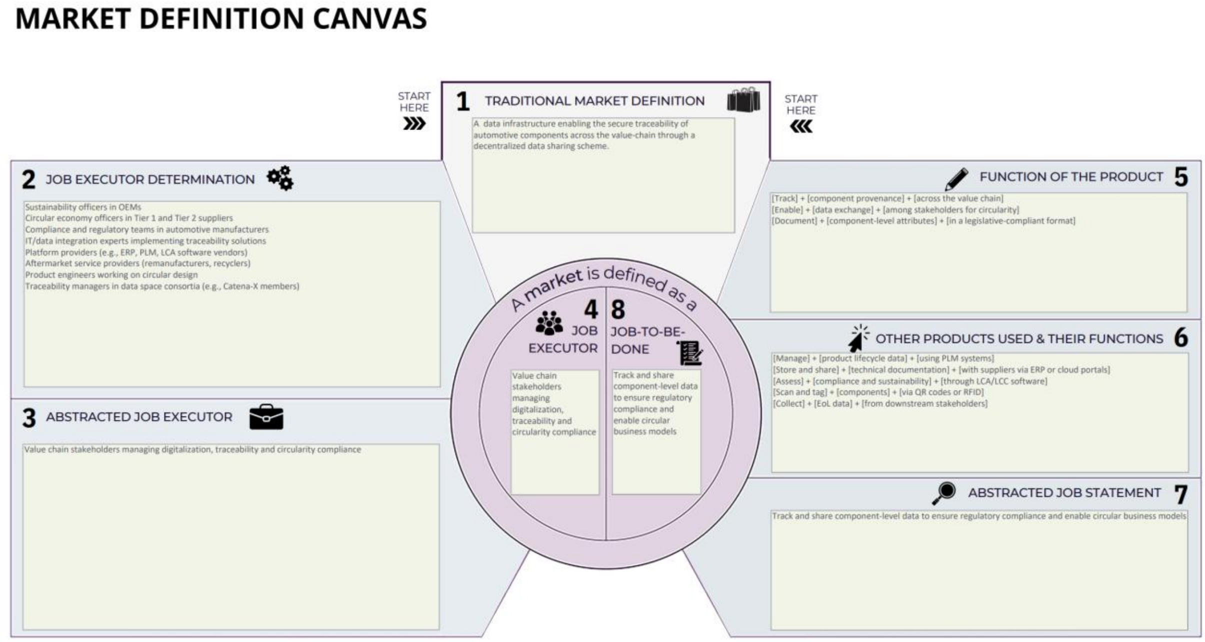

Figure 9: *FPL G2M value proposition canvas*

The outcomes of the Unique Value Proposition Canvas and the Market Definition Canvas provide a clear, structured understanding of each PKER's distinctive value and target market, enabling deeper and more accurate execution of the subsequent exploitation steps, such as ground identification, contribution and benefit analysis, and the detailed assessments outlined in Sections 4.2.2 through 4.2.10.

4.2.2 Ground identification

Ground identification sets the foundation for p-KER exploitation. In this step, the partners providing background had to declare whether they want to claim rights over the P-KER or not. Partners who did not wish to claim rights could still request a Non-Disclosure Agreement (NDA) on their foreground knowledge. The aim was to reach a consensus between partners in case that conflicts arose or could be foreseen. The result scan be seen in Table 9 below. In bold, the lead partners per P-KER are indicated.

Table 9: *P-KERs Ground identification*

Partner	Are you willing to go to the market and exploit the KER?	If you do not wish to go to the market? Do you wish to claim the rights?	If you do not want to claim rights, do you wish to request an NDA?	Nature of the activity foreseen for this result by each partner?	Eventual Comments
P-KER 1: 100% Recycled Wrought Aluminium for extruded profiles					
RAF	Yes	Yes	No	Manufacturing/Realization	We don't want to share how we produce these alloys (scrap utilized, melting method, cleaning method, etc.)
FRA	Yes	No	No	Research	Result is base for further R&D
BEN	No	Yes	Yes	Manufacturing/Realization	The results are not quite ready for industrialization yet- We need to create a business case for each individual result.
UBO	No	Yes	Yes	Research	We would disseminate the results and share the application, but we would keep rights on the adopted methodology and developed models.

Partner	Are you willing to go to the market and exploit the KER?	If you do not wish to go to the market? Do you wish to claim the rights?	If you do not want to claim rights, do you wish to request an NDA?	Nature of the activity foreseen for this result by each partner?	Eventual Comments
P-KER 2: Recycled Plastics (up to 70% PCR) for interior parts					
FPL	Yes			Research	The KER aligns with PLM's research roadmap on digital product passports and circular manufacturing. Exploitation will focus on scientific valorisation, extension to further use-cases, and potential contributions to DPP/Catena-X standards.
VTT	No	Yes	No	Research	Developing final compound formulations. VTT is not a production company; and serves the industry & research by licensing the concepts & formulations to the relevant and interested internal & external partners.
RISE	No	No	No	Research	Willing to support with material models.
SKO	Yes			Research	

Partner	Are you willing to go to the market and exploit the KER?	If you do not wish to go to the market? Do you wish to claim the rights?	If you do not want to claim rights, do you wish to request an NDA?	Nature of the activity foreseen for this result by each partner?	Eventual Comments
P-KER 3: Traceability of components through Digital Product Passport (DPP)					
PLM	Yes			Research	The KER aligns with PLM's research roadmap on digital product passports and circular manufacturing. Exploitation will focus on scientific valorisation, extension to further use-cases, and potential contributions to DPP/Catena-X standards.
RISE	Yes	Yes	Yes	Consultancy/Training	

Partner	Are you willing to go to the market and exploit the KER?	If you do not wish to go to the market? Do you wish to claim the rights?	If you do not want to claim rights, do you wish to request an NDA?	Nature of the activity foreseen for this result by each partner?	Eventual Comments
P-KER 4: AI head impact criterion tool for steel repurposing					
EDAG	Yes			Services	We are offering 2 Services. On the one hand the general service of engineering the hood in including the simulation of the the HIC for vehicles in a much more advanced and fast way than before. On the other hand, the new service of checking the suitability of sheet metal from used car for repurposing.

Partner	Are you willing to go to the market and exploit the KER?	If you do not wish to go to the market? Do you wish to claim the rights?	If you do not want to claim rights, do you wish to request an NDA?	Nature of the activity foreseen for this result by each partner?	Eventual Comments
P-KER 5: Thermoplastic composite semi-products (organo sheets and/or GMT) made of recycled (PCR) PET and glass fabrics					
FAU	Yes			Research	

4.2.3 Contribution-benefit matrix

In Table 10, a contribution-benefits matrix that defines partner commitments, is presented, the purpose of the matrix allows partners describe what they benefit from the others, while also stating how they contribute to benefits.

Table 10: *Contribution-benefit matrix*

		RAF benefits	FRA benefits	BEN benefits	UBO benefits	VW benefits
P-KER 1: 100% Recycled Wrought Aluminium for extruded profiles						
RAF contributions	Production aluminum recycled alloys.	X	Knowledge gained in working with RAF-alloys (parameters of material as well as processing parameters).	Gaining reliable production of recycled aluminum alloys and tailored chemistry windows that are feasible for downstream processing at bar.	Knowledge on recycled Al alloys formability and microstructure evolution.	Material supplier.
FRA contributions	Alloy tests in the laboratory but also through the evaluation of the behaviour of a real component.	Know the potential properties of the alloy produced, and if they are negative, identify any targeted modifications to it to mitigate or	X	Benefiting from alloy property assessment, including component-level behavior and early identification of microstructural or performance risks.	Knowledge on recycled Al alloys formability and microstructure evolution.	Knowledge gain and exchange regarding testing results and application areas.

		eliminate the problem.				
BEN contributions	Demonstration of product - and process feasibility using recycled aluminum alloys.	Providing tailored chemistry windows feasible for downstream processing at bar.	Experience on technological transfer to serial production level.	X	Validation feedback for prediction models and proof of concept.	Validation and demosntration of product performance in crash management using aluminum scrap alloys.
UBO contributions	Comparison of formability through flow stress characterization; development and training models for microstructure prediction.	The deep knowledge of the microstructure of the aluminum alloy and its behavior during extrusion helps us to understand how and where to improve the design of the alloy itself.	Knowledge about die design and simulation.	Receiving formability and microstructure-evolution insights from flow-stress tests and model validation. These data strengthen prediction models for extrusion and crash-relevant downstream processing.	X	Informational exchange regarding feasibility of processing in comparison to state of the art.
VW contributions	Information for simulation and evaluation for CMS and for alloy crash profile.	Important information to evaluate the alloy's behavior and, if necessary, its improvement.	Parameter analysis after small scale extrusion/experience.	A shared shift in paradigm from certifying fixed alloy data-sheets toward defining feasible scrap-composition windows that still secure all OEM performance requirements. This collaborative approach enables both VW and Benteler to reduce dependency on virgin alloys, expand	Specs and requirements of application. Discussion of potential and future project content.	X

				the acceptable scrap spectrum, and align PPAP (Production Part Approval Process) acceptance with realistic recycled-content strategies.		

		FPL benefits	VTT benefits	TME benefits	RISE benefits	SKO benefits
P-KER 2: Recycled Plastics (up to 70% PCR) for interior parts						
FPL contributions	Leads the identification and suitability assessment of interior plastic parts for 70% PCR material use, and later supports material processing and injection moulding trials. Jointly with VTT, conduct small-scale mounding trials.	X	Utilizes the processing and testing data of FPL and tailors the final formulations based on the feedback of FPL's part production.	Receives samples and part-level insights supporting OEM validation.	Highlight which material properties are key to industrial application when assessing recycled materials	Receives component-level moulding results that help assess manufacturability and validate the suitability of high-PCR materials for interior parts.
VTT contributions	Responsible for analysing recycled feedstocks, exploring	From receiving optimized and pre-validated recycled material formulations,	X	Access to validated PCR material grades for testing.	Provides data for many of the material properties required by simulation data allowing the creation	Benefits from optimized and pre-validated PCR formulations, enabling faster OEM testing and

	recycling routes, compounding selected grades with fillers and additives, and stabilizing materials using its advanced tandem extruder. Jointly with FPL, conduct small-scale moulding trials.	which reduce development time and increase the success of moulding trials.			of material models suitable for recycled plastics.	reducing risks during material qualification
TME contributions	Provides technical requirements and, together with SKO, validates the final material formulations.	Gains clear guidance on the technical requirements for materials and benefits from the joint validation with SKO, ensuring that the final material formulations meet the necessary standards. This reduces the risk of issues during production and supports faster, more reliable implementation of the materials in target parts.	VTT develops compound formulations based on the technical requirements of TME and SKO. Tailors the final formulations based on the feedback of TME, SKO and FPL.	X	Allow the validation and verification of the simulations as well as establishing what the key outputs need to be.	Gains aligned OEM validation and shared technical requirements, ensuring that the selected materials meet production standards and reduce implementation risks.

RISE contributions	Simulations, design and production of plastic components, which are then manufactured via injection moulding and undergo final validation.	By obtaining validated designs and simulation data for plastic components, which reduces trial-and-error during production. This ensures higher accuracy in injection-molded parts, shortens development time, and improves the reliability and quality of the final components.	Uses the feedback from the simulations and tunes the compound formulations accordingly if needed.	Simulation data supporting material validation.	X	Obtains simulation and design insights that support the evaluation of part performance and guide decisions on adopting recycled materials.
SKO contributions	Provides technical requirements and, together with TME, validates the final material formulations.	By receiving clear technical requirements and jointly validating final material formulations with TME, ensuring that the materials meet production standards. This minimizes risks during manufacturing, facilitates smoother integration into target parts, and accelerates	VTT develops compound formulations based on the technical requirements of TME and SKO. Tailors the final formulations based on the feedback of TME, SKO and FPL.	Complementary OEM validation insights.	Allow the validation and verification of the simulations as well as establishing what the key outputs need to be.	X

		material implementation in series production.				

		PLM benefits	RISE benefits
P-KER 3: Traceability of components through Digital Product Passport (DPP)			
PLM contributions	Coordination of the KER definition and exploitation strategy. Development of DPP data model for traceability across vehicle components.	X	These results will 'elevate the floor' for the exploitable results of the project, hence making it easier to reach out to the market with solutions from this project.
RISE contributions	Integration of use-case requirements and alignment with ESPR, CIRPASS, and Catena-X standards. Contribution to methodology and dissemination.	Linked to their ongoing work on analysing Catena-X standards (CX-0117, CX-0131, and CX-0143) and identifying gaps with ESPR, ISO, and circular economy standardisation activities, which directly supports the long-term vision of the KER by aligning the DPP data model with the broader automotive ecosystem.	X

	EDAG benefits
P-KER 4: AI head impact criterion tool for steel repurposing	
EDAG contributions	Improvement of accuracy, reduction of time effort, automated EU-AI-Act-proof AI-Training process, improved GUI of the Software.

	Compositec benefits
P-KER 5: Thermoplastic composite semi-products (organo sheets and/or GMT) made of recycled (PCR) PET and glass fabrics	
FAU contributions	New offer for composite offer with high recycled content and low GWP.

4.2.4 Patent analysis

During the patent analysis, the activities included assessing the state of the art and understanding how the project goes beyond it. The analysis was completed by looking at the existing project high-level landscape, and scientific literature and conducting patent research (database ESPACENET has been used). The results are shown in Table 11.

Table 11: *Patent analysis*

Publication number	Title	Assignee	Priority date	Publication date	Summary of the principal claims
P-KER 1: 100% Recycled Wrought Aluminium for extruded profiles					
EP3601626B1 [2]	Casting recycled Aluminum scrap	NOVELIS INC [US]	23/03/2018	11/05/2022	Techniques are disclosed for casting high-strength and highly formable metal products from recycled metal scrap without the addition of substantial or any amounts of primary aluminum.
US2021388468A1 [3]	High strength recycled aluminum alloys from manufacturing scrap with cosmetic appeal	APPLE INC [US]	10/06/2021	16/12/2021	The disclosure provides an aluminum alloy including Fe, Si, Mg, Mn, Cr, Al
WO2024157130A1 [4]	High recycled content aluminum alloys, aluminum alloy products, and methods of producing a brazed product	NOVELIS KOBLENZ GMBH [DE]	24/01/2023	02/08/2024	Disclosed herein are aluminum alloys which may be used for a core alloy. The aluminum alloy may be produced from 50 % or greater of recycled aluminum alloy material and exhibit good strength and corrosion resistance for use in heat exchangers.
US2023183841A1 [5]	Aluminum alloys produced from recycled aluminum alloy scrap	NOVELIS INC [US]	14/04/2021	15/06/2023	Provided herein are aluminum alloys and methods of making these alloys. The aluminum

					alloys described herein are produced with a high content of recycled scrap.
US10975461B2 [6]	Casting recycled aluminum scrap	NOVELIS INC [US]	23/03/2018	13/04/2021	Techniques are disclosed for casting high-strength and highly formable metal products from recycled metal scrap without the addition of substantial or any amounts of primary aluminum. Additional alloying elements, such as magnesium, can be added to metal scrap
US8202347B2 [7]	Process for recycling aluminum alloy scrap coming from the aeronautical industry	VERDIER JEAN-FRANCOIS [FR]; BUTRUILLE JEAN-REMI [FR]; LEROY MICHEL [FR]; VALAX DIDIER [FR]; CONSTELLIUM FRANCE [FR]	18/06/2007	19/06/2012	A manufacturing process for a remelt block containing aluminum designed for making aluminum alloy for the aircraft industry in which scrap containing mainly aluminum alloys used in the aircraft industry is supplied during a supply stage

Publication number	**Title**	**Assignee**	**Priority date**	**Publication date**	**Summary of the principal claims**
P-KER 2: Recycled Plastics (up to 70% PCR) for interior parts					
EP4101889B1 [8]	Polypropylene composition for interior automotive applications	BOREALIS AG [AT]	09/06/2021	20/12/2023	A composition suitable for automotive application obtainable by blending at least components (A), (B) and (C)
WO2024251869A1 [9]	Recyclate containing polypropylene composition for interior automotive applications	BOREALIS AG [AT]	07/06/2023	12/12/2024	The present invention relates to a polypropylene composition (PC) being a mixed plastic polypropylene blend containing recycled material and comprising inclusions attributed to automotive paints and to articles comprising said polypropylene composition (PC).

US12291274B2 [10]	Automotive trim part based on recycled materials	AUTONEUM MAN AG [CH]	28/11/2022	06/05/2025	An automotive trim part is provided made of a laminated structure generally consisting of a thermoplastic core layer extruded from at least one feedstock derived from recycled material.

Publication number	Title	Assignee	Priority date	Publication date	Summary of the principal claims
P-KER 3: Traceability of components through Digital Product Passport (DPP)					
US11354762B2 [11]	Digital passport systems and methods	MASTERCARD INTERNATIONAL INC [US]	01/12/2017	01/12/2017	A wallet provider (WP) device manages the extension of a digital passport stored in a digital wallet. It processes an augmentation request from a user device, retrieves the necessary template and authentication data, and generates an augmentation package. The device then sends an authentication request to another user device, evaluates the authentication response, and, if valid, sends the updated augmentation package to the sponsoring authority.
US2025061416A1 [12]	Chemical product passport in product chains	BASF SE [DE]	14/10/2022	20/02/2025	An apparatus generates a product passport using computing nodes and computer-readable media. It receives a request for a decentralized identifier (DID) linked to a physical entity in the supply or recycling chain, provides the DID, creates the product passport with the DID and related data, and makes it accessible to a data-consuming service under the control of the data owner's data-providing service.

Publication number	Title	Assignee	Priority date	Publication date	Summary of the principal claims
P-KER 4: AI head impact criterion tool for steel repurposing					
EP3338631B1 [13]	Detection and characterization of head impacts	CLEVELAND CLINIC FOUND [US]	15/07/2010	14/07/2021	The system characterizes impacts on a user by measuring acceleration and angular velocity at a sensor, calculating the resulting acceleration at a point of interest like the head or neck, and presenting the results in an understandable form.
US2023282350A1 [14]	Machine learning models for vehicle accident potential injury detection	STATE FARM MUTUAL AUTOMOBILE INSURANCE CO [US]	03/03/2022	07/09/2023	Techniques described herein relate to training and executing machine learning models configured to determine injury probabilities based on vehicle accident data.
US10582883B2 [15]	Detection and characterization of head impacts	CLEVELAND CLINIC FOUND [US]	15/07/2010	10/03/2020	Systems and methods are provided for determining an acceleration at a location of interest within one of a user's head and neck.

Publication number	Title	Assignee	Priority date	Publication date	Summary of the principal claims
P-KER 5: Thermoplastic composite semi-products (organo sheets and/or GMT) made of recycled (PCR) PET and glass fabrics					
US5476628A [16]	GMT sheet material produced from GMT recyclate	BASF AG [DE]	11/09/1993	19/12/1995	Semi-finished GMT sheet material of GMT recyclate in which more than 50% by weight of the glass fibers are more than 2 mm in length and which is produced by extruding GMT recyclate particles without significant comminution of the glass fibers
US6271270B1 [17]	Fiber-reinforced recycled thermoplastic composite	GEORGIA COMPOSITES [US]	25/04/1997	07/08/2001	Fiber-reinforced recycled thermoplastic composites and methods for their manufacture are presented. In a preferred embodiment, the thermoplastic composite incorporates a matrix

					of recycled thermoplastic and a plurality of high modulus fibers.
CN101439604A [18]	Method for manufacturing light GMT sheet material	YUNQING HUANG [CN]	10/12/2008	27/05/2009	The invention discloses a method for manufacturing a light GMT board.

4.2.5 Competitor search and analysis

Bax created a comprehensive list of competitors with detailed information and description, including market share, sales, locations, strategy, and level of competition. The findings are presented in Table 12 below.

Table 12: *P-KERs Competitor search analysis*

Competitor	Description	Sales	Market relevance	Nº of employees	Locations	Strategy
P-KER 1: 100% Recycled Wrought Aluminum for extruded profiles						
Hydro (Hydro CIRCAL)	Global leader in low-carbon and recycled aluminum. Hydro CIRCAL uses at least 75% post-consumer scrap. Produces both primary and recycled aluminum and operates several remelt and recycling facilities.	N/A	N/A	32,000 (Total Hydro)	140 locations and 42 countries	Towards 2030, step up growth in aluminum recycling and extrusions, and renewable power generation. Execute their own decarbonization roadmap, and contribute to nature positive and a just transition, while shaping the market for greener aluminum.
Novelis	World's largest recycler of aluminum and major producer of rolled products for automotive, packaging, and construction sectors.	€10.6B (2011)	N/A	11,000	11 countries	Circular model using recycled scrap, investment in recycling across Europe.
Speira	Specialist in aluminum and magnesium scrap recycling,	N/A	N/A	5,400	11 manufacturing facilities across	Become the industry benchmark in sustainability by

	providing liquid metal and alloy ingots.				Germany and Norway	delivering high-quality low-carbon products.
Constellium	Constellium is a global leader in the development, manufacturing, and recycling of aluminum products and solutions.	$7.3B (2024)	N/A	~12,000	25 production sites and 3 R&D centers	Expand recycling capacity, increase recycled content share.

Competitor	Description	Sales	Market relevance	Nº of employees	Locations	Strategy
P-KER 2: Recycled Plastics (up to 70% PCR) for interior parts						
BASF	Global leader in chemicals and materials, with strong investments in recycled plastics for automotive.	€68.9B (2023)	N/A	111,500	93 countries	Innovation in sustainable materials, chemical recycling.
Covestro	Specialist in high-performance polymers (polyurethanes, polycarbonates) with advanced mechanical and chemical recycling projects.	€18.0B (2022)	N/A	18,000	30+ sites	Focus on circular economy, electrification, and sustainable mobility.
Lanxess	Supplier of engineering plastics (polyamides, PBT) with recycling programs in automotive interiors and exteriors.	€6.4B (2024)	N/A	11,900	32 countries	High-performance materials, integration of PCR solutions into OEM supply chains.
INEOS Styrolution	European leader in styrenics with strong automotive focus and mechanical recycling initiatives.	€6.6B (2022)	Leading styrenics player in Europe	3,100	16 sites globally	Circular styrenics strategy, expanding PCR-based ABS for automotive interiors.
LyondellBasell	Large player in polyolefins with growing PCR product	€40.3B (2024)	N/A	20,000	30+ countries	Expansion of PCR materials, partnerships

	line for automotive and packaging.					with European OEMs for sustainable automotive solutions.

Competitor	**Description**	**Sales**	**Market relevance**	**Nº of employees**	**Locations**	**Strategy**
P-KER 3: Traceability of components through Digital Product Passport (DPP)						
Circularise	Dutch startup developing blockchain-based DPPs; pilot projects with plastics, chemicals, and automotive.	N/A	N/A	N/A	Global	Scale blockchain-enabled DPPs through industrial partnerships.
iPoint-systems	Provides leading software for product compliance and sustainability, helping global companies meet complex regulations. Their platform manages the entire product lifecycle, enabling data collection for LCA.	N/A	N/A	N/A	Global	Integrating regulatory requirements, LCA, and supply chain data to provide a single source of truth, enabling companies to make data-driven, sustainable decisions.
SAP	SAP is a leading German software company that specializes in ERP systems. Its software integrates all core business processes, like finance, HR, and supply chain, into a single platform to help companies run more efficiently.	€30.0B	Leading global ERP provider	N/A	Global	Creating Intelligent Sustainable Enterprises by integrating AI and Machine Learning (ML) into its cloud ERP solutions to automate business processes and foster innovation.

Competitor	Description	Sales	Market relevance	Nº of employees	Locations	Strategy
P-KER 4: AI head impact criterion tool for steel repurposing						
Bertrandt	An independent and international development service provider with long years of automotive expertise.	€1.1 B	N/A	13,000	50 sites worldwide	To accelerate technological progress and make a relevant contribution to a sustainable future.
AVL	One of the world's leading mobility technology companies for development, simulation and testing in the automotive industry, and in other sectors.	N/A	N/A	12,200	50+ tech and engineering centers worldwide	Relentlessly striving towards climate-neutral mobility
Akkodis	Global digital engineering consulting company that empowers organizations to accelerate and innovate. With roots in IT and engineering, research & development (ER&D), they combine technology and talent to drive their clients' digital transformation.	€4.0B	N/A	50,000	30 countries	Akkodis combines best-in-class tech expertise and digital engineering talent to drive global innovation.
ALTEN	ALTEN's core business has historically been Engineering, it has been recognised as the leading technological partner for major industrial clients. It has developed a complementary positioning in IT Services to provide multisectoral solutions to clients, enabling it to cover the	€4.1B	Global leader in engineering and IT services	57,700	30+ countries	Making a positive and lasting impact, pushing the boundaries of innovation, and always staying one step ahead.

	entire product development cycle on technological projects.					

Competitor	Description	Sales	Market relevance	Nº of employees	Locations	Strategy
P-KER 5: Thermoplastic composite semi-products (organo sheets and/or GMT) made of recycled (PCR) PET and glass fabrics						
Indorama Ventures	Global leader in PET and rPET production. Manufactures recycled PET resins used for packaging, fibers, and engineering plastics. Significant presence in chemical recycling and polymer circularity initiatives.	€15.4 B (2024)	Major player in global PET and rPET markets.	25,000	114 locations in 32 countries	Investing in building our global recycling capacity, decarbonizing their operations, and switching to more circular and bio-based feedstock.
Berry Global Inc.	One of the world's largest plastic packaging manufacturers, producing high-performance films and sheets with PCR content.	€13.0 B (2018)	N/A	40,000+	240+ locations across the globe	Offers industry leading material science knowledge and manufacturing capabilities to help customers achieve their business and sustainability goals in a circular economy.
Alpek S.A.B.	Major PET, PTA, and rPET producer serving packaging and textile industries.	$10.0B.	N/A	5,500+	34 locations in 9 countries	Alpek thrives on leading by example in the recycling and sustainability efforts necessary to maintain a healthy environment and is positioned as a leader in the circular economy.

						Alpek leads extensive efforts to foster a circular lifecycle for PET and its other products.
SABIC	Global chemical company producing advanced thermoplastics, including PP, PET, and PA-based composites.	€40.0 B (2024)	N/A	31,000+	HQ in Saudi Arabia	SABIC has a strong culture of giving and volunteerism that complements our commitment to sustainability. This culture inspires our investments in corporate social responsibility (CSR) programs that create lasting, positive impacts throughout our global communities.
BASF	Leading chemical company, original developer of GMT and organo-sheet technology.	€90.0 B (2024)	Largest chemical producer in the world	111,822	Operations in 80+ countries.	Enabling our customers' green transformation is the source of their motivation and will be the key driver for their profitable growth.

4.2.6 Potential costumer research

BAX continued with the potential customer search. The results are presented in Table 13.

Table 13: *P-KERs potential customer search*

Prospective and Existing Customers	How and why do these prospective/existing customers fit this specific key exploitable result?	Market relevance	Number of employees	Locations	Strategy
P-KER 1: 100% Recycled Wrought Aluminium for extruded profiles					
Automotive OEMs (e.g., Volkswagen, Stellantis, BMW, Renault)	Strong focus on lightweight materials and CO_2 reduction targets. Recycled aluminum alloys meet structural requirements (strength, corrosion resistance) while reducing carbon footprint.	N/A	N/A	Global	Promote closed-loop recycling, highlight carbon footprint reduction, and support compliance with EU sustainability regulations.
Airbus	Require high-performance alloys with strict mechanical properties. Using recycled aluminum reduces energy use and aligns with sustainability commitments.	~60% of global commercial aircraft deliveries	157,000	180 locations	Reduce the environmental footprint of the Company's activities, by offering products and services which help nations protect citizens, defend sovereignty and advance global security, and by doing business in a way that benefits society.
Apple	Already committed to using 100% recycled aluminum in product casings.	Leading global consumer electronics brand	~160,000	Global	By 2030 to become carbon neutral across our global footprint by using more recycled materials, renewable electricity, and lower carbon transportation.
Ball corporation	Largest aluminum can manufacturer; relies on recyclability of aluminum,	World leader in beverage packaging	16,000	Global	Committees' scope is to ensure we add economic value to the business by fully integrating sustainability into their

	energy savings and carbon reduction.				strategies and aligning themselves with stakeholder expectations.
Bosch	Uses aluminum castings in powertrain and mobility solutions. Recycled alloys help OEMs meet CO_2 goals.	Leading Tier-1 supplier	429,416 (2023)	Europe, US and Asia	Accelerate automotive transformation through partnerships.
Automotive TIER1	Increase their market share by acquiring new customers or production orders from OEM.	N/A	N/A	Global	Promote closed-loop recycling, highlight carbon footprint reduction, and support compliance with EU sustainability regulations.
Other mobility sector (Trains, trucks, Naval) OEM and TIER1	Increase their market share by acquiring new customers or production orders.	N/A	N/A	Global	Promote closed-loop recycling, highlight carbon footprint reduction, and support compliance with EU sustainability regulations.

Prospective and Existing Customers	**How and why do these prospective/existing customers fit this specific key exploitable result?**	**Market relevance**	**Number of employees**	**Locations**	**Strategy**
P-KER 2: Recycled Plastics (up to 70% PCR) for interior parts					
Volkswagen Group	Strong commitment to sustainability and circular economy; already implementing recycled plastics in ID. models and Audi/VW interiors.	~25% EU market share (2022)	~676,000	HQ in Wolfsburg, Germany; multiple European/global plants	To play an active role in shaping the transformation of the automotive industry – as "The Global Automotive Tech Driver".
Stellantis	Actively using PCR plastics. High demand for scalable suppliers.	~20% EU market share (2022)	~260,000	HQ in Amsterdam; production in France, Italy, Germany, Spain	To embrace breakthrough ideas that will reinforce our leadership in offering innovative, clean, safe and affordable mobility.

BMW Group	Aims for 50% secondary materials by 2030; BMW interiors from 100% recycled materials.	~10% EU market share (2022)	~150,000	HQ Munich; plants in Germany, UK, Austria, etc.	At the BMW Group, forward-looking technologies meet emotive products and individual customer care to create a unique overall experience.
Mercedes	Integrating PCR materials in EQ electric line (fabrics, plastics). Looking for scalable PCR solutions.	~12% EU market share (2022)	~167,000	HQ Stuttgart; plants across Germany and Europe	Sustainability is a high priority for the Mercedes-Benz Group. The interests of the most important stakeholders are taken into account: customers, investors and employees, business partners and society as a whole.
Renault	Circular economy pioneer (Indra, Gaia); pushing recycled plastics in interiors.	~10% EU market share (2022)	~106,000	HQ Paris; plants in France, Spain, Eastern Europe	Pivot the business model to tech, energy and mobility; making Groupe Renault a frontrunner in the value chain of new mobility.
Tier-1 Suppliers (Faurecia, Grupo Antolin, Magna, Adient)	Direct buyers of interior plastics to supply dashboards, door panels, seats; critical link between OEMs and materials.	N/A	N/A	Global	N/A

Prospective and Existing Customers	**How and why do these prospective/existing customers fit this specific key exploitable result?**	**Market relevance**	**Number of employees**	**Locations**	**Strategy**
P-KER 3: Traceability of components through Digital Product Passport (DPP)					
Volkswagen Group	Needs DPP integration to comply with upcoming EU end-of-life vehicle regulation.	~25% EU market share (2022)	~676,000	HQ in Wolfsburg, Germany; multiple European/global plants	To play an active role in shaping the transformation of the automotive industry – as "The Global Automotive Tech Driver".
Stellantis	Needs DPP integration to comply with upcoming EU end-of-life vehicle regulation.	~20% EU market share (2022)	~260,000	HQ in Amsterdam; production in	To embrace breakthrough ideas that will reinforce our leadership in

				France, Italy, Germany, Spain	offering innovative, clean, safe and affordable mobility.
BMW Group	Needs DPP integration to comply with upcoming EU end-of-life vehicle regulation.	~10% EU market share (2022)	~150,000	HQ Munich; plants in Germany, UK, Austria, etc.	At the BMW Group, forward-looking technologies meet emotive products and individual customer care to create a unique overall experience.
Mercedes	Needs DPP integration to comply with upcoming EU end-of-life vehicle regulation.	~12% EU market share (2022)	~167,000	HQ Stuttgart; plants across Germany and Europe	Sustainability is a high priority for the Mercedes-Benz Group. The interests of the most important stakeholders are taken into account: customers, investors and employees, business partners and society as a whole.
Renault	Needs DPP integration to comply with upcoming EU end-of-life vehicle regulation.	~10% EU market share (2022)	~106,000	HQ Paris; plants in France, Spain, Eastern Europe	Pivot the business model to tech, energy and mobility; making Groupe Renault a frontrunner in the value chain of new mobility.
Bosch	Large Tier-1 supplier delivering systems to OEMs; DPP allows part-level traceability and smoother compliance with OEM/customer requirements.	Leading Tier-1 supplier	429,416 (2023)	Europe, US and Asia	Accelerate automotive transformation through partnerships.
Valeo	Large Tier-1 supplier delivering systems to OEMs; DPP allows part-level traceability and smoother compliance with OEM/customer requirements.	N/A	113,601	Global	Building a Group that is technologically stronger and ideally positioned, and accelerating in electrification, ADAS, reinvention of the interior experience and lighting everywhere.
Magna international	Large Tier-1 supplier delivering systems to OEMs; DPP allows part-level traceability and smoother compliance with OEM/customer requirements.	N/A	179,000 (2023)	Global	Decarbonization strategy focused on energy conservation and renewable electricity procurement.

Prospective and Existing Customers	How and why do these prospective/existing customers fit this specific key exploitable result?	Market relevance	Number of employees	Locations	Strategy
P-KER 4: AI head impact criterion tool for steel repurposing					
Volkswagen Group	One of the world's largest automakers, producing millions of steel-based components per year.	~25% EU market share (2022)	676,000	HQ in Wolfsburg, Germany; multiple European/global plants	To play an active role in shaping the transformation of the automotive industry – as "The Global Automotive Tech Driver".
Mercedes-Benz Group	Premium OEM with complex component validation processes. Develops high-performance steel structures with strict validation requirements.	~12% EU market share (2022)	167,000	HQ Stuttgart; plants across Germany and Europe	Sustainability is a high priority for the Mercedes-Benz Group. The interests of the most important stakeholders are taken into account: customers, investors and employees, business partners and society as a whole.
BMW Group	Innovative premium OEM with strong R&D in materials and digital twins. Uses advanced simulations for structural and safety components.	~10% EU market share (2022)	150,000	HQ Munich; plants in Germany, UK, Austria, etc.	At the BMW Group, forward-looking technologies meet emotive products and individual customer care to create a unique overall experience.
NEXT.e.GO Mobile SE	German urban EV startup with rapid prototyping and local manufacturing.	N/A	~400	Germany	Offer affordable electric vehicle.
Sono Motors	Sustainability-driven EV startup using solar integration and recycled materials.	N/A	~300	Germany	Leading the integration of solar into the global vehicle ecosystem; SonoSolar is driving the shift towards solar-powered, sustainable mobility.
Bosch	Global Tier-1 supplier providing powertrain, chassis, and body components to nearly all major OEMs.	Leading Tier-1 supplier	429,416 (2023)	Europe, US and Asia	Accelerate automotive transformation through partnerships.

Prospective and Existing Customers	How and why do these prospective/existing customers fit this specific key exploitable result?	Market relevance	Number of employees	Locations	Strategy
P-KER 5: Thermoplastic composite semi-products (organo sheets and/or GMT) made of recycled (PCR) PET and glass fabrics					
OEMs	Automotive OEMs and suppliers are key users of thermoplastic composites. They are increasing the use of recycled materials for lightweight BEV battery covers, underbody panels, and interior components.	N/A	N/A	Global	N/A
Saint-Gobain	Uses glass fiber–based composites for façade, roofing, and insulation systems. Recycled GMTs align with its decarbonization roadmap and circular material sourcing.	N/A	161,000+	80 countries	Become carbon neutral by 2050.
Kingspan Group	Manufactures sandwich panels and insulation systems. Could use recycled GMT sheets as skins or reinforcements in high-performance insulation panels.	N/A	22,000	80 countries	Incorporate circular composite materials in next-generation insulation systems.
Alstom	Requires lightweight, recyclable materials for interior panels and energy-efficient rolling stock. Recycled GMTs provide stiffness and recyclability over thermosets.	Top 3 global rail OEM	86,000	63 countries	Accompany all transportation stakeholders in meeting tomorrow's mobility challenges. Strive to provide them with the most efficient and digital mobility systems, while further improving the environmental friendliness of their solutions.
Siemens Mobility	Develops train and metro systems with lightweight, fire-safe composites. Recycled GMT	N/A	40,000	Global	Digital transformation consulting, smart city strategies, and data strategies for sustainable growth. These services are designed to help

	sheets could replace traditional thermosets in panel systems.				businesses navigate the complexities of digital transformation and achieve their strategic goals.

4.2.7 Market

The results of the market research are shown in Table 14. These tables are also complemented by the exploitation intentions table completed by the partners in the HRB sessions. The tables will be included in Annex A.

Table 14: *P-KERs Market analysis*

Sector Tendencies	Prospective and Existing Customers	Current Products	Competitive Market Forces
P-KER 1: 100% Recycled Wrought Aluminium for extruded profiles			
Demand for high-recycled-content and near-zero-carbon aluminum for extrusions is accelerating as OEMs and construction specifiers push circularity and low-carbon supply chains	Automotive OEMs, Tier-1 suppliers, aerospace, packaging and technology, other mobility sectors (trains, trucks, ships)	100% post-consumer recycled billets / ingots for extrusion 100% recycled aluminum coils (flat products). Tailored recycled alloys for extrusions. Finished extruded profiles for building, façade, windows, automotive & EV structural components.	Hydro (Hydro CIRCAL), Novelis, Speira, Constellium

Sector Tendencies	Prospective and Existing Customers	Current Products	Competitive Market Forces
P-KER 2: Recycled Plastics (up to 70% PCR) for interior parts			
The shift to lightweight, recyclable thermoplastic composites in the automotive sector is accelerating, driven by EV-platform requirements and sustainability targets: materials such as recycled-PET based organosheets and	OEMs and Tier-1 suppliers	Recycled PET (rPET) sheets	BASF, Covestro, Lanxess, INEOS Styrolution, LyondellBasell

GMT (Glass-Mat Thermoplastics) are now being developed to include high PCR content while maintaining structural performance. Regulatory pressure (circular economy, end-of-life vehicle directives) plus OEM demands for higher recycled content are pushing suppliers to innovate in semi-finished composite sheets with PCR feedstocks and glass fabrics.			

Sector Tendencies	Prospective and Existing Customers	Current Products	Competitive Market Forces
P-KER 3: Traceability of components through Digital Product Passport (DPP)			
The Digital Product Passport (DPP) is emerging as a cornerstone of the EU's Circular Economy and Ecodesign for Sustainable Products Regulation (ESPR), enabling full material traceability, lifecycle transparency, and data exchange across supply chains. Automotive OEMs and suppliers are actively developing pilot DPP frameworks to track materials, carbon footprints, and recyclability data in anticipation of upcoming EU end-of-life and circular vehicle regulations.	OEMs and Tier-1 suppliers	Early-stage DPP frameworks and pilot platforms. Blockchain-based traceability tools. Digital IDs and material passports for component.	Circularise, iPoint-systems, SAP

Sector Tendencies	Prospective and Existing Customers	Current Products	Competitive Market Forces
P-KER 4: AI head impact criterion tool for steel repurposing			
Engineering Service Market is expanding by 4-6% per year (except for crises).	All OEMs, EDAG Focus is on German OEMs as well as on Automotive Start-ups	Wide range of engineering services up to entire vehicle development.	Bertrandt, AVL, Akkodis, ALTEN (Engineering Service Provider)

Sector Tendencies	Prospective and Existing Customers	Current Products	Competitive Market Forces
P-KER 5: Thermoplastic composite semi-products (organo sheets and/or GMT) made of recycled (PCR) PET and glass fabrics			
Automotive interior and structural semi-products are increasingly shifting to high-PCR (post-consumer recycled) thermoplastic composites—such as recycled PET or PP matrices reinforced with glass-fiber mats—to meet OEM sustainability targets and circular-economy requirements. At the same time, materials technology is advancing toward high-performance GMT and organo-sheet semi-products with recycled content, where controlling fiber length, mat architecture and composite consolidation is key to retaining mechanical/corrosion/impact properties comparable to virgin materials.	OEMs, Saint-Gobain, Kingspan Group, Alstom, Siemens Mobility	Recycled-content GMT and organo-sheet materials	Indorama Ventures, Berry Global Inc., Alpek S.A.B., SABIC, BASF properties comparable to virgin materials.

4.2.8 IPR

IPR claims ensure proper knowledge transfer and commercialization. First, Table 15presents the background and foreground contributed by each partner for the KER, followed by Table 16, which outlines the partners' commercialization interests. The tables are complemented by information gathered during the HRB sessions, with the tables included in Annex A.

Table 15: *P-KERs background/foreground description*

Partner	Background knowledge description	Foreground knowledge description
P-KER 1: 100% Recycled Wrought Aluminium for extruded profiles		
RAF	Knowledge of the various types of end-of-life aluminum scrap, how to clean, and select and sort them.	Knowledge on how to melt it in the correct way to obtain a high-quality product.
FRA	General material know-how and specialization at Aluminum. Experience in extrusion and casting as well as in recycling processes. Work intensively in Aluminum (especially foam production).	Installment of cooling equipment and determination of effectivity. Experiences in online temperature measurement of extruded profiles. Knowledge of alloy compositions and their mechanical behavior.
BEN	Downstream processing know-how for aluminum extrusions; proprietary heat-treating and forming parameters; internal alloy acceptance criteria; crash-system performance corridors; empirical datasets linking chemistry, extrusion, and crash behavior; historical scrap-tolerance windows; supplier specifications; proprietary crash-test protocols.	Validated feasible scrap-composition windows; industrial test results confirming "100%" recycled alloy feasibility; new datasets for process–structure–property relationships; prototype CMS components from high-R alloys; performance envelopes for OEM interaction; scrap-window PPAP concept.
UBO	Flow stress behaviour of conventional primary Al alloys; recrystallization models for some common primary Al alloys (6060, 6063, 6082, 6061).	Flow stress behaviour of tested Al alloys (6082 recycled, AA7108, AA6061HyperAl); Recrystallization models for tested Al alloys (6082 recycled, AA7108, AA6061 hyperAl).
VW	Knowledge of the various types of end-of-life aluminum scrap, how to clean, and select and sort them.	Feasibility study of the secondary material content. And 1st impressions of how to adapt the internal material specification on materials with higher and secondary material share.

Partner	Background knowledge description	Foreground knowledge description
P-KER 2: Recycled Plastics (up to 70% PCR) for interior parts		
FPL	Pre-existing know-how and conceptual models on DPP architecture, semantic data modelling, and circular manufacturing systems developed in previous EU projects (i.e., DigiPrime, CIRPASS). Includes data models for traceability and lifecycle decision support.	Development of a prototype data model and knowledge graph for traceability of automotive components through the DPP. Integration of lifecycle events, ZEvRA use cases, and interoperability mappings to ESPR requirements.
VTT	In-line monitoring of melt properties (viscosity, NIR, UV-Vis, VOC), ABS and PP formulation and compounding know-how.	Formulation know-how of ABS and PP generated during the project; feedstock variability comparison and validation for final compounds.
TME	TME contributes general OEM knowledge related to material requirements, part validation, regulatory compliance, and integration of new materials into vehicle applications. This includes established processes, standards, and know-how for assessing suitability, performance, and quality of components used in automotive interiors.	Validation input and requirements for interior parts using high-PCR materials.
RISE	Internet of Materials (IoM), a full description of the data model needed for a full circular life of any material, plus the ABSolEU data model describing the life cycle of a material item, plus the SPINE model for LCA and the RAVEL models for eco design, and the OMNIITOX model for toxicity data, and the impact assessment 1998 model for impact asssessment and the model for eco-efficiency described in R Carlson's report from 2009.	Mapping the background data on to other open data as well as to the background data provided by RISE as well as Catia-X.
SKO	OEM perspective to material development. Know-how from car-manufacturing.	Cooperation on material topics.

Partner	Background knowledge description	Foreground knowledge description
P-KER 3: Traceability of components through Digital Product Passport (DPP)		
PLM	Pre-existing know-how and conceptual models on DPP architecture, semantic data modelling, and circular manufacturing systems developed in previous EU projects (i.e., DigiPrime, CIRPASS). Includes data models for traceability and lifecycle decision support.	Development of a prototype data model and knowledge graph for traceability of automotive components through the DPP. Integration of lifecycle events, ZEvRA use cases, and interoperability mappings to ESPR requirements.
RISE	IoM, detailed model on circular material data handling from the ABSolEU-project, and other earlier designs of impact assessment data models and circular performance calculation.	In this project we map existing data model libraries to each other to test for interoperability and gaps and risks during interoperability.

Partner	Background knowledge description	Foreground knowledge description
P-KER 4: AI head impact criterion tool for steel repurposing		
EDAG	Software, Knowhow and existing service.	Improvement of accuracy, reduction of time effort, automated EU-AI-Act-proof AI-Training process, improved GUI of the Software.

Partner	Background knowledge description	Foreground knowledge description
P-KER 5: Thermoplastic composite semi-products (organo sheets and/or GMT) made of recycled (PCR) PET and glass fabrics		
FAU	Knowledge and know-how related to the design, testing, and manufacturing of thermoplastic composite semiproducts such as organos and GMT, and their molding by thermocompression or one shot thermostamping/backinjection.	Use of FAU background technology to develop TPC semi-products (GMT and organo) with 95% content of recycled materials. Characterization of these semi-products.

Table 16: *P-KERs partners' commercialization interest*

Partner	Dissemination Level	Exploitation form	Interest exploitable results	Contribution to the this result during the project?	Negotiations with other partners needed?
P-KER 1: 100% Recycled Wrought Aluminium for extruded profiles					
RAF	Sensitive (SEN)	License practices	High	Yes	Yes
FRA	Public (PU)	Use of the results for academic purposes Articles and other publications	Project acquisition	Yes	Yes
BEN	Sensitive (SEN)	Others	Business case study and industrialization plan	Yes	Yes
UBO	Sensitive (SEN)	Use of the results for academic purposes Articles and other publications	Yes	Yes	Yes
VW	Public (PU)	Articles and other publications	Business case & fulfill internal and external regulations	Yes	Yes

Partner	Dissemination Level	Exploitation form	Interest exploitable results	Contribution to the this result during the project?	Negotiations with other partners needed?
P-KER 2: Recycled Plastics (up to 70% PCR) for interior parts					
FTP	Sensitive (SEN)	Use of the results for academic purposes	High — as part of long-term research and innovation roadmap on DPP-enabled circular value chains	Yes	Yes
VTT	Sensitive (SEN)	License practices		Yes	Yes

		Patents & publications possibility	Yes		
TME	Sensitive (SEN)	Others	Usage for further R&D	Yes	Yes
RISE	Sensitive (SEN)	License practices	Licensing	Yes	Yes
SKO	Sensitive (SEN)	Others	Usage for further R&D	Yes	Yes

Partner	**Dissemination Level**	**Exploitation form**	**Interest exploitable results**	**Contribution to the this result during the project?**	**Negotiations with other partners needed?**
P-KER 3: Traceability of components through Digital Product Passport (DPP)					
PLM	Sensitive (SEN)	Use of the results for academic purposes	High: as part of long-term research and innovation roadmap on DPP-enabled circular value chains	Yes	Yes
RISE	Sensitive (SEN)	Standardization and/or consultancy Others	To establish societal decision making	Yes	No

Partner	Dissemination Level	Exploitation form	Interest exploitable results	Contribution to the this result during the project?	Negotiations with other partners needed?
P-KER 4: AI head impact criterion tool for steel repurposing					
EDAG	Sensitive (SEN)	Services	AI tool is a background IP of EDAG	Yes	No

Partner	Dissemination Level	Exploitation form	Interest exploitable results	Contribution to the this result during the project?	Negotiations with other partners needed?
P-KER 5: Thermoplastic composite semi-products (organo sheets and/or GMT) made of recycled (PCR) PET and glass fabrics					
FEU	Sensitive (SEN)	Other	Industrial use of the results for development and manufacturing of composite parts for mobility sector	Yes	No

4.2.9 Standardisation

Supported by a standardization process for efficient EU/global market entry. The results are filled for the KER owner and are shown in Table 17. The information presented in these tables will be complemented by the work of task 6.3.2, aiming at identifying gaps in standardization for the technologies covered in ZEvRA and therefore provide recommendations based on the obtained results of the project. This also coheres with the exploitation roadmap details which are provided through the HRB and can be found in section 4.2.11.

Table 17: *P-KERs Standardisation*

Innovative product/service ?	Wide market potential ?	Plan to export ?	Regulated elements ?	Relevant standards ?	Public procurement interest?	Market-ready in 3 years?	Need consumer safety assurance ?	New measurement regime needed?	Tech compatibility needed?	Quality mark required ?
P-KER 1: 100% Recycled Wrought Aluminium for extruded profiles										
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No

Innovative product/service ?	Wide market potential ?	Plan to export ?	Regulated elements ?	Relevant standards ?	Public procurement interest?	Market-ready in 3 years?	Need consumer safety assurance ?	New measurement regime needed?	Tech compatibility needed?	Quality mark required ?
P-KER 2: Recycled Plastics (up to 70% PCR) for interior parts										
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Innovative product/service ?	Wide market potential ?	Plan to export ?	Regulated elements ?	Relevant standards ?	Public procurement interest?	Market-ready in 3 years?	Need consumer safety assurance ?	New measurement regime needed?	Tech compatibility needed?	Quality mark required ?
P-KER 3: Traceability of components through Digital Product Passport (DPP)										
Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes

Innovative product/service?	Wide market potential?	Plan to export?	Regulated elements?	Relevant standards?	Public procurement interest?	Market-ready in 3 years?	Need consumer safety assurance?	New measurement regime needed?	Tech compatibility needed?	Quality mark required?
P-KER 4: AI head impact criterion tool for steel repurposing										
Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes

Innovative product/service?	Wide market potential?	Plan to export?	Regulated elements?	Relevant standards?	Public procurement interest?	Market-ready in 3 years?	Need consumer safety assurance?	New measurement regime needed?	Tech compatibility needed?	Quality mark required?
P-KER 5: Thermoplastic composite semi-products (organo sheets and/or GMT) made of recycled (PCR) PET and glass fabrics										
Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes

4.2.10 Risk assessment

A risk assessment, supported by a risk matrix, prioritizes potential barriers, such as partnership, market, or environmental risks, to effectively manage and mitigate them, ensuring that the exploitation and business pathways address all identified risks.

Table 18: *Risk assessment table for pKER 1- Recycled Wrought Aluminium Alloys for Extrusion Applications*

pKER 1 - Recycled Wrought Aluminium Alloys for Extrusion Applications							
	Description of Risks	Degree of criticality of the risk related to the final achievement of this Key Exploitable Result. Please rate from 1 to 10	Probability of risk happening		Description of Risks	Degree of criticality of the risk related to the final achievement of this Key Exploitable Result. Please rate from 1 to 10	Probability of risk happening
Partnership risk factors							
1	Different priorities or timing between partners	8	6	48	Hold regular meetings and align milestones with shared KPIs.	8	Control.
2	Poor communication or data exchange within the consortium.	7	5	35	Create a shared data platform and clear reporting rules.	9	Control.
3	Partners' resource changes delaying validation.	7	6	42	Formal commitment to activities and contingency scheduling.	7	Control.
Technological Risk Factors							
6	Alloy may not meet mechanical or surface performance targets.	9	7	63	Continue R&D and validation with Fraunhofer and Benteler.	8	Action!
7	Scrap quality variation affecting alloy consistency.	8	7	56	Improve scrap sorting and	7	Action!

					supplier qualification.		
8	Issues adapting extrusion lines to new alloy.	7	5	35	Co-engineering to adjust process parameters.	8	Control.
Market Risk Factors							
11	OEMs hesitant to replace primary aluminium.	9	4	36	Show proven results and certified CO_2 benefits.	8	Control.
12	Low awareness of environmental/economic benefits.	7	7	49	Strengthen marketing and sustainability communication.	9	Control.
13	Competition from "low-carbon" primary aluminium.	7	5	35	Emphasize 100% recycled and EU origin.	8	Control.
IPR/Legal Risk Factors							
16	Disclosure of confidential alloy or process data.	8	5	40	Use NDAs and internal data protection rules.	9	Control.
17	Unclear ownership of shared project results.	7	6	42	Define IP ownership and access rights in agreements.	8	Control.
18	Patent overlap with existing alloys.	6	4	24	Conduct prior-art and freedom-to-operate checks.	8	Control.
Financial/Management Risk Factors							
21	Higher costs for sorting and refining operations.	8	6	48	Phase investments and use public funding.	8	Control.

22	Delays in reaching market scale (TRL 8).	8	5	40	Track milestones and allocate contingency funds.	8	Control.
23	Limited access to financing for scale-up.	7	5	35	Engage investors and green financing partners early.	7	Control.
Environmental/Regulation/Safety risks							
26	Unstable price of post-consumer scrap affecting production margins.	8	7	56	Secure long-term scrap supply contracts and monitor commodity prices.	8	Action!
27	Difficulty in setting a competitive market price against primary aluminium.	8	6	48	Highlight environmental value and certified low-carbon benefits in pricing strategy.	8	Control.
28	Lower-than-expected customer demand reducing production volumes.	9	5	45	Diversify applications (construction, transport) and engage more OEMs.	7	Control.

Figure 10: *Risk assessment matrix pKER1: recycled wrought aluminium*

As can be seen from Figure 10: Risk assessment matrix pKER1: recycled wrought aluminium, the risk assessment from the combined EXPLOITT methodology and HRB, pKER1 identifies 15 control risks, and 3 action risks; together these indicate the need to strengthen control effectiveness, close identified gaps through targeted actions, and ensure end-to-end risk treatment is fully embedded.

Table 19: *Risk assessment table for pKER 2- Recycled plastics (up to 70% PCR) for interior parts*

pKER 2: Recycled Plastics (up to 70% PCR) for interior parts							
	Description of Risks	Degree of criticality of the risk related to the final achievement of this Key Exploitable Result. Please rate from 1 to 10	Probability of risk happening		Description of Risks	Degree of criticality of the risk related to the final achievement of this Key Exploitable Result. Please rate from 1 to 10	Probability of risk happening
Partnership risk factors							
1	Coordination challenges with partners across value chain in the consortium	7	2	14	Establish clear communication protocols, regular steering meetings	7	Control.
2	Technology transfer delays from research partners to industrial application	6	3	18	Organize joint technical workshops, co-locate engineers during validation	6	Control.
Technological Risk Factors							
6	PCR material quality inconsistency	8	7	56	Implement strict supplier qualification; inline rheometry control.	7	Action!
7	Mechanical property degradation (e.g., lower tensile)	9	5	45	Use optimized additive packages and mechanical validation program.	7	Control.
8	Flowability challenges (MFR below specification)	6	6	36	Tune processing conditions; employ rheology modifiers.	8	Control.
Market Risk Factors							

11	Limited PCR supply	8	8	64	Multi-year PCR supplier contracts, vertical integration exploration	5	Between Action & Warning
12	Price volatility recycled vs virgin	7	7	49	Price corridors, total cost ownership models, OEM contracts	7	Control.
13	Slow OEM adoption beyond pilots	6	7	42	Marketing validation results, outreach, industry events	5	Between Control & No Action
14	Negative recycled material perception	4	6	24	Rebranding 'sustainable' materials messaging	8	Control.
IPR/Legal Risk Factors							
16	Regulatory changes to ELV directive	7	6	42	Regular monitoring, design surplus PCR content	8	Control.
17	Patent landscape complexity	6	5	30	FTO analysis, file patents on formulations/processes	7	Control.
18	Trade secret protection	7	5	35	NDAs, confidentiality measures, restricted access	8	Control.
Financial/Management Risk Factors							
21	Investment needs for production adaptation	7	7	49	Phased investment plan, external grants	6	Control.
22	Pressure on commercialisation activities	8	7	56	Deeper communication with management	2	Warning;
23	Uncertain ROI/revenue projections	7	6	42	Develop conservative & optimistic business cases	6	Control.
24	Currency volatility (TRY)	5	8	40	Price contracts in stable currencies, hedging	6	Control.

Environmental/Regulation/Safety risks							
26	LCA insufficient CO_2 reduction	6	4	24	Optimize supply chain, prioritize EU PCR feedstock	8	Control.
27	Occupational safety with PCR handling	4	5	20	MSDS review, worker training, ventilation improvements	9	Control.
28	Waste management of PCR scrap	5	6	30	Closed-loop scrap recycling, partnerships with compounders	8	Control.

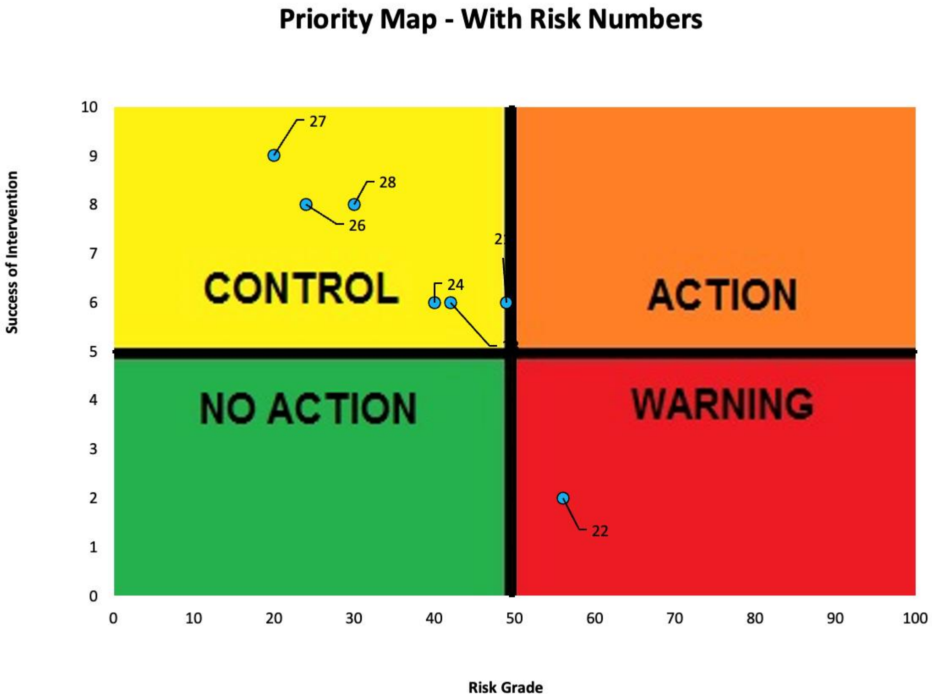

Figure 11: *Risk assessment Farplas*

As can be seen from Figure 11: Risk assessment Farplas, the risk assessment for pKER2, produced through the combined EXPLOITT ® methodology and HRB identifies 15 control risks, 1 action risk, and 1 warning risk; together these highlight the need to strengthen control effectiveness, address outstanding remediation requirements, monitor emerging warnings proactively, and ensure end-to-end risk treatment is fully embedded.

Table 20: *Risk assessment table for pKER 3- Traceability of components trhougth the Digital Product Passport*

pKER 3: Traceability of components through the Digital Product Passport (DPP)							
	Description of Risks	Degree of criticality of the risk related to the final achievement of this Key Exploitable Result. Please rate from 1 to 10	Probability of risk happening		Description of Risks	Degree of criticality of the risk related to the final achievement of this Key Exploitable Result. Please rate from 1 to 10	Probability of risk happening
Partnership risk factors							
1	Disagreement on further investments	8	6	48	Secure commitment via Memorandum of Understanding (MoU) and post-project exploitation roadmap	9	Control.
2	No manufacturing or deployment partner willing to host DPP pilot	9	7	63	Identify pilot manufacturing/OEM users early through ZEvRA	8	Action!
3	Loss of key personnel or expertise continuity	7	3	21	Document KER assets, ensure internal knowledge transfer	9	Control.
Technological Risk Factors							
6	Technical interoperability issues across data standards	9	6	54	Early validation with Catena-X APIs and ESPR alignment	7	Action!

7	Integration challenges with ERP/legacy systems	8	5	40	Provide API documentation and testing sandbox	9	Control.
8	Better interoperability or DPP frameworks may emerge earlier	8	6	48	Focus on open, standards-based architecture to ensure adaptability	8	Control.
Market Risk Factors							
11	Customers perceive the product as too complex or costly for SMEs	8	7	56	Offer light-weight and open source trial version	9	Action!
12	Customers fear of data exposure or unclear value	9	7	63	Develop strong communication of compliance, value recovery, and data protection benefits	8	Action!
IPR/Legal Risk Factors							
16	Risk of patent or data-rights infringement	8	5	40	Conduct early IP assessment and legal review	8	Control.
17	Data model or interoperability design easy to copy	7	6	42	Protect through copyright, licensing, and brand identity	5	Between Control & No Action
18	Patent or standards application rejected or delayed	6	4	24	Use CEN/CENELEC CWA pathway to secure early recognition	9	Control.
Financial/Management Risk Factors							
21	No resources (human/financial) secured post-project	9	6	54	Apply for follow-up calls for grants to increase the TRL	8	Action!
22	Inadequate business plan or unclear ownership	8	6	48	Refine exploitation plan, define business	9	Control.

					model for licensing and service use		
Environmental/Regulation/Safety risks							
26	DPP delegated acts delayed or modified	9	8	72	Maintain engagement with DPP community and CEN/CENELEC working groups to adapt model rapidly	8	Action!
27	Product does not comply with evolving DPP standards	8	6	48	Implement continuous compliance checks and standard tracking	9	Control.

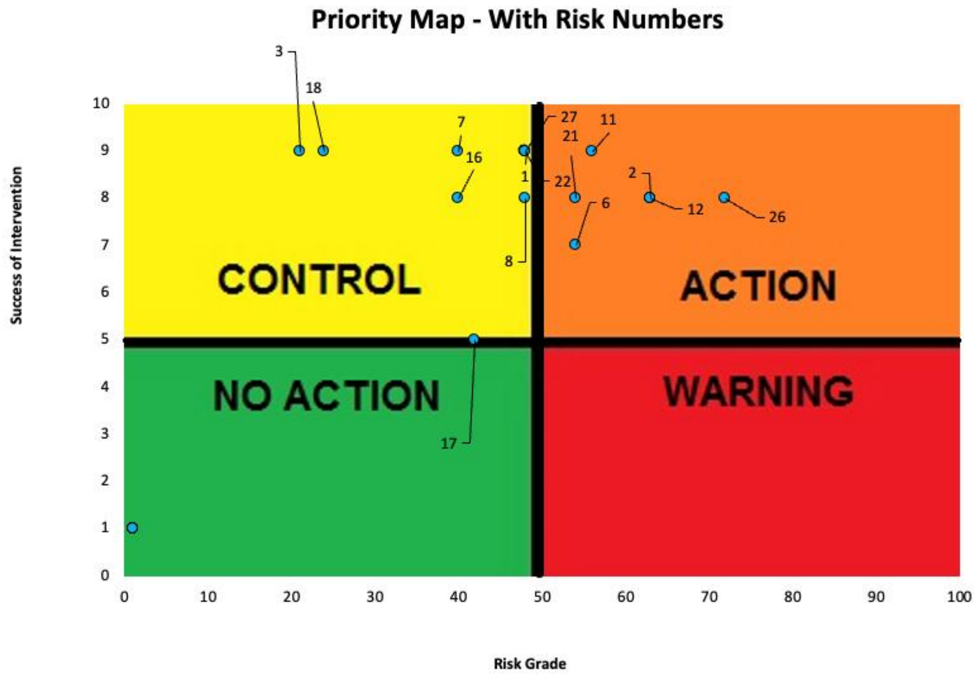

Figure 12: *Risk assessment DPP*

As can be seen from Figure 12: Risk assessment DPP, the risk assessment for pKER3, produced through the combined EXPLOITT ® methodology and HRB identifies 8 control risks, 6 action risks, and 1 hybrid risk sitting between a control gap and a non-actionable observation; together these emphasise the need to reinforce existing controls, drive timely completion of required actions, clarify ownership of the intermediate risk, and ensure comprehensive, end-to-end risk treatment.

Table 21: *Risk assessment table for pKER 4 - AI head impact criterion tool for steel repurposing*

pKER 4: AI head impact criterion tool for steel repurposing							
	Description of Risks	Degree of criticality of the risk related to the final achievement of this Key Exploitable Result. Please rate from 1 to 10	Probability of risk happening		Description of Risks	Degree of criticality of the risk related to the final achievement of this Key Exploitable Result. Please rate from 1 to 10	Probability of risk happening
Partnership risk factors							
1	Technology transfer delays from research partners to industrial application	5	2	10	Organize joint technical workshops, co-locate engineers during validation	2	
Technological Risk Factors							
2	Better technology/methodology exists.	10	5	50	Adapt product to competition level	7	
3	Mechanical property degradation	10	8	80		2	
Market Risk Factors							
4	Performance lower than market needs	5	5	25	Increase performance by adaption material	7	B & Warning
5	Rejected by end-users.	10	9	90	Promote solution to more OEMS	5	

Financial/Management Risk Factors							
6	Weak exploitation. Inadequate business plan.	3	2	49	Improve business plan	6	Control.

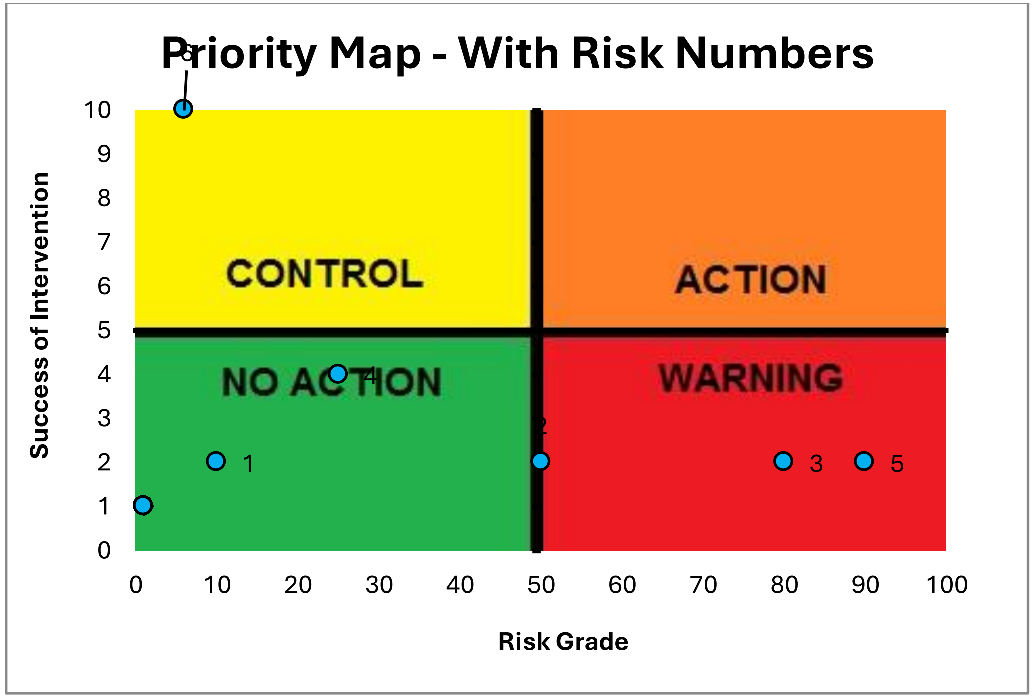

Figure 13: *Risk assessment AI head impact*

As can be seen from Figure 13: Risk assessment AI head impact, the risk assessment for pKER4, produced through the EXPLOITT ® methodology identifies 1 control risks, 2 warning risks, 1 action risk, 2 no-action, and 1 hybrid risk sitting between no-action and warning; together these emphasise the need to reinforce existing controls, drive timely completion of required actions, clarify ownership of the intermediate risk, and ensure comprehensive, end-to-end risk treatment.

Table 22: *Risk assessment table for pKER 5- Thermoplastic composite semi-products (organo sheets and/or GMT) made of recycled (PCR) PET and glass fabrics*

pKER 5: Thermoplastic composite semi-products (organo sheets and/or GMT) made of recycled (PCR) PET and glass fabrics							
	Description of Risks	Degree of criticality of the risk related to the final achievement of this Key Exploitable Result. Please rate from 1 to 10	Probability of risk happening		Description of Risks	Degree of criticality of the risk related to the final achievement of this Key Exploitable Result. Please rate from 1 to 10	Probability of risk happening
Partnership risk factors							
1	Coordination challenges with partners across value chain in the consortium	10	5	50	Establish clear communication protocols, regular steering meetings	10	Between Control & Action
2	Technology transfer delays from research partners to industrial application	5	2	10	Organize joint technical workshops, co-locate engineers during validation	2	
Technological Risk Factors							
3	Better technology/methodology exists.	7	5	35	Adapt product to competition level	7	Control.
4	Mechanical property degradation	10	8	80	Reduction of hybrid connection areas. Thermal residual stresses and possible corrosive influences can be reduced	2	
Market Risk Factors							
5	Performance lower than market needs	8	3	24	Increase performance by adaption material	7	B Control. & Warning

6	Rejected by end-users.	10	4	40	Promote solution to more OEMS	5	Between Control & No Action
7	Too expensive	10	6	60	Conduct economic analysis for series process	8	
IPR/Legal Risk Factors							
8	Easy to counterfeit the patent.	6	8	40	Regular monitoring, design surplus PCR content	9	Control.
Financial/Management Risk Factors							
9	Weak exploitation. Inadequate business plan.	7	7	49	Improve business plan	6	Control.
Environmental/Regulation/Safety risks							
10	Does not comply with the standards.	8	5	40	Look for other applications or align material with standards	8	Control.
11	Standards to make it compulsory don't yet exist.	5	5	25		2	

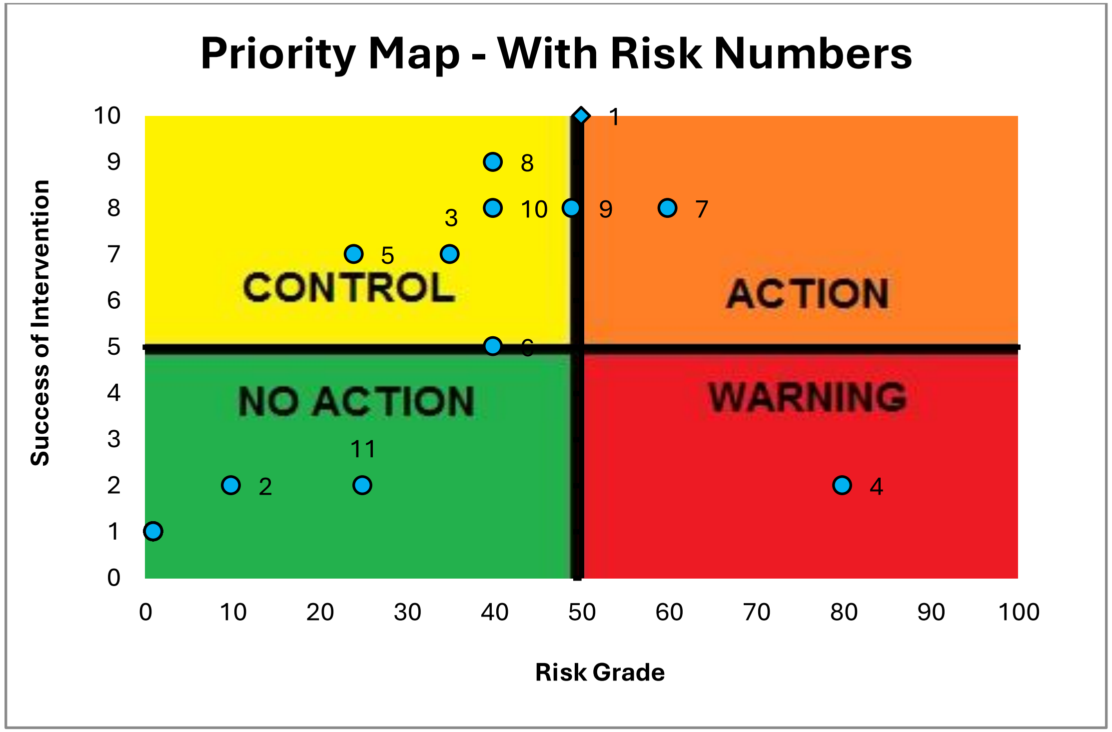

Figure 14: *Risk Assessment thermoplastics*

As can be seen from Figure 14: Risk Assessment thermoplastics, the risk assessment for pKER5, produced through the EXPLOITT ® methodology identifies 5 control risks, 1 warning risks, 1 action risk, and 2 hybrid risk sitting between a control gap and a non-actionable observation; together these emphasise the need to reinforce existing controls, drive timely completion of required actions, clarify ownership of the intermediate risk, and ensure comprehensive, end-to-end risk treatment.

Based on the results of the various risk assessments and the analysis presented in the risk matrices, it is recommended that the KER owners, who are very aware of such actions required, take a structured and proactive approach to risk management. High-likelihood and high-impact risks should be prioritised for immediate mitigation, with clear action plans and allocated resources to reduce their potential impact. Medium-priority risks should be closely monitored and prepared for through contingency planning, while low-priority risks can be documented and periodically reviewed without significant resource investment. The findings and recommended mitigations, as detailed in each of the tables, have also been communicated and discussed during the HRB sessions to ensure alignment and awareness across relevant stakeholders. The KER owner should continue to use the risk matrix to guide decision-making, regularly update mitigation strategies, and reassess risks as conditions evolve, thereby safeguarding key objectives and optimizing resource allocation.

4.2.11 Explotation roadmap

Now that the previous steps have been completed and understood, the exploitation roadmap comes into place. This exploitation roadmap, which was derived during the workshops from the HRB, outlines the strategy to bring a KER from development to market. It covers validation, industrial implementation, performance verification, stakeholder engagement, sustainability demonstration, and commercial deployment, aiming to maximize environmental, economic, and technological impact while ensuring scalability, regulatory compliance, and protection of intellectual property. This complements the information provided from sections 4.2.1 to 4.2.9 to allow the pKER owners to understand and outline the roadmap to market, from current stage (during the project delivery) and beyond. The following activities that will take place in D6.8 in M36, such as business planning, lean canvases, and others, will ensure a full exploitation and business plan is created for each of the 5 pKERs, using a continuation of EXPLOIT ® and HRB.

Table 23: *Exploitation roadmap for pKER1 - Recycled Wrought Aluminium Alloys for Extrusion Applications*

Actions	1. Provide recycled aluminium alloy to the extrusion manufacturer (Benteler) to validate performance and processability. 2. Meet mechanical performance and decarbonisation requirements defined by automotive manufacturers (Volkswagen, Skoda). 3. Demonstrate to the automotive industry and other sectors (e.g., construction, electronics) that recycled aluminium alloys can replace the same alloys produced from virgin material. 4. Protect confidential information relating to the type of aluminium scrap used and proprietary melting and treatment processes. 5. Define a marketing and communication strategy highlighting environmental benefits, European sourcing, and EPD/ISO 14067 certification. 6. Conduct a cost-benefit analysis comparing recycled versus primary alloy production.
Roles	1. Raffmetal S.p.A. – Supplier of post-consumer recycled aluminium alloy and technical leader for material preparation, sorting, and melting • Responsible person: R&D Manager – responsible for alloy design, post-consumer scrap selection, and process optimization. • Technical support: Production Engineer, in charge of pilot melting, refining, and material characterization. • Quality and sustainability lead: HSE Manager, responsible for EPD verification and environmental reporting. 1. Benteler – Extrusion Manufacturer • Responsible person: Process Development Manager, overseeing billet production, extrusion trials, and process adaptation to the new alloy. • Technical contact: Extrusion Line Supervisor, coordinating equipment setup, temperature control, and mechanical performance monitoring. • Quality assurance: Material Quality Specialist, validating dimensional accuracy and surface finishing. 2. Fraunhofer Institute – Research and Testing Partner • Responsible person: Head of Materials Characterization, coordinating experimental testing and data analysis. • Research engineers: conducting tensile, fatigue, and corrosion tests on extruded samples. • Reporting lead: responsible for test report preparation and data transfer to industrial partners.

	3. Volkswagen – Skoda (OEMs) • Responsible person: Materials Engineering Lead, in charge of assessing material compliance with OEM standards. • Validation engineer: Component Development Engineer, supervising integration of recycled extrusions in demonstrator vehicles. Sustainability officer: CO_2 and Circularity Specialist, verifying alignment with OEM decarbonisation and CSRD targets.
Milestones	1A) Material properties achieved and verified: by the end of 2026. • Q2 2026: Production of pilot batches of 100% post-consumer recycled aluminum alloy at Raffmetal. • Q3 2026: Delivery of alloy ingots to Benteler for melting and extrusion trials. • Q4 2026: Achievement of target mechanical properties (yield strength, elongation, surface quality) verified by Fraunhofer. 2A) Validation of recycled aluminum alloy in real automotive components: by the end of the ZEVRA project (2026). • End of 2024: Verified material properties in laboratory and pilot-scale extrusion. • End of 2025: Alloy qualification report approved by Volkswagen/Skoda technical teams. • End of 2026: Full validation of recycled alloy in real automotive components (ZEVRA demonstrator vehicle). 3A) CO_2 footprint reduction: target ≥ 90% compared to primary aluminum. • 2025: Publication of technical validation data and case studies in EU dissemination channels. • 2026: Presentation of results to European Aluminum and OEM networks; first external customer pilot beyond the automotive sector. 4A) Recycled content: 100% post-consumer scrap. • 2026: Implementation of internal confidentiality protocol and restricted-access database for alloy recipes. • 2026: Formalization of Non-Disclosure Agreements (NDAs) with partners. • Throughout project: Continuous IP review and risk assessment to ensure know-how protection. 5A) Marketing and Certification Strategy Finalised and Communicated to OEMs • 2026: Completion of updated EPD and ISO 14067 carbon footprint report for the new alloy. • 2027: Launch of communication plan targeting OEMs and Tier 1 suppliers in Europe. • 2028: Inclusion of the product in digital product passport platforms (e.g., Catena-X). 6A) Cost-Benefit and Profitability Analysis of Recycled Alloy Completed • 2026: Baseline cost analysis of pilot production (sorting, melting, logistics). • 2027: Comparative assessment including environmental and energy benefits. • 2028: Final economic model validated, confirming profitability and scalability of full industrial production.
Costs	The estimated costs for implementing the planned activities (to be enrolled after the ZEvRA project finishes) mainly concern scrap sorting, cleaning, and process optimization, and depend on: • The required investments to increase TRL and reach market readiness. • The quantity of recycled alloy to be produced and tested. Assuming a production of 1,000 tons/year, the estimated costs are: • €300,000 in the first year (investment in sorting and cleaning systems).

	• €1,000,000 by the third year, as production and process control are scaled up.
Revenues	Expected revenues and profits generated once the KER is exploited are: • €200/ton of recycled aluminium alloy in the first year. • Increasing to €300/ton in the third year, as the selection and production processes become optimized and more efficient. These revenues will derive from the sale of certified low-carbon extrusion alloys to Tier 1 and OEM customers across Europe, as describe across the market analysis (Table 13). Example of initial sales scenario: • Customer 1 – Benteler Automotive (Germany): supply of 400 tons/year of post-consumer recycled extrusion alloy for battery housing and crash management systems. • Customer 2 – Constellium Automotive Structures (France): supply of 300 tons/year for lightweight profiles and cross-members. • Customer 3 – Volkswagen Group / Skoda (Czech Republic): direct supply of 200 tons/year for pilot applications in EV structural components. • Customer 4 – Hydro Extrusions (Italy): supply of 100 tons/year for sustainability validation and secondary markets (building & transport). Total initial annual volume: approximately 1,000 tons of recycled alloy. Average selling price: €2,800/ton Average production cost: €2,500–2,600/ton Gross margin: €200–300/ton Expected revenue projection: • Year 1 (pilot phase): ~€2.8 million turnover, with €0.25 million gross profit. • Year 3 (industrial scale-up): ~€4.2 million turnover, with ~€1.0 million gross profit, as production efficiency and sorting yield improve. These revenues will increase proportionally as production expands and new customers in the automotive, construction, and transport sectors adopt the recycled alloy for high-performance extruded components.
Other sources of coverage	The investments required to reach market readiness and enable industrial exploitation—approximately €300,000 in year 1 and €1,000,000 by year 3—will be covered through: • Internal partner budgets for R&D and pilot production. • Private equity and industrial loans for scaling up facilities and ensuring commercial deployment. Additional EU or national funding instruments (e.g., Innovation Fund, Green Transition loans) may also be explored to accelerate deployment and replication. 1. Innovation Level / TRL Progression • Initial TRL: 5 (pilot validation of alloy composition and lab extrusion). • Target TRL: 8 (validated alloy in full-scale automotive components with OEM approval). 2. Potential Impact • Enabling OEMs and Tier 1s to reduce CO_2 emissions from aluminium-intensive vehicle parts by up to 95%. • Strengthening the European circular supply chain and reducing dependency on imported primary aluminium. • Establishing a scalable model for integrating recycled aluminium alloys into other high-performance sectors (construction, transport, consumer goods). • Reinforcing Europe's strategic autonomy in critical raw materials and sustainable manufacturing.

Table 24: *Exploitation roadmap for pKER2- PLM- recycled plastics (up to 70%PCR) for interior car parts*

Actions	1. Deeper communication with Farplas management 2. Conduct intensive customer discovery and engagement efforts targeting potential passenger car original equipment manufacturers (OEMs) and Tier-1 suppliers interested in components made with 70% PCR PA6 polymers. This includes presentations of ZEvRA validation results, sustainability benefits, cost and regulatory advantages. 3. Finalize the detailed commercialization and business plan incorporating customer feedback, defining clear go-to-market strategies, pricing models, and sales targets for the next 12-24 months. 4. Initiate and accelerate intellectual property protections by filing patents on proprietary formulations and processing methods developed through ZEvRA. 5. Commence collection of necessary certifications and authorizations—initiating ISCC PLUS mass balance certification procedures and preparing documentation for OEM-specific material approvals and DPP compliance. 6. Establish strategic agreements with certified PCR PA6 material Suppliers or consortium partners who developed the material to secure long-term supply and define quality assurance standards for incoming materials. 7. Prepare the production line adaptation and industrialization activities, including process parameter development and quality monitoring setup, but defer full industrialization to a later phase beyond 6 months post-project.
Roles	1. Active communication about each step of the project and results for better engagement of management – Farplas R&D Team 2. Farplas assumes primary responsibility for exploiting the KER, leading commercialization, production scale-up, and customer relationships. – Farplas R&D Team and Sales Team 3. Reports and analysis of plans – Farplas Sales Team 4. Farplas R&D Center leads formulation optimization, process engineering, quality control, and regulatory documentation preparation. Legal Advisors manage IP filings and licensing agreements. – Farplas R&D Team and third-party advisors 5. Certification Bodies (e.g., ISCC PLUS) handle mass balance and supply chain certifications. – Farplas Project and Sales Teams 6. Sales and Marketing Team within Farplas drives customer acquisition, OEM qualification support, and brand positioning. – Farplas Sales Team 7. Establishment of production line and quality control processes – Farplas R&D Team and Farplas Production Team
Milestones	1. Internal and Final Reports for management about the results 2. Completion of customer engagement and formal expressions of interest from 3-5 potential OEMs and Tier-1s (Target: within 6 months post-project) 3. Final commercialization and business plan, go-to-market strategy, pricing model, and sales targets 4. Submission and acceptance of patent applications on Farplas PCR PA6 formulations and quality control processes (within first quarter post-project) 5. Initiation of ISCC PLUS certification audit and documentation (start within 12 months post-project) 6. Signing of preliminary supply agreements with at least 2 PCR material suppliers (within 6 months) 7. Ready production line
Costs	Year 1 (bridge to market – 2027)

	• Production line adaptation: €100,000 • Patent costs (filing, attorney fees): €20,000 • Testing and quality assurance equipment: €10,000 • Marketing and customer acquisition: €80,000 • Personnel (business development, engineers): €250,000 • Material qualification and sampling: €120,000 Years 2-3 (Scale-up and Growth - 2028-2029): • Capacity expansion and new line installation: €500,000 • Product portfolio development: €200,000 • Marketing and sales expansion: €300,000 • Ongoing certification and compliance updates: €100,000 • Working capital and inventory: €400,000
Revenues	Expected revenues and profits generated once the KER is exploited, with a revenue of 4750€/ton, are: • Year 1: With supply of 200 tons/year of material made up from 70% post-consumer recycled plastic. This would be the ramp up year with high initial investment • Year 2: With supply of 800 tons/year of material made up from 70% post-consumer recycled plastic. With the focus in year 2 of scaling up with breakeven approaching • Year 3: With supply of 150 tons/year of material made up from 70% post-consumer recycled plastic, with the intentions for an established business with multiple OEMs to supply to
Other sources of coverage	• Internal Funding: Farplas R&D budget allocation cross-subsidization from other profitable product lines during ramp-up, and working capital management. • Turkish Government Incentives: TUBITAK grants, Technology Development Zone tax benefits, R&D expense deductions (€100,000–150,000 projected). • OEM Co-development Funds: Cost-sharing agreements for material qualification with OEMs (€100,000–200,000).

Table 25: *Exploitation roadmap for pKER3- Traceability of components through the digital product passport*

Actions	1. Finalize DPP data model for automotive components aligned with ESPR delegated acts and Catena-X interoperability (Assumption: delegated acts published 2026, no major scope change in first 24 months). 2. Draft and propose a CEN/CENELEC Workshop Agreement (CWA) for traceability implementation (Assumption: 18-month standardization cycle; estimated €50k internal cost). 3. Conduct post-project validation pilots with early adopters (OEMs, Tier-1s, recyclers). (Assumption: 2–3 pilots, each 6-month duration, €30–40k per pilot). 4. Develop a business and exploitation plan integrating cost–benefit validation and IP governance (Assumption: TRL 6 → TRL 8 by Year-3). 5. Submit follow-up proposal under Horizon Europe Made in Europe / Data Space Calls for scale-up funding (Assumption: 50% co-funding).
Roles	1. PLM – Main exploiter: leads business plan, IP management, and standardization track. 2. RISE – Supports standardization and Catena-X compliance gap analysis. 3. External partners (OEMs/Tier-1s) – Provide pilot validation data and operational integration feedback. 4. Assumption: RISE contributes 20% technical input; PLM leads all exploitation and coordination activities.

Milestones	1. M1 (3 months): Validated DPP data model — KPI: 1 integrated Catena-X connector. 2. M2 (6 months): Draft CWA proposal — KPI: submission to CEN/CENELEC (Assumption: 18-month CWA approval). 3. M3 (6 months): Business plan complete — KPI: internal approval by partners. 4. M4 (9 months): 2 MoUs signed with industry adopters 5. M5 (12 months): Follow-up proposal submitted — KPI: 1 funding submission.
Costs	1. Year 1: €110k–€140k • €40k staff (extension & validation) • €40–50k standardization coordination and partner effort for CEN/CENELEC Workshop Agreement (CWA) — no direct fee to CEN/CENELEC, cost reflects internal staff time, workshop facilitation, and stakeholder engagement. • €20–25k business model & legal/IP work • €10–15k technical hosting & maintenance 2. Year 3: €350k–€500k • Includes 3 validation pilots, data model updates, certification, and dissemination activities. • Assumptions: Cloud costs +20%/year; staff overhead 15%; standardization cycle 18 months; TRL increase from 6 to 8 within 3 years.
Revenues	Expected revenues and profits generated once the KER is exploited: • Year 1: €0- Pre-commercial phase, focus on validation and standardisation • Year 3: €250-350k/year, based on: • Integration and support services (€20–30 k per adopter, 5–6 adopters- as decribed in the customer segment tables (Table 12)) • Annual licence or subscription fees (€10–15 k per adopter / year). • Consulting for DPP and ESPR alignment (€30 k / year). • Cumulative 3-year revenue: c.a €500–600 k. • Assumptions: Early adoption rate 5 % in Y2 → 10 % in Y3; 90 % license renewal; 20 % gross margin; first positive cash flow expected in Y3
Other sources of coverage	• Internal PLM and RISE R&D budgets (c.a €50k each). • Follow-up Horizon project (50% co-funded). • National/regional grants (e.g., Lombardy funding calls, PLM technology transfer office). • Industrial co-funding from OEMs participating in pilots (in-kind data sharing, €10k–€20k equivalent). • Assumptions: Funding gap covered within 6 months post-project; no equity investment required.

5 Exploitation Plan – Next stages

5.1 Phase A – Technology assessment

At this stage, all the activities related to the technology assessment (technology identification A1, and Technology evaluation A2) have been completed, using a combination of the templates and process guidance from EXPLOITT ® and HRB. These results will be used to copmlemented the remaining workshops and templatezs from the HRB, for example the lean canvas, business plan, and others, which will be presented in M36 in D6.8.

5.2 Phase B- Business plan

The business planning phase translates this technical evaluation into a concrete exploitation strategy and building upon the exercise done with the HRB on the exploitation roadmaps. The 3-5 KERs that have been evaluated will follow this process, as the KERs that are most strategically and commercially viable, with 3 following the HRB, and all 5 following EXPLOITT□. The business plan outlines how the chosen KER can be developed, marketed, or otherwise utilized to achieve maximum impact. It considers factors such as market opportunities, operational requirements, potential partnerships, and resource allocation. This phase ensures that the selected KER moves beyond analysis and is supported by a practical roadmap for implementation and value creation. The exploitation roadmaps developed with the HRB allows projects partners to strategize actions from TRL5 to commercial stage while Phase B of the EXPLOITT□ methodology will pave the way for a successful market uptake.

The business plan section will include a mixture of work from BAX and the KER owners and their participants, covering key players, competitors, and landscape, business model design, financial and risk, and marketing plan and implementation roadmap. Some of these phases have already begun, but once completed, will be detailed in D6.8.

6 Final remarks

At the current stage, Technology identification (A1) and evaluation (A2) have been completed. There were over 30 KERs identified by all 28 project partners of ZEvRA. These were then characterised to understand further detail about each of the KERs, for example, details on their unique selling point, regulations, further descriptions of each KER, their innovativeness, and the partners involved in the KER. After discussion between BAX and the coordinator, the list was then filtered down to 14 KERs, before the prioritisation workshop where pKERs have been identified as KERs for ZEvRA to undergo further evaluation and business planning. These are the following:

- pKER 1: 100% Recycled Wrought Aluminium for extruded profiles
- pKER 2: Recycled Plastics (up to 70% PCR) for interior parts
- pKER 3: Traceability of components through Digital Product Passport (DPP)
- pKER 4: AI head impact criterion tool for steel repurposing
- pKER 5: Thermoplastic composite semi-products (organo sheets and/or GMT) made of recycled (PCR) PET and glass fabrics

These pKERs were prioritised based on their level of innovation, exploitability, potential industry impact, and organisational resources. Each selected pKER has been evaluated following the EXPLOITT ® and HRB methodologies, covering ground identification and customer and market research, to unique value propositions, standardisation, and risk assessment of each of the 5 pKERs. The combined work of the EXPLOITT⍰ methodology and the HRB allowed elaborating actions that facilitate TRL growth from TRL5 to commercial readiness and then pave the way for a successful market uptake. With progress complete from the technology evaluation, business planning is currently beginning and will be completed in the final 12 months of the ZEvRA project.

The next steps will consiste of the business plan, which again, will cover a combination of the EXPLOITT ® methodology and the HRB, these activities will be completed by M36 and will ensure a feasibale path to market for each of the 5 selected pKERs.

7 References

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8 Annex

8.1 Annex A . Explotation intentions

Exploitation intentions tables for the 3 pKERs evaluated in the HRB session. The Exploitation Intentions Tables have been included in the Annex as supplementary information supporting several stages of Section 4.2. They provide detailed context for each of the three PKERs, including the description of the KER, target market, users, and competitive advantage. While key insights from these tables are incorporated into the main body of the report, the full tables offer additional supporting detail and transparency regarding the exploitation planning process. The tables were developed through the HRB methodology, ensuring a structured and consistent approach across all three pKERs.

Table 26: *Exploitation intentions table for pKER 1 (RAF)*

pKER 1: 100% Recycled Wrought Aluminium for extruded profiles	Input from the Beneficiary
Description	Production of wrought aluminium alloys for extruded profiles by maximizing recycled content with up to 100% scrap. The alloy development includes evaluating scrap, sorting, and tailoring to certain chemistry by monitoring the content of Mg, Si, Fe, Cu, Zn and other tramp elements to maintain properties.
Target market/ end users	These recycled wrought aluminum alloys for extruded profiles are suitable for applications in various sectors, especially in the Automotive and Building sectors. Potential customers and/or end users are car manufacturers or construction companies that can lower the carbon footprint of their products while guaranteeing the same properties of the alloys used.
Competitive advantages	The advantages are manifold both from a production point of view and from the point of view of the environment and the valorization of raw materials found in Europe. In fact, being alloys produced using Aluminium scrap present in our territory, we do not depend on the importation of raw materials from outside Europe. In addition, alloys from recycled materials allow an energy saving in the production phase of 95% compared to the same production with primary aluminium and a 90% reduction in carbon footprint.
Use model	Alloys produced using post-consumer recycled aluminum can be used by billet producers and therefore extruded products. Recycled aluminum alloys can easily replace the same aluminum alloys from ore, without modifying the billet production processes.
Partners	Benteler – Fraunhofer – UNIBO – Volkswagen
Timing	queste leghe di alluminio da riciclo sono già testate ottenendo risultati confrontabili con le medesime leghe di alluminio da minerale (Primarie), quindi il mercato le possono utilizzare immediatamente
IP status	Not yet

Table 27: *Exploitation intentions table for pKER 2 (FPL)*

pKER2 – Recycled Plastics (up to 70% PCR) for Interior Parts	Input from the Beneficiary
Description	This KER refers to the development and use of interior automotive plastic parts manufactured from up to 70% post-consumer recycled (PCR) materials such as PP, ABS, and PA6. The aim is to demonstrate the technical feasibility, performance, and scalability of recycled materials in high-standard automotive applications.
Target market/ end users	Target market: • Automotive OEMs and Tier-1 suppliers aiming for higher PCR content in compliance with EU green transition policies • Material compounders and recyclers seeking new markets and specifications • Policymakers and regulators involved in setting circularity, recyclability, and PCR targets (e.g., under ELV, ESPR) • End-of-life vehicle processors and waste management companies evaluating recyclable interior plastic applications End-users / Customers: • Automotive manufacturers (Toyota, Skoda, etc.) • Plastic recycling companies and compounders • Policy developers who define and revise environmental thresholds • Circular economy consultants and certification bodies
Competitive advantages	The proposed solution offers several competitive advantages. It enables the use of up to 70% post-consumer recycled (PCR) content in interior automotive plastic parts, significantly exceeding current industry standards. This directly supports the sustainability targets of OEMs and aligns with key EU regulations such as ELV, CSRD, and ESPR. The material formulations are compatible with existing industrial injection moulding processes and are optimized with fillers and additives to ensure mechanical, thermal, and aesthetic performance. One of the key differentiators is the integration of digital simulations, which allows early-stage validation of part performance and reduces the need for costly and time-consuming physical prototyping. The solution has already been tested across multiple OEM scenarios (e.g., Toyota and Skoda), demonstrating replicability and traceability. Beyond its technical value, the project also aims to influence future regulations by showcasing the feasibility of high-PCR content materials in demanding automotive applications.
Use model	The recycled material formulations will be used in manufacturing injection-moulded automotive interior parts such as center consoles and glove boxes. These parts will be produced and validated in collaboration with OEM partners, adhering to real-world automotive quality standards. The material development process is carried out collaboratively: VTT is responsible for PP and ABS-based recycled compounds, while Farplas develops recycled PA6, both targeting a minimum of 70% post-consumer recycled content. In parallel, validation and testing procedures are coordinated with Toyota Motor Europe (TME), including prototype part manufacturing, realistic performance analysis, and compliance with OEM-specific quality metrics. Additionally, Skoda will evaluate the validated materials and processes on its own platform, ensuring broader scalability and replicability across multiple OEMs. To enhance product consistency and visual quality, inline rheometry will also be

	applied during injection moulding, replacing conventional systems with a more efficient setup that improves material flow tracking, surface finish, and dimensional stability. This integrated, multi-stakeholder process increases the likelihood of market adoption and showcases the material's adaptability across different platforms.
Partners	Farplas (material development, part production, and validation) VTT & RISE (material blending, testing, and validation) TMEe & Skoda (OEM-side use-case implementation) Euronova (sister company of Farplas, compounding and additive support)
Timing	Initial material development and formulation activities are ongoing within the project, with different partners focusing on specific recycled content types: VTT leads the development of PP and ABS compounds, while Farplas develops rPA6 formulations. Currently, small-batch pilot production and performance testing are being carried out in collaboration with OEM partners (e.g., TME and Skoda). These include material validation, injection moulding trials, and digital simulation-based quality assessments. While a potential market launch within 1–2 years after the project is seen as a realistic target, this will largely depend on the results of validation and part performance within the project timeline. The feasibility of scaling up and commercializing these materials will be confirmed based on their mechanical, thermal, and visual compliance with OEM standards. In addition, non-technical challenges may also influence the timeline, including bureaucratic and regulatory issues such as cross-border customs limitations, recycled content certification, and national implementation of EU circularity targets. These policy-related dynamics, especially in sourcing recycled materials across EU–Türkiye borders, may affect the overall exploitability and timing of market entry.
IP status	There is no specific IP protection claimed for the recycled material formulas at this stage. However, know-how and formulation expertise are kept confidential. Potential for trade secret protection or material-specific IP filings will be considered during post-project exploitation phase, especially if customer-specific adaptations are made.

Table 28: *Exploitation intentions table for pKER 3*

Traceability of components through the DPP	**Input from the Beneficiary**
Description	A standardized data model for the Digital Product Passport (DPP) tailored to circular economy use cases in the automotive sector. The model enables traceability and lifecycle data exchange for critical components (such as steel, aluminum, tyres, and rare earth elements) supporting regulatory compliance and revalorization at end-of-life. The tool integrates top-down policy alignment (ESPR, ELV proposal, Battery Regulation) with bottom-up stakeholder input to ensure both feasibility and interoperability across the vehicle supply chain.
Target market/ end users	• Responsible Economic Operators: Automotive OEMs and Tier 1–3 suppliers, who must comply with emerging DPP requirements and report

	lifecycle data for circularity assessment. (Possible interaction with IMDS "International Material Data System" • Digital service providers and platform developers building DPP-compliant infrastructures. • Regulators and standardization bodies requiring a clear data structure for delegated acts. • Circular Economy Operators (Recyclers, remanufacturers, repair workshops) who need access to structured product information at component level.
Competitive advantages	• Regulation-aligned: Based on the continuously evolving legislative reference and anticipates structure for the proposed ELV and ESPR regulations. • Cross-sectoral applicability: Designed for both vehicle and component levels, with flexible modularity that enables integration into different DPP infrastructures. • Stakeholder-driven: Built through real industry use cases and workshop validation, ensuring data relevance, feasibility, and access control definition. • Interoperable architecture: Uses a harmonized set of attribute categories that can be extended or adapted for upcoming product categories or material families
Use model	• A reference architecture for digital infrastructure developers implementing decentralized DPP systems. • A pre-standard input to CEN/CENELEC or other harmonization initiatives. • A service model for component manufacturers seeking compliance support and implementation guidance. • A support tool in contract research or consulting for companies preparing DPP-compliant datasets. Early adopters include ZEvRA use case partners (steel, aluminum, REEs, plastics, glass, tyres), and automotive OEMs participating in Horizon Europe consortia.
Partners	• POLIMI (lead exploiter) • Use case partners from the ZEvRA consortium
Timing	• Validation phase: ongoing (2025) • Pre-standardization draft: ready by early 2026 • Market uptake (by early adopters and service providers): 2026–2027 • Alignment with final ELV delegated acts: subject to legislative timeline
IP status	No formal IP protection is foreseen, as the model is intended for open, pre-standardization use and contribution to public policy alignment. Attribution and authorship by POLIMI and project partners will be maintained.

8.2 Annex C

The Characterization Template from the Horizon Results Booster has also been included in the Annex as complementary information. While the key elements of characterization have already been addressed within the main text, through the characterization stages of the exploitation methodology and various related templates, this template provides additional supporting detail and context to accompany the analysis presented in the report.

Table 29: *RAF Characterisation table- recycled wrought aluminium alloys for extrusion applications*

	Input from the Beneficiary
Description	The result consists of a new generation of wrought aluminium alloys produced entirely from post-consumer scrap, designed for extrusion applications in automotive and other lightweight sectors. This innovation enables aluminium extruders and OEMs to replace primary (virgin) aluminium with a fully recycled alloy that maintains comparable mechanical and surface properties, while significantly reducing carbon footprint and material costs. The solution directly addresses the industry's need for decarbonised, circular, and traceable materials without compromising product quality or production efficiency.
Target market/end users	The target market is the European aluminium and automotive manufacturing sector, particularly companies involved in extrusion and assembly of structural and semi-structural components for vehicles. Primary customers / end-users: • Tier 1 suppliers producing extruded components (e.g., battery housings, crash management systems, subframes). • OEMs (Original Equipment Manufacturers) committed to CO_2-neutral production and circular sourcing, such as Volkswagen, Skoda, Stellantis, and BMW. • Secondary markets: Construction, transportation, and electronics sectors seeking sustainable aluminium solutions.
End-users needs / problems	• Reduce the carbon footprint of aluminium components while maintaining quality and performance. • Ensure stable European sourcing of low-carbon materials to mitigate supply risks from imported primary aluminium. • Comply with EU regulations and OEM targets for recycled content, circular economy, and traceability (CSRD, CBAM, ELV, Catena-X). • Avoid process disruptions when transitioning from primary to recycled alloys. • Obtain certified environmental data to support sustainability reporting and Life Cycle Assessment.
Competitive advantages	• 100% post-consumer scrap content, offering up to 95% lower CO_2 footprint than primary aluminium. • Equivalent mechanical and surface performance to primary alloys, validated by industrial partners (Benteler, Fraunhofer, Volkswagen). • Certified traceability and carbon footprint according to ISO 14067 and EPD standards. • European sourcing and supply-chain resilience, fully aligned with the EU Green Deal. • Process compatibility with existing extrusion technologies, requiring minimal adaptation.
Use model	The KER will be industrialised and commercialised by Raffmetal through the manufacturing and sale of certified recycled aluminium alloys for extrusion to Tier 1 suppliers and OEMs. The use model combines direct supply agreements with technical collaboration for alloy qualification, including: • Bilateral contracts for supply of recycled alloy ingots. • Joint validation projects with Tier 1 customers. • Integration into European digital product passport and traceability systems (Catena-X).

Early Adopters	• Tier 1 aluminium extruders such as Benteler, Hydro Extrusions, or Constellium Automotive Structures, already engaged in lightweight EV components. • Automotive OEMs (Volkswagen Group, Stellantis, BMW) with strong CO_2 reduction commitments. • Channels to reach them: o Demonstration activities within ZEVRA. o European Aluminium network and sustainability forums. o Direct industrial workshops and co-engineering meetings.
Adopters' problems/needs	Adopters (extruders, OEMs, Tier 1s) need a low-carbon, reliable, and locally available alternative to primary aluminium that: • Meets stringent mechanical specifications. • Reduces production-related emissions. • Simplifies sustainability and traceability reporting. • Guarantees stable price and supply conditions.
Alternative solution	Currently, adopters rely mainly on: • Primary aluminium produced from bauxite, with a much higher CO_2 footprint (6–15 tCO_2/tAl). • Partially recycled alloys containing mixed post-industrial scrap, which provide limited decarbonisation benefits. • Low-carbon primary aluminium sourced from hydro-powered smelters (outside the EU), but still dependent on imported raw materials and limited in availability.
Unique Value Proposition	Raffmetal's KER provides a proven, industrially scalable alternative that: • Achieves near-zero carbon aluminium through 100% post-consumer scrap. • Maintains primary-grade performance without process changes. • Is "Made in Europe", ensuring supply security, compliance, and traceability. • Aligns with OEM and EU sustainability goals, reducing both Scope 3 emissions and material costs.
Competitors	• Primary aluminium producers (Hydro, Rio Tinto, Alcoa) offering low-carbon primary aluminium. o Strengths: established supply networks and known quality. o Weaknesses: still rely on virgin raw materials, higher CO_2 footprint, imported sources. • Other secondary producers (Befesa, Alumetal, Eccomelt) focused mainly on foundry alloys rather than extrudable grades. o Strengths: experience in recycling. o Weaknesses: limited capability to produce wrought alloys for extrusion applications. Raffmetal's competitive edge lies in technological expertise in refining post-consumer scrap to achieve high-performance wrought alloys compatible with demanding extrusion and automotive requirements.
Timing	• 2025: Laboratory and pilot-scale validation of alloy mechanical properties (TRL 6–7). • 2026–2027: OEM validation and pre-commercial trials in real automotive components (TRL 8). • Market entry: 2027–2028, with full-scale industrial production and supply agreements.
IP Strategy	IP strategy is relevant. • Background (Raffmetal): proprietary know-how on scrap selection, melting, refining, and alloying processes.

	• Foreground (ZEVRA consortium): validated process data, mechanical performance results, and environmental assessment methodologies. Raffmetal will: • Protect confidential information related to scrap composition and treatment processes through trade secrets and restricted data-sharing. • Ensure joint exploitation agreements defining IP ownership and access rights with partners (Benteler, Fraunhofer, Volkswagen). • Consider future patent or design protection for alloy formulations or process innovations when commercially justified.

Table 30: *FPL Characterisation table- KER name: Recycled Plastics (up to 70% PCR) for Interior Parts (FPL)*

	Input from the Beneficiary
Description	Farplas is developing interior automotive components—glovebox and armrest—using advanced post-consumer recycled (PCR) plastic compounds. These parts deliver the same durability, mechanical properties, and aesthetics as traditional virgin polymer alternatives, while helping manufacturers meet strict sustainability mandates and reduce carbon footprint. The solution provides traceable, certified recycled content, addressing both Original Equipment Manufacturers (OEMs) regulatory requirements and growing customer demand for greener vehicles, particularly produced in Türkiye and the UK.
Target market/end users	The primary target market is European passenger car automotive OEMs for interior trim components. These customers and end users operate within the passenger car and commercial vehicle segments, particularly those focused on regulatory compliance and corporate sustainability goals.
End-users needs / problems	OEMs and their supply chain face mounting pressure to integrate recycled content into interior vehicle components, meet EU circular economy legislation, and demonstrate progress toward net-zero targets—all without sacrificing product quality, safety, or passenger comfort. Passenger car OEMs in another way, end-users need solutions that are validated, technically robust, and supported by documentation for certification and digital product passports for their mass production.
Competitive advantages	Farplas's solution delivers: • Validated OEM performance, matching virgin plastic properties (strength, durability, surface finish) in key components. • Industry-leading 70% PCR content, exceeding EU regulatory requirements and competitive offerings (typically 25-30% PCR). • Certified material traceability and readiness for digital product passport systems. • Accelerated qualification timelines through ZEVRA validation, reducing the time and cost for OEM adoption. • Integrated support for quality compliance, documentation, and ongoing process optimization.
Use model	Farplas manufactures and supplies fully validated PCR-based glovebox and armrest assemblies to automotive OEMs, with options for direct integration into mass production lines, technical support for quality validation, and the ability to license polymer recipes or processing IP for broader adoption in other applications.
Early Adopters	Initial targets are sustainability-driven European passenger car OEMs such as, Stellantis, Ford, with outreach to Renault, Stellantis and VW Group

Adopters' problems/needs	Early adopters need to rapidly qualify new recycled content components to comply with EU mandates, achieve ESG/corporate sustainability reporting targets, and differentiate their brand on climate commitment—while managing risks around cost, supply chain, production feasibility, and customer acceptance.
Alternative solution	Most competitors currently rely on: • Virgin polymer glovebox and armrest designs (non-compliant with new EU rules): Faurecia, Magna, Plastic Omnium, Martur • Low PCR-content alternatives (25-30%) from major chemical companies, insufficient for future policy targets: Plastivaloire, Novares, Plastic Omnium, IAC Group, Yanfeng, Faurecia, Magna • In-house OEM development, which is slow and costly: Magna, Faurecia, Martur, IAC Group, Yanfeng, • Limited bio-based plastic options (costly, niche, not targeting PCR content regulations): Magna
Unique Value Proposition	Farplas is a Tier-1 supplier with a validated solution for 70% PCR interior components, providing OEMs with immediate regulatory compliance, proven equivalent performance, and traceable sustainability credentials—delivered with technical and documentation support to minimize risk and accelerate time-to-market.
Competitors	• Key competitors: • Faurecia – lightweight, low VOC, recycled contented armrest and glovebox • Magna – not recycled content but sustainable and lightweight interior trims • Plastic Omnium - full interior modules using recycled and low carbon plastics
Timing	Market introduction is expected within 6–12 months post-ZEVRA project completion (from mid-2027), allowing rapid OEM qualification and production ramp-up to support 2030 compliance deadlines.
IP Strategy	• Background: Farplas's legacy know-how in automotive plastics processing & project partner research contributions. • Foreground: New PCR formulations and inline quality monitoring developed through ZEVRA, to be patented by Farplas. • IP management: Patent filings in EU and Turkey, supported by NDAs and licensing options; strategic focus on proprietary processing/traceability methods and component design optimizations.

Table 31: *PLM Characterisation table- Traceability of Components through the Digital Product Passport (DPP*

	Input from the Beneficiary
Description	A data infrastructure enabling the secure traceability of automotive components across the value chain through a decentralized data-sharing scheme. The system provides full tracking capabilities from material origin to end-of-life and recovery, including markers for critical raw materials. By linking components' features to value and material recovery potential, it supports compliance with ESPR, ELV, and CRM Acts while connecting directly to EU data spaces and Catena-X for interoperability.
Target market/end users	Target market: Automotive manufacturing and recycling ecosystem transitioning toward ESPR-compliant circular value chains. End-users:

	1. OEMs and Tier-1 suppliers needing product-level compliance and traceability. 2. Recyclers, dismantlers, and remanufacturers seeking access to standardized product data. 3. Regulators and market surveillance authorities verifying sustainability and circularity metrics.
End-users needs / problems	1. Difficulty complying with ESPR, ELV, and CRM Acts due to fragmented data. 2. Lack of reliable traceability across supply chains. 3. Manual reporting and audit processes increasing compliance costs. 4. Data silos and fear of exposing sensitive information. 5. Regulatory uncertainty making technology investments risky.
Competitive advantages	1. Provides secure access rights and decentralized data governance. 2. Offers harmonized data attributes aligned with the Battery Passport and ESPR framework. 3. Ensures future interoperability with Catena-X and other EU data spaces. 4. Links component-level data to value and material recovery, going beyond compliance. 5. Adaptable to evolving regulations and existing IT/ERP environments.
Use model	Implemented as a digital service and data infrastructure supporting multiple integration pathways: • Plug-in for OEMs' PLM or ERP systems. • Data-space connector module for Catena-X or GAIA-X ecosystems. • Reference model for standardization and policy development (CEN/CENELEC TS or CWA).
Early Adopters	• Automotive OEMs and Tier-1 suppliers participating in ZEvRA and Catena-X pilots. • Regulatory agencies preparing delegated acts under ESPR. • Remanufacturers and recyclers engaged in EU-funded testbeds for traceability. • Channels: Reached via project demonstrators, Catena-X working groups, ESPR stakeholder forums, and policy roundtables.
Adopters' problems/needs	1. Need to exchange product lifecycle data securely across organizational boundaries. 2. Need for standardized, machine-readable formats for circularity metrics. 3. Difficulty integrating DPP requirements into existing industrial data systems.
Alternative solution	• Proprietary traceability systems (e.g., OEM-specific platforms). • Manual data collection and reporting via spreadsheets or PDFs. • Closed supply-chain solutions without interoperability (limited scalability).
Unique Value Proposition	An interoperable, secure, and regulation-ready DPP infrastructure that bridges compliance (ESPR) and industrial implementation (Catena-X). It reduces audit costs, protects data confidentiality, and creates measurable value from traceability by connecting lifecycle information to material and value recovery.
Competitors	• Proprietary OEM traceability systems – strong integration but closed architectures. • Commercial sustainability modules (e.g., SAP, Siemens) – mature but not fully ESPR-aligned.

	• Our strengths: Open, modular, interoperable, and compliant with EU and ISO standards. • Their weaknesses: Vendor lock-in, limited adaptability, lack of transparency across the value chain.
Timing	2–3 years to market, in alignment with ESPR delegated acts (2026–2028)
IP Strategy	• Background: DPP-related ontologies and interoperability models from PLM's prior projects (DigiPrime, CIRPASS). • Foreground: DPP data model extensions, traceability schema, and integration layer developed in ZEvRA. • Protection: Use of open technical specifications and potential CEN/CENELEC Workshop Agreement (CWA) to ensure interoperability and wide adoption.