

Zero Emission electric Vehicles enabled by haRmonised circularArity

Deliverable D7.2

Scientific and technical management guidelines

31th March, 2024

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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 CO_{2e} 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), unfilled/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.

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, which includes industry and academia covering the entire automotive value chain.

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Abbreviations and Acronyms

Table 1: *Abbreviations and Acronyms*

Abbr.	Full name
CA	Consortium Agreement
CBM	Circular Business Model
DfC	Design For Circularity
DT	Digital Twin
EC	European Commission
ELCA	European Lightweight Clusters Alliance
EoL	End of Life
ESB	External Stakeholder Board
GA	General Assembly
IB	Innovation Board
LCA	Life Cycle Assessment
LCC	Life Cycle Costing
LCT	Life Cycle Thinking
OEM	Original Equipment Manufacturer
PC	Project Coordinator
PMT	Project Management Team
QRM	Quality and Risk Identification Manager
REE	Rare Earth Elements
RP	Reporting Period
RTO	Research and Technology Organization
SC	Steering Committee
SLCA	Social Life Cycle Assessment
SME	Small and medium size enterprise
STM	Scientific and Technical Manager
TB	Technical Board
WP	Work Package

1 Executive summary

This deliverable will define how scientific and technical (S&T) activities will be managed and monitored throughout the project, including all design, development, prototyping, technology assessment, testing, and validation activities. This will be completed to affirm that the S&T content is of high quality. The project will be managed and monitored using work packages (WPs), tasks (Ts), deliverables (Ds) and milestones (MSs) defined in the ZEvRA Grant Agreement (GA) as well Consortium Agreement (CA). To accomplish this target, ZEvRA's consortium will utilize various means to identify deviations in a simple manner and allow robust follow-up approaches. This document will provide a clear handbook of procedures and practical guidelines to enable the S&T of the project for all partners. It provides guidance regarding the planning and development of deliverables and identifies contractual rules and management procedures relevant to the technical management of the project as well as both internal and EC level reporting. The management structure related to S&T activities will be presented, as well as the procedures used to ensure appropriate monitoring of technical progress. This is in alignment with the procedures in the risks' identification plan (D7.3, D7.4 and D7.5).

2 Introduction

Efficient management of scientific and technical activities is crucial to the success of any research project, especially one as large and complex as ZEvRA. ZEvRA aims to integrate the principles of the circular economy into vehicle development and production. Central to achieving the objectives of ZEvRA is the adherence to comprehensive scientific and technical guidelines. These guidelines provide a structured framework for the management of the project's scientific and technical activities. A clear and agreed definition of the procedures and roles for the management of ZEvRA from a scientific and technical perspective is essential. The Scientific and Technical Manager (STM) and the Work Package Leaders (WPL) serve as the linchpin in this framework by coordinating and directing the scientific and technical activities to align the project's objectives with societal, environmental and economic needs. This report looks at the scientific and technical guidelines implemented within the ZEvRA project and highlights their importance and impact on the promotion of the circular economy in vehicle development and production in the European automotive sector.

The document presents the main roles and steps required to manage the project from a scientific and technical point of view, by identifying the main objectives and associated deliverables as well as the structure and technical roles of partners.

3 Overview of the ZEvRA project

3.1 Project summary











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 CO₂ 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), unfilled/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. To maximise the outreach of the 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, which includes industry and academia covering the entire automotive value chain.

3.2 Consortium

Effective participation of industrial partners (including SMEs) will help ensure industrial significance and impact of the research effort. The ZEvRA's consortium is well balanced between research excellence and industrial leadership and represents scientific and technological excellence in the EU. The ZEvRA partnership brings together five OEM, SMEs, industry, and research and education organizations in a strategic mix of competences, expertise and emerging capabilities that provide exceptional opportunities to design and provide novel solutions for light and safe vehicles. 28 organizations from 13 different European countries. One entity (UNN) is an associated partner (United Kingdom) and two are affiliated entities (Conti CAT, DE and Conti Puchov, SK) belonging to the beneficiary Conti Reifen, DE.

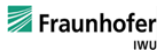

Table 2: List of ZEVRA partners

Partner No	Logo	Partner full name	Short name	Type*	Country
1 (PC)		Fraunhofer Gesellschaft zur Foerderung der Angewandten Forschung E.V.	FRA	RTO	DE
2		Fundacio EURECAT	EUT	RTO	ES
3		Bay Zoltan Alkalmazott Kutatasi Kozhasznu Nonprofit KFT.	BZN	RTO	HU
4		Alma Mater Studiorum - Universita di Bologna	UBO	UNI	IT
5		Skoda Auto AS	SKO	OEM	CZ
6		RKW Sachsen GmbH Dienstleistung und Beratung	RKW	BSO	DE
7		RISE Research Institutes of Sweden AB	RISE	RTO	SE
8		Faurecia Automotive Composites	FAU	IND	FR
9		EDAG Engineering GmbH	EDAG	IND	DE
10		Havel metal foam GmbH	HMF	SME	DE
11		Raffmetal Spa	RAF	IND	IT
12		Technische Universitaet Braunschweig	BRA	UNI	DE
13		Farplas Otomotiv Anonim Sirketi	FPL	IND	TR
14		Benteler Automotive Raufoss AS	BEN	IND	NO
15		Norges Teknisk-Naturvitenskapelige Universitet	NTNU	UNI	NO
16		Toyota Motor Europe Nv	TME	OEM	BE
17		Psa Automobiles Sa	STL	OEM	FR
18		Automotive Parts Remanufacturers Association Europe	APRA	Assoc.	BE

Partner No	Logo	Partner full name	Short name	Type*	Country
19		Centro Ricerche Fiat Scpa	CRF	OEM	IT
20		Polymeris	POL	Assoc.	FR
21		Endurance Amann GmbH	END	IND	DE
22		Teknologian Tutkimuskeskus Vtt Oy	VTT	RTO	FI
23		Politecnico di Milano	PLM	UNI	IT
24		Turkiye Sise ve Cam Fabrikalari AS	SIS	IND	TR
25		Continental Reifen Deutschland GmbH	CON	IND	DE
26		Volkswagen Aktiengesellschaft Wolfsburg	VW	OEM	DE
27		Bax Innovation Consulting SL	BAX	SME	ES
28		University of Northumbria at Newcastle	UNN	UNI	UK

The combination of these complementary expertise and resources ensuring the critical mass required to accomplish the foreseen WPs of the project. The partners are active in all research, development and industrial areas related to the project and each one is expected, through the exchange of the technical knowledge and intensive cooperation, to prompt its expertise at a higher rate leading to an accelerated project progression. The consortium covers the full spectrum necessary for ensuring the successful development of the materials and the acceleration of their technological transfer to the global market (see Table 3).

Table 3: Partners' distinguished contributions in ZEVRA

Partners	Main Expertise in ZEVRA	WP involvement
	FRA: Project coordinator; - project management, communication and dissemination, R&D, prototyping, education and training	Lead: WP4, WP7, T2.4, T3.5, T4.1, T4.2, T6.1, T7.1, T7.2 Participate: WP1-3, WP5-6
	Fundacio EURECAT – R&D, education and training	Lead: WP1, T1.1, 1.2, Participate: WP2-7

Partners	Main Expertise in ZEVRA	WP involvement
	Bay Zoltan Alkalmazott Kutatasi Kozhasznu Nonprofit KFT. – project management, communication and dissemination, R&D, testing and validating	Lead: T1.3, T3.4, T7.3 Participate: WP1, WP3, WP4, WP6-7
 ALMA MATER STUDIORUM UNIVERSITA DI BOLOGNA	Alma Mater Studiorum - Universita di Bologna – project management, communication and dissemination, co-definition of research and market needs, R&D, testing and validating, prototyping, education and training	Lead: T2.3, Participate: WP1-2, WP4-7
 SKODA	Skoda Auto AS – communication and dissemination, testing and validating, prototyping,	Lead: T3.1, Participate: WP1-7
 RKW Sachsen Wege für die Wirtschaft	RKW Sachsen GmbH Dienstleistung und Beratung – project management, communication and dissemination, co-definition of research and market needs, R&D, testing and validating, IPR management, education and training	Lead: T5.3, Participate: WP5-7
	RISE Research Institutes of Sweden AB – R&D, testing and validating, education and training	Lead: WP2, T2.2, Participate: WP1-2, WP4, WP6-7
	Faurecia Automotive Composites – communication and dissemination, R&D, testing and validating, prototyping	Participate: WP1-4, WP6-7
	EDAG Engineering GmbH – project management, communication and dissemination, R&D, testing and validating, prototyping, education and training	Lead: WP3, T2.1, T3.2, T3.3 Participate: WP1-2, WP4-7
 Havel metal foam	Havel metal foam GmbH – project management, R&D, testing and validating, prototyping	Participate: WP1, WP4, WP6-7
	Raffmetal Spa – R&D	Participate: WP1, WP4, WP6-7
 Technische Universität Braunschweig	Technische Universität Braunschweig – Researching	Participate: WP2, WP6-7
	Farplas Otomotiv Anonim Sirketi – co-definition of research and market needs, testing and validating, prototyping, education and training	Lead: T4.3, Participate: WP1-2, WP4-7
 BENTELER makes it happen	Benteler Automotive Raufoss AS – R&D, testing and validating	Participate: WP1-4, WP6-7
 NTNU Norwegian University of Science and Technology	Norges Teknisk-Naturvitenskapelige Universitet – R&D, testing and validating, education and training	Participate: WP1-2, WP4-7
 TOYOTA	Toyota Motor Europe Nv – co-definition of research and market needs, testing and validating, prototyping	Participate: WP1, WP3-4, WP6-7

Partners	Main Expertise in ZEvRA	WP involvement
	Psa Automobiles Sa - co-definition of research and market needs, testing and validating, prototyping	Participate: WP1, WP4-7
	Automotive Parts Remanufacturers Association Europe – project management, communication and dissemination, co-definition of research and market needs, testing and validating, IPR management, education and training	Lead: T5.1, Participate: WP6
	Centro Ricerche Fiat Scpa – co-defintion of research and market needs, testing and validating, IPR management	Participate: WP1, WP3-4, WP6-7
	Polymeris -project management, communication and dissemination, IPR management	Lead: T2.5, Participate: WP5-7
	Endurance Amann GmbH – R&D, testing and validating, prototyping	Participate: WP1, WP4, WP6-7
	Teknologian Tutkimuskeskus Vtt Oy – co-definition of research and market needs, R&D, testing and validating, prototyping	Lead: T4.4, Participate: WP1, WP4, WP6-7
	Politecnico di Milano – Researching, testing	Participate: WP2, WP6-7
	Turkiye Sise ve Cam Fabrikalari AS – R&D, testing and validating, prototyping,	Participate: WP1, WP3-4, WP6-7
	Continental Reifen Deutschland GmbH – communication and dissemination, co-definition of research and market needs, R&D, testing and validating, prototyping	Participate: WP1, WP3-4, WP6-7
	Continental Automotive Technologies GmbH – co-definition of research and market needs, testing and validating	Participate: WP7
	Continental Tires Slovakia S.R.O. – co-definition of research and market needs, testing and validating	Participate: WP4
	Volkswagen Aktiengesellschaft Wolfsburg – project management, communication and dissemination, R&D, testing and validating, prototyping	Participate: WP1, WP3-4, WP6-7
	Bax Innovation Consulting SL – project management, communication and dissemination, co-definition of research and market needs, IPR management, education and training, social sciences and humanities	Lead: WP6, T6.2, T6.3, T7.4, T7.5 Participate: WP7
	University of Northumbria at Newcastle – project management, communication and dissemination, co-definition of research and market needs, R&D, prototyping, education and training	Lead: WP5, T5.2, Participate: WP1-4, WP6

3.3 Main objectives

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 processes, which aligns with the European Union's goal of achieving zero CO₂e emissions by 2035, particularly in the EV value chain. Derived from this overarching overall goal, several sub-goals can be defined that must be achieved to achieve the overall goal. In order to be able to monitor the achievement of goals, appropriate Key Performance Indicators (KPIs) have been defined to make success measurable.

Specific Technical Objectives and KIPs are listed in the following:

- **Obj1:** To increase the implementation of targeted and high-impact circularity strategies in the European automotive industry by developing a Design for Circularity (DfC) methodology and a holistic circularity assessment aimed at improving the production of electric vehicles (EVs) based on the 9Rs2.
- KPI1: Methodology and holistic assessment adopted by > 2 EU projects and 5 OEMs.
- **Obj2:** To validate our methodology 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.
 - **Obj.2.1:** To reuse 100% steel by repurposing an EoL car component, supported by the artificial intelligence (AI) tool. The manufacturing process chain will be similar (80%) to common engineering. To repurpose a used forming tool to reshape used steel components to new ones.
 - KPI2.1: Meeting the >95% of crashworthiness performance criteria by reusing steel parts, reduces designing time by >99% (1 hour vs. 6 weeks), at least 80% of the steel material of the 2nd life prototyping tool in repurpose used forming tools.
 - **Obj2.2:** To achieve minimal virgin material usage in three versions of aluminium without compromising on properties.
 - KPI2.2: 0% virgin material usage in three versions of aluminium without compromising on properties.
 - **Obj2.2.1:** Extrusion Aluminium component from aluminium scrap.
 - **Obj2.2.2:** High-performance AlSiMnMg casting alloy component from aluminium scrap.

- KPI2.2.2: Better lightweight performance by 20% through die casting ribs for local reinforcement.
 - **Obj2.2.3**: Aluminium foam component from aluminium scrap, with reduced energy requirements during processing.
 - KPI2.2.3: Reducing energy by at least 360 kJ/kg.
 - **Obj2.3**: Diminish recycled material usage in plastics and composites.
 - KPI2.3: Reduction by 60-100%.
 - **Obj2.3.1**: To develop fibre reinforced thermoplastic (TP) material through thermocompression and thermos tamping with >70% recycled TP material, with CO₂ reduction.
 - KPI2.3.1: CO₂ reduction at least 60% vs. Polypropylene (PP) organ, at least 30% wt. reduction (vs. virgin steel components).
 - **Obj2.3.2**: To manufacture interior parts with unfilled/short fibre plastics.
 - KPI2.3.2: More than 70% recycled TP compounds (PP, ABS, PA) as a resin base.
 - **Obj2.4**: In glass manufacturing, to reduce enamel paint used for serigraphical method by applying digital printing techniques. To increase energy efficiency by producing an output power ranging via integration of photovoltaic cells into a panoramic laminated sunroof glass. To integrate laser technology to reduce water and chemical consumption during glass cutting & grinding.
 - KPI2.4: Reduce paint use by 6,5 g/windshield, reduce water and chemical consumption to 0 during glass cutting & grinding.
 - **Obj2.5**: To reuse more of a C1 or C2 tyre carcass for the manufacturing of a new tyre and reach as much as possible secondary material for the tread and sidewall that are needed for optimal performance.
 - KPI2.5: Reuse 100% of C1 or C2 tyre for manufacturing, close to 100% secondary material use for tread and sidewall production.
- **Obj3**: To create a circular car concept based on the Skoda Enyaq baseline which virtually integrates (digital twin) the 8 use cases from the 5 OEMs and Tier 1's in the consortium.

- **KPI3:** >90% functional requirements fulfilled. Concept will consider easier assembly/disassembly and joining techniques to reduce the time and cost effort for disassembly by >50%.
- **Obj4:** To increase the awareness and acceptability of our circularity strategy by implementing a guided approach and facilitate effective engagement by demonstrating key aspects and advantages.
- **KPI4:** 12 webinars, 6 workshops, and 8 hackathons for European and international researchers and experts (600+ attendees by 2027).
- **Obj5:** To strengthen human capital in R&I by developing skills regarding the developed DfC methodology and use cases' set of technologies, large-scale prototyping, and manufacturing. To create a virtual learning and a robust educational platform for training and upskilling the industrial workforce.
- **KPI5:** ca. 1,000 visits/year on the platform. A set of training packages (10+ long/short courses and learning nuggets; 3 in-house workshops; 3 educational conferences). 150+ researchers, engineers, and students to be trained and upskilled.
- **Obj6:** To adopt circular business models (CBMs) to our zero emission solutions.
- **KPI6:** To make available >50 t of secondary plastics, thermoplastics and glass each in >2 EU countries through the DigiPrime3 platform by 2027. To contribute to the traceability of components through a specific digital product passport (DPP). To elucidate the logistic streams and barriers of secondary plastic and FRP material in the EU.

3.4 Technical Enablers and Components to be developed

In order to achieve the goals and KPs described in chapter 3.3, numerous technical developments are necessary. The focus is on process and material science innovations that enable the use of recycled materials or EoL components. The corresponding technical use cases focus on the main materials used in vehicle production. To know which technologies have been developed, various demonstrators are selected, manufactured, and tested. These physical processes are supplemented by virtual methods. The concept is illustrated in Figure 1.

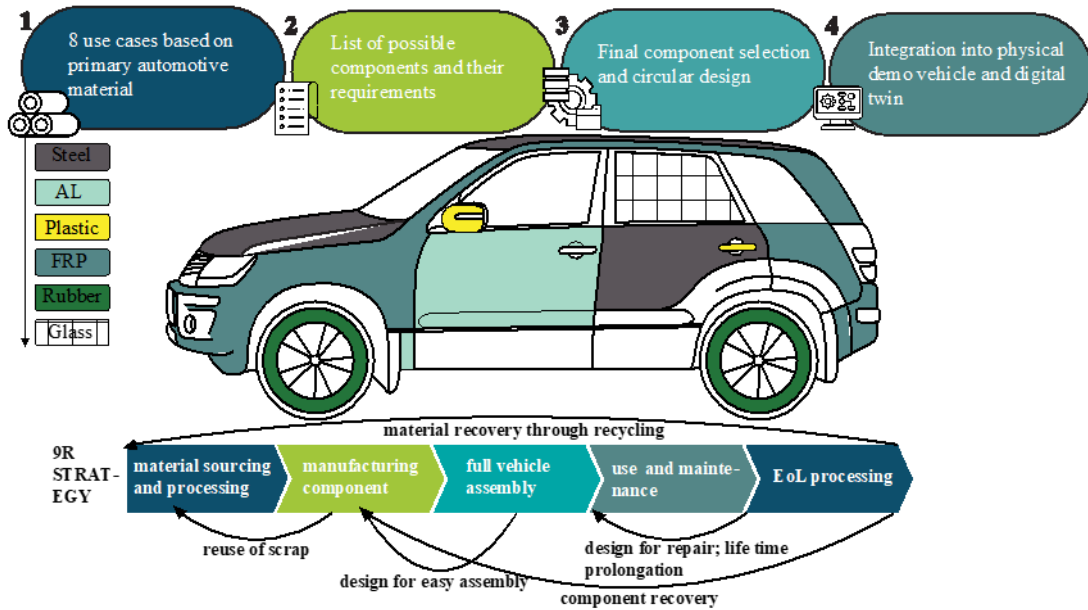


Figure 1: ZEvRA objectives and targets

The components aimed to develop during the project is defined in WP4:

Repurposing of sheet metal steel: The aim of the task is to repurpose an old steel component for development of a new vehicle car part (e.g.) fender, bonnet using 0% virgin material. The steel case will be based on the reProd® method.

Components made by aluminium: The aim is to increase the share of recycled aluminium in automotive parts aiming at 100%. Three versions of the aluminium use case will be developed: wrought, casting and foam aluminium: Wrought aluminium; Aluminium casting and aluminium foam.

Plastics and Fibre-reinforced composites: Including thermoplastic composites and mineral filled/short fibre-reinforced composites. Three materials/technologies will be developed and compared: Organo sheets (continuous fibre prepregs), glass mat TP (chopped fibre prepregs) and pellets/flakes of long fibre TP (LFT). Development of interior plastic parts with 70% PCR material.

Glass, tyres and REE: Quarterlight sized automotive glass will be cut by laser and afterwards printed and encapsulated; silicon or organic photovoltaic cells will be integrated into laminated automotive glazing. The carcass of the EoL tyre will be combined with tread and sidewall compound with a maximized hare of recycled (and potentially renewable) material and undergo an adapted production process. Magnets or magnet materials that require metallurgical processes to either re-produce reagents directly usable in magnets or intermediate products for the industries for further refining.

4 Management Structure and Procedures

4.1 Organizational Structure and Decision Making Responsibilities and Procedures

4.1.1 Governance of the ZEvRA project

An exceptionally efficient governance structure for an effective project direction and management for such a large consortium will be constructed to handle the complexity and ensure a smooth implementation and achievement of the project's ambitious goals and complete the project in within the defined scope, quality, schedule, and cost constraints. The ZEvRA management and organisational activities aim to reach the technological and scientific objectives according to the project plan and within the allocated schedule, budgets, resources, and with the needed quality. Thus, the main tasks are:

Coordination of general administrative, financial, scientific, and technology activities;

- Provision of ZEvRA with decision making bodies and procedures;
- Monitoring and supervision of the project procedures in order to ensure the development and finishing achievements on schedule;
- Establishment and provision of efficient communication among the project partners, towards the EC, as well as the user group dissemination initiatives and interested public bodies and population; and
- Management of knowledge, IP, and innovation related activities during and after the project lifecycle. The project management structure presented in the following paragraphs reflects these objectives and will be based on a clear definition of responsibilities for activities related to the given tasks. Figure 3 shows the main management bodies, partners and leading roles.
- A guiding principle behind the organizational structure is separation between strategic and operative/executive leadership functions.

The Strategic level comprises the Executive Board (EB) in other EU projects sometimes called General Assembly (GA), represents all partners in ZEvRA, with a close link with the External Stakeholders Board (ESB), includes top-level technological competence and high-level representatives from EU industries.

The Executive Board (EB) is the ultimate decision-making body of the consortium. Project Management team (PMT) represent the operative management level of the project inside the main partner (FRA), meanwhile the Steering Committee (SC) as the supervisory body for the execution of the project, which shall report to and be accountable to the Executive Board. The coordinator

as the legal entity acting as the intermediary between the Parties and the Granting Authority. Coordinator shall, in addition to its responsibilities as a Party, perform the tasks assigned to it as described in the Grant Agreement and the Consortium Agreement. The diagram in Figure 2 shows the structure of the project organisation with arrows indicating the lines of communication and information exchange.

The Technical Board members are the Scientific & Technical Manager (STM), the Quality & Risk Manager (QRM), and the work package leaders. Meanwhile the Innovation Board assembled by the Innovation & Exploitation Manager (IEM), Dissemination & Communication Manager (DCM) and Open Sciences and Data Manager (OSDM)

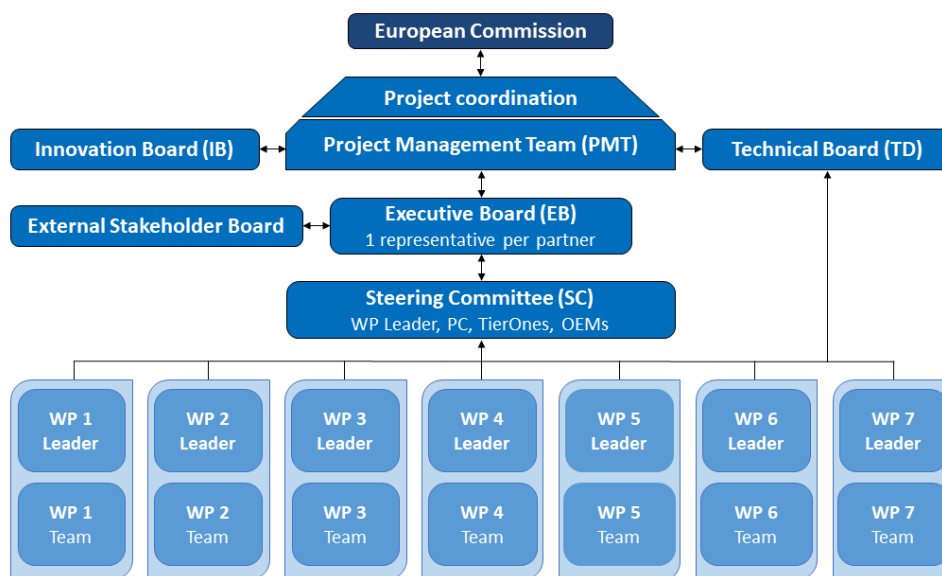


Figure 2: Project management organizational structure of ZEvRA

4.1.2 Management procedures

In the strategic level, overall scientific and technological directions and the general implementation structure of ZEvRA will be defined. In the operative level, the PMT, supported by the IB and TB, will be responsible for the project execution. The project will be supported by a Consortium Agreement (CA) that regulates the framework for items such as responsibilities of parties, non-disclosure of information, financial provisions, access rights, IPR, as well as legal aspects. The operative/executive management boards, constitutions and rules are presented Table 4.

Table 4: Roles in ZEvRA project

Executive Board (EB)

Composed by the representatives of partners (two-third is needed for quorum, minimum 50% of members are females) - Chaired by Daniel Nebel (FRA),

The EB is the highest decision-making body of the ZEvRA where all partners are represented. It convenes at least twice a year, in connection with a yearly ZEvRA conference. The main tasks are: Monitor, review, evaluate overall progress; Assess milestones and deliverables; Decide on strategic issues; Discuss, debate, and make recommendations to the SC; Recognize proper activities for effective performance; Resolve matters and conflicts, appointment of SC and ESB members.

Project Management Team (PMT); Chaired by Daniel Nebel (FRA)

Supporting unit of the PC. Monitors the progress of the project, informs the PC and takes the necessary

actions, ensure the appropriate flow of information within the project structure.

Members: Selected staff of Lead Partner (PC, STM, financing, DCM, etc.)

Reports to EB, meets at least every 2 weeks, and as it required.

Technical Board (TB): Leader, Justus von Freeden (FRA)

Organises and supervises the implementation of the non-research tasks of the project and the compliance of the activities to be carried out with the GA. Nominates Deliverable Reviewer.

Members: STM, QRM and WP leaders

Reports to PMT in every 2 months

Scientific & Technical Manager (STM): Justus von Freeden (FRA)

The STM will monitor the technical objectives of the project, ensuring that the technical objectives are met, while also overseeing the visibility and promotion of the project. The STM will work together with the technical managers, composed of members appointed by each WPL, to support all technical decisions.

Reports to TB every 2 months.

Quality and Risk Identification Manager (QRM): Árpád Horánszky (BZN)

Prepare the project's Quality and Risk Management Plan and ensure its updating. Organize the implementation of the plan. Collect from WP managers every 3 months the risks encountered during the project implementation, their classification and recommendations for their management, assess the effectiveness of previous risk minimisation activities and present them to the TB.

Reports to TB every 2 months.

Technical Work Package Leaders (WPLs): José Espi (EUR, WP1), Yvonne Aitomäki (RISE, WP2), Marco Groß (EDAG, WP3), Christian Hanneman (FRA, WP4), Ahmed Elmarakbi (UNN, WP5), Ricardo del Valle (BAX, WP6), Daniel Nebel (FRA, WP7)

Monitor and control the progress of WP leded by them. Organise regular meetings, ensure achievement of objectives participate of work of TB and SC.

Reports to TB every 2 months.

Innovation Board (IB): Leader, Ricardo del Valle (Bax)

Evaluates new innovations created by the project.

Members: Innovation and Exploitation Manager (IEM), DCM and QSDM

Innovation and Exploitation Manager (IEM):

The IEM will mobilise and harness the creative skills of the partners to continuously develop ZEvRA, and aims to support the consortium in developing their business plans and market access strategies, while managing intellectual property aspects. The SC will be consulted on IPR issues. The IEM will ensure the proper and effective implementation of the project exploitation strategy, including the market access strategy as defined in Annex 1 and updated from WP6, the assessment of the market impact of the technologies, business development strategies and training materials for all use cases, use case scaling strategies, and opportunities to attract investment and further increase TRL.

Reports to PMT, every 3 months.

Dissemination and Communication Manager (DCM): Cindy Jung (FRA)

DCM is responsible for the main dissemination and communication activities. The DCM, in cooperation with the IEM, reports to the PMT and is responsible for the further development of dissemination strategies. This includes the definition of target groups, dissemination routes, development and approval of dissemination materials.

Reports to PMT, IB every 3 months.

Open Sciences and Data Management Data Manager (OSDM): Emma Arussi (Bax)

Responsible for the collection, management and sharing of data, controls the protection of data during collection, processing, analysis and backup. Also ensures that the data complies with legal requirements, monitors and evaluates the performance of databases, creates new databases and improves the efficiency of database tools and services. Where appropriate, OSDM involves stakeholders in the joint development of R&I agendas and content. In cooperation with WP6 participants, OSDM manages data related to 26standardization.

Reports to PMT, IB every 3 months

Steering Committee (SC): Chaired by Daniel Nebel (FRA)

The SC is created to have an effective and responsive decision-making process and to report to the EB. Other partners might be invited to attend the meetings based on the status and information needed at the time. Overall project's progress and achievements will be discussed in the SC meetings. The SC has the final responsibility for all technical, financial, administrative, exploitation and dissemination aspects. The SC decides on aspects related to: Major changes in WPs; Preparation and final approval of the annual implementation plan prior to submission to the EC; Budget-related matters; Designation of trustees in accordance with the CA. The SC will also be responsible for: Supervising the project progress, approving progress reports, and resolving conflict issues if exist; Making decision on strategic issues; Approving the project quality plan, milestone plans, and deliverables; Monitoring delivery of the impact plan, dissemination and exploitation activities. Support work of ESB.

Meets 4 times a year.

Members are WP leaders, Skoda, Stellantis, Benteler, Faurecia.

Reports to EB

External Stakeholders Board (ESB): Chaired by a selected member

Meets Semi-annually

The ESB will be an integral part of ZEvRA. It consists of scientific and technological experts and its key tasks are to: Advise on strategic devolvement decisions; Advise on issues pertaining to handling and protection of IP and requirements on implementation implied by an efficient IPR management; Facilitate contacts to related national and international programs; Act as ambassador for ZEvRA. The ESB will meet twice a year, with additional meetings as needed. The ESB organises its work as it sees fit in terms of choosing a Chair or other function that it deems necessary. The PMT will attend the meetings; provide a secretary and other support functions as needed.

4.2 Innovation Management

The goal is to increase innovation capacity and innovation results in terms of intellectual property, new ventures, commercialised products/services, and examples of use and other technical outputs of working group partners; to increase the overall innovation competence of ZEvRA; to improve and implement policies for IPR and innovation governance; and to increase the capacity to act in line with EU stakeholder priorities and EU strategy. This will lead to improved innovation capacity, including better central awareness of innovation results and opportunities, better allocation of competences for innovation management, and closer links between the project and external market opportunities. The IEM (BAX) leading the IB will represent innovation issues and perspectives in the PMT, where operational innovation support measures will be informed and recorded. As a member of the PMT, the IEM will also participate in the SC and will be responsible for making recommendations to the ZEvRA management on the development of the project in relation to technical WPs based on innovation potential. The governance structure of the project is designed to prioritise industrial needs and thus the market uptake of the project results.

4.3 Consortium Agreement

Before the start of the project work, the PMT elaborated the CA that has been signed by all partners. It regulates all issues that may arise between partners during the implementation of the project or as consequence of the project after its completion. The PMT will be in continuous contact with the WPLs to keep a close watch on the project progress. In case there is a deviation from the work plan, the PMT will initiate corrective actions through the WPLs, who will be responsible to implement these actions.

5 Monitoring and reporting of technical progress

5.1 Planning and development of deliverables

Project deliverables were defined in the proposal and recorded in GA “List of work packages” tables with scheduling and responsibilities (Lead beneficiary). Any changes require addendum.

The format is specified by “Template of deliverables” for each.

It is consistent with the work specifications and associated tasks, ensuring that the results are fully in line with the target system defined at the project design stage. Not only must the requirements of the GA and CA be fully met, but the interdependency of the tasks must be such that they are completed in a form and content that ensures that subsequent tasks build on the previous deliverables.

The outputs (data, description, reports etc.) should be clear, concrete and easy for users to understand. Lead beneficiaries (LB) and dedicated task teams write draft version and send to Coordinator and PMT at latest three weeks before the due date of deliverable via e-mail for quality assurance. After revising PMT send back to LB with comments 2 weeks before due date. LB send final version to PMT 1 week before due date in editable and pdf form as well.

The Coordinator submit all deliverables on the F&T platform.

5.2 Progress monitoring and reporting

5.2.1 Reporting and quality monitoring

The project reporting is in line with the deadlines set in the GA and the content defined by the Funding & Tenders portal. In order to monitor the accurate and up-to-date funding situation, the partners will prepare financial reports on their expenditure every 6 months and send them to the coordinator.

Finance reports to be electronically signed by each beneficiary in the Portal and then submitted for the whole consortium by the coordinator after 18 and 36 months (always together with a technical report), 60 days after end of reporting period, funding is then released 90 days after receiving the reports. PMT has the right to ask ad hoc report from any partner(s) in any issue if it needed, and the partner(s) concerned must send the ad hoc report to the PMT within a maximum of two weeks.

5.2.2 Communication flow and meetings

Communication throughout the project will be mainly electronic. Between the consortium and the promoter via the official portal by the coordinator. Within the consortium, mostly through online meetings with reminders, e-mail communication and face-to-face meetings with reminders.

The PMT and WPLs will meet online at least every month, without excluding the possibility of carrying out physical meetings. In order to support the efficient implementation of the project, different types of business management tools will be used to facilitate the engagement of partners and monitor the overall performance of the work plan, this includes specific apps and databases which will be also available at the SharePoint (T7.4). An intensive kick-off meeting will ensure that partners are comfortable working together and ready for a successful collaboration. Further communication will be facilitated by phone and e-mail contact. Many ZEvRA partners have worked together in the past in the framework of the European Lightweight Cluster Alliance (ELCA), which will facilitate a robust start and fruitful cooperation.

5.2.3 Preparation of deliverables, technical progress, peer reviews and milestones

The preparation of deliverables will follow 5 consequent phases:

1. **< 2 month before submission:** Lead Beneficiary (LB) starts drafting the deliverable including a table of content. Technical aspects are discussed in advance with the WPLs and task participants. The QRM revise and provides recommendations before approving the table of content. Once approved, task participants provide the information required by the table of content and the LB elaborates the whole content and prepares a preliminary version.
2. **< 4 weeks before submission:** LB sends the preliminary complete version (100%) to PC, STM, QRM and the designated deliverable reviewer. The deliverable reviewer provides feedback, which is double-checked and confirmed by QRM/STM who carry out a second review and sent back to the deliverable reviewer. The Deliverable Reviewer summarises all feedback.
3. **At the latest 2 weeks before submission:** Deliverable reviewer provide feedback to LB. LB works on the comments within the following 5 days before circulating the final version to all involved partners.
4. **1 week before submission:** LB then sends the final Deliverable to Coordinator for final check. The LB is available for queries and to provide missing points until the final submission. **The Coordinator submits** the Deliverables in the EC Portal.

For each of the phases described above, the LB (author and main owner of the deliverable) and WPL will be make sure that high quality outcomes are presented. Any delay or and low-quality

will be reported to the PMT. Furthermore, any kind of issue or problem should be immediately reported by the LB to the STM and QRM. The STM and QRM will be informed at all times during the phases explained above so they have enough time to react to any potential problem (technical and non-technical) that might disturb the work progress or timely submission of a deliverable. The STM and QRM will work hand in hand to resolve any potential issue attending to the following mitigation actions:

1. The STM and QRM will contact the LB (author of the deliverable) to discuss the problem and potential solutions in a timely manner, avoiding at all times any kind of delay in the submission. Related WPLs will be informed.
2. If the issue can't be resolved, the STM and QRM will raise the issue to the PMT and the SC if the problems persist.
3. If a decision cannot be made or agreed upon, the PC will contact the Project Officer (PO). This situation rarely occurs.

Each report must cover the full description of the work and its overall progress and include the following headings where applicable:

- Executive summary
- Progress made in relation to objectives and outcomes
- Explanation of the work carried out per task
- Expected Impact
- Dissemination and exploitation of results
- Communication activities
- Data managements plans and activities
- Follow up and plans according to comments and recommendation (if any)
- Risks or deviations from plans and associated mitigation actions (if any)

Peer reviewers are selected from the TB and will be responsible of evaluating the deliverable at least one month before submission. The LB that owns the deliverable owners can suggest a person from a beneficiaries to act as peer reviewer, previous consultation with the TB. The peer review process will be handled by at least one peer reviewer for each deliverable and completed at least 1 month before submission. The reviewers are expected to be selected according to their expertise and relevant knowledge in the domain of the deliverable. The authors and contributors of deliverables cannot participate in the peer review process.

WPLs are expected to manage and monitor activities of their tasks and communicate regularly with task leaders. WPLs will also manage the flow of information across other WPs while making sure that the work fits the WP plan consistently. At project level, the STM oversees all technical activities, monitoring progress, balancing the work of different WPs, and highlighting inconsistencies or deviations. Furthermore, the STM identifies developments and technologies

related to ZEvRA which will ensure that the technical work of the project meets the highest standard levels.

Regarding the milestones of the project, since these are directly linked to tasks, deliverables and success measurements, the STM will monitor process following the same procedures for deliverables.

5.2.4 Liaise with external Stakeholders Board (ESB) on technical matters

The aim of the ESB is to provide external advice with regards scientific, technical, business, sustainability and commercial aspects. The innovations of ZEvRA will be also validated by the ESB, which will be chaired by one of its members, elected during the ESB's first meeting. Besides punctual consultation, the ESB might also attend project meetings in order to be informed and give advices on the project's progress. According to this feedback, the consortium will adjust as appropriate. The names of ESB members will be identified by the PMT who will also prepare a description of a Terms of Reference for their role.

5.2.5 Periodic technical progress report

The PC is responsible of coordinating and submitting the deliverables to the EC portal. Before each project review (M18, M36), the PC provides a detailed report of the work carried per WP, including an overview of results that meet the objectives and a summary of key exploitable results.

6 Conclusions

In such a large project with many partners, different thematic aspects and different nationalities, a clear allocation of roles and good management are necessary. The scientific and technical guidelines supplement the Project Management Handbook (D71.) and place a stronger focus on the quality of the work carried out. The work package leaders and the scientific and technical manager play a key role here. The core task is to support the coordinator in the technical areas. The relevant committee is the Technical Board, which regularly discusses the scientific and technical progress of the project. This ensures that the organizational and overarching issues of project management do not become blurred with the scientific and technical aspects. This clear separation enables efficient project management.